DELPHI Collaboration **DELPHI 97-148 PROG-223**

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DELPHI
LongDST Content

Version 1.05

Description

Tz.Spassoff

Abstract

LongDST is the main data format of Delphi collaboration for the LEP1 leptonic data and early LEP2 data analysis. Its content may be subject to improvement and development. A regularly updated version of this note could be found at http://wwwcn.cern.ch/~spassoff/des/longdes.ps .

Contents

1 INTRODUCTION

The general structure of the DELPHI longDST data follows the rules of the ZEBRA I/O package FZ [1] and in this respect it is not different from the general structure of the other DELPHI data sets (RAW, TANAGRA, DST etc.). For every data structure there are two logical records – a pilot record in integer format followed by a data record containing the actual data as ZEBRA banks. These records may be related either to event data or to status information.

The event data records provide all data relative to the events. In this case the pilot records held an event summary while the ZEBRA data records contain more detailed information about the events. The longDST event data are written in the form of a single ZEBRA structure – one pilot record followed by one data record.

Interleaved with the actual event data some status records are written out at each change of a run. They provide a technical information on the running conditions of the detector modules or software processors. The status records are valid for all the events which follow until another status record is encountered.

The DELPHI longDST content is a subject of improvement and development reflecting the increasing ability of the Delphi analysis software to identify particles and secondary interactions in a reliable way. With any important change of the content of the longDST its version number is changing as well. The present description indicates in a clear way the new material of each consecutive version.

Pilot Record

The ZEBRA pilot record is aimed to contain sufficient information to determine if the data contained in the ZEBRA data record which follows are of any use for a given topic of interest. It includes information about the status of the processing, the event quality and topoligy as well as its global physics characteristics. The ZEBRA I/O package [2] reads first the pilot record and allows the user to examine its contents and to decide whether to load into the memory or skip the following record containing the actual ZEBRA data banks. This feature speeds up considerably the scanning through a sequential medium if only few events have to be selected. Subsequently when the list of these events is known the direct access organization of the DELPHI longDST data should be used instead.

All pilot records, whether containing status information or event data, have the same structure. They are formatted as a set of "blocklets" which are the minimum units of information accessed by a standard software. Each blocklet consists of a set of actual data words surrounded by a 3-word header defining the size of the blocklet and the origin of its data, and a 1-word trailer. The definition of a blocklet leaves the possibility not only to create an arbitrary number of levels of nesting for the blocklets, but also to drop or add blocklets to the original content without disturbing the rest of the pilot record.

The blocklet header consists of the blocklet wordcount WC which is a single word giving the total number of the 32-bit words in the blocklet, and two words identifying the blocklet (identifier and sub-identifier), giving the type and the source of the data and reporting errors if any. The blocklet type can be identified as well by a mnemonic character name (e.g. DAS, DANA, LEP etc.) atributted to each combination of identifier and subidentifier. The blocklet trailer contains once again the wordcount WC (as the first word of the blocklet) which allows the scan of the pilot record in forward and backward direction.

After the end of the last blocklet the pilot record contains a *zero* to indicate the end of the record.

The longDST pilot record contains the following blocklets :

- DAS blocklet (0.0) written on the main Raw data pilot by the Data Aquisition System during the data taking and copied subsequently on the longDST. It contains the experiment, run, file (tape) and event number, as well as the event date and time defined by the on-line system (or by the simulation). The processing status describes the stages of processing through which the event has passed and the corresponding information which exists in the event record. Set to 0 by DAS it is updated at the processing stages. The calibration status gives the list of detector modules for which a calibration has been done by setting bits to 0 or 1. The last two words are not always present in the blocklet.

- VERS blocklet (1.0) written on the pilot during the longDST creation. It contains the version numbers of the main identification packages used to produce the longDST as well as the general data processing identifier.

- NTRI blocklet (2.0) containing a reduced version of the TRIG blocklet created by the TRIGGER system during the data aquisition.

- IDEN blocklet (7.0) written in the pilot during the longDST creation. It contains the global results (for the event as a whole) of the processors for the identification of the muons, electrons, hadrons and other particles.

- DANA blocklet (8.0) created by the DELANA reconstruction program at the stage of the main event processing and copied on the longDST pilot. It contains the main results of the event reconstruction including the event quality and topology, as well as flags classifying the event as belonging to a given type.

- DPHA blocklet (9.0) containing information about the event type and team tagging as defined by the DELANA reconstruction program.

- SAT blocklet (11.1) containing information about the bhabha events accepted by the SAT detector.

- VSAT blocklet (11.2) containing information about the bhabha triggers in the VSAT detector.
- TRIG blocklet (12.0) containing a trigger information and created by the TRIGGER system during the data aquisition.
- TRGR blocklet (12.1) containing a higher level trigger information for T4 and T3 triggers. Created by the TRIGGER system during the data aquisition as well.
- DETV blocklet (13.4) containing the transformation matrix from the OD detector reference frame to the Delphi general frame.
- DETP blocklet (13.5000) containing special information for the TPC detector.
- LEP blocklet (14.0) created by the Data Aquisition System and containing information about the configuration and the status of LEP at the moment of the data taking.
- TAG blocklet (15.N) where N is the number of Delphi physics teams (N$\leq$14), containing tagging words for each team.

Pilot blocklet access

When reading the longDST the pilot record information is contained in the vector IPILOT of the sequence /PHCDE/ of the ZEBRA I/O package PHDST [2]. The users can easily access different pilot blocklets using PHDST tools.

The following pilot record access tools are most appropriate :

- **IPHPIL** – search a blocklet address in the PILOT record by the integer blocklet type. The function allows to find the address of a given blocklet using the numerical blocklet identifiers :

  IADDR = IPHPIL (IDN1, IDN2)

  where

Input :	IDN1	–	blocklet identifier
	IDN2	–	blocklet sub-identifier
Output:	IADDR	–	blocklet address in the pilot
			-1 = not found
			-13 = contradiction encountered

- **IPHPIC** – search a blocklet address in the PILOT record by the character blocklet type. The function allows to find the address of a given blocklet using the mnemonic names logically connected to the numerical blocklet types.

  IADDR = IPHPIC (CTYPE, DUMMY)

  where

Input :	CTYPE	–	character blocklet identifier
	DUMMY	–	not used
Output:	IADDR	–	blocklet address in the pilot
			-1 = not found
			-13 = contradiction encountered

The address IADDR is pointing in front of the respective blocklet in the vector IPILOT, i.e. IPILOT (IADDR + 1) = Wordcount.

Data Record

The LongDST data record has the form of a very simple ZEBRA structure. Each event has one DTOP bank supporting a linear chain of vertex banks PV at its first structural link. In the same way each PV bank is supporting a chain of PA banks with information for the particles going out from this vertex, one bank per particle.

Up to the version 1.02 there are only two vertices on the longDST data structure for the real data (see PV BANK, page 48) as on the original fullDST :

- primary vertex (as defined by DELANA [4]) collecting all well converging to it particles PA. This vertex is identified by no status bit of the respective PV bank set and a mass code of the origin particle Q(LPV + 4) = 0.

- dummy vertex collecting the rest of the particles PA which do not converge to the primary one. For this vertex the status bit 1 is set and the mass code is Q(LPA + 4) = 999.

Since version 1.03 additional PV-PA structures are created for many well identified secondary interactions and decays as photon conversion, secondary hadronic interaction, V0 decay etc. While the format of the new PV and PA banks corresponds to the general one they have some particularities :

- photon conversion - a new PV vertex is build up at the photon conversion point as well as a photon track PA between the primary vertex and the new one which becomes an end vertex of that track. The status bit 3 of the new PV bank is set to 1 to indicate that the vertex is secondary and the photon identification bits 19-25 of the PA mass ambiguity code (see PA BANK, page 51) have a value of 21 to 24 for photon converted in front of the TPC. The charged tracks PA from the photon conversion are moved from the primary or dummy vertex to the new one without any changes of their parameters.

- secondary hadronic interaction - a new PA bank is lifted with an end PV vertex in the interaction point. The PA banks of the outgoing particles are moved to this PV. The new end PV is flagged as an hadronic one by setting up the third status bit. The bits 19-25 of the mass ambiguity code of the incoming PA are equal to 120. The incoming PA bank contains only the extra-module MAIN(0).

- VD only track - created when there is at least one hit in each Vertex Detector layer and no measurements in any other detector. A new PA bank supported by the dummy PV vertex of the event is lifted containing the MAIN(0) and TRAC(8) extra-modules. It can be identified by the bits 19-25 of its mass ambiguity code which are equal to 75 if the Z information is measured, or 77 otherwise.

- VD only track with hadronic vertex - a combination of the previous two cases. The PA bank of the incoming particle to the secondary hadronic interaction is dropped when a VD only track is found to match better this interaction and its end vertex is moved to the VD only track. The mass ambiguity code bits 19-25 are then changed from 75 to 124 or from 77 to 126.

- V^0 decay - a new PA bank is lifted for the V_0 neutral track (K^0 or Λ^0) with an end PV vertex to it at the V_0 decay point. The PV bank status bits 2 is set as for a secondary vertex and the mass ambiguity code bits 19-25 have the value 111 for K^0 and 112 for Λ^0. The PA banks of the decay particles are moved to the new V^0 vertex bank without any change of their parameters.

  This modification of the structure is done only if the V_0 is defined as "very tight" (see V0ID BANK, page 157) and the charged outgoing tracks are not considered as candidates for a secondary interaction. On the other hand tracks identified by the DELPHI analysis software as electrons (mass ambiguity code bits 19-25 equal to 28, 29 or 30) are not considered as possible V^0 decay products.

- HAC only track - a neutral track created when there is an appropriate shower in the Hadron Calorimeter. A new PA bank supported by the dummy PV vertex of the event is lifted. It contains the MAIN(0) and TRAC(8) extra-modules and the mass ambiguity code bits 19-25 are equal to 115 (the track is created since the longDST version 1.02 with TANAGRA identifier 7777777).

The TANAGRA identifier of the new tracks is unique but negative to indicate that the track has been created on the longDST level. It is composed by the mass ambiguity code plus thousend multiplied by the sequential number of the track if there is more than one particle with the same code in the event.

The PA bank includes information from different processors or detectors. This information is organized inside the bank in separate linear sections following one after another and called extra-modules. Each PA extra-module has an unique numerical label and a corresponding mnemonic character name. It contains the results of one processor or detector having a distinct physical nature. This internal organization of the PA bank contents is similar to the the pilot record blocklets and allows the flexibility to add or drop modules without disturbing the rest of the bank.

The following PA extra-modules are written at present on the longDST :

- MAIN (0) – contains the main kinemathical characteristics of the track.
- CCAL (1) – contains the combined showers in HCAL and HPC.
- EMCA (2) – contains an electromagnetic showers information.
- HCAL (3) – contains the hadronic showers information in HCAL.
- MU (4) – contains the Muon chambers information.
- EL (5) – contains extra EMF and HPC detector information.
- MRIC (6) – contains RICH liquid and gas radiator information.
- MTPC (7) – contains the dE/dx information for the tracks in TPC.
- TRAC (8) – contains the main track parameters after fitting.
- TOF (9) – contains time of flight information for the track.
- TDHA (11) – contains TD information for HCAL isolated tracks.
- TEID (12) – contains track elements TER in the Inner Detector.
- TETP (13) – contains track elements TER in the TPC Detector.
- TEOD (14) – contains track elements TER in the Outer Detector.
- TEFA (15) – contains track elements TER in the Forward Chamber A.
- TEFB (16) – contains track elements TER in the Forward Chamber B.
- TDID (17) – contains TD tracks for the Inner Detector calibration.
- TDID (18) – contains SAT detector shower information.

- STIC (19) – contains information for the STIC detector showers.
- TRAX (20) – contains track extrapolation information at detector surfaces.
- TERF (21) – contains track elements TER in the Forward RICH.
- EMNC (22) – contains condensed results of the electromagnetic calorimetry.
- HCNC (23) – contains condensed results of the hadron calorimetry after fixing (package HACFIX) and neutral shower correction (package HACCOR).
- MUID (24) – contains muon identification information after fixing (packages MUCFIX and MUFLAG).
- ELID (25) – contains electron identification information also after fixing (package ELEPHANT).
- HAID (26) – contains hadron identification information (package HADSIGN).
- MUFI (27) – contains the information from the muon chambers after muon refitting. It is written-out only for leptonic events.
- ELTR (28) – contains the track parameters (as module TRAC) refitted for the electron tracks.
- ODHI (29) – contains information for the Outer Detector hits.
- PHOT (30) – contains results of the photon and π^0 identification in HPC.
- OTRK (31) – contains the old parameters (as in modules MAIN and TRAC) of the tracks replaced by the ID−VD track search package IDVDANA.
- NMUS (32) – contains information from the surrounding muon chambers.
- SSTC (33) – contains condensed information form the STIC detector.
- HCRO (34) – contains HCAL cathode read-out information.
- TEST (41) – contains track elements TER in the Straw Tubes.
- TEVF (42) – contains track elements TER in the Very Forward Tracker.

The extra-modules with labels between 22 and 40 are created during the longDST production. The others are created at previous stages of data processing and copied to the longDST. While the extra-module MAIN is always present, as well as the extra-modules TRAC for the charged tracks, the others are written out only if the respective information exists.

Besides the PA bank many other banks are created or copied during the longDST production. They contain an information which could not be reffered to one PA track only but concerns the event as a whole. As for the PA bank their supporting bank is DTOP.

Data structure access

When reading the longDST the data record information is contained in the ZEBRA storage residing in the /PHCDE/ sequence of the ZEBRA I/O package PHDST [2]. The users can access different banks using the ZEBRA structural links, e.g. the primary vertex is at address LPV = LQ(LDTOP–1) and each consecutive vertex (if any) at LPV = LQ(LPV) along the linear chain of vertex banks. The particle banks PA are supported by the vertex from which they are comming out and their address is LPA = LQ(LPV–1) the next particle from the same vertex being at LPA = LQ(LPA).

The PA bank extra-modules can be accessed using the PHDST tools :

- **LPHPA** – get the address of a PA bank extra-module using the character module type (name). The calling syntax of this function is :

  L = LPHPA (CHID, LPA, NUM)

  where

Input :	CHID	–	character string specifying the extra-module name
	LPA	–	ZEBRA address of the PA bank
	NUM	–	module number (if many)
Output:	L	–	address of the extra-module = 0 if not found

- **LPHPAN** – get the address of a PA bank extra-module using its label number. The calling syntax of this function is :

  L = LPHPAN (LPA, NUM)

  where

Input :	LPA	–	ZEBRA address of the PA bank
	NUM	–	module label number
Output:	L	–	address of the extra-module = 0 if not found

The address L is pointing in front of the respective extra-module in the Q vector of ZEBRA, i.e. Q (L + 1) = Label of the module.

Status Records

Status records are written out by DAS for a change of run or file, and by the off-line to indicate the start or end of a program run. The start records provide information remaining unchanged for all events which follow until a new start record is encountered. The end records point out the end of validity of the current start information and contain statistics related to the events since the last start record.

On the longDST the following status records are written :

– SOR (Start Of Run), status at each start of a new DAS run

– BOF (Begining Of File), status at each start of a new file (tape)

– SOS (Start Of Simulation), start status for simulation

– EOS (End Of Simulation), end status for simulation

The content of the SOR and BOF status records is described in Appendix A (page 179), of the SOS record - in Appendix B (page 181) and of the EOS record - in Appendix C (page 207) respectively.

Record type access

The different data and status records are distinguished by the record identifier contained in the word 4 of their first Pilot blocklet (DAS) which is always present. The integer identifier could be converted into a character name by the PHDST function :

- **PHRTY** – get character record type

Example:

```
      SUBROUTINE USER02
*
      IMPLICIT NONE
+CDE, PHCDE.
      CHARACTER*4 PHRTY
      CHARACTER*4 RECTYP
      ...............
*--   Check the record type
      RECTYP = PHRTY()
      IF ( RECTYP .NE. 'DST ' ) RETURN
      ...............
      END
```

PILOT RECORD
DAS blocklet(0.0)

+1	Wordcount	(12 or 14)
+2	Identifier (bits 1- 4)	(0)
	Error code (bits 5-32)	(usualy FF10)
+3	Sub-identifier	(0)
+4	Record type : 1 RAW (Raw Data)	
	2 SIM (Simulation)	
	3 TAN (Tanagra)	
	4 INT (Intermediate)	
	5 DST (DST or longDST)	
	11 SOR (Start Of Run)	
	16 SOS (Start Of Simulation)	
	61 BOF (Beginning of file)	
+5	Experiment number	
+6	Run number	
+7	File sequence number	
+8	T2 (trigger level 2) event number	
+9	Event number	
+10	Event date (format 'yymmdd')	
+11	Event time (format 'hhmmss')	
+12	Processing status (if wordcount >12)	
+13	Calibration status (if wordcount >12)	
+14	Wordcount	(12 or14)

PILOT RECORD
VERS blocklet(1.0)

+1	Wordcount	(8)
+2	Identifier (bits 1- 4)	(0)
	Error code (bits 5-32)	(usualy FF10)
+3	Sub-identifier	(0)
+4	bits 1-10 : DSTFIX version number	
	11-20 : AABTAG version number	
	21-30 : RECV0 version number	
+5	bits 1-10 : MUFLAG version number	
	11-20 : ELEPHANT version number	
	21-30 : HADIDENT version number	
+6	bits 1-10 : HACCOR version number	
	11-20 : DEDXID version number	
	21-30 : not used version number	
+7	Processing identifier 'YYLN' where :	
	YY is the year of data taking	
	L is the Full DST version letter	
	N is the Long DST version number	
+8	Wordcount	(8)

PILOT RECORD
NTRI blocklet(2.0)

+1	Wordcount	(23)
+2	Identifier (bits 1- 4)	(2)
	Error code (bits 5-32)	(usualy FF10)
+3	Sub-identifier	(0)
+4	PYTHIA 2nd level : input 1 from receiver	
+5	PYTHIA 2nd level : input 2 from receiver	
+6	PYTHIA 2nd level : input 3 from receiver	
+7	PYTHIA 2nd level : input 4 from receiver	
+8	Results from C after scaling, 2nd level	
+9	Trigger pattern, 2nd level	
+10	Trigger pattern, 2nd level	
+11	Trigger pattern, 2nd level	
+12	Trigger pattern, 2nd level	
+13	Majority pattern, 2nd level	
+14	Majority pattern, 2nd level	
+15	Output T3 trigger pattern	
+16	Output T3 trigger pattern	
+17	Output T3 trigger pattern	
+18	Output T3 trigger pattern	
+19	Output T3 majority pattern	
+20	Output T3 majority pattern	
+21	Output T3 DF pattern	
+22	Bunch number from VSAT (bits 1-30)	
	Trigger level 4 status flag (bits 31-32) :	
	0 – not operational	
	1 – operational	
	2 – status unknown	
+23	Wordcount	(23)

PILOT RECORD
IDEN blocklet(7.0)

+1	Wordcount		(19)
+2	Identifier (bits 1- 4)		(7)
	Error code (bits 5-32)		(usualy FF10)
+3	Sub-identifier		(0)
+4	Short DST version number +		
	$1000\times$date of production ('yymmdd')		
+5	Processing status bits (set to 1 or 0) :		
	bits	1 :	DSTFIX fixing code run
		2 :	Muon identification code run
		3 :	Electron identification code run
		4 :	Hadron identification cod run
		5 :	B tagging code run
		6-32 :	free
+6	Hadron selection bits (set to 0 or 1) :		
	bits	1 :	team 4 selection, number of charged tracks ≥ 5
		2 :	team 4 selection, charged energy ≥ 0.12 E(LEP)
		3 :	free
		4 :	free
		5 :	open selection, number of charged tracks ≥ 5
		6 :	open selection, charged energy ≥ 0.10 E(LEP)
		7 :	open selection, event thrust axes ≤ 0.95
		8 :	free
		9 :	Pch $\geq$0.2 GeV, number of charged tracks ≥ 7
		10 :	Pch $\geq$0.2 GeV, charged energy ≥ 0.15 E(LEP)
		11 :	Pch $\geq$0.2 GeV, Ech + Eneut ≥ 0.30 E(LEP)
		12 :	Pch $\geq$0.2 GeV, Efor, Eback ≥ 0.03 E(LEP)
		13 :	Pch $\geq$0.4 GeV, number of charged tracks ≥ 7
		14 :	Pch $\geq$0.4 GeV, charged energy ≥ 0.15 E(LEP)
		15 :	Pch $\geq$0.4 GeV, Ech + Eneut ≥ 0.30 E(LEP)
		16 :	Pch $\geq$0.4 GeV, Efor, Eback ≥ 0.03 E(LEP)
		7-32 :	free

PILOT RECORD
IDEN blocklet(7.0)

cont.

+7		Muon identification (bitted word) :
	bits 1- 3 :	number of muons (OR of all types, P > 2 GeV)
	4- 6 :	number of muons loose, standard and tight
	7- 9 :	number of muons loose
	10-12 :	number of muons standard
	13-15 :	number of muons tight
	16-18 :	number of muons hadronic
	19-25 :	most energetic muon momentum $\times$ 10, all types
	25-32 :	most energetic muon momentum $\times$ 10, standard
+8		Electron identification (bitted word) :
	bits 1- 3 :	number of electrons (OR of all types, P > 1 GeV)
	4- 6 :	number of electrons loose
	7- 9 :	number of electrons standard
	10-12 :	number of electrons tight
	13-15 :	number of electrons loose, standard and tight
	19-25 :	most energetic electron momentum $\times$ 10, all types
	26-32 :	most energetic electron momentum $\times$ 10, all types
+9		Hadron identification (bitted word) :
	bits 1- 3 :	number of kaons loose
	4- 6 :	number of kaons standard
	7- 9 :	number of kaons tight
	10-12 :	number of protons loose
	13-15 :	number of protons standard
	16-18 :	number of protons tight
	19-25 :	most energetic Kaon momentum $\times$ 10, all types
	26-32 :	most energetic Proton momentum $\times$ 10, standard
+10		V^0 reconstruction bits :
	bits 1- 4 :	number of V^0 tight
	5- 9 :	number of V^0 loose
	10-32 :	free
+11		Charged multiplicity in hemispheres :
	bits 1- 6 :	multiplicity in hemisphere 1
	7-23 :	multiplicity in hemisphere 2
	13-32 :	free

PILOT RECORD
IDEN blocklet(7.0)

cont.

+12	Energy in hemisphere 1, method 1 (Calorimeters)	$\times 10^5$	
+13	Energy in hemisphere 1, method 2 (Ch.tr.,neut.sh.)	$\times 10^5$	
+14	Energy in hemisphere 2, method 1 (Calorimeters)	$\times 10^5$	
+15	Energy in hemisphere 2, method 2 (Ch.tr.,neut.sh.)	$\times 10^5$	
+16	X)		
+17	Y) $\Rightarrow$ components of the missing P		
+18	Z)		
+19	Wordcount		(19)

PILOT RECORD
DANA blocklet(8.0)

+1	Wordcount	(54)
+2	Identifier (bits 1- 4)	(8)
	Error code (bits 5-32)	(usualy FF10)
+3	Sub-identifier	(0)
+4	Detectors in the central partition (bitted word)	
+5	Reconstruction status bits − each bit indicates which detector/processor has been processed in DELANA :	

bits 4 : VD	bits 14 : HAB	bits 24 : SAT
5 : ID	15 : MUB	25 : LUM
6 : TPC	18 : MUS	26 : FCB
7 : RIB	19 : STIC	27 : EMF
9 : OD	21 : FCA	30 : HOF
10 : HPC	22 : RIF	31 : MUF
12 : TOF	23 : HAF	

+6 Run statistics :

bits 1-16 : number of Z^0 hadronic so far in the run

17-32 : number of Bhabha so far in the run

+7 Atmospheric presure

+8 X)

+9 Y) ⇒ primary vertex coordinates (in μm)

+10 Z)

+11 Event topology at primary vertex (bitted word) :

bits 1- 8 : neutrals

9-16 : gammas

17-24 : negative particles

25-32 : positive particles

+12 Not yet set

+13 Energy in the Center of Mass from LEP (in MeV)

+14 Date of processing ('yymmdd')

+15 Time of processing ('hhmmss')

+16 Magnetic filed measured (bitted word) :

bits 1-24 : magnet power supply current (Amps)

: or field (Gauss)

25 : 0 if the current measured

1 if the field measured

+17 Outer detector time flag :

−1 unknown

0 event in time with BCO

1 cosmic (not in time with BCO)

PILOT RECORD
DANA blocklet(8.0)

cont.

+18	DELANA tagging bits :	
	bits 1 = 1	if hadronic Z^0
	2 = 1	if leptonic Z^0
	3 = 1	if ambiguous Z^0
	4 = 1	if cosmic or beam gas
	5 = 1	if SAT bhabha
	6 = 1	if calibration
	7 = 1	if unknown
	11 = 1	if single e^+ or e^- (low energy)
	12 = 1	if compton
	13 = 1	if STP event 2 tracks Barrel
	14 = 1	if STP event 2 elm.showers Barrel
	15 = 1	if STP event 2 tracks Forward
	16 = 1	if STP event 2 elm.showers Forward
	17 = 1	if Forward e^+e^- without tracks
	18 = 1	if Extra Tau event
	19-24 = 1	special flags for teams
	25-32 = 0	free
+19	DELANA cradle date	
+20	Reserved	
+21	LEP status	
+22	LEP colimator status	
+23	Status of Data Base and related information (bitted word) :	
	bits 1 = 1	data base available
	2 = 1	trigger partition available
	3 = 1	discrepency in FILL number
	4 = 1	discrepency in LEP status
	5 = 1	discrepency in colimator status
	6 = 1	Ebeam from data base
	7 = 1	Ebeam from first estimate in Trigger Partition
	8 = 1	Ebeam from final estimate in Trigger Partition
	9 = 1	Ebeam from data cards
	10 = 1	Magnet current from data base
	11 = 1	Magnet current from Trigger Partition
	12 = 1	Magnet current from data cards
	13-32 = 0	free

PILOT RECORD
DANA blocklet(8.0)

cont.

+24	MUB information
+25	MUB information
+26	VD status word (bitted) :
	bits 1- 4 : status flag 1
	5- 8 : status flag 2
	9-32 : detector user bits
+27	ID status word (bitted) :
	bits 1- 4 : status flag 1
	5- 8 : status flag 2
	9-32 : detector user bits
+28	TPC status word (bitted) :
	bits 1- 4 : status flag 1
	5- 8 : status flag 2
	9-32 : detector user bits
+29	RIB status word (bitted) :
	bits 1- 4 : status flag 1
	5- 8 : status flag 2
	9-32 : detector user bits
+30	free
+31	OD status word (bitted) :
	bits 1- 4 : status flag 1
	5- 8 : status flag 2
	9-32 : detector user bits
+32	HPC status word (bitted) :
	bits 1- 4 : status flag 1
	5- 8 : status flag 2
	9-32 : detector user bits
+33	HPC information
+34	TOF status word (bitted) :
	bits 1- 4 : status flag 1
	5- 8 : status flag 2
	9-32 : detector user bits
+35	HAB status word (bitted) :
	bits 1- 4 : status flag 1
	5- 8 : status flag 2
	9-32 : detector user bits
+36	HAB information

PILOT RECORD
DANA blocklet(8.0)

cont.

+37	MUB status word (bitted) : bits 1- 4 : status flag 1 5- 8 : status flag 2 9-32 : detector user bits
+38	MUB information
+39	MUB information
+40	MUB information
+41	VSAT status word (bitted) : bits 1- 4 : status flag 1 5- 8 : status flag 2 9-32 : detector user bits
+42	HAC status word (bitted) : bits 1- 4 : status flag 1 5- 8 : status flag 2 9-32 : detector user bits
+43	FCA status word (bitted) : bits 1- 4 : status flag 1 5- 8 : status flag 2 9-32 : detector user bits
+44	RIF status word (bitted) : bits 1- 4 : status flag 1 5- 8 : status flag 2 9-32 : detector user bits
+45	HAF status word (bitted) : bits 1- 4 : status flag 1 5- 8 : status flag 2 9-32 : detector user bits
+46	SAT status word (bitted) : bits 1- 4 : status flag 1 5- 8 : status flag 2 9-32 : detector user bits
+47	VSAT status word (bitted) : bits 1- 4 : status flag 1 5- 8 : status flag 2 9-32 : detector user bits

PILOT RECORD
DANA blocklet(8.0)

cont.

+48	FCB status word (bitted) :	
	bits 1- 4 : status flag 1	
	5- 8 : status flag 2	
	9-32 : detector user bits	
+49	EMF status word (bitted) :	
	bits 1- 4 : status flag 1	
	5- 8 : status flag 2	
	9-32 : detector user bits	
+50	FCB information	
+51	SAT information	
+52	HOF status word (bitted) :	
	bits 1- 4 : status flag 1	
	5- 8 : status flag 2	
	9-32 : detector user bits	
+53	MUF status word (bitted) :	
	bits 1- 4 : status flag 1	
	5- 8 : status flag 2	
	9-32 : detector user bits	
+54	Wordcount	(54)

PILOT RECORD
DANI blocklet(8.1)

+1	Wordcount	(5)
+2	Identifier (bits 1- 4)	(8)
	Error code (bits 5-32)	(usualy FF10)
+3	Sub-identifier	(1)
+4	Processing identifier 'YYD ' where :	
	YY is the year of data taking	
	L is the DELANA processing version	
+5	Wordcount	(5)

PILOT RECORD
DPHA blocklet(9.0)

+1	Wordcount	(43)
+2	Identifier (bits 1- 4)	(9)
	Error code (bits 5-32)	(usualy FF10)
+3	Sub-identifier	(0)
+4	Event type (bitted word):	

bits 1 = 1 the type is defined
2 = 1 background event
3 = 1 cosmic event
4 = 1 beam-gas interaction
5 = 1 $\gamma\gamma$ or 3γ candidate
6 = 0 free
7 = 0 free
8 = 1 $\mu^+\mu^-$ candidate
9 = 1 e^+e^- candidate
10 = 1 $\tau^+\tau^-$ candidate
11 = 0 free
12 = 0 free
13 = 1 $e^+e^- \to \gamma\gamma$ candidate
14 = 0 free
15 = 0 free
16 = 1 $q\bar{q}$ candidate
17 = 1 $u\bar{u}$ and $d\bar{d}$ candidate
18 = 1 $s\bar{s}$ candidate
19 = 1 $c\bar{c}$ candidate
20 = 1 $b\bar{b}$ candidate
21 = 1 $t\bar{t}$ candidate
22 = 0 free
23 = 0 free
24 = 1 large missing energy event
25 = 1 large sphericity event
26 = 1 high energy isolated γ event
27 = 1 high energy isolated lepton event
28 = 0 free
29 = 0 free
30 = 0 free
31 = 0 free
32 = 0 free

PILOT RECORD
DPHA blocklet(9.0)

cont.

+5	Total reconstructed energy (Mev)
+6	Total reconstructed Px (Mev/c)
+7	Total reconstructed Py (Mev/c)
+8	Total reconstructed Pz (Mev/c)
+9	Sphericity $\times$ 1000
+10	Trust $\times$ 1000
+11	Team tagging (bitted word):
	bits 1 = 1 event tagged by Team 1
	2 = 1 event tagged by Team 2
	3 = 1 event tagged by Team 3
	4 = 1 event tagged by Team 4
	5 = 1 event tagged by Team 5
	6 = 1 event tagged by Team 6
	7 = 1 event tagged by Team 7
	8 = 1 event tagged by Team 8
	9 = 1 event tagged by Team 9
	10 = 1 event tagged by Team 10
	11 = 1 event tagged by Team 11
	12 = 1 event tagged by Team 12
	13 = 1 event tagged by Team 13
	14 = 1 event tagged by Team 14
+12	Number of charged tracks from a vertex at $R\leq4.$ and $Z\leq10.$
+13	Energy of charged tracks from a vertex at $R\leq4.$ and $Z\leq10.$
+14	Number of charged tracks from a vertex at $R>4.$
+15	Energy of charged tracks from a vertex at $R>4.$
+16	Number of charged tracks from a vertex at $R\leq4.$ and $Z>10.$
+17	Energy of charged tracks from a vertex at $R\leq4.$ and $Z>10.$
+18	Number of HPC showers associated with charged tracks
+19	Energy of HPC showers associated with charged tracks
+20	Number of neutral HPC showers identified as photon
+21	Energy of neutral HPC showers identified as photon
+22	Number of neutral HPC showers not identified as photon
+23	Energy of neutral HPC showers not identified as photon
+24	Number of HAC showers associated with charged tracks
+25	Energy of HAC showers associated with charged tracks
+26	Number of neutral HAC showers with $E>1.$ GeV
+27	Total energy of neutral HAC showers with $E>1.$ Gev
+28	Number of neutral HAC showers with $E<1.$ GeV
+29	Total energy of neutral HAC showers with $E<1.$ Gev

PILOT RECORD
DPHA blocklet(9.0)

cont.

+30	Number of EMF showers associated with charged tracks	
+31	Energy of EMF showers associated with charged tracks	
+32	Number of neutral EMF showers identified as photon	
+33	Energy of neutral EMF showers identified as photon	
+34	Number of neutral EMF showers not identified as photon	
+35	Energy of neutral EMF showers not identified as photon	
+36	Number of CCA showers associated with charged tracks	
+37	Energy of CCA showers associated with charged tracks	
+38	Number of neutral CCA showers	
+39	Energy of neutral CCA showers	
+40	Number of neutral CCA showers identified as charged by HAC	
+41	Energy of neutral CCA showers identified as charged by HAC	
+42	Total energy of the event (sum of 13, 15, 17, 21, 27, 29, 33, 35 and 39)	
+43	Wordcount	(43)

PILOT RECORD
SAT blocklet(11.1)

+1	Wordcount	(13)
+2	Identifier (bits 1- 4)	(11)
	Error code (bits 5-32)	(usualy FF10)
+3	Sub-identifier	(1)
+4	Number of Bhabha events accepted since the previous event has been written to the output	
+5	Number of Bhabha events accepted in BCO−1 since the previous event has been written to the output	
+6	*Idem* for BCO−2	
+7	*Idem* for BCO−3	
+8	*Idem* for BCO−4	
+9	*Idem* for BCO−5	
+10	*Idem* for BCO−6	
+11	*Idem* for BCO−7	
+12	*Idem* for BCO−8	
+13	Wordcount	(13)

PILOT RECORD
VSAT blocklet(11.2)

+1	Wordcount	(24)
+2	Identifier (bits 1- 4)	(11)
	Error code (bits 5-32)	(usualy FF10)
+3	Sub-identifier	(2)
+4	Number of Bhabha triggers in arm 1	
+5	Number of Bhabha triggers in arm 2	
+6	Total number of Bhabha triggers in both arms	
	The following words refer to events above the treshold :	
	– energy deposition in 2 opposite modules $\geq$ *0.8*$\times E_{beam}$	
	– the two electrons are in the VSAT fiducial volume	
+7	*Idem* as 4 for events above the treshold	
+8	*Idem* as 5 for events above the treshold	
+9	*Idem* as 6 for events above the treshold	
	The **false** *Bhabha events refer to background ones :*	
	2 not Bhabha electrons in coincidence	
	in 2 opposite modules	
+10	Number of **false** Bhabha triggers in arm 1	
+11	Number of **false** Bhabha triggers in arm 2	
+12	Total number of **false** Bhabha triggers in both arms	
+13	Number of **false** Bhabha triggers in arm 1 above the treshold	
+14	Number of **false** Bhabha triggers in arm 2 above the treshold	
+15	Total number of **false** Bhabha triggers in both arms above the treshold	
+16	Number of corrupted Bhabha events in arm 1	
+17	Number of corrupted Bhabha events in arm 2	
+18	Number of corrupted **false** Bhabha events in arm 1	
+19	Number of corrupted **false** Bhabha events in arm 2	
+20	Number of corrupted DELPHI events (one DELPHI event can contain one or more VSAT events)	
+21	Number of not identified false Bhabha events	
+22	Total number of corrupted Bhabha events	
+23	Not used	
+24	Wordcount	(24)

PILOT RECORD
TRIG blocklet(12.0)

+1	Wordcount	(69)
+2	Identifier (bits 1- 4)	(12)
	Error code (bits 5-32)	(usualy FF10)
+3	Sub-identifier	(0)
+4	B1 trigger (from scalers)	
+5	PYTHIA 1st level : input 1 from receiver	
+6	PYTHIA 1st level : input 2 from receiver	
+7	PYTHIA 1st level : input 3 from receiver	
+8	PYTHIA 1st level : input 4 from receiver	
+9	Output from A module, 1st level	
+10	Output from A module, 1st level	
+11	Output from A/B module, 1st level	
+12	Output from A/B module, 1st level	
+13	B1 forward majority trigger (from scalers)	
+14	PYTHIA 2nd level : input 1 from receiver	
+15	PYTHIA 2nd level : input 2 from receiver	
+16	PYTHIA 2nd level : input 3 from receiver	
+17	PYTHIA 2nd level : input 4 from receiver	
+18	Output from A module, 2nd level	
+19	Output from A module, 2nd level	
+20	Output from A/B module, 2nd level	
+21	Output from A/B module, 2nd level	
+22	Input module C, 1st level	
+23	Results from C, 1st level	
+24	Results from C after mask, 1st level	
+25	Results from C after scaling, 1st level	
+26	Trigger pattern, 1st level	
+27	Trigger pattern, 1st level	
+28	Trigger pattern, 1st level	
+29	Trigger pattern, 1st level	
+30	Majority pattern, 1st level	
+31	Majority pattern, 1st level	
+32	Input module C, 2nd level	
+33	Results from C, 2nd level	
+34	Results from C after mask, 2nd level	
+35	Results from C after scaling, 2nd level	
+36	Trigger pattern, 2nd level	
+37	Trigger pattern, 2nd level	
+38	Trigger pattern, 2nd level	
+39	Trigger pattern, 2nd level	

PILOT RECORD
TRIG blocklet(12.0)

cont.

+40	Majority pattern, 2nd level	
+41	Majority pattern, 2nd level	
+42	B1 pattern	
+43	Internal T3 trigger pattern	
+44	Internal T3 trigger pattern	
+45	Internal T3 trigger pattern	
+46	Internal T3 trigger pattern	
+47	Internal T3 majority pattern	
+48	Internal T3 majority pattern	
+49	Internal T3 DF pattern	
+50	Output T3 trigger pattern	
+51	Output T3 trigger pattern	
+52	Output T3 trigger pattern	
+53	Output T3 trigger pattern	
+54	Output T3 majority pattern	
+55	Output T3 majority pattern	
+56	Output T3 DF pattern	
+57	TPC tagging	
+58	Bunch number from VSAT	
+59	Bunch number from UNG_CLK_BCO	
+60	Vernier scan (bitted) :	
	bits 1- 2 : start of scan	
	3- 4 : end of scan	
	5- 8 : detector identification	
	9-32 : step	
+61	First level prescaling factors	
+62	First level prescaling factors	
+63	First level prescaling factors	
+64	First level prescaling factors	
+65	Second level prescaling factors	
+66	Second level prescaling factors	
+67	Second level prescaling factors	
+68	Second level prescaling factors	
+69	Wordcount	(69)

PILOT RECORD
TRGR blocklet(12.1)

+1	Wordcount		(7)
+2	Identifier (bits 1- 4)		(12)
	Error code (bits 5-32)		(usualy FF10)
+3	Sub-identifier		(1)
+4	T4 tag :		
	bits 1 :	T4 HPC	
	5 :	T4 EMF	
	9 :	T4 TPC	
	13 :	T4 STIC	
	17 :	Team tag	
	21 :	T3 tag	
	25 :	T4 Pass	
	29 :	T4 Delana	
		or	
	1-32 :	= 0 if no Tag set by T4	
	1-32 :	=-1 if T4 not there	
+5	T3 single gamma bits :		
	bits 2 :	Bhabha	
	15-16 :	Single Gamma	
		or	
	1-32 :	=-1 if no T3 Trigger bank	
+6	T3 TPC tag :		
	bits 1- 8 :	HAD tag	
	9-16 :	LEP tag	
	17-24 :	LLB tag	
	25-32 :	TPC tag	
		or	
	1-32 :	=-1 if no T3 Trigger bank	
+7	Wordcount		(7)

PILOT RECORD
DETV blocklet(13.4)

+1	Wordcount	(16)
+2	Identifier (bits 1- 4)	(13)
	Error code (bits 5-32)	(usualy FF10)
+3	Sub-identifier -	(ID)
	Module identifier ID of the detectors [1]	
	for which the transformation matrix is given :	

3 : VD	8 : OD	14 : MUB	21 : RIF	25 : FCB
4 : ID	9 : HPC	17 : MUS	22 : HAF	26 : EMF
5 : TPC	11 : TOF	18 : STIC	23 : SAT	29 : HOF
6 : RIB	13 : HAB	20 : FCA	24 : LUM	30 : MUF

Transformation matrix from a detector reference frame to the DELPHI general reference frame[2]

+4	Transformation matrix element 1	
⋮	⋮	
+15	Transformation matrix element 12	
+16	Wordcount	(16)

[1]The transformation matrix of the Inner Detector only is present in the LongDST Pilot.

[2]The transformation matrix elements are multiplied by 1000000 before being stored as integers.

PILOT RECORD
DETI blocklet(13.4000)

+1	Wordcount	(70)
+2	Identifier (bits 1- 4)	(13)
	Error code (bits 5-32)	(usualy FF10)
+3	Sub-identifier	(4000)
+4	bits 1-16 : T0 $\times$ 100	
	17-32 : T0_bpu $\times$ 100	
+5	bits 1-16 : Jet_pressure $\times$ 10000	
	17-32 : bpu_time $\times$ 100	
+6	bits 1-16 : Temp1 $\times$ 10000	
	17-32 : Atm_pressure $\times$ 10000	
+7	bits 1-16 : Temp(2) $\times$ 100	
	17-32 : Temp(1) $\times$ 100	
+8	bits 1-16 : Temp(4) $\times$ 100	
	17-32 : Temp(3) $\times$ 100	
+9	bits 1-16 : Temp(6) $\times$ 100	
	17-32 : Temp(5) $\times$ 100	
+10	bits 1-16 : Temp(8) $\times$ 100	
	17-32 : Temp(7) $\times$ 100	
+11	bits 1-16 : Temp(10) $\times$ 100	
	17-32 : Temp(9) $\times$ 100	
+12	bits 1-16 : Jet anode volts 2	
	17-32 : Jet anode volts 1	
+13	bits 1-16 : Jet anode volts 4	
	17-32 : Jet anode volts 3	
+14	bits 1-16 : Jet anode volts 6	
	17-32 : Jet anode volts 5	
+15	bits 1-16 : Jet anode volts 8	
	17-32 : Jet anode volts 7	
+16	bits 1-16 : Jet anode volts 10	
	17-32 : Jet anode volts 9	
+17	bits 1-16 : Jet anode volts 12	
	17-32 : Jet anode volts 11	
+18	bits 1-16 : Jet anode volts 14	
	17-32 : Jet anode volts 13	
+19	bits 1-16 : Jet anode volts 16	
	17-32 : Jet anode volts 15	
+20	bits 1-16 : Jet anode volts 18	
	17-32 : Jet anode volts 17	

PILOT RECORD
DETI blocklet(13.4000)

cont.

+21	bits	1-16 :	Jet anode volts 20
		17-32 :	Jet anode volts 19
+22	bits	1-16 :	Jet anode volts 22
		17-32 :	Jet anode volts 21
+23	bits	1-16 :	Jet anode volts 24
		17-32 :	Jet anode volts 23
+24	bits	1-16 :	Jet field shaping volts 2
		17-32 :	Jet field shaping volts 1
+25	bits	1-16 :	Jet field shaping volts 4
		17-32 :	Jet field shaping volts 3
+26	bits	1-16 :	Jet field shaping volts 6
		17-32 :	Jet field shaping volts 5
+27	bits	1-16 :	Jet field shaping volts 8
		17-32 :	Jet field shaping volts 7
+28	bits	1-16 :	Jet field shaping volts 10
		17-32 :	Jet field shaping volts 9
+29	bits	1-16 :	Jet field shaping volts 12
		17-32 :	Jet field shaping volts 11
+30	bits	1-16 :	Jet field shaping volts 14
		17-32 :	Jet field shaping volts 13
+31	bits	1-16 :	Jet field shaping volts 16
		17-32 :	Jet field shaping volts 15
+32	bits	1-16 :	Jet field shaping volts 18
		17-32 :	Jet field shaping volts 17
+33	bits	1-16 :	Jet field shaping volts 20
		17-32 :	Jet field shaping volts 19
+34	bits	1-16 :	Jet field shaping volts 22
		17-32 :	Jet field shaping volts 21
+35	bits	1-16 :	Jet field shaping volts 24
		17-32 :	Jet field shaping volts 23
+36	bits	1-24 :	Jet trigger bits
		25-32 :	not used
+37	bits	1-24 :	TL anode trigger bits
		25-32 :	not used
+38	bits	1-24 :	TL cathode trigger bits 1-24
		25-32 :	not used
+39	bits	1-24 :	TL cathode trigger bits 25-48
		25-32 :	not used

PILOT RECORD
DETI blocklet(13.4000)

cont.

+40	bits 1-32 : TL hit bits for layer 1	
+41	bits 1-32 : TL hit bits for layer 1	
+42	bits 1-32 : TL hit bits for layer 1	
+43	bits 1-32 : TL hit bits for layer 1	
+44	bits 1-32 : TL hit bits for layer 1	
+45	bits 1-32 : TL hit bits for layer 1	
+46	bits 1-32 : TL hit bits for layer 2	
+47	bits 1-32 : TL hit bits for layer 2	
+48	bits 1-32 : TL hit bits for layer 2	
+49	bits 1-32 : TL hit bits for layer 2	
+50	bits 1-32 : TL hit bits for layer 2	
+51	bits 1-32 : TL hit bits for layer 2	
+52	bits 1-32 : TL hit bits for layer 3	
+53	bits 1-32 : TL hit bits for layer 3	
+54	bits 1-32 : TL hit bits for layer 3	
+55	bits 1-32 : TL hit bits for layer 3	
+56	bits 1-32 : TL hit bits for layer 3	
+57	bits 1-32 : TL hit bits for layer 3	
+58	bits 1-32 : TL hit bits for layer 4	
+59	bits 1-32 : TL hit bits for layer 4	
+60	bits 1-32 : TL hit bits for layer 4	
+61	bits 1-32 : TL hit bits for layer 4	
+62	bits 1-32 : TL hit bits for layer 4	
+63	bits 1-32 : TL hit bits for layer 4	
+64	bits 1-32 : TL hit bits for layer 5	
+65	bits 1-32 : TL hit bits for layer 5	
+66	bits 1-32 : TL hit bits for layer 5	
+67	bits 1-32 : TL hit bits for layer 5	
+68	bits 1-32 : TL hit bits for layer 5	
+69	bits 1-32 : TL hit bits for layer 5	
+70	Wordcount	(70)

PILOT RECORD
DETP blocklet(13.5000)

Since the version 1.04

+1	Wordcount	(7)
+2	Identifier (bits 1- 4)	(0)
	Error code (bits 5-32)	(usualy FF10)
+3	Sub-identifier	(5000)
+4	Pressure in the TPC	
+5	Normalization used for the integerated dE/dx	
+6	Ratio (int.amplitude / max.amplitude)	
+7	Wordcount	(7)

PILOT RECORD
LEP blocklet(14.0)

+1	Wordcount	(variable)
+2	Identifier (bits 1- 4)	(14)
	Error code (bits 5-32)	(usualy FF10)
+3	Sub-identifier	(0)
+4	Date of last update ('yymmdd')	
+5	Time of last update ('hhmmss')	
+6	Fill number	
+7	LEP status as given by the machine (from 1 to 9)	
+8	LEP status derived from current, energy and collimator (DELPHI evaluation) : 1 = No beam 2 = Setup 3 = Physics 4 = End of fill 5 = Unknown	
+9	Time of last change of LEP status ('hhmmss')	
+10	Collimators setting : 0 = Unknown 1 = Open 2 = Coarse 3 = Fine	
+11	Number of positron bunches in the machine	
+12	Actual ring energy in MeV	
+13	Flip coil energy	
+14	Current in the main coil (Amps)	
+15	Field in mids-NRM probe (Gauss)	
+16	Horizontal (X) beta value	
+17	Vertical (Y) beta value	
+18	X)	
+19	Y) $\Rightarrow$ Beam position (to be implemented)	
+20	Z)	
+21		
+22		
+23		

PILOT RECORD
LEP blocklet(14.0)

cont.

+24	Positron stack current (μ amps)
+25	Positron stack current (μ amps)
+26	Positron stack current (μ amps)
+27	Positron stack current (μ amps)
+28	Electron stack current (μ amps)
+29	Electron stack current (μ amps)
+30	Electron stack current (μ amps)
+31	Electron stack current (μ amps)

If LEP works in a bunch mode –

For cosmic data:

+32	1 – no measurement available (-9999) or 2 – the crossing time in nsec. measured
+33	Crossing time wrt BCO from TOF
+34	Crossing time wrt BCO from OD
+35	Crossing time wrt BCO from FCB
+36	Crossing time wrt BCO from HOF
+37	Crossing time wrt BCO from ID straws

For physics data:

+32	Interacting bunch (used in DELANA)	
+33	Bunch number from ID	
+34	Bunch number from FCB	
+35	Bunch number from FCA	
+36	Bunch number from TOF	
+37	Bunch number from OD	
+38	Bunch number from HOF	
+39	Bunch number from STIC	
+40	Bunch number from ID straws	
+41	Bunch number from DAS	
+42	Interval between bunches from DAS	
+43	not used	
+44	Wordcount	(variable)

PILOT RECORD
TAG blocklet(15.0)

+1	Wordcount	(variable)
+2	Identifier (bits 1- 4)	(15)
	Error code (bits 5-32)	(usualy FF10)
+3	Sub-identifier $\equiv$ Number of teams	(N_{team})
	For each team :	
+4 to $+3+N_{team}$	Team tagging words (one per team)	
$+4+N_{team}$	Team tagging running (bitted word): bits 1 = 1 Team 1 tagging effectively run 2 = 1 Team 2 tagging effectively run 3 = 1 Team 3 tagging effectively run 4 = 1 Team 4 tagging effectively run 5 = 1 Team 5 tagging effectively run 6 = 1 Team 6 tagging effectively run 7 = 1 Team 7 tagging effectively run 8 = 1 Team 8 tagging effectively run 9 = 1 Team 9 tagging effectively run 10 = 1 Team 10 tagging effectively run 11 = 1 Team 11 tagging effectively run 12 = 1 Team 12 tagging effectively run 13 = 1 Team 13 tagging effectively run	
$+5+N_{team}$	Team accepted for output even if not tagged by DELANA or other teams (bitted word) : bits 1 = 1 Team 1 accepted for the output 2 = 1 Team 2 accepted for the output 3 = 1 Team 3 accepted for the output 4 = 1 Team 4 accepted for the output 5 = 1 Team 5 accepted for the output 6 = 1 Team 6 accepted for the output 7 = 1 Team 7 accepted for the output 8 = 1 Team 8 accepted for the output 9 = 1 Team 9 accepted for the output 10 = 1 Team 10 accepted for the output 11 = 1 Team 11 accepted for the output 12 = 1 Team 12 accepted for the output 13 = 1 Team 13 accepted for the output 14 = 1 Team 14 accepted for the output	
$+6+N_{team}$	Wordcount	(variable)

DTOP BANK

29	Structural links
0	Reference links
5	Data (format 4I −1B)

Link LDTOP

LINKS

0	Next DTOP bank (DFIX bank)
-1	PV banks from reconstruction
-4	Initial e^+e^- system
-5	Final e^+e^- system (after gamma radiation)
-6	$l\bar{l}$ or $q\bar{q}$ system before gluon radiation
-7	TE information
-8	not used (former Trigger information)
-9	Vertex Detector TD information
-10	Unassociated TE information
-11	OD timing information
-12	VSAT results
-13	Ambiguous showers information
-14	HPC trigger bank
-15	Combined calorimetry
-16	Unassociated HPC clusters
-17	JET information (former DJET blocklet)
-18	HAC cathode read-out information
-19	ID straws information
-20	STIC trigger information
-21	Micro Vertex Detector hits
-22	Reconstructed V0's
-23	Unassociated TE's from OD, FCA and FCB
-24	Reconstructed photons
-25	B tagging information
-26	New tracks from VD-ID pattern recognition
-28	New simulated PV list
-29	New simulated ST list
-41	Rich photon information
-42	VFT Pixel data
-43	VFT Ministrip data

DTOP BANK

cont.

STATUS BITS

bit 1 = 1 if a D^* canditate is tagged in the event
from the channel $D^* \to D^0\pi$, $D^0 \to K\pi$
2 = 1 if the event contains a $(K\pi)\pi$ baclground
combination to D^*
3 = 1 if a D^0 canditate is tagged in the event
from the channel $D^0 \to K\pi$
4 = 1 if the event contains a $(K\pi)$ background
combination to D^0
5 = 1 if a loose D_s canditate is tagged in the event
from the channel $D_s \to K^+K^-\pi$
6 = 1 if a tight D_s canditate is tagged in the event
from the channel $D_s \to K^+K^-\pi$

DATA CONTENT

+1	Date of processing (format 'yymmdd')						
+2	Time of processing (format 'hhmm')						
+3	Version numer of PXDST $\times$ 100						
+4	Laboratory identifier[1] :						
	WIEN	BELG	NBI	HELS	CCPN	CDF	LAL
	LPNH	SACL	STRA	LYON	GREN	MARS	BAST
	KARL	WUPP	LIVE	OXFO	RAL	ATHE	ANTU
	DEMO	BOLO	GENO	MILA	PADU	ROMA	TRIE
	TORI	NIKH	BERG	OSLO	CRAC	WARS	SANT
	VALE	LUND	STOC	UPPS	AMES	SERP	DUBN
	LISB	PRAG	BRAT	SNAK	FARM	CERN	LJUB
	BRAZ						

[1]The conversion of the hollerith laboratory identifier to a character variable can be done using the CERNLIB routine CFROMI

DTOP BANK

cont.

+5 List of activated Extra Modules (bitted word):

bits	1 :	CCAL	Combined calorimetry
	2 :	EMCA	Forward electromagnetic calorimeter
	3 :	HCAL	Hadron calorimeter
	4 :	MU	Muon chambers
	5 :	EL	Electron identification
	6 :	MRIC	RICH information
	7 :	MTPC	TPC information (dE/dx)
	8 :	TRAC	Track parameters
	9 :	TOF	Time of flight information
	11 :	TDHA	Points of Hadron calorimeter
	12 :	TEID	Tracks from ID
	13 :	TETP	Tracks from TPC
	14 :	TEOD	Tracks from OD
	15 :	TEFA	Tracks from FCA
	16 :	TEFB	Tracks from FCB
	17 :	TDID	Drift times in ID
	18 :	SAT	SAT information
	19 :	STIC	STIC information
	20 :	TRAX	Track extrapolation information
	22 :	EMNC	Electromagnetic new calorimetry
	23 :	HCNC	Hadron calorimeter new calorimetry
	24 :	MUID	Muon identification
	25 :	ELID	Electron identification
	26 :	HAID	Hadron identification
	27 :	MUFI	Muon track refitting
	28 :	ELTR	Electron track refitting
	29 :	ODHI	Outer detector hits
	30 :	PHOT	Photon identification
	31 :	OTRK	Old tracks replaced by OD-VD
	32 :	NMUS	New surounding muon chambers

DTOP BANK

cont.

For Monte Carlo data[2] :

+6	Incoming electromagnetic	energy for HPC
+7	Outgoing electromagnetic	energy for HPC
+8	Incoming muon	energy for HPC
+9	Outgoing muon	energy for HPC
+10	Incoming hadronic	energy for HPC
+11	Outgoing hadronic	energy for HPC
+12	Incoming electromagnetic	energy for EMF
+13	Outgoing electromagnetic	energy for EMF
+14	Incoming muon	energy for EMF
+15	Outgoing muon	energy for EMF
+16	Incoming hadronic	energy for EMF
+17	Outgoing hadronic	energy for EMF
+18	Incoming electromagnetic	energy for COI
+19	Outgoing electromagnetic	energy for COI
+20	Incoming muon	energy for COI
+21	Outgoing muon	energy for COI
+22	Incoming hadronic	energy for COI
+23	Outgoing hadronic	energy for COI
+24	Incoming electromagnetic	energy for HAB
+25	Outgoing electromagnetic	energy for HAB
+26	Incoming muon	energy for HAB
+27	Outgoing muon	energy for HAB
+28	Incoming hadronic	energy for HAB
+29	Outgoing hadronic	energy for HAB
+30	Incoming electromagnetic	energy for HAF
+31	Outgoing electromagnetic	energy for HAF
+32	Incoming muon	energy for HAF
+33	Outgoing muon	energy for HAF
+34	Incoming hadronic	energy for HAF
+35	Outgoing hadronic	energy for HAF

[2] For the Real data these words are set to zero.

DFIX BANK

0	Structural links
0	Reference links
5	Data (format 4I −1B)

Link LDFIX = LQ(LDTOP)

DATA	CONTENT
+1	Date of processing (format 'yymmdd')
+2	Time of processing (format 'hhmmss')
+3	Version numer of DSTFIX $\times$ 100
+4	Laboratory identifier of DSTFIX processing (as in DTOP bank)
+5	List of activated Fixing processors (bitted word):

bits 1 :	VD	bits 9 :	HPCC
2 :	ID	10 :	HPCN
3 :	TPC	11 :	EMFC
4 :	OD	12 :	EMFN
5 :	FCA	13 :	HACB
6 :	FCB	14 :	HACF
7 :	RIB	15 :	MUB
8 :	RIF	16 :	MUF

PV BANK

1	Structural links
1	Reference links
16	Data (format 3B −F)

Link LPV = LQ(LDTOP-1)

LINKS

0	Next PV bank
-1	PA of the outgoing particles
-2	PA of the incoming particles

STATUS BITS

bits 1 = 1 if a dummy vertex
2 = 1 if a secondary vertex
3 = 1 if a secondary hadronic vertex
4 = 1 if a vertex with simulation data

If a D^0 or D^* is tagged :
5 = 1 if a K from D^0 is linked to this vertex

If a D_s is tagged :
5 = 1 if a K from Φ is linked to this vertex

DATA CONTENT

+1	TANAGRA identifier of the TV bank
+2	Number of the outgoing particles
+3	Number of the degrees of freedom
+4	Mass code of the origin particle Special cases: 0. for primary vertex 999. for dummy vertex
+5	X)
+6	Y) ⇒ vertex coordinates
+7	Z)
+8	χ^2 of the vertex fit

PV BANK

cont.

+9	xx)	
+10	xy)	
+11	yy) >	error matrix
+12	xz)	
+13	yz)	
+14	zz)	

If tracks attached to this vertex are found to form a D^0 or D^* candidate :

+15 (Kπ) mass of D^0 candidate

+16 (K$\pi\pi$ − Kπ) mass difference of D^* candidate

If tracks attached to this vertex are found to form a D_s candidate :

+15 ($\mathrm{K}^+\mathrm{K}^-$) mass of Φ candidate

+16 ($\mathrm{K}^+\mathrm{K}^-\pi$) mass of D^* candidate

SIMULATED PV BANK

1	Structural links
1	Reference links
14	Data (format 3B −F)

Link LSPV = LQ(LDTOP-2)[1]

LINKS

0	Next PV bank
-1	PA of the outgoing particles
-2	PA of the incoming particles

STATUS BITS

bits 1 = 1 if a dummy vertex
2 = 1 if a secondary vertex
3 = 1 if a secondary hadronic vertex
4 = 1 **if a vertex with simulation data**

DATA CONTENT

+1	TANAGRA identifier of the TV bank	
+2	Number of the outgoing particles	
+3	Number of the degrees of freedom	
+4	Mass code of the origin particle	
	Special cases: 0. for primary vertex	
	999. for dummy vertex	
+5	X)	
+6	Y) >	vertex coordinates
+7	Z)	
+8	χ^2 of the vertex fit	
+9	xx)	
+10	xy)	
+11	yy) >	error matrix
+12	xz)	
+13	yz)	
+14	zz)	

[1]The PV bank at LDTOP-2 exists for the simulated data only. It is supporting a chain of simulated vertices and tracks corresponding to those of the reconstructed chain at LDTOP-1. The status bit 4 of the simulated PV banks is set to 1.

PA BANK

0	Structural links
4	Reference links
N	Data (format 3B $*$I $-$F)

Link LPA = LQ(LPV-1)

LINKS

0	Next PA bank
-1	PV bank of the end vertex (if any)
-2	Matching simulated PA (if any)

STATUS BITS

bits 1 = 1 if the track is discarded
2 = 1 if the correlation matrix is given
3 = 1 if the track has an unresolved TE
4 = 1 if the track is made with overlapping showers
5 = 1 if the track contains results from CCA
6 = 1 if the track is given by the forward combined fit
7 = 1 if the energy is obtained from substraction in the calorimeters
8 = 1 if the match with simulated track is good
9 = 1 if the match is O.K., ambiguity solved
10 = 1 if matched with showers
11 = 1 if unmatched track
12 = 1 if remaining TER from calorimeters
13 = 1 if remaining TER from OD not associated to TKX (this track is attached to a dummy vertex)
14 = 1 when multiple scattering from the first measured point is included
15 = 1 for a track tagged as a V^0 branch candidate by the TPCANA algorithm

If a D^0 or D^* is tagged :
16-17 = 1 if the track is a K candidate from a $D^0 \rightarrow K\pi$
= 2 if the track is a π candidate from a $D^0 \rightarrow K\pi$
= 3 if the track is a π candidate from a $D^* \rightarrow D^0\pi$

PA BANK

cont.

If a D_s is tagged :

bits 16-17 = 1 if the track is a K^+ candidate from a $\Phi \to K^+K^-$
= 2 if the track is a K^- candidate from a $\Phi \to K^+K^-$
= 3 if the track is a π candidate from a $D_s \to \Phi\pi$

DATA	CONTENT
+1	TANAGRA identifier of the TK bank, or Label for simulated tracks
+2	Detectors used in the reconstruction (bitted word) :

bits 4 : VD	bits 14 : HAB	bits 24 : SAT
5 : ID	15 : MUB	25 : LUM
6 : TPC	18 : MUS	26 : FCB
7 : RIB	19 : STIC	27 : EMF
9 : OD	21 : FCA	30 : HOF
10 : HPC	22 : RIF	31 : MUF
12 : TOF	23 : HAF	

+3 Mass ambiguity code (bitted word) :

Muon identification

bits 1 = 1 very loose μ
2 = 1 loose μ
3 = 1 standard μ
4 = 1 tight μ
5 = 1 HCAL μ
6 = 0 free

Electron identification

7- 9 = 0 no identification run on this track
= 1 identified NOT to be an electron
= 2 very loose electron
= 3 loose electron
= 4 standard electron
= 5 tight electron

PA BANK

cont.

	Electron from γ-convertion (veto)
bits 10-12 = 0	no identification run on this track
= 1	loose electron
= 2	standard electron
= 3	tight electron
	Kaon signature with RICH
13-15 = 0	no measurement available
= 1	track compatible with π
= 2	loose K
= 3	standard K
= 4	tight K
	Proton signature with RICH
16-18 = 0	no measurmenet available
= 1	track compatible with π
= 2	loose proton
= 3	standard proton
= 4	tight proton
	HPC photon identification
19-25 = 1	good HPC photon
= 6	HPC shower, failed transverse profile cuts
= 7	HPC shower, failed longitudinal profile cuts
= 8	HPC shower, failed both cuts
	HPC photon with linked OD shower TE
=11	HPC good photon
=16	HPC shower, failed transverse profile cuts
=17	HPC shower, failed longitudinal profile cuts
=18	HPC shower, failed both cuts
	Photon converted in front of the TPC
=21	convertion from 2 TPC tracks (type I pair)
=22	convertion from 2 TPC tracks (type II pair)
=23	convertion from 2 TPC tracks (type III pair)
=24	convertion from 1 TPC track (type I pair)

PA BANK

cont.

Electron from converted photon
19-25 = 28 electron forming a single track converted photon
= 29 electron forming a double track converted photon

Electron radiation
= 30 electron radiating a photon in front of TPC
= 40 electron radiating a photon behind the TPC

Photon from electron radiation behind TPC
= 39 photon linked to electron

Photon from electron radiation in front of TPC
= 49 photon linked to electron

Photon converted behind of the TPC
= 50 convertion from 2 OD TEs with a HPC link
= 51 convertion from 2 OD TEs one with HPC
= 52 convertion from 2 OD TEs without HPC link
= 53 convertion from 1 OD TE with a HPC link
= 56 as 53 but failed transverse profile cuts
= 57 as 53 but failed longitudinal profile cuts
= 58 as 53 but failed both cuts
= 59 shower linked to a OD TEs used in (50)-(58)

Photon which is part of a shower cluster
= 61 HPC good photon
= 66 HPC shower, failed transverse profile cuts
= 67 HPC shower, failed longitudinale profile cuts
= 68 HPC shower, failed both cuts
= 69 HPC shower, rejected (from curling electron)

VD only track
= 75 VD only track, Z information measured
= 77 VD only track, Z information not measured

Incoming track to hadronic interaction
=120 track to a secondary hadronic interaction (not seen)
=124 VD only track to hadronic interaction, Z measured
=126 VD only track to hadronic interaction, Z not measured

$\boxed{\textbf{PA BANK}}$

cont.

		Shower unambiguously identified as a clean π^0
19-25	=101	good π^0 (unlikely to be a single photon)
		Neutral tracks
	=111	K^0 to a V^0 decay
	=112	Λ^0 to a V^0 decay
	=115	track to a shower in HAC
26-28	= 0	free
29	= 0	dE/dx defined
30-32	= 0	free

+4 Number of information modules (main + extra)
+5 Length of the main module (= 27 or 32)

For each extra-module
+1 Length of the extra-module

PA MODULES
MAIN MODULE (0)

Up to the version 1.03

LENGTH: 27 words

CONTENT

+1	Label of the module (=0)
+2	Particle mass
+3	Px)
+4	Py) $\Rightarrow$ At the closest distance approach to the vertex
+5	Pz)
+6	E, energy
+7	P, momentum (absolute value)
+8	Charge (0=neutral, 1=positive, 2=negative, 3=undefined)
+9	Track length (negative if incoming particle)
+10	Mass code
+11	Impact parameter (with sign): If VC is the distance of the vertex to the curvature center and R the curvature radius with sign opposite to the charge sign, then rp = sign(R)*(|R|-VC)
+12	Error on the impact parameter
+13	not used (=-1.)
+14	not used (= 0.)
+15	not used (=-1.)
+16	χ^2 of the fit of the TK without VD hits
+17	Number of degrees of freedom without VD hits
+18	χ^2 of the VD hits associated with the track
+19	Error on E
+20	Z impact parameter = ZP - ZV, where ZP is the z coordinate of the track extrapolation at the closest distance approach to the vertex in R-Rϕ plane
+21	Error on ZP
+22	Polar angle of the point of closest approach to the vertex
+23	X)
+24	Y) $\Rightarrow$ Coordinates of the first measured point of the track
+25	Z)
+26	χ^2 of the fit of the TK
+27	Number of degrees of freedom

PA MODULES
MAIN MODULE (0)

Since the version 1.04

LENGTH: 32 words

CONTENT

+1	Label of the module (=0)
+2	Particle mass
+3	Px)
+4	Py) $\Rightarrow$ At the closest distance approach to the vertex
+5	Pz)
+6	E, energy
+7	P, momentum (absolute value)
+8	Charge (0=neutral, 1=positive, 2=negative, 3=undefined)
+9	Track length (negative if incoming particle)
+10	Mass code
+11	Impact parameter (with sign): If VC is the distance of the vertex to the curvature center and R the curvature radius with sign opposite to the charge sign, then rp = sign(R)*(|R|-VC)
+12	Error on the impact parameter
+13	Error matrix on Px, Py, Pz (at the beam pipe inner surface)
$\vdots$	$\vdots$
+18	Error matrix on Px, Py, Pz
+19	Error on E
+20	Z impact parameter = ZP - ZV, where ZP is the z coordinate of the track extrapolation at the closest distance approach to the vertex in R-Rϕ plane
+21	Error on ZP
+22	Polar angle of the point of closest approach to the vertex
+23	X)
+24	Y) $\Rightarrow$ Coordinates of the first measured point of the track
+25	Z)
+26	χ^2 of the fit of the TK with VD hits
+27	Number of degrees of freedom with VD hits
+28	Module number of the track
+29	Track type (V0, had. interaction etc.)
+30	not used

PA MODULES
MAIN MODULE (0)

+31	χ^2 of the VD hits associated with the track		
+32	Ambiguity track processor word :		
		$n1 =$	number of potential PA's having the same TPC TE
	$+$	$100 \times n2 =$	number of potential PA's having at least one VD or TPC TE in common
	$+$	$10000 \times n3 =$	the largest number of PA's which could be chosen from the n2 possibilities, so that any TE is assigned to only one PA
	$+$	$100000 \times n4 =$	number of ways to choose the n3 unique solutions from the n2 poosibilities

PA MODULES
CCAL MODULE (1)

LENGTH: variable

CONTENT

+1	Label of the module (=1)
+2	Number of associated showers N_s
	For each associated shower
+1	Length of the shower information
+2	Detector identifier : 31 = CCA
+3	Energy of the shower
+4	X)
+5	Y) *Rightarrow* coordinates of the shower
+6	Z)
+7	Mass identification (from DELANA)
+8	θ angle
+9	ϕ angle

PA MODULES
EMCA MODULE (2)

LENGTH: variable

CONTENT

+1	Label of the module (=2)
+2	Number of associated showers
	For each associated shower
+1	Length of the shower information
+2	Detector identifier : 9 = HPC, 26 = EMF
+3	Energy of the shower[1]
+4	X)
+5	Y) $\Rightarrow$ coordinates of the shower
+6	Z)
+7	Mass identification (from DELANA)
+8	θ angle
+9	ϕ angle
	For HPC detector only :
+10	Number of clusters in the shower
+11	Length of the cluster information
	For each cluster
+1	bits 1- 6 : Layer number[2]
	7-20 : Energy (in MeV)
+2	1-12 : $\phi(\mathrm{rad})\times 2^9$
	13-20 : $(\mathrm{R(cm)}-205)\times 5$[3]
+3	1- 8 : (Width(cm) in Z)$\times$10
	9-20 : $(\mathrm{Z(cm)}+260)\times 8$[4]

[1] This energy is **not** corrected for non-linearities in the HPC. For the neutrals the energy given in the MAIN module is corrected for non-linearities and crack losses.

[2] The layer number has the range from 1 to 10, 4 is the trigger gap. It is set to -1 in case of error.

[3] The radius R of the cluster is offset by the inner radius of the HPC detector.

[4] The Z coordinate of the cluster is offset by 260 cm to be a positive number.

PA MODULES
HCAL MODULE (3)

LENGTH: variable

CONTENT

+1	Label of the module (=3)
+2	Number of associated showers N_s
	For each associated shower
+1	Length of the shower information
+2	Detector identifier : 13 = HAB/HAF
+3	Energy of the shower
+4	X)
+5	Y) $\Rightarrow$ coordinates of the shower
+6	Z)
+7	Mass identification (from DELANA)
+8	θ angle
+9	ϕ angle
+10	Number of layers hit in the shower N_l
+11	Layer hit pattern (bitted word) - each bit set indicates a layer hit
	For each layer hit
+1	Energy deposited in the tower (GeV)
+2	Number of channels active in the tower + 1000$\times$Layer number
	TD information of the tower
+1	Number of towers hit
	For each tower
+1	Energy deposited in the tower (GeV)
+2	Tower coordinates - 10000 $\times$ layer number 100 $\times$ cell number along θ 1 $\times$ cell number along ϕ

PA MODULES
MU MODULE (4)

LENGTH: variable

CONTENT Muon Chambers information

+1	Label of the module (=4)
+2	Detector identifier : 14 = MUB, 17 = MUS, 30 = MUF
+3	Number of associated layers N_l
+4	Number of degrees of freedom
+5	Global χ^2
+6	X coordinate in the first layer
+7	Y coordinate in the first layer
+8	Expected hit pattern (MUB only)
+9	χ^2 for the MU chambers alone
+10	X (extrapolated − fitted)
+11	Y (extrapolated − fitted)
+12	θ (extrapolated − fitted)
+13	ϕ (extrapolated − fitted)
+14	Error on X (extrapolated − fitted)
+15	Error on Y (extrapolated − fitted)
+16	Error on θ (extrapolated − fitted)
+17	Error on ϕ (extrapolated − fitted)
+18	Layer hit pattern (bitted word) − each bit set indicates a layer hit
	For each layer in MUB and MUS
+1	Submodule identifier
+2	χ^2 of the layer
+3	R measured
+4	Rϕ(fitted) − Rϕ(measured)
+5	Z (fitted) − Z (measured)
+6	Error on Rϕ
+7	Error on Z
+8	Rϕ measured
+9	Z measured
+10	Status of the TER bank after EMMASS : 0. − deactive, 1. − active

PA MODULES
MU MODULE (4)

cont.

	For each layer in MUF
+1	Submodule identifier
+2	χ^2 of the layer
+3	X (fitted) − X (measured)
+4	Y (fitted) − Y (measured)
+5	Z measured
+6	Error on X
+7	Error on Y
+8	X measured
+9	Y measured
+10	Status of the TER bank after EMMASS : 0. − deactive, 1. − active

	Information for refit : *(T1/T2 stands for $R\phi/Z$ (MUB/MUS) or X/Y (MUF))*		
+1	T3 fit)		
+2	dT1 − dT1)		
+3	dT1 − dT2)		
+4	dT2 − dT2)		Covariance matrix of the TKX
+5	dT1 − dθ)	$\Rightarrow$	at the reference surface closest
+6	dT2 − dθ)		to the interaction point
+7	dθ − dθ)		
+8	dT1 − dφ)		
+9	dT2 − dφ)		
+10	dθ − dφ)		
+11	dφ − dφ)		

PA MODULES
EL MODULE (5)

LENGTH: variable

CONTENT Extra EMF and HPC detector information[1]

+1	Label of the module (=5)
+2	Length of the module information + 100 × Detector identifier (9 = HPC, 26 = EMF)
	EMF information
+3	Shower number[2] + 10×length of the shower information
+4	Address of the central counter of the shower

Energy deposeted in the internal frame
of glass blocks or ERROR FLAG.
The block order in standard X− Y view is :

3	*2*	*1*
6	*5*	*4*
9	*8*	*7*

+5	Energy deposited in block 1
⋮	⋮
+13	Energy deposited in block 9 or ERROR FLAG = -9999. if a non existing glass = -999. if a dead sting glass = -998. if a glass killed by EMFANA = 1000. + Energy if noisy glass
+14	not used

Energy deposeted in the external frame
of glass blocks (if any).
The block order in standard X− Y view is :

5	*4*	*3*	*2*	*1*
7				*6*
9				*8*
11				*10*
16	*15*	*14*	*13*	*12*

[1] This information is not forseen in the standard electromagnetic calorimetry module EMCA(2). It is intended mainly for the electron identification.

[2] Up to 3 showers could be associated to the track.

PA MODULES
EL MODULE (5)

cont.

	The energies are packed as follwes :
+15	$1000\times E_1 + E_2$
+16	$1000\times E_3 + E_4$
+17	$1000\times E_5 + E_6$
+18	$1000\times E_7 + E_8$
+19	$1000\times E_9 + E_{10}$
+20	$1000\times E_{11} + E_{12}$
+21	$1000\times E_{13} + E_{14}$
+22	$1000\times E_{15} + E_{16}$
	HPC information
+3	Rotation angle of the transverse charge distribution tensor (in mrad) + 1000×Calculated shower mass
+4	Shower history
+5	Mass selection flag - γ or π^0 for neutrals π^+ for charged
+6	Eigenvalue of the transverse charged deposition×10
+7	Accepted local maxima×1000 + 10×Total local maxima×1000

PA MODULES
MRIC MODULE (6)

Up to the version 1.04

LENGTH: variable

CONTENT

+1	Label of the module (=6)		
	Liquid radiator information		
+2	bits	1 :	0 for Barrel RICH 1 for Forward RICH
		2 :	0 for liquid radiator 1 for gas radiator
		3- 8 :	Sector number - from 1 to 48 for BRICH (15^0 sectors) from 1 to 24 for FRICH (30^0 sectors)
		9-11 :	0 for BRISH (not used) 1-3 for FRICH, liquid radiator number
		12-22 :	Qualification number
	For the liquid radiator (if bit2=0):		
+3	Sum of absolute probablities (before normalization)		
+4	bits	1-11 :	Total number of photons between e and π rings (within $\pm 3\sigma$)
		12-22 :	Fitted background for the best hypothesis
+5	bits	1-10 :	$< \theta_c >$ (mrad) for **electron** hypothesis
		11-20 :	σ_c (units 0.1 mrad)
+6	bits	1- 7 :	Number of photoelectrons within $\pm 3\sigma$ (σ=.015)
		8-14 :	Number of expected photoelectrons
		15-22 :	Electron probablity (1.%)
+7	bits	1-10 :	Deri. of the average Cerenkoff angle (in mrad/cm+1000)
		11-20 :	Deri. log probability (.1%) per cm (1000$\times$DP/P/cm)+1000
+8	bits	1-10 :	$< \theta_c >$ (mrad) for μ hypothesis
		11-20 :	σ_c (units 0.1 mrad)
+9	bits	1- 7 :	Number of photoelectrons within $\pm 3\sigma$ (σ=.015)
		8-14 :	Number of expected photoelectrons
		15-22 :	Electron probablity (1.%)

PA MODULES
MRIC MODULE (6)

cont.

+10	bits	1-10 :	Deri. of the average Cerenkoff angle
			(in mrad/cm+1000)
		11-20 :	Deri. log probability (.1%) per cm
			(1000×DP/P/cm)+1000
+11	bits	1-10 :	$< \theta_c >$ (mrad) for π hypothesis
		11-20 :	σ_c (units 0.1 mrad)
+12	bits	1- 7 :	Number of photoelectrons within $\pm 3\sigma$ (σ=.015)
		8-14 :	Number of expected photoelectrons
		15-22 :	Electron probablity (1.%)
+13	bits	1-10 :	Deri. of the average Cerenkoff angle
			(in mrad/cm+1000)
		11-20 :	Deri. log probability (.1%) per cm
			(1000×DP/P/cm)+1000
+14	bits	1-10 :	$< \theta_c >$ (mrad) for **K** hypothesis
		11-20 :	σ_c (units 0.1 mrad)
+15	bits	1- 7 :	Number of photoelectrons within $\pm 3\sigma$ (σ=.015)
		8-14 :	Number of expected photoelectrons
		15-22 :	Electron probablity (1.%)
+16	bits	1-10 :	Deri. of the average Cerenkoff angle
			(in mrad/cm+1000)
		11-20	Deri. log probability (.1%) per cm
			(1000×DP/P/cm)+1000
+17	bits	1-10 :	$< \theta_c >$ (mrad) for **p** hypothesis
		11-20 :	σ_c (units 0.1 mrad)
+18	bits	1- 7 :	Number of photoelectrons within $\pm 3\sigma$ (σ=.015)
		8-14 :	Number of expected photoelectrons
		15-22 :	Electron probablity (1.%)
+19	bits	1-10 :	Deri. of the average Cerenkoff angle
			(in mrad/cm+1000)
		11-20 :	Deri. log probability (.1%) per cm
			(1000×DP/P/cm)+1000

PA MODULES
MRIC MODULE (6)

cont.

Gas radiator information

+2	bits	1 :	0 for Barrel RICH
			1 for Forward RICH
		2 :	0 for liquid radiator
			1 for gas radiator
		3- 8 :	Sector number -
			from 1 to 48 for BRICH (15^0 sectors)
			from 1 to 24 for FRICH (30^0 sectors)
		9-11 :	first mirror number -
			from 1 to 6 for BRICH
			from 1 to 5 for FRICH
		12-22 :	Qualification number

For the gas radiator (if bit2=1):

+3	Sum of absolute probablities (before normalization)		
+4	bits	1-11 :	Total number of photons between e and π rings (within $\pm 3\sigma$)
		12-22 :	Fitted background for the best hypothesis
+5	bits	1-10 :	$< \theta_c >$ (mrad) for **electron** hypothesis
		11-20 :	σ_c (units 0.1 mrad)
+6	bits	1- 7 :	Number of photoelectrons within $\pm 3\sigma$ (σ=.005)
		8-14 :	Number of expected photoelectrons
		15-22 :	Electron probablity (1.%)
+7	bits	1-10 :	Deri. of the average Cerenkoff angle (in mrad/cm+1000)
		11-20 :	Deri. log probability (.1%) per cm ($1000\times$DP/P/cm)+1000
+8	bits	1-10 :	$< \theta_c >$ (mrad) for μ hypothesis
		11-20 :	σ_c (units 0.1 mrad)
+9	bits	1- 7 :	Number of photoelectrons within $\pm 3\sigma$ (σ=.005)
		8-14 :	Number of expected photoelectrons
		15-22 :	Electron probablity (1.%)

PA MODULES
MRIC MODULE (6)

cont.

+10	bits	1-10 :	Deri. of the average Cerenkoff angle (in mrad/cm+1000)
		11-20 :	Deri. log probability (.1%) per cm ($1000 \times$DP/P/cm)+1000
+11	bits	1-10 :	$< \theta_c >$ (mrad) for π hypothesis
		11-20 :	σ_c (units 0.1 mrad)
+12	bits	1- 7 :	Number of photoelectrons within $\pm 3\sigma$ (σ=.005)
		8-14 :	Number of expected photoelectrons
		15-22 :	Electron probablity (1.%)
+13	bits	1-10 :	Deri. of the average Cerenkoff angle (in mrad/cm+1000)
		11-20 :	Deri. log probability (.1%) per cm ($1000 \times$DP/P/cm)+1000
+14	bits	1-10 :	$< \theta_c >$ (mrad) for **K** hypothesis
		11-20 :	σ_c (units 0.1 mrad)
+15	bits	1- 7 :	Number of photoelectrons within $\pm 3\sigma$ (σ=.005)
		8-14 :	Number of expected photoelectrons
		15-22 :	Electron probablity (1.%)
+16	bits	1-10 :	Deri. of the average Cerenkoff angle (in mrad/cm+1000)
		11-20 :	Deri. log probability (.1%) per cm ($1000 \times$DP/P/cm)+1000
+17	bits	1-10 :	$< \theta_c >$ (mrad) for **p** hypothesis
		11-20 :	σ_c (units 0.1 mrad)
+18	bits	1- 7 :	Number of photoelectrons within $\pm 3\sigma$ (σ=.005)
		8-14 :	Number of expected photoelectrons
		15-22 :	Electron probablity (1.%)
+19	bits	1-10 :	Deri. of the average Cerenkoff angle (in mrad/cm+1000)
		11-20 :	Deri. log probability (.1%) per cm ($1000 \times$DP/P/cm)+1000

PA MODULES
MRIC MODULE (6)

cont.

Track parameters at RICH entry

For Barrel RICH

+1	Rϕ
+2	Z
+3	θ
+4	φ
+5	1/P
+6	$\sigma^2_{R\phi}$ - squared error on Rϕ
+7	σ^2_Z - squared error on Z
+8	σ^2_θ - squared error on θ
+9	σ^2_φ - squared error on φ
+10	$\sigma^2_{1/P}$ - squared error on 1/P
+11	X)
+12	Y) $\Rightarrow$ coordinates from extrapolation
+13	Z)
+14	X)
+15	Y) $\Rightarrow$ coordinates from RICH dE/dx
+16	Z)

For Forward RICH

+1	X
+2	Y
+3	θ
+4	φ
+5	1/P
+6	σ^2_X - squared error on X
+7	σ^2_Y - squared error on Y
+8	σ^2_θ - squared error on θ
+9	σ^2_φ - squared error on φ
+10	$\sigma^2_{1/P}$ - squared error on 1/P
+11	X)
+12	Y) $\Rightarrow$ coordinates when leaving the drift tube
+13	Z)
+14	not used
+15	not used
+16	not used

PA MODULES
MRIC MODULE (6)

cont.

DST extention, global part

Liquid radiator

+1 Refractive index for liquid
or 0 if no liquid information
+2 Number of expected photons, e hypothesis
+3 Number of expected photons, μ hypothesis
+4 Number of expected photons, π hypothesis
+5 Number of expected photons, K hypothesis
+6 Number of expected photons, p hypothesis

Gas radiator

+1 Refractive index for gas
or 0 if no gas information
+2 Number of expected photons, e hypothesis
+3 Number of expected photons, μ hypothesis
+4 Number of expected photons, π hypothesis
+5 Number of expected photons, K hypothesis
+6 Number of expected photons, p hypothesis

+7 Number of points around the track
in a cylinder with radius 2 cm.

DST extention, photon part 1

+1 Number of photons from the liquid radidator

For each photon

+1 bits 1-10 : Cerenkov angle θ_C (mrad)
11-16 : Error on the Cerenkov angle: $2 \times \sigma_\theta$
17-22 : Position of the photon on the Cerenkov ring: $10 \times \phi_C$

+1 Number of photons from the gas radidator

For each photon

+1 bits 1-10 : Cerenkov angle θ_C (mrad)
11-16 : Error on the Cerenkov angle: $2 \times \sigma_\theta$
17-22 : Position of the photon on the Cerenkov ring: $10 \times \phi_C$

PA MODULES
MRIC MODULE (6)

cont.

DST extention, photon part 2

	For each photon from liquid		
+1	bits	1-10 :	Photon identification : 5 × unique identifier in the 15^0 sector + sector number relative to the track entry point + 2
		11-17 :	Conversion probability
		18 :	For BRICH: member of a R_ϕ cluster
		19 :	For BRICH: at least two other close hits
	For each photon from gas		
+1	bits	1-10 :	Photon identification : 5 × unique identifier in the 15^0 sector + sector number relative to the track entry point + 2
		11-17 :	Conversion probability
		18 :	For BRICH: member of a R_ϕ cluster
		19 :	For BRICH: at least two other close hits

DST extention, selected volume in the detector

+1 Volume selected for the liquid analysis
+2 Volume selected for the gas analysis

PA MODULES
MRIC MODULE (6)

Since the version 1.05

LENGTH: variable

CONTENT[1]

	Liquid radiator information
+1	Refractive index for liquid or 0 if no liquid information
	If liquid radiator (index $\neq$ 0):
+2	Sum of absolute probabilities
+3	Selected volume in the drift box
+4	For BRICH: R of the emission point For FRICH: Z of the emission point
	Gas radiator information
+1	Refractive index for gas or 0 if no gas information
	If gas radiator (index $\neq$ 0):
+2	Sum of absolute probabilities
+3	Selected volume in the drift box
+4	For BRICH: R of the emission point For FRICH: Z of the emission point

[1] Since the version 1.05 the RICH photon information is moved to the RICH photon bank (41) (page 173).

PA MODULES
MRIC MODULE (6)

cont.

Track parameters at RICH entry

For Barrel RICH

+1	Rϕ	
+2	Z	
+3	θ	
+4	φ	
+5	1/P	
+6	$\sigma^2_{R\phi}$	- squared error on Rϕ
+7	σ^2_Z	- squared error on Z
+8	σ^2_θ	- squared error on θ
+9	σ^2_φ	- squared error on φ
+10	$\sigma^2_{1/P}$	- squared error on 1/P

For Forward RICH

+1	X	
+2	Y	
+3	θ	
+4	φ	
+5	1/P	
+6	σ^2_X	- squared error on X
+7	σ^2_Y	- squared error on Y
+8	σ^2_θ	- squared error on θ
+9	σ^2_φ	- squared error on φ
+10	$\sigma^2_{1/P}$	- squared error on 1/P

Track coordinates at exit of the sensitive volume

+11	X)	
+12	Y)	$\Rightarrow$ coordinates from extrapolation
+13	Z)	
+14	X)	
+15	Y)	$\Rightarrow$ coordinates from RICH dE/dx
+16	Z)	

PA MODULES
MTPC MODULE (7)

Up to the version 1.03

LENGTH: 19 words

CONTENT

+1	Label of the module (=7)
+2	dE/dx measured in the TPC − mean value of the 80% lowest amplitude (ampl.= maximum of the wire cluster) normalized to 1. for the MIPs
+3	σ of the 80% truncated Landau distribution
+4	not used
+5	not used
+6	Number of words in the TER extention of the TPC dedicated to dE/dx
+7	Number of bad points in the track + 100×TPC sector number of the track start + 1000×TPC sector number of the track end
+8	Number of hit wires + 1000×Number of wires crossed the track
+9	Number of wires used in the dE/dx
+10	Number of saturated hits inside the truncation
+11	Average gap (cm)
+12	Average distance of the track (cm) to the edges of the sector in Rϕ plane
+13	TPC presure (mbar)
+14	Normalization factor used to convert the integral amplitude measurement into normalized dE/dx
+15	Ratio between the normalization factor and the maximum amplitude measurement
+16	Number of wires used in the Z fit of the track
+17	χ^2 of the Z fit
+18	80% dE/dx (integrated amplitude)
+19	Track bit pattern for V^0 : bits 1-16 : pad rows hit by the track 17-20 : number of the first pad row if V^0 flagged : or 0 if no V^0 detected with this track

PA MODULES
MTPC MODULE (7)

Since the version 1.04

LENGTH: 19 words

CONTENT

+1	Label of the module (=7)
+2	dE/dx measured in the TPC – mean value of the 80% lowest amplitude (ampl.= maximum of the wire cluster) normalized to 1. for the MIPs
+3	σ of the 80% truncated Landau distribution
+4	dE/dx measured in the TPC – mean value of the 65% lowest amplitude (= maximum of the wire cluster) normalized to 1. for the MIPs
+5	σ of the 65% truncated Landau distribution
+6	dE/dx measured in the TPC – mean value of the 80% lowest amplitude (ampl.= integral of the wire cluster) normalized to 1. for the MIPs
+7	Number of pad points in the track + 100×TPC sector number of the track start + 10000×TPC sector number of the track end
+8	Number of wires crossed by the track + 1000×Number of hits with a "close cluster" + 1000000×method used for dE/dx calculation (=1 good hits only, =2 hits from TPC edge included)
+9	Number of wires considered in the dE/dx calculation + 1000×Number of usable hits at the TPC edge
+10	bits 1- 8 : Number of wires with saturated amplitude before truncation 9-16 : Number of empty hits kept before truncation 17-20 : Sector of the last wire seen (selected or not)
+11	Mean gap (cm) after 80% truncation
+12	Mean distance of the track (cm) to the edges of the sector in Rϕ plane (after 80% truncation)
+13	Number of wires used in the Z fit of the track
+14	χ^2 of the Z fit
+15	Track bit pattern for V^0 : bits 1-16 : pad rows hit by the track 17-20 : number of the first pad row if V^0 flagged : or 0 if no V^0 detected with this track

PA MODULES
MTPC MODULE (7)

cont.

+16	Mean distance between wire clusters in Z (= average distance with n closest clusters, see +8)
+17	Contribution of the empty hits to the dE/dx 80%
+18	bits 1- 8 : First non empty wire seen for the track 9-12 : Sector of the first wire seen 13-20 : Last wire seen for the track (selected or not)
+19	Average undershoot correction for dE/dx 80%
	Information to compute the momenta of the Landau distribution up to order 3 :
+20	(dE/dx) / (gap correction)
+21	(dE/dx) / (gap correction)$^{1/2}$
+22	$(dE/dx)^2$ / (gap correction)
+23	(dE/dx) / (gap correction)$^{1/3}$
+24	$(dE/dx)^2$ / (gap correction)$^{2/3}$
+25	$(dE/dx)^3$ / (gap correction)
	For modules longer than 25 words :
+26	Number of hits common to 2 tracks + 1000×Number of saturated hits (full Landau)
+27	dE/dx full Landau for common hits of 2 tracks
+28	Corresponding σ
	or
+26	Average gap of the cluster contributing to the dE/dx 80%
+27	dE/dx 80% for common hits of 2 tracks
+28	Corresponding σ
+29	Index of the current track + 1000×Index of the track with common hits
	The last word is positive or negative depending on the content of the words 26 to 28

PA MODULES
TRAC MODULE (8)

LENGTH: 21 words

CONTENT

+1	Label of the module (=8)	
+2	ε impact parameter	
+3	z impact parameter	
+4	θ angle	
+5	ϕ angle	
+6	1./R (R - radius of the curvature)	
+7	Weight matrix for these parameters :	$\varepsilon - \varepsilon$
+8		$z - \varepsilon$
+9		$z - z$
+10		$\varepsilon - \theta$
+11		$z - \theta$
+12		$\theta - \theta$
+13		$\varepsilon - \phi$
+14		$z - \phi$
+15		$\theta - \phi$
+16		$\phi - \phi$
+17		$\varepsilon - 1/R$
+18		$z - 1/R$
+19		$\theta - 1/R$
+20		$\phi - 1/R$
+21		$1/R - 1/R$

PA MODULES
TOF MODULE (9)

LENGTH: 12 words

CONTENT

+1	Label of the module (=9) [1]
+2	Detector identifier
+3	Counter number
+4	Rϕ coordinate
+5	Z coordinate
+6	Time of flight
+7	Error on time of flight
+8	External TDC + 256$\times$(external ADC)
+9	Internal TDC + 256$\times$(internal ADC)
+10	Extrapolated Z coordinate
+11	TOF quality flag
+12	Multihit information (1024$\times$T3 level)

[1]The next module label 10 reserved initialy for Vertex Detector information has never been used.

PA MODULES
TDHA MODULE (11)

LENGTH: variable

CONTENT

The module contains individual TD information
for the HCAL data associated to an isolated track.
It is intended for a better muon identification.

+1	Label of the module (=11)
+2	Number of HCAL layers N_l
	For each layer
+1	Length of the layer data
+2	Layer number
+3	Location : 0. = barrel, 1. = end-cap
+4	X/R)
+5	Y/Rϕ)
+6	Z) $\Rightarrow$ for the extrapolated track [1]
+7	θ)
+8	ϕ)
+9	Number of associated TD's in the layer N_{td}
	For each associated TD
+1	X/R
+2	Y/Rϕ
+3	Z
+4	Energy

[1] The coordinates given in the module are at constant R for the Barrel or at constant Z for the End-caps.

PA MODULES
TEID MODULE (12)

LENGTH: variable

CONTENT

The module contains extra information from the TER's in the Inner Detector associated to the TK of the track.

+1	Label of the module (=12)
	+ 0.1×stage at which the TE is created (1 or 2)[1]
+2	TE data descriptor and measurement code :
	bits 1 = 0 if coordinates are given as x, y, z
	= 1 if coordinates are given as R, RΦ, z
	2 = 0 if standard coordinates (as above)
	= 1 if non-standard coordinates (u,v,z)
	3 = 1 if coordinate 1 is measured
	4 = 1 if coordinate 2 is measured
	5 = 1 if coordinate 3 is measured
	6 = 1 if t_1 (x or RΦ) is measured
	7 = 1 if t_2 (y or z) is measured
	8 = 1 if θ is measured
	9 = 1 if ϕ is measured
	10 = 1 if 1/P is measured
	11 = 1 if 1/Pt is measured
	12 = 1 if E is measured
	13 = 1 if β is measured
	14 = 1 if dE/dx is measured
	15 = 1 if time is measured
+3	Coordinate 1 : X or R)
+4	Coordinate 2 : Y or RΦ) ⇒ of TE reference point
+5	Coordinate 3 : Z)
+6	θ angle
+7	ϕ angle
+8	1/P or 1/Pt momentum at TE reference point

[1]For the Inner Detector stage 1 means jet chamber TE, and stage 2 − trigger layer TE.

PA MODULES
TEID MODULE (12)

cont.

The error matrix contains only the elements corresponding to the (n) measured quantities declared in the measurement code, i.e. $m = n(n+1)/2$ elements. When t_1, t_2, θ, ϕ and p are measured the order is (reading line by line) :

$D(t_1, t_1)$				
$C(t_1, t_2)$	$D(t_2, t_2)$			
$C(t_1, \theta)$	$C(t_2, \theta)$	$D(\theta, \theta)$		
$C(t_1, \phi)$	$C(t_2, \phi)$	$C(\theta, \phi)$	$D(\phi, \phi)$	
$C(t_1, p)$	$C(t_2, p)$	$C(\theta, p)$	$C(\phi, p)$	$D(p, p)$

+8+1	Error matrix element 1
⋮	⋮
+8+m	Error matrix element m
+9+m	Number of degrees of freedom
+10+m	χ^2
+11+m	Length of the Track Element

PA MODULES
TETP MODULE (13)

LENGTH: variable

CONTENT

The module contains extra information from the TER's in the TPC Detector associated to the TK of the track.

+1 Label of the module (=13)
+ 0.1×stage at which the TE is created (1 or 2)
+2 TE data descriptor and measurement code :
bits 1 = 0 if coordinates are given as x, y, z
= 1 if coordinates are given as R, RΦ, z
2 = 0 if standard coordinates (as above)
= 1 if non-standard coordinates (u,v,z)
3 = 1 if coordinate 1 is measured
4 = 1 if coordinate 2 is measured
5 = 1 if coordinate 3 is measured
6 = 1 if t_1 (x or RΦ) is measured
7 = 1 if t_2 (y or z) is measured
8 = 1 if θ is measured
9 = 1 if ϕ is measured
10 = 1 if 1/P is measured
11 = 1 if 1/Pt is measured
12 = 1 if E is measured
13 = 1 if β is measured
14 = 1 if dE/dx is measured
15 = 1 if time is measured
+3 Coordinate 1 : X or R)
+4 Coordinate 2 : Y or RΦ) ⇒ of TE reference point
+5 Coordinate 3 : Z)
+6 θ angle
+7 ϕ angle
+8 1/P or 1/Pt momentum at TE reference point

PA MODULES
TETP MODULE (13)

cont.

The error matrix contains only the elements corresponding to the (n) measured quantities declared in the measurement code, i.e. $m = n(n+1)/2$ *elements. When* t_1, t_2, θ, ϕ *and* p *are measured the order is (reading line by line) :*

$D(t_1, t_1)$				
$C(t_1, t_2)$	$D(t_2, t_2)$			
$C(t_1, \theta)$	$C(t_2, \theta)$	$D(\theta, \theta)$		
$C(t_1, \phi)$	$C(t_2, \phi)$	$C(\theta, \phi)$	$D(\phi, \phi)$	
$C(t_1, p)$	$C(t_2, p)$	$C(\theta, p)$	$C(\phi, p)$	$D(p, p)$

+8+1	Error matrix element 1
⋮	⋮
+8+m	Error matrix element m
+9+m	Number of degrees of freedom
+10+m	χ^2
+11+m	Length of the Track Element

PA MODULES
TEOD MODULE (14)

LENGTH: variable

CONTENT

The module contains extra information from the TER's in the Outer Detector associated to the TK of the track.

+1	Label of the module (=14)
	+ 0.1×stage at which the TE is created (1 or 2)
+2	TE data descriptor and measurement code :
	bits 1 = 0 if coordinates are given as x, y, z
	= 1 if coordinates are given as R, RΦ, z
	2 = 0 if standard coordinates (as above)
	= 1 if non-standard coordinates (u,v,z)
	3 = 1 if coordinate 1 is measured
	4 = 1 if coordinate 2 is measured
	5 = 1 if coordinate 3 is measured
	6 = 1 if t_1 (x or RΦ) is measured
	7 = 1 if t_2 (y or z) is measured
	8 = 1 if θ is measured
	9 = 1 if ϕ is measured
	10 = 1 if 1/P is measured
	11 = 1 if 1/Pt is measured
	12 = 1 if E is measured
	13 = 1 if β is measured
	14 = 1 if dE/dx is measured
	15 = 1 if time is measured
+3	Coordinate 1 : X or R)
+4	Coordinate 2 : Y or RΦ) ⇒ of TE reference point
+5	Coordinate 3 : Z)
+6	θ angle
+7	ϕ angle
+8	1/P or 1/Pt momentum at TE reference point

PA MODULES
TEOD MODULE (14)

cont.

The error matrix contains only the elements corresponding to the (n) measured quantities declared in the measurement code, i.e. $m = n(n+1)/2$ *elements. When* t_1, t_2, θ, ϕ *and* p *are measured the order is (reading line by line) :*

$D(t_1, t_1)$				
$C(t_1, t_2)$	$D(t_2, t_2)$			
$C(t_1, \theta)$	$C(t_2, \theta)$	$D(\theta, \theta)$		
$C(t_1, \phi)$	$C(t_2, \phi)$	$C(\theta, \phi)$	$D(\phi, \phi)$	
$C(t_1, p)$	$C(t_2, p)$	$C(\theta, p)$	$C(\phi, p)$	$D(p, p)$

+8+1	Error matrix element 1
⋮	⋮
+8+m	Error matrix element m
+9+m	Number of degrees of freedom
+10+m	χ^2
+11+m	Length of the Track Element

PA MODULES
TEFA MODULE (15)

LENGTH: variable

CONTENT

The module contains extra information from the TER's in the Forward Chamber A associated to the TK of the track.

+1	Label of the module (=15)
	+ 0.1×stage at which the TE is created (1 or 2)
+2	TE data descriptor and measurement code :
	bits 1 = 0 if coordinates are given as x, y, z
	= 1 if coordinates are given as R, RΦ, z
	2 = 0 if standard coordinates (as above)
	= 1 if non-standard coordinates (u,v,z)
	3 = 1 if coordinate 1 is measured
	4 = 1 if coordinate 2 is measured
	5 = 1 if coordinate 3 is measured
	6 = 1 if t_1 (x or RΦ) is measured
	7 = 1 if t_2 (y or z) is measured
	8 = 1 if θ is measured
	9 = 1 if ϕ is measured
	10 = 1 if 1/P is measured
	11 = 1 if 1/Pt is measured
	12 = 1 if E is measured
	13 = 1 if β is measured
	14 = 1 if dE/dx is measured
	15 = 1 if time is measured
+3	Coordinate 1 : X or R)
+4	Coordinate 2 : Y or RΦ) ⇒ of TE reference point
+5	Coordinate 3 : Z)
+6	θ angle
+7	ϕ angle
+8	1/P or 1/Pt momentum at TE reference point

PA MODULES
TEFA MODULE (15)

cont.

The error matrix contains only the elements corresponding to the (n) measured quantities declared in the measurement code, i.e. $m = n(n+1)/2$ elements. When t_1, t_2, θ, ϕ and p are measured the order is (reading line by line) :

$D(t_1, t_1)$				
$C(t_1, t_2)$	$D(t_2, t_2)$			
$C(t_1, \theta)$	$C(t_2, \theta)$	$D(\theta, \theta)$		
$C(t_1, \phi)$	$C(t_2, \phi)$	$C(\theta, \phi)$	$D(\phi, \phi)$	
$C(t_1, p)$	$C(t_2, p)$	$C(\theta, p)$	$C(\phi, p)$	$D(p, p)$

+8+1	Error matrix element 1
⋮	⋮
+8+m	Error matrix element m
+9+m	Number of degrees of freedom
+10+m	χ^2
+11+m	Length of the Track Element

PA MODULES
TEFB MODULE (16)

LENGTH: variable

CONTENT

The module contains extra information from the TER's in the Forward Chamber B associated to the TK of the track.

+1	Label of the module (=16)
	+ 0.1×stage at which the TE is created (1 or 2)
+2	TE data descriptor and measurement code :
	bits 1 = 0 if coordinates are given as x, y, z
	= 1 if coordinates are given as R, RΦ, z
	2 = 0 if standard coordinates (as above)
	= 1 if non-standard coordinates (u,v,z)
	3 = 1 if coordinate 1 is measured
	4 = 1 if coordinate 2 is measured
	5 = 1 if coordinate 3 is measured
	6 = 1 if t_1 (x or RΦ) is measured
	7 = 1 if t_2 (y or z) is measured
	8 = 1 if θ is measured
	9 = 1 if ϕ is measured
	10 = 1 if 1/P is measured
	11 = 1 if 1/Pt is measured
	12 = 1 if E is measured
	13 = 1 if β is measured
	14 = 1 if dE/dx is measured
	15 = 1 if time is measured
+3	Coordinate 1 : X or R)
+4	Coordinate 2 : Y or RΦ) ⇒ of TE reference point
+5	Coordinate 3 : Z)
+6	θ angle
+7	ϕ angle
+8	1/P or 1/Pt momentum at TE reference point

PA MODULES
TEFB MODULE (16)

cont.

The error matrix contains only the elements corresponding to the (n) measured quantities declared in the measurement code, i.e. $m = n(n+1)/2$ *elements. When* t_1, t_2, θ, ϕ *and* p *are measured the order is (reading line by line) :*

$D(t_1, t_1)$				
$C(t_1, t_2)$	$D(t_2, t_2)$			
$C(t_1, \theta)$	$C(t_2, \theta)$	$D(\theta, \theta)$		
$C(t_1, \phi)$	$C(t_2, \phi)$	$C(\theta, \phi)$	$D(\phi, \phi)$	
$C(t_1, p)$	$C(t_2, p)$	$C(\theta, p)$	$C(\phi, p)$	$D(p, p)$

+8+1	Error matrix element 1
⋮	⋮
+8+m	Error matrix element m
+9+m	Number of degrees of freedom
+10+m	χ^2
+11+m	Length of the Track Element

PA MODULES
TDID MODULE (17)

LENGTH: 26 words

CONTENT

The module contains tracks for the Inner Detector calibaration with momentum above 2 GeV/c, TE in the TPC and ID jet part

+1	Label of the module (=17)
+2	ID jet sector number containing the track. Its sign is related to the drift direction : + for clockwise − for counter-clockwise
	For each wire[1]
+3	Raw drift time for wire 1
+4	Raw drift time for wire 2
+5	Raw drift time for wire 3
+6	Raw drift time for wire 4
+7	Raw drift time for wire 5
+8	Raw drift time for wire 6
+9	Raw drift time for wire 7
+10	Raw drift time for wire 8
+11	Raw drift time for wire 9
+12	Raw drift time for wire 10
+13	Raw drift time for wire 11
+14	Raw drift time for wire 12
+15	Raw drift time for wire 13
+16	Raw drift time for wire 14
+17	Raw drift time for wire 15
+18	Raw drift time for wire 16
+19	Raw drift time for wire 17
+20	Raw drift time for wire 18
+21	Raw drift time for wire 19
+22	Raw drift time for wire 20
+23	Raw drift time for wire 21
+24	Raw drift time for wire 22
+25	Raw drift time for wire 23
+26	Raw drift time for wire 24

[1] If for some wires the drift time is not available in the TD, a "scaled" drift time is given with a sign "−".

PA MODULES
SAT MODULE (18)

LENGTH: variable

CONTENT

+1	Label of the module (=18)
+2	Number of associated shower N_s
	For each shower
+1	Length of the shower information
+2	Z coordinate of the shower
	For each SAT detector contributing to the shower
+1	R coordinate of the detector
+2	Rϕ coordinate of the detector
+3	Energy deposited in the detector

PA MODULES
STIC MODULE (19)

LENGTH: variable

CONTENT

+1	Label of the module (=19)
+2	Number of detected showers N_s
+3	STIC trigger (bitted word) :
	bits 1- 2 = 1 bhabha event
	3- 4 = 1 single arm forward
	5- 6 = 1 single arm backward
	7- 8 = 1 multiplicity bits forward
	9-10 = 1 multiplicity bits baclward
	11-32 = 0 free
	For each shower
+1	Length of the shower information
+2	Subdetector identifier :
	1 = calorimeter part for positive Z
	2 = calorimeter part for negative Z
	3 = first silicon layer for positive Z
	4 = second silicon layer for positive Z
	5 = first silicon layer for negative Z
	6 = second silicon layer for negative Z
	7 = veto detector for positive Z
	8 = veto detector for negative Z
+3	Shower identifier (from 1 to 999)
	+ 1000×Number of hits in the shower N_h
+4	Quality flag for the shower -
	0 = good (separated) shower
	1 = cluster
	2 = bad shower
	+ 1000×Number of showers N_{ass} from other sub-detectors associated with the current one
+5	Energy of the shower (GeV)
+6	R (cm)
+7	Rϕ (cm×radian)
+8	Z (cm)
+9	Mass identifier (from DELANA)

PA MODULES
STIC MODULE (19)

cont.

+10	Charge from the veto counter - 0 = neutral 1 = positive 2 = negative 3 = positive or negative 4 = no veto identification
	List of showers from other sub-detectors associaited with the current one. *The length of the list is $n = (N_{ass} - 1)/2$ words*
+10+1	Shower 1 identifier + 1000×Shower 2 identifier
⋮	⋮
+10+n	Shower (n-1) identifier + 1000×Shower n identifier
	For each calorimeter hit N_h of this shower
+1	Energy deposited by the hit (GeV)
+2	θ number + 100×ϕ number of the hit (tower units)
+1	Numbers of the three counters in the 1st Veto plane (central and two neighbours) associated with the shower $N_{left} + 100 \times N_{center} + 10000 \times N_{right}$
	Veto counter signals after pedestal substraction and 3σ cut for three sectors in the 1st and 2nd plane
+2	Veto counter signals $1000 \times S^1_{left} + S^1_{center}$
+3	Veto counter signals $1000 \times S^1_{right} + S^2_{left}$
+4	Veto counter signals $1000 \times S^2_{center} + S^2_{right}$
	Since the version 1.04 *Small Veto counter signals and second ADC's*
+5	Small counter signals $1000 \times S^1_{small} + S^2_{small}$
+6	2nd Veto ADC signals $1000 \times S^1_{left} + S^1_{center}$
+7	2nd Veto ADC signals $1000 \times S^1_{right} + S^2_{left}$
+8	2nd Veto ADC signals $1000 \times S^2_{center} + S^2_{right}$
+9	2nd Veto ADC signals $1000 \times S^1_{small} + S^2_{small}$

PA MODULES
STIC MODULE (19)

cont.

	Silicon strip data for two clusters associated with the calorimeter shower
+1	Total number of clusters in the 1st silicon plane associated with the current calorimeter shower + 100 $\times$ the same number in the 2nd silicon plane
	For the most energetic silicon cluster associated with the calorimeter shower (if any):
+2	θ angle reconstructed by the 1st silicon plane
+3	φ angle reconstructed by the 1st silicon plane
+4	Maximum signal in the 1st silicon plane cluster
+5	θ angle reconstructed by the 2nd silicon plane
+6	φ angle reconstructed by the 2nd silicon plane
+7	Maximum signal in the 2nd silicon plane cluster
	For the second energetic silicon cluster associated with the calorimeter shower (if any):
+8	θ angle reconstructed by the 1st silicon plane
+9	φ angle reconstructed by the 1st silicon plane
+10	Maximum signal in the 1st silicon plane cluster
+11	θ angle reconstructed by the 2nd silicon plane
+12	φ angle reconstructed by the 2nd silicon plane
+13	Maximum signal in the 2nd silicon plane cluster

PA MODULES
TRAX MODULE (20)

LENGTH: variable

CONTENT

+1	Label of the module (=20)	
+2	Total number of extrapolation points	
	For each extrapolation point	
+1	Number of words for the point	
+2	Detector identifier	
+3	Track measurement code : 0 if plane reference surface 1 if cylinder reference surface	
+4	Coordinate 1 : R_{ref} or X	)
+5	Coordinate 2 : RΦ or Y	) ⇒ of the extrapolation point
+6	Coordinate 3 : Z or Z_{ref}	)
+7	θ angle	)
+8	ϕ angle	) ⇒ of the track
+9	1/p[1]	)

The covariance matrix contains 15 elements corresponding to the 5 parameters of the track. The order is (in case of plane ref. surface read x,y instead of RΦ,z) :

$$
\begin{array}{lllll}
D(R\Phi , R\Phi) & & & & \\
C(R\Phi , z) & D(z , z) & & & \\
C(R\Phi , \theta) & C(z , \theta) & D(\theta, \theta) & & \\
C(R\Phi , \phi) & C(z , \phi) & C(\theta, \phi) & D(\phi, \phi) & \\
C(R\Phi , 1/p) & C(z , 1/p) & C(\theta, 1/p) & C(\phi, 1/p) & D(1/p , 1/p)
\end{array}
$$

+10	Covariance matrix element 1
⋮	⋮
+24	Covariance matrix element 15

[1]This quantity has the sign of the geometric curvature measured from inside to outside the detector.

PA MODULES
TERF MODULE (21)

LENGTH: variable

CONTENT

The module contains extra information from the TER's in the FRICH associated to the TK of the track.

+1	Label of the module (=21)
	+ 0.1×stage at which the TE is created (1 or 2)
+2	TE data descriptor and measurement code :
	bits 1 = 0 if coordinates are given as x, y, z
	= 1 if coordinates are given as R, RΦ, z
	2 = 0 if standard coordinates (as above)
	= 1 if non-standard coordinates (u,v,z)
	3 = 1 if coordinate 1 is measured
	4 = 1 if coordinate 2 is measured
	5 = 1 if coordinate 3 is measured
	6 = 1 if t_1 (x or RΦ) is measured
	7 = 1 if t_2 (y or z) is measured
	8 = 1 if θ is measured
	9 = 1 if ϕ is measured
	10 = 1 if 1/P is measured
	11 = 1 if 1/Pt is measured
	12 = 1 if E is measured
	13 = 1 if β is measured
	14 = 1 if dE/dx is measured
	15 = 1 if time is measured
+3	Coordinate 1 : X or R)
+4	Coordinate 2 : Y or RΦ) ⇒ of TE reference point
+5	Coordinate 3 : Z)
+6	θ angle
+7	ϕ angle
+8	1/P or 1/Pt momentum at TE reference point

PA MODULES
TERF MODULE (21)

cont.

The error matrix contains only the elements corresponding to the (n) measured quantities declared in the measurement code, i.e. m = n(n+1)/2 elements. When t_1, t_2, θ, ϕ and p are measured the order is (reading line by line) :

$D(t_1,\ t_1)$				
$C(t_1,\ t_2)$	$D(t_2,\ t_2)$			
$C(t_1,\ \theta)$	$C(t_2,\ \theta)$	$D(\theta,\ \theta)$		
$C(t_1,\ \phi)$	$C(t_2,\ \phi)$	$C(\theta,\ \phi)$	$D(\phi,\ \phi)$	
$C(t_1,\ p)$	$C(t_2,\ p)$	$C(\theta,\ p)$	$C(\phi,\ p)$	$D(p,\ p)$

+8+1	Error matrix element 1
⋮	⋮
+8+m	Error matrix element m
+9+m	Number of degrees of freedom
+10+m	χ^2
+11+m	Length of the Track Element

PA MODULES
EMNC MODULE (22)

LENGTH: variable

CONTENT

+1	Label of the module (=22)
+2	Number of associated shower + 100 $\times$ Detector identifier (9 = HPC, 26 = EMF)
	For each shower :
+1	Energy of the shower
+2	X)
+3	Y) $\Rightarrow$ coordinates of the shower
+4	Z)
	HPC information
+5	Number of layer hit in this shower
+6	Layer pattern (bitted word) :
	bits 1 = 1 if hit in layer 1
	2 = 1 if hit in layer 2
	3 = 1 if hit in layer 3
	4 = 1 if hit in layer 4
	5 = 1 if hit in layer 5
	6 = 1 if hit in layer 6
	7 = 1 if hit in layer 7
	8 = 1 if hit in layer 8
	9 = 1 if hit in layer 9
	10 = 1 if hit in layer 10
	For each layer :
+1	Energy deposited in the layer
	EMF information
+5	Number of associated showers
	For each shower :
+6	Address of the central counter of the shower
+7	Number of hitted blocks

PA MODULES
EMNC MODULE (22)

cont.

+6	Block pattern (bitted word) :
	bits 1 = 1 if hit in block 1
	2 = 1 if hit in block 2
	3 = 1 if hit in block 3
	4 = 1 if hit in block 4
	5 = 1 if hit in block 5
	6 = 1 if hit in block 6
	7 = 1 if hit in block 7
	8 = 1 if hit in block 8
	9 = 1 if hit in block 9
	10 = 0 free
	11 = 1 if hit in block 1 and 2 of external frame
	12 = 1 if hit in block 3 and 4 of external frame
	13 = 1 if hit in block 5 and 6 of external frame
	14 = 1 if hit in block 7 and 8 of external frame
	15 = 1 if hit in block 9 and 10 of external frame
	16 = 1 if hit in block 11 and 12 of external frame
	17 = 1 if hit in block 13 and 14 of external frame
	18 = 1 if hit in block 15 and 16 of external frame
	For each block
+1	Energy deposited in the block(s)
	or
	ERROR FLAG = -9999. if a non existing glass
	= -999. if a dead sting glass
	= -998. if a glass killed by EMFANA
	= 1000. + Energy if noisy glass

PA MODULES
HCNC MODULE (23)

LENGTH: variable

CONTENT

+1	Label of the module (=23)
+2	Number of associated shower
	For each shower :
+1	Energy of the shower
+2	X)
+3	Y) > coordinate of the shower
+4	Z)
+5	Number of layers hit in this shower
	For each layer :
+1	Energy deposited in the layer
+2	Number of active channels in the layer + 1000 $\times$ layer number

PA MODULES
MUID MODULE (24)

Up to the version 1.04

LENGTH: variable

CONTENT

+1	Label of the module (=24)
+2	Global tag (bitted word) :
	bits 1 = 1 if very loose refit
	2 = 1 if loose and standard refit
	3 = 1 if tight refit
	4 = 1 if very loose tag
	5 = 1 if loose tag
	6 = 1 if standard tag
	7 = 1 if tight tag

Very loose refit information (always present) :

+1	Hit pattern (bit 8 set if MUB, unset if MUF)		
+2	Global χ^2		
+3	Hit pattern with inefficiencies (different from 1. for Monte Carlo)		
+4	Hit pattern with ambiguities		
+5	R / x	)	
+6	Rϕ / y	)	Position and direction
+7	z	)	of the fitted track in MUB/MUF
+8	θ	)	at the inner MUC layer
+9	ϕ	)	

Loose and standard refit information (if bit 2 set) :

+1	Hit pattern (bit 8 set if MUB, unset if MUF)		
+2	Global χ^2		
+3	Extrapolation χ^2		
+4	Global azimuthal χ^2		
+5	Extrapolation azimuthal χ^2		
+6	Extrapolation polar χ^2		
+7	R / x	)	
+8	Rϕ / y	)	Position and direction
+9	z	)	of the fitted track in MUB/MUF
+10	θ	)	at the inner MUC layer
+11	ϕ	)	

PA MODULES
MUID MODULE (24)

cont.

	Tight refit information (if bit 3 set) :	
+1	Hit pattern (bit 8 set if MUB, unset if MUF)	
+2	Global χ^2	
+3	Extrapolation χ^2	
+4	R / x)	
+5	Rϕ / y)	Position and direction
+6	z)	of the fitted track in MUB/MUF
+7	θ)	at the inner MUC layer
+8	ϕ)	

PA MODULES
MUID MODULE (24)

Since the version 1.05

LENGTH: variable

CONTENT

+1	Label of the module (=24)
+2	Global tag (bitted word) :
	bits 1 = 1 if very loose refit
	2 = 1 if loose and standard refit
	3 = 1 if tight refit
	4 = 1 if very loose tag
	5 = 1 if loose tag
	6 = 1 if standard tag
	7 = 1 if tight tag

Very loose refit information (always present) :

+1	Hit pattern (bit 9 set if MUB, bit 10 set if MUF, neither if SMC)	
+2	Global χ^2	
+3	Hit pattern with inefficiencies (different from 1. for Monte Carlo)	
+4	Hit pattern with ambiguities	
+5	R / x)	
+6	Rϕ / y)	Position and direction
+7	z)	of the fitted track in MUB/MUF/SMC
+8	θ)	at the inner MUC layer
+9	ϕ)	

Loose and standard refit information (if bit 2 set) :

+1	Hit pattern (bit 9 set if MUB, bit 10 set if MUF, neither if SMC)	
+2	Global χ^2	
+3	Extrapolation χ^2	
+4	Global azimuthal χ^2	
+5	Extrapolation azimuthal χ^2	
+6	Extrapolation polar χ^2	
+7	R / x)	
+8	Rϕ / y)	Position and direction
+9	z)	of the fitted track in MUB/MUF/SMC
+10	θ)	at the inner MUC layer
+11	ϕ)	

PA MODULES
MUID MODULE (24)

cont.

	Tight refit information (if bit 3 set) :		
+1	Hit pattern (bit 9 set if MUB, bit 10 set if MUF, neither if SMC)		
+2	Global χ^2		
+3	Extrapolation χ^2		
+4	R / x	)	
+5	Rϕ / y	)	Position and direction
+6	z	)	of the fitted track in MUB/MUF/SMC
+7	θ	)	at the inner MUC layer
+8	ϕ	)	
	Unassociated TE information		
+1	Unassociated TE word		

PA MODULES
ELID MODULE (25)

LENGTH: 40 words

CONTENT

+1	Label of the module (=25)
+2	Number of words + 1000.*Det.id. (9-HPC,26-EMF)
+3	1000*Vers.No. + 100.*ITAG + 10.*IVETO
+4	Electron probabilty from the HPC
+5	Gamma conversion radius from PXVETO
+6	Probability from the shower fit
+7	Fitted shower energy (not properly calibrated)
+8	HPC-crack flag (0=No,1=ϕ,2=θ,3=ϕ,θ)
+9	E_shower/P_track (fixed flat at 1 for electrons)
+10	Z (extrapolation) - Z (HPC)
+11	Phi(extrapolation) - Phi(HPC) (direction)
+12	Z position at HPC boarder from TRK-EXTRAP
+13	Probablity for radiated photon behind the TPC
+14	Probability that next shower found is from this track
+15	Probability that OD-TE found is from this track
+16	TANAGRA photon identifier (radiation behind TPC)
+17	Tanagra identifier of the next shower
+18	Probability from E/P
+19	Probability from Z(TPC) - Z(HPC)
+20	RICH tag
+21	Probablity for radiated photon in front of the TPC
+22	TANAGRA photon identifier (radiation in front of TPC)
+23	Phi(extrapolation) - Phi(HPC) (position)
+24	Normalized curvature change between ID/TPC
+25	Normalized curvature change between TPC/OD
+26	χ^2 of curvature change fit between ID/TPC
+27	χ^2 of curvature change between fit TPC/OD
+28	Fixed HPC_energy + nonlinearity corrections
+29	Best estimate for electron energy at vertex
+30	Electron Px fixed
+31	Electron Py fixed
+32	Electron Pz fixed

PA MODULES
ELID MODULE (25)

cont.

+33	Probability from ϕ-direction mismatch
+34	Combined dE/dX and HPC probability
+35	Probability from dE/dX for electron
+36	Probability from dE/dX for pion
+37	Rotation angle from shower analysis
+38	Significance of 2-peak shower substructure
+39	Momentum from track refit + addition of radiation
+40	Phi position at HPC boarder from TRK-EXTRAP

PA MODULES
HAID MODULE (26)

LENGTH: variable

CONTENT

+1	Label of the module (=26)
+2	Number of ionization data +
	$10 \times$ number of RICH(gas) data +
	$100 \times$ number of RICH(liquid) data +
	$1000 \times$ number of VD (dE/dx) data +
	$10000 \times$ number of RINGSCAN data +
	$100000 \times$ number of RICH status data
	$1000000 \times$ number of TPC (dE/dx) data
	Ionization information
+3	dE/dx measured value normalized to 1 for MIP's
+4	Width of dE/dx Landau distribution (NOT dE/dx error)
+5	Number of wires used for the dE/dx measurement
+6	Mean distance between the wires for the track (gap)
+7	Tagging word (bitted) :
	Kaon signature with dE/dx
	bits 1- 3 = 0 no measurement available
	= 1 compatible with a π
	= 2 loose K
	= 3 standard K
	= 4 tight K
	Proton signature with dE/dx
	bits 4- 6 = 0 no measurement available
	= 1 compatible with a π
	= 2 loose proton
	= 3 standard proton
	= 4 tight proton
	Used for combined tag
	bits 7-10 = 1 dE/dx only
	= 2 RICH gas
	= 3 RICH liquid
	Pion signature with RICH
	bits 11-13 = 0 no measurement available
	= 1 not a π
	= 3 a π
+8	Combined kaon tag + $100 \times$ combined proton tag

PA MODULES
HAID MODULE (26)

cont.

	RICH gas information
+1	Measured Cherenkov angle
+2	σ of the Cherenkov angle per photon
+3	Number of photoelectrons in ring +
	500 $\times$ (expected number of phototelectrons $\times$ 10)
+4	Quality flag (bitted word) :

RING (>1 photons)	VETO ($\leq$ 1 photon)
bits 1= extrapolation to RICH	bits 1= idem
2= acceptance theta	2= idem
3= run selection, no trip	3= idem
4= good ring cuts	4= $\leq$ 3 photons in bands
5= tight ring cuts	5= as 4 and no trip
6= hits on track(s)	6= idem

	RICH liquid information
+1	Measured Cherenkov angle
+2	σ of the Cherenkov angle per photon
+3	Number of photoelectrons in ring +
	500 $\times$ (expected number of phototelectrons $\times$ 10)
+4	Quality flag (bitted word) :

RING (BRICH >3 photons) (FRICH >2 photons)	VETO (BRICH $\leq$3 photons) (FRICH $\leq$2 photons)
bits 1= extrapolation to RICH	bits 1= idem
2= acceptance theta	2= idem
3= run selection, no trip	3= idem
4= good ring cuts	4= as 2 and hits
5= tight ring cuts	5= as 4 and $\chi^2 > 9$
6= hits on track(s)	6= idem

Since the version 1.03

	VD ionization information
+1	dE/dx value measured with VD only
+2	Number of VD hits in the measurement

PA MODULES
HAID MODULE (26)

cont.

RINGSCAN information

+1	Tagging word (bitted) :	
	bits 1- 2 = 1	loose e
	= 2	standard e
	= 3	tight e
	3 = 1	local maximum for probability
	4 = 1	8 (3) and more photoelectrons around this hypothesis for p<2.5 (p>2.5)
	5- 6 = 1	loose μ
	= 2	standard μ
	= 3	tight μ
	7 = 1	local maximum for probability
	8 = 1	8 (3) and more photoelectrons around this hypothesis for p<2.5 (p>2.5)
	9-10 = 1	loose π
	= 2	standard π
	= 3	tight π
	11 = 1	local maximum for probability
	12 = 1	8 (3) and more photoelectrons around this hypothesis for p<2.5 (p>2.5)
	13-14 = 1	loose K
	= 2	standard K
	= 3	tight K
	15 = 1	local maximum for probability
	16 = 1	8 (3) and more photoelectrons around this hypothesis for p<2.5 (p>2.5)
	17-18 = 1	loose p
	= 2	standard p
	= 3	tight p
	19 = 1	local maximum for probability
	20 = 1	8 (3) and more photoelectrons around this hypothesis for p<2.5 (p>2.5)
+2	bits 1-13	mean θ angle in liquid
	14-24	logarithm of the maximum probablity
+3	bits 1-13	mean θ angle in gas
	14-24	logarithm of the maximum probablity

PA MODULES
HAID MODULE (26)

cont.

+1 **RICH status** (bitted word) :

bits 1 = 1 no liquid in the barrel for this period
2 = 1 no liquid in the forward for this period
3 = 1 do not use the gas for this track
4 = 1 do not use the liquid for this track
5 = 1 absorption length between 2 and 5 m. (doubt for gas)
6 = 1 no hit in the tube (doubt for veto)
7 = 1 no ionization around this track (doubt for veto)
8 = 1 no hit in this tube and 2 neighbours (doubt for liquid)
9 = 1 track close to midwall (important for liquid)
10 = 1 liquid affected by HV trip
11 = 1 LTD overflow or DAS problem for gas
12 = 1 LTD overflow or DAS problem for liquid
13 = 1 the gas info was killed by RICFIX
14 = 1 the liquid info was killed by RICFIX

Since the version 1.05

dE/dx error information

+1 Momentum of the track in TPC
+2 Error of the track momentum in TPC

PA MODULES
MUFI MODULE (27)

LENGTH: variable

CONTENT Muon Chambers information after refitting

+1	Label of the module (=27)
+2	Detector identifier (14=MUB, 17=MUS, 30=MUF)
+3	Number of associated layers
+4	Number of degrees of freedom
+5	Global χ^2
+6	X coordinate in the first layer
+7	Y coordinate in the first layer
+8	Expected number of missing layers
+9	χ^2 for the MU chambers alone
+10	X (extrapolated − fitted)
+11	Y (extrapolated − fitted)
+12	θ (extrapolated − fitted)
+13	ϕ (extrapolated − fitted)
+14	Error on X (extrapolated − fitted)
+15	Error on Y (extrapolated − fitted)
+16	Error on θ (extrapolated − fitted)
+17	Error on ϕ (extrapolated − fitted)
+18	Layer hit pattern (bitted word) – each bit set indicates a layer hit
	Layer information for MUB and MUS :
+1	Submodule identifier TER(2)
+2	χ^2 of the layer
+3	R measured
+4	Rϕ(fitted) − Rϕ(measured)
+5	Z (fitted) − Z (measured)
+6	Error on Rϕ
+7	Error on Z
+8	Rϕ measured
+9	Z measured
+10	Status of the TER bank after EMMASS : 0. − deactive, 1. − active

PA MODULES
MUFI MODULE (27)

cont.

	Layer information for MUF :
+1	Submodule identifier TER(2)
+2	χ^2 of the layer
+3	X (fitted) − X (measured)
+4	Y (fitted) − Y (measured)
+5	Z measured
+6	Error on X
+7	Error on Y
+8	X measured
+9	Y measured
+10	Status of the TER bank after EMMASS : 0. − deactive, 1. − active

Information for refit :
(T1/T2 stands for $R\phi/Z$ (MUB) or X/Y (MUF))

+1	T3 fit	)	
+2	dT1 − dT1	)	
+3	dT1 − dT2	)	
+4	dT2 − dT2	)	Covariance matrix of TKX
+5	dT1 − dθ	) >	at the closest reference surface
+6	dT2 − dθ	)	to the interaction point
+7	dθ − dθ	)	
+8	dT1 − dφ	)	
+9	dT2 − dφ	)	
+10	dθ − dφ	)	
+11	dφ − dφ	)	

PA MODULES
ELTR MODULE (28)

LENGTH: 21 words

CONTENT Extra-module TRAC(8) refitted for the electron tracks

+1	Label of the module (=8)	
+2	ε impact parameter	
+3	z impact parameter	
+4	θ angle	
+5	ϕ angle	
+6	1./R (R - radius of the curvature)	
+7	Weight matrix for these parameters :	$\varepsilon - \varepsilon$
+8		$\mathrm{z} - \varepsilon$
+9		$\mathrm{z} - \mathrm{z}$
+10		$\varepsilon - \theta$
+11		$\mathrm{z} - \theta$
+12		$\theta - \theta$
+13		$\varepsilon - \phi$
+14		$\mathrm{z} - \phi$
+15		$\theta - \phi$
+16		$\phi - \phi$
+17		$\varepsilon - 1/\mathrm{R}$
+18		$\mathrm{z} - 1/\mathrm{R}$
+19		$\theta - 1/\mathrm{R}$
+20		$\phi - 1/\mathrm{R}$
+21		$1/\mathrm{R} - 1/\mathrm{R}$

PA MODULES
ODHI MODULE (29)

LENGTH: 3 words

CONTENT Outer Detector hits information

+1	Label of the module (=29)
+2	Number of OD hits with azimuthal angle $\phi < 5^0$ from the TK angle extrapolated at the OD surface
+3	Spread of these hits around the center of gravity

PA MODULES
PHOT MODULE (30)

LENGTH: 6 or 26(33) words

CONTENT γ and π^0 identification in HPC

+1	Label of the module (=30)
+2	Length of γ part + 100 $\times$ length of π^0 part
	γ **information**
+3	Energy weighted depth
+4	1000 $\times$ number of clusters + 100 $\times$ first layer number + 10 $\times$ number of layers + maximum number of consecutive layers
+5	Transverse shower fluctuation measure
+6	Longitudinal shower fit (reserved for)
	π^0 **information**
+7	Mass of HPCANA tensor fit
+8	Rotation angle of HPCANA tensor fit
+9	1-st eigenvalue of HPCANA tensor
+10	2-nd eigenvalue of HPCANA tensor
+11	Number of connected maxima in HPCANA
+12	Number of accepted maxima in HPCANA
+13	Realtive energy of the first Gaussian
+14	Position of the first Gaussian
+15	Width of the first Gaussian
+16	Position of the second Gaussian
+17	Width of the second Gaussian
+18	Fitted mass
+19	1-st eigenvalue
+20	2-nd eigenvalue
+21	Rotation angle
+22	θ of the shower center
+23	ϕ of the shower center
+24	θ of the shower
+25	ϕ of the shower
+26	Number of OD links + 100 $\times$ number of stray showers

PA MODULES
PHOT MODULE (30)

cont.

	π^0/γ **separation**
+27	Number of weighted HPC hits in the main peak after the π^0 mass constraint fit
+28	Number of weighted HPC hits in the second peak after the π^0 mass constraint fit
+29	χ^2 of the π^0 mass constraint fit
+30	Number of fitted bins (degrees of freedom) of the π^0 mass constraint fit
+31	χ^2 of the γ constraint fit
+32	Gaussian width of the γ shower shape in ϕ
+33	Gaussian width of the γ shower shape in θ

PA MODULES
OTRK MODULE (31)

Up to the version 1.03

LENGTH: 47 words

CONTENT Old track parameters replaced by the ID-VD track search [1]

+1	Label of the module (=31)
	PA module MAIN section
+2	Particle mass
+3	Px)
+4	Py) > At the closest distance approach to the vertex
+5	Pz)
+6	E, energy
+7	P, momentum (absolute value)
+8	Charge (0=neutral, 1=positive, 2=negative, 3=undefined)
+9	Mass code
+10	Track length (negative if incoming particle)
+11	Impact parameter (with sign): If VC is the distance of the vertex to the curvature center and R the curvature radius with sign opposite to the charge sign, then rp = sign(R)*(|R|-VC)
+12	Error on the impact parameter
+13	not used (=-1.)
+14	not used (= 0.)
+15	not used (=-1.)
+16	χ^2 of the fit of the TK without VD hits
+17	Number of degrees of freedom without VD hits
+18	χ^2 of the VD hits associated with the track
+19	Error on E
+20	Z impact parameter = ZP - ZV, where ZP is the z coordinate of the track extrapolation at the closest distance approach to the vertex in R-Rϕ plane
+21	Error on ZP
+22	Polar angle of the point of closest approach to the vertex
+23	X)
+24	Y) > Coordinates of the first measured point of the track
+25	Z)
+26	χ^2 of the fit of the TK
+27	Number of degrees of freedom

PA MODULES
OTRK MODULE (31)

cont.

	PA module TRAC section	
+1	ε impact parameter	
+2	z impact parameter	
+3	θ angle	
+4	ϕ angle	
+5	1./R (R - radius of the curvature)	
+6	Weight matrix for these parameters :	$\varepsilon - \varepsilon$
+7		$z - \varepsilon$
+8		$z - z$
+9		$\varepsilon - \theta$
+10		$z - \theta$
+11		$\theta - \theta$
+12		$\varepsilon - \phi$
+13		$z - \phi$
+14		$\theta - \phi$
+15		$\phi - \phi$
+16		$\varepsilon - 1/R$
+17		$z - 1/R$
+18		$\theta - 1/R$
+19		$\phi - 1/R$
+20		$1/R - 1/R$

[1] The replaced (overwritten) tracks have a new TANAGRA identifier '8888888'.

PA MODULES
NMUS MODULE (32)

LENGTH: variable

CONTENT Surounding Muon Chamber information

+1	Label of the module (=32)
+2	Detector identifier (=17)
+3	Number of associated layers
+4	Number of degrees of freedom
+5	Global χ^2
+6	X coordinate in the first layer
+7	Y coordinate in the first layer
+8	Expected number of missing layers
+9	χ^2 for the MU chambers alone
+10	X (extrapolated − fitted)
+11	Y (extrapolated − fitted)
+12	θ (extrapolated − fitted)
+13	ϕ (extrapolated − fitted)
+14	Error on X (extrapolated − fitted)
+15	Error on Y (extrapolated − fitted)
+16	Error on θ (extrapolated − fitted)
+17	Error on ϕ (extrapolated − fitted)
+18	Layer hit pattern (bitted word) − each bit set indicates a layer hit
	For each layer
+1	Submodule identifier
+2	χ^2 of the layer
+3	R measured
+4	Rϕ(fitted) − Rϕ(measured)
+5	Z (fitted) − Z (measured)
+6	Error on Rϕ
+7	Error on Z
+8	Rϕ measured
+9	Z measured
+10	Status of the TER bank after EMMASS : 0. − deactive, 1. − active

PA MODULES
NMUS MODULE (32)

cont.

	Information for refit		
+1	T3 fit	)	
+2	dRϕ − dRϕ	)	
+3	dRϕ − dZ	)	
+4	dZ − dZ	)	Covariance matrix of TKX
+5	dRϕ − dθ	) >	at the closest reference surface
+6	dZ − dθ	)	to the interaction point
+7	dθ − dθ	)	
+8	dRϕ − dφ	)	
+9	dZ − dφ	)	
+10	dθ − dφ	)	
+11	dφ − dφ	)	

PA MODULES
SSTC MODULE (33)

LENGTH: variable

CONTENT Shortened STIC information

+1	Label of the module (=33)
	Up to the version 1.02
+2	Number of associated showers + 100 $\times$ length of the shower information
	For each shower
+1	Energy of the shower (GeV)
+2	R (cm)
+3	R $\times$ ϕ (cm $\times$ radian)
+4	Detector identification code : bits 1-12 = 1 if STIC_A (at z=−220. cm) = 2 if STIC_C (at z=+220. cm) Charge tag from the veto : bits 13-24 = 0 no information available = 1 for neutrals = 2 for charged
	Since the version 1.03
+2	Number of associated showers
	For each shower
+1	Length of the shower information
+2	Cluster quality flag + 10 $\times$ number of hits for this shower
	For each hit
+1	Tower hit information : bits 1- 8 : tower $\theta + 10 \times \phi$ 9-22 : deposeted energy (in 10 MeV units)
+1	Veto counter signal 1000 $\times$ S(1)left + S(1)center
+2	Veto counter signal 1000 $\times$ S(1)righ + S(2)left
+3	Veto counter signal 1000 $\times$ S(2)center + S(2)right
+4	Veto counter hit pattern for plane 1 (bits 1-16)
+5	Veto counter hit pattern for plane 2 (bits 1-16)

PA MODULES
HCRO MODULE (34)

Since the version 1.05

LENGTH: 8 or 13 words

CONTENT HCAL cathode read-out information

+1	Label of the module (=34)
+2	Number of words + 1000 $\times$number of assigned hits
+3	Mean distance (with sign) between the hits and the track
+4	RMS of the mean distance
+5	Number of hits in planes 1 - 5
+6	Number of hits in planes 6 - 10
+7	Number of hits in planes 11 - 15
+8	Number of hits in planes 16 - 20
	If the track is identified as muon :
+9	Muon identification flags : 1 = loose μ 2 = standard μ 3 = tight μ
+10	ϕ angle of the matching TE
+11	χ^2 of the matching
+12	Dispersion of the number of near-by hits
+13	Number of points used in the fit + Maximum layer number of hits in the fit $\times$ 100 + Minimum layer number of hits in the fit $\times$ 10000 + Number of degrees of freedom in the fit $\times$ 1000000

PA MODULES
TEST MODULE (41)

Since the version 1.05

LENGTH: variable

CONTENT

The module contains extra information from the TER's in the Straw Tubes associated to the TK of the track.

+1	Label of the module (=41)
	+ 0.1×stage at which the TE is created (1 or 2)[1]
+2	TE data descriptor and measurement code :
	bits 1 = 0 if coordinates are given as x, y, z
	= 1 if coordinates are given as R, RΦ, z
	2 = 0 if standard coordinates (as above)
	= 1 if non-standard coordinates (u,v,z)
	3 = 1 if coordinate 1 is measured
	4 = 1 if coordinate 2 is measured
	5 = 1 if coordinate 3 is measured
	6 = 1 if t_1 (x or RΦ) is measured
	7 = 1 if t_2 (y or z) is measured
	8 = 1 if θ is measured
	9 = 1 if ϕ is measured
	10 = 1 if 1/P is measured
	11 = 1 if 1/Pt is measured
	12 = 1 if E is measured
	13 = 1 if β is measured
	14 = 1 if dE/dx is measured
	15 = 1 if time is measured
+3	Coordinate 1 : X or R)
+4	Coordinate 2 : Y or RΦ) ⇒ of TE reference point
+5	Coordinate 3 : Z)
+6	θ angle
+7	ϕ angle
+8	1/P or 1/Pt momentum at TE reference point

[1] For the Inner Detector stage 1 means jet chamber TE, and stage 2 – trigger layer TE.

PA MODULES
TEST MODULE (41)

cont.

The error matrix contains only the elements corresponding to the (n) measured quantities declared in the measurement code, i.e. $m = n(n+1)/2$ elements. When t_1, t_2, θ, ϕ and p are measured the order is (reading line by line) :

$D(t_1,\ t_1)$				
$C(t_1,\ t_2)$	$D(t_2,\ t_2)$			
$C(t_1,\ \theta)$	$C(t_2,\ \theta)$	$D(\theta,\ \theta)$		
$C(t_1,\ \phi)$	$C(t_2,\ \phi)$	$C(\theta,\ \phi)$	$D(\phi,\ \phi)$	
$C(t_1,\ p)$	$C(t_2,\ p)$	$C(\theta,\ p)$	$C(\phi,\ p)$	$D(p,\ p)$

+8+1	Error matrix element 1
⋮	⋮
+8+m	Error matrix element m
+9+m	Number of degrees of freedom
+10+m	χ^2
+11+m	Length of the Track Element

PA MODULES
TEVF MODULE (42)

Since the version 1.05

LENGTH: variable

CONTENT

The module contains extra information from the TER's in the Very Forward Tracker associated to the TK of the track.

+1	Label of the module (=42)
	+ 0.1×stage at which the TE is created (1 or 2)[1]
+2	TE data descriptor and measurement code :
	bits 1 = 0 if coordinates are given as x, y, z
	= 1 if coordinates are given as R, RΦ, z
	2 = 0 if standard coordinates (as above)
	= 1 if non-standard coordinates (u,v,z)
	3 = 1 if coordinate 1 is measured
	4 = 1 if coordinate 2 is measured
	5 = 1 if coordinate 3 is measured
	6 = 1 if t_1 (x or RΦ) is measured
	7 = 1 if t_2 (y or z) is measured
	8 = 1 if θ is measured
	9 = 1 if ϕ is measured
	10 = 1 if 1/P is measured
	11 = 1 if 1/Pt is measured
	12 = 1 if E is measured
	13 = 1 if β is measured
	14 = 1 if dE/dx is measured
	15 = 1 if time is measured
+3	Coordinate 1 : X or R)
+4	Coordinate 2 : Y or RΦ) ⇒ of TE reference point
+5	Coordinate 3 : Z)
+6	θ angle
+7	ϕ angle
+8	1/P or 1/Pt momentum at TE reference point

[1]For the Inner Detector stage 1 means jet chamber TE, and stage 2 – trigger layer TE.

PA MODULES
TEVF MODULE (42)

cont.

The error matrix contains only the elements corresponding to the (n) measured quantities declared in the measurement code, i.e. $m = n(n+1)/2$ elements. When t_1, t_2, θ, ϕ and p are measured the order is (reading line by line) :

$D(t_1, t_1)$				
$C(t_1, t_2)$	$D(t_2, t_2)$			
$C(t_1, \theta)$	$C(t_2, \theta)$	$D(\theta, \theta)$		
$C(t_1, \phi)$	$C(t_2, \phi)$	$C(\theta, \phi)$	$D(\phi, \phi)$	
$C(t_1, p)$	$C(t_2, p)$	$C(\theta, p)$	$C(\phi, p)$	$D(p, p)$

+8+1	Error matrix element 1
⋮	⋮
+8+m	Error matrix element m
+9+m	Number of degrees of freedom
+10+m	χ^2
+11+m	Length of the Track Element

SH BANK

0	Structural links
4	Reference links
14	Data (format −F)

Link LSH = LQ(LDTOP-3)

LINKS

0	Next SH bank
-1	SH bank of daughter particle
-2	SH bank of mother particle
-3	SH bank of sister particle
-4	ST bank (simulated track)

STATUS BITS not used

DATA	CONTENT
	Simulation history bank from the generation
+1	Particle mass code (DELPHI convention)
+2	Particle mass value
+3	Px)
+4	Py)
+5	Pz) ⇒ in laboratory system
+6	E)
+7	P)
+8	Charge from LUND
+9	Index in LUND common
+10	K(I,1) = 10000×KS + KH (LUND convention)
+11	KF (LUND convention)
+12	z of fragmentation
+13	Type of continuum event generated with matrix element option (MSTJ(120) in LUND)
+14	Decay mode in LUND

INITIAL e^+e^- BANK

0	Structural links
0	Reference links
9	Data (format −F)

Link LPIEE = LQ(LDTOP-4)

DATA	CONTENT
	Simulated initial state of the e^+e^- system from the beam definition
+1	Px)
+2	Py) ⇒ of the system
+3	Pz)
+4	E
+5	P
+6	$\cos(\vartheta)$
+7	φ
+8	Code of particle 1 (DELPHI convention)
+9	Code of particle 2 (DELPHI convention)

FINAL e^+e^- BANK

0	Structural links
0	Reference links
9	Data (format −F)

Link LPFEE = LQ(LDTOP-5)

DATA	CONTENT
	Simulated final state of the e^+e^- system after emitting a bremsstrahlung photon
+1	Px)
+2	Py) ⇒ of the system
+3	Pz)
+4	E
+5	P
+6	$\cos(\vartheta)$
+7	φ
+8	Code of particle 1 (DELPHI convention)
+9	Code of particle 2 (DELPHI convention)

INITIAL $l\bar{l}$ / $q\bar{q}$ BANK

0	Structural links
0	Reference links
9	Data (format −F)

Link LPIQL = LQ(LDTOP-6)

DATA	CONTENT
	Simulated initial state of the $l\bar{l}$ or $q\bar{q}$ system before gluon radiation
+1	Px)
+2	Py) $\Rightarrow$ of the system
+3	Pz)
+4	E
+5	P
+6	$\cos(\vartheta)$
+7	φ
+8	Code of particle 1 (DELPHI convention)
+9	Code of particle 2 (DELPHI convention)

TE BANK

0	Structural links
4	Reference links
19	Data (format −I)

Link LDETE = LQ(LDTOP-7)

LINKS	not used
DATA	CONTENT
	Number of TE's (track elements) reconstructed by each detector or module in the event
+1	TE's reconstructed by VD
+2	TE's reconstructed by ID
+3	TE's reconstructed by TPC
+4	TE's reconstructed by RIB
+5	TE's reconstructed by OD
+6	TE's reconstructed by HPC
+7	TE's reconstructed by TOF
+8	TE's reconstructed by HAC
+9	TE's reconstructed by MUB
+10	TE's reconstructed by FCA
+11	TE's reconstructed by RIF
+12	TE's reconstructed by HAF
+13	TE's reconstructed by SAT
+14	TE's reconstructed by LUM
+15	TE's reconstructed by FCB
+16	TE's reconstructed by EMF
+17	TE's reconstructed by HOF
+18	TE's reconstructed by MUF
+19	TE's reconstructed by CCA
+20	TE's reconstructed by STRAW

VD points BANK

0	Structural links
N_h	Reference links
N	Data (format 1I–F)

Link LPD = LQ(LDTOP-9)

LINKS

0	Next PD bank
$-N_h$	PA bank (if any, else 0) associated to the hit N_h

DATA	CONTENT
+1	Number of words per hit + 1000×VD version number
	Then for each hit N_h [1] *:*
+1	Module number with the sign of Z + 1000×channel number of the first strip
+2	R coordinate (from TE if associated) – the sign "+" indicates Rϕ – the sign "–" indicates RZ
+3	Rϕ or Z (since 94) coordinate – the sign of Z from TE if associated, or estimated if not associated
+4	Z coordinate from extrapolation if associated hit, otherwise from the module
+5	Error on Rϕ or Z (from TE if associated)
+6	Local X or Z (since 94) coordinate – In case of multiplexed area local Z of the hits if associated, otherwise local Z corresponding to the smallest |Z| in DELPHI frame

[1] The number of hits in the VD can be obtained only from the ZEBRA structure and it's directly equal to the number of links IQ(LPD-3) of the bank. Using the number of data words IQ(LPD-1) the number of hits is given by (IQ(LPD-1)-1)/NWPH where NWPH is the number of hits per hit. Then the address of each hit NH is LPD+1+(NH-1)*NWPH.

VD points BANK

cont.

	Strip information (packed pulse height and noise)
+1	Strip with maximum pulseheight
+2	Its highest neighbor
+3	The 1-st adjacent strip
+4	The 2-nd adjacent strip

Unassociated TE BANK

15	Structural links
0	Reference links
0	Data

Link LPTEM = LQ(LDTOP-10)

LINKS[1]

-1	ID	unassociated TE banks[2]
-2	TPC	unassociated TE banks
-3	TPC	unassociated TE banks
-4	OD	unassociated TE banks
-5	TOF	unassociated TE banks[3]
-6	MUB	unassociated TE banks
-7	FCA	unassociated TE banks
-8	RIF	unassociated TE banks
-9	FCB	unassociated TE banks
-10	MUF	unassociated TE banks
-11	HOF	unassociated TE banks[3]
-12	MUS	unassociated TE banks
-13	STRAW	unassociated TE banks
-14	not used	
-15	not used	

[1]At each link there is a linear chain of banks for one detector. Each bank contains information from an active TER not associated with a TK. For the MU chambers only the deactive TER's are kept as well.

[2]The format of the TE banks is identical for most of the detectors. The description of the ID unassociated TE bank is given as an example. For the module identifiers of the other detectors concerned see page 35.

[3]The formats of TOF and HOF are different and therefore described individually.

ID unassociated TE BANK

0	Structural links
0	Reference links
13+m	Data (format 4I −F)

Link LPT = LQ(LPTEM-1)

LINKS

0	Next ID unassociated TE bank

DATA CONTENT

The bank contains extra information from the TER's in the Inner Detector unassociated to the TK of the track.

+1	Module identifier (= 4)
+2	Submodule identifier
+3	Stage at which the TE was created (1 or 2)[1]
+4	TE data descriptor and measurement code : bits 1 = 0 if coordinates are given as x, y, z = 1 if coordinates are given as R, RΦ, z 2 = 0 if standard coordinates (as above) = 1 if non-standard coordinates (u,v,z) 3 = 1 if coordinate 1 is measured 4 = 1 if coordinate 2 is measured 5 = 1 if coordinate 3 is measured 6 = 1 if t_1 (x or RΦ) is measured 7 = 1 if t_2 (y or z) is measured 8 = 1 if θ is measured 9 = 1 if ϕ is measured 10 = 1 if 1/P is measured 11 = 1 if 1/Pt is measured 12 = 1 if E is measured 13 = 1 if β is measured 14 = 1 if dE/dx is measured 15 = 1 if time is measured
+5	Coordinate 1 : X or R)
+6	Coordinate 2 : Y or RΦ) ⇒ of TE reference point
+7	Coordinate 3 : Z)

[1]For the Inner Detector only the TER's from the jet chamber are considered, and only if they are validated by the trigger part.

ID unassociated TE BANK

cont.

+8	θ angle
+9	ϕ angle
+10	1/P or 1/Pt momentum at TE reference point

The error matrix contains only the elements corresponding to the (n) measured quantities declared in the measurement code, i.e. m = n(n+1)/2 elements. When t_1, t_2, θ, ϕ and p are measured the order is (reading line by line) :

$D(t_1, t_1)$				
$C(t_1, t_2)$	$D(t_2, t_2)$			
$C(t_1, \theta)$	$C(t_2, \theta)$	$D(\theta, \theta)$		
$C(t_1, \phi)$	$C(t_2, \phi)$	$C(\theta, \phi)$	$D(\phi, \phi)$	
$C(t_1, p)$	$C(t_2, p)$	$C(\theta, p)$	$C(\phi, p)$	$D(p, p)$

+10+1	Error matrix element 1
⋮	⋮
+10+m	Error matrix element m
+11+m	Number of degrees of freedom
+12+m	χ^2
+13+m	Length of the Track Element

TOF unassociated TE BANK

0	Structural links
0	Reference links
14	Data (format 4I –F)

Link LPT = LQ(LPTEM-5)

LINKS

0	Next TOF unassociated TE bank

DATA CONTENT

The bank contains extra information from the TER's in the TOF Detector unassociated to the TK of the track.

+1 Module identifier (= 11)
+2 Submodule identifier
+3 Stage at which the TE was created (1 or 2)
+4 TE data descriptor and measurement code :
bits 1 = 0 if coordinates are given as x, y, z
= 1 if coordinates are given as R, RΦ, z
2 = 0 if standard coordinates (as above)
= 1 if non-standard coordinates (u,v,z)
3 = 1 if coordinate 1 is measured
4 = 1 if coordinate 2 is measured
5 = 1 if coordinate 3 is measured
6 = 1 if t_1 (x or RΦ) is measured
7 = 1 if t_2 (y or z) is measured
8 = 1 if θ is measured
9 = 1 if ϕ is measured
10 = 1 if 1/P is measured
11 = 1 if 1/Pt is measured
12 = 1 if E is measured
13 = 1 if β is measured
14 = 1 if dE/dx is measured
15 = 1 if time is measured
+5 Coordinate 1 : X or R)
+6 Coordinate 2 : Y or RΦ) ⇒ of TE reference point
+7 Coordinate 3 : Z)

TOF unassociated TE BANK

cont.

+8	θ angle
+9	ϕ angle
+10	Time of flight measurement
+11	bits 1- 8 : External TDC
	9-16 : External ADC
	17-24 : not used
+12	bits 1- 8 : Internal TDC
	9-16 : Internal ADC
	17-24 : not used
+13	TOF quality flag
+14	Multi hit information ($1024 \times$T3 level)

HOF unassociated TE BANK

0	Structural links
0	Reference links
14	Data (format 4I −F)

Link LPT = LQ(LPTEM-11)

LINKS

0	Next HOF unassociated TE bank

DATA CONTENT

The bank contains extra information from the TER's in the HOF Detector unassociated to the TK of the track.

+1 Module identifier (= 29)
+2 Submodule identifier
+3 Stage at which the TE was created (1 or 2)
+4 TE data descriptor and measurement code :
bits 1 = 0 if coordinates are given as x, y, z
= 1 if coordinates are given as R, RΦ, z
2 = 0 if standard coordinates (as above)
= 1 if non-standard coordinates (u,v,z)
3 = 1 if coordinate 1 is measured
4 = 1 if coordinate 2 is measured
5 = 1 if coordinate 3 is measured
6 = 1 if t_1 (x or RΦ) is measured
7 = 1 if t_2 (y or z) is measured
8 = 1 if θ is measured
9 = 1 if ϕ is measured
10 = 1 if 1/P is measured
11 = 1 if 1/Pt is measured
12 = 1 if E is measured
13 = 1 if β is measured
14 = 1 if dE/dx is measured
15 = 1 if time is measured
+5 Coordinate 1 : X or R)
+6 Coordinate 2 : Y or RΦ) $\Rightarrow$ of TE reference point
+7 Coordinate 3 : Z)

HOF unassociated TE BANK

cont.

+8	θ angle
+9	ϕ angle
+10	Time of flight measurement
+11	Error on X
+12	not used
+13	Error on Y
+14	Error on time (1.0)

OD timing BANK

0	Structural links
0	Reference links
N	Data (format −B)

Link LTIOD = LQ(LDTOP-11)

DATA	CONTENT		
+1	Number of words N_w		
+2	bits	1-16 :	T0 to be used in the OD analysis
		17-32 :	Nominal time value of BCO signal expected in OD
+3	bits	1-16 :	Actual time value of BCO signal in OD in this event
		17-32 :	Not used
+4	Number of hits N_h		
	For each hit		
+1	bits	1-13 :	10×(Drift time + 1450) after T0 and pedestal substraction
		14-19 :	Z value + 1
		20 :	Tag bit
		21-32 :	Plank + 24×(Cell + 32×Layer)

VSAT results BANK

0	Structural links
0	Reference links
28	Data (format −F)

Link LTEVS = LQ(LDTOP-12)

DATA	CONTENT
	Track element TE for VSAT module 1
+1	Energy deposited in the fads of the module
+2	X1 coordinate reconstructed from the first strip plane
+3	Y coordinate reconstructed fro the second strip plane
+4	Z coordinate distance along the beam from the interaction point
+5	X2 coordinate reconstructed from the second strip plane
+6	θ angle (range 0^0-180^0)
+7	ϕ angle (range 0^0-360^0)
	Track element TE for VSAT module 2
+8	Energy deposited in the fads of the module
+9	X1 coordinate reconstructed from the first strip plane
+10	Y coordinate reconstructed fro the second strip plane
+11	Z coordinate distance along the beam from the interaction point
+12	X2 coordinate reconstructed from the second strip plane
+13	θ angle (range 0^0-180^0)
+14	ϕ angle (range 0^0-360^0)
	Track element TE for VSAT module 3
+15	Energy deposited in the fads of the module
+16	X1 coordinate reconstructed from the first strip plane
+17	Y coordinate reconstructed fro the second strip plane
+18	Z coordinate distance along the beam from the interaction point
+19	X2 coordinate reconstructed from the second strip plane
+20	θ angle (range 0^0-180^0)
+21	ϕ angle (range 0^0-360^0)

VSAT results BANK

cont.

	Track element TE for VSAT module 4
+22	Energy deposited in the fads of the module
+23	X1 coordinate reconstructed from the first strip plane
+24	Y coordinate reconstructed fro the second strip plane
+25	Z coordinate distance along the beam from the interaction point
+26	X2 coordinate reconstructed from the second strip plane
+27	θ angle (range 0^0-180^0)
+28	ϕ angle (range 0^0-360^0)

Ambiguous shower BANK

0	Structural links
N_L	Reference links
N_D	Data (format −I)

Link LCAMB = LQ(LDTOP-13)

LINKS

0	Next ambiguous shower bank
-1	1st PA associated to the shower
-2	2nd PA associated to the shower
⋮	⋮
-N_L	Last PA associated to the shower

DATA	CONTENT
+1	Type of the ambiguous shower bank : 1 for CCA, 2 for HCAL
+2	Number n_c of PA's connected to this shower
+3	Internal count of PA processed
+4	TANAGRA identifier of the CCA or HAC TER
+5	TANAGRA identifier of the TK of the first PA
+6	Pointer to the corresponding extra-module (CCA or HAC) in the first PA
+7	Number n_e of electromagnetic TE's in the CCA
+8	Number n_h of HAC TE's in the shower
	For CCA (type 1) :
+8+1	TANAGRA identifier of the 1st EM TE
⋮	⋮
+8+n_e	TANAGRA identifier of the last EM TE

HPC trigger BANK

0	Structural links
0	Reference links
$2N_m+2$	Data (format –I)

Link LHPT1 = LQ(LDTOP-14)

DATA	CONTENT[1]
+1	Global word count
+2	Number of modules with data N_m
	For each module with data :
+1	Module number[2]
+2	A.D.C content of that module[3]

[1] The bank is not written out for events in which none of the scintillators is above the threshold.

[2] The module numbers range from 1 to 144 for the HPC scintillators, from 145 to 168 for the 90^0 counters, and from -11 to 0 for the spare channels. Each 90^0 counter module covers 15^0 in ϕ starting at 262.5^0.

[3] The ADC content is pedestal-substracted.

CCA BANK

0	Structural links
N_L	Reference links
N_D	Data (format 2I −F)

Link LNCCA = LQ(LDTOP-15)

LINKS[1]

-1	1st	origin PA associated to the CCA shower
-2	2nd	origin PA associated to the CCA shower
⋮	⋮	
$-N_L$	Last	origin PA associated to the CCA shower

DATA	CONTENT[2]
+1	TANAGRA identifier of the CCA bank
+2	Reserved (=0)
+3	Number of CCA modules N
+4	Pointer to the 1st CCA module
+5	Pointer to the 2nd CCA module
⋮	⋮
+3+N	Pointer to the Nth CCA module
	CCA results module
+1	CCA result code : $1000\times N_{EMF} + 100\times N_{HPC} + 10\times N_{HAC} + N_{CH}$
+2	Energy
+3	X
+4	Y
+5	Z
+6	θ
+7	φ

[1] The link area contains references to the tracks contributing to the CCA structure. The bunch of tracks is associated to a bunch of calorimeter showers.

[2] The data content of the bank is organized in several modules (CCA results, Charged track extrapolation and TOF hits) in order to allow reassociation or better energy measurement.Each module is identified by its first word.

CCA BANK

cont.

Carged tracks extrapolation module

+1	ID = 8
+2	Number of extrapolations given in the module

For each extrapolation

+1	Sequential number of the charged track (according to the CCA bank links)
+2	X
+3	Y
+4	Z
+5	θ
+6	φ
+7	P

TOF hits module

+1	ID = 9
+2	Number of TOF hits given in the module

For each TOF hit

+1	X
+2	Y
+3	Z
+4	External TDC + 256×(external ADC)
+5	Internal TDC + 256×(internal ADC)

HPC clusters BANK

0	Structural links
0	Reference links
$3N_c+2$	Data (format 2I −B)

Link LTUB = LQ(LDTOP-16)

DATA	CONTENT
	Unassociated HPC cluster information
+1	Clobal word count
+2	Number of unassociated HPC clusters N_c in the event
	For each cluster :
+1	bits 1- 6 : Layer number
	8-12 : Energy (GeV)$\times$1000
+2	bits 1-12 : ϕ (rad) of the cluster
	13-20 : Cluster radius R (cm)
+3	bits 1- 8 : σ_z of the cluster
	9-32 : Z coordinate of the cluster

JET BANK

0	Structural links
0	Reference links
N^w_{jet}	Data (format –I)

Link LDJET = LQ(LDTOP-17)

+1	Wordcount N^w_{jet}	(variable)
+2	Identifier (bits 1- 4)	(1)
	Error code (bits 5-32)	(usualy FF10)
+3	Sub-identifier	(0)
+4	Number N_{jet} of reconstructed jets	
+5	Number N_e of $e^\pm$ with energy $>$ 2 GeV	
+6	Number N_μ of $\mu^\pm$ with energy $>$ 3 GeV	
+7	Number N_γ of γ's with energy $>$ 8 GeV	
+8	Number N_π of $\pi^\pm$ with energy $>$ 8 GeV	
+9	Number N_K of $K^\pm$ with energy $>$ 5 GeV	
+10	Number N_p of $p/\bar{p}$ with energy $>$ 5 GeV	
+11	Number N_{K_S} of K^0_S with energy $>$ 5 GeV	
+12	Number N_{K_L} of $n/\bar{n}$ or K^0_L with energy $>$ 10 GeV	
+13	Number N^S_{PV} of secondary vertices	
+14	Pointer to the JET area	
+15	Pointer to the TRACK area	
+16	Pointer to the VERTEX area	

For each reconstructed jet

+1	Effective mass of the jet (in MeV/c^2)
+2	Px)
+3	Py) $\Rightarrow$ of the jet (in MeV/c)
+4	Pz)

For each track which total number is
$N_e + N_\mu + N_\gamma + N_\pi + N_K + N_p + N_{K_S} + N_{K_L}$

+1	Mass code of the track
+2	Px)
+3	Py) $\Rightarrow$ of the track
+4	Pz)
+5	Parent jet number
+6	Mass identification code
	(1 byte per mass assignement)

JET BANK

cont.

	For each secondary vertex	
+1	Mass code of the origin track	
+2	X)	
+3	Y) $\Rightarrow$ of the vertex	
+4	Z)	
+5	Distance to the primary vertex	
+6	Error on the distance	
N^w_{jet}	Wordcount N^w_{jet}	(variable)

HCAL cathode readout BANK

0	Structural links
0	Reference links
N	Data (format 1I −B)

Link LKTUB = LQ(LDTOP-18)

DATA CONTENT

	Packed information of HCAL tube cathode readout
+1	Number of tube hits N_h in the event
	For each tube hit :
+1	Tube identifier −
	bits 1- 7 : Module number
	8-12 : Plane number
	13-16 : Tube number
	17-20 : Cluster number
+2	Coordinates of tube center (in Delphi frame) −
	bits 1-16 : R(cm)×100 in the barrel
	: D(cm)×100 in the end caps (D is the distance with sign from the module axis)
	17-32 : $\phi\times 10000$
	Packed information of HCAL anode readout
$2N_h+2$	Number of words N_a with anode read-out information
	For each two modules :
$2N_h+3$	Anode read-out timing −
	bits 1- 8 : Module number
	9-16 : Time in ADC units
	17-24 : Module number
	25-32 : Time in ADC units
$2N_h+N_a+3$	Length of the next information module (if any) or 0

STRAW timing BANK

0	Structural links
0	Reference links
N	Data (format −B)

Link LTIST = LQ(LDTOP-19)

DATA	CONTENT	
+1	Number of words N_w	
+2	bits 1-16 :	T0 to be used in the STRAW analysis
	17-32 :	Nominal time value of BCO signal expected in STRAW
+3	bits 1-16 :	Actual time value of BCO signal in STRAW in this event
	17-32 :	Not used
+4	Number of hits N_h	
	For each hit	
+1	bits 1-13 :	10×(Drift time + 1450) after T0 and pedestal substraction
	14-19 :	Not used
	20 :	Tag bit
	21-32 :	Sector + 20×(Cell + 32×Layer)

STIC trigger BANK

0	Structural links
0	Reference links
16	Data (format 5I –B)

Link LSTT1 = LQ(LDTOP-20)

DATA	CONTENT[1]
	STIC calorimeter and Veto counter trigger information
+1	General trigger description : 0 = no problem detected 1 = no Calorimeter LTS_DB trigger blocklet 2 = no Veto counter VDB trigger blocklet 3 = both trigger blocklets are absent
+2	Side C low threshold hit patterns for the Calorimeter
+3	Side C high threshold hit patterns for the Calorimeter
+4	Side A low threshold hit patterns for the Calorimeter
+5	Side A high threshold hit patterns for the Calorimeter
+6	Side A 1st Veto counter plane : bits 1-16 : 1st wagon 17-32 : 2nd wagon
+7	Side A 1st Veto counter plane : bits 1-16 : 3rd wagon 17-32 : 4th wagon
+8	Side A 2nd Veto counter plane : bits 1-16 : 1st wagon 17-32 : 2nd wagon
+9	Side A 2nd Veto counter plane : bits 1-16 : 3rd wagon 17-32 : 4th wagon
+10	Side C 1st Veto counter plane : bits 1-16 : 1st wagon 17-32 : 2nd wagon
+11	Side C 1st Veto counter plane : bits 1-16 : 3rd wagon 17-32 : 4th wagon

STIC trigger BANK

cont.

+12	Side C 2nd Veto counter plane :	
	bits 1-16 :	1st wagon
	17-32 :	2nd wagon
+13	Side C 2nd Veto counter plane :	
	bits 1-16 :	3rd wagon
	17-32 :	4th wagon
+14	bits 1-16 :	Neutral trigger from arm A
	17-32 :	Neutral trigger from arm C
+15	bits 1- 8 :	Small veto counter trigger bits
	9-32 :	not used
+16	bits 1- 4 :	Small veto hit bits from ADB 1st wagon
	5- 8 :	Small veto hit bits from ADB 2nd wagon
	9-12 :	Small veto hit bits from ADB 3rd wagon
	13-16 :	Small veto hit bits from ADB 4th wagon
	17 :	Ratio cut decision side A
	18 :	Ratio cut decision side C
	19 :	Ratio cut enabled side A
	20 :	Ratio cut enabled side C
	21 :	Small veto enabled side A
	22 :	Small veto enabled side C
	23-32 :	not used

[1]The last several words of this bank are added at a different time for various reprocessings. To read its content correctly the exact number of the data words should be found in the ZEBRA structure at IQ(LSST1-1).

μVD Hits BANK

0	Structural links
N_a	Reference links
N	Data (format 1I–F)

Link LMVDH = LQ(LDTOP-21)

LINKS

0	Next μVD Hits bank
$-N_a$	PA bank associated to the hit N_a [1]

DATA	CONTENT
+1	Number of hits N_h + 1000×number of words per hit
	Then for each hit N_h [2] *:*
+1	Module number with the sign of Z
+2	Local X or Z (since 94) coordinate – In case of multiplexed area local Z of the hits if associated, otherwise local Z corresponding to the smallest $\|Z\|$ in DELPHI frame
+3	R coordinate (from TE if associated) – the sign "+" indicates Rϕ – the sign "–" indicates RZ
+4	Rϕ or Z (since 94) coordinate – the sign of Z from TE if associated, or estimated if not associated
+5	Signal to noise ratio of the hit

[1] The number of the reference links is equal to the number of the associated VD hits only.

[2] The VD hits in the bank are ordered - all associated hits are coming first followed by the unassociated ones.

V0ID BANK

0	Structural links
$2N_{V^0}$	Reference links
N	Data (format 1I-F)

Link LV0ID = LQ(LDTOP-22)

LINKS

	PA banks of the i-th V^0 decay products
−L1	LQ(LV0ID − 2∗I + 1)
−L2	LQ(LV0ID − 2∗I)

DATA	CONTENT
+1	Number of reconstructed V^0's N_{V^0}
	For each reconstructed V^0 :
+1	bits 1-10 : Number of words
	11-14 : Number of hypothesis
	15-20 : Tagging flag : 0 – loose V^0
	1 – tight V^0
	– very tight V^0 :
	2 – K^0 background
	3 – Λ background
	22 – K^0
	33 – Λ
+2	V^0 momentum (GeV/c)
+3	Probability of χ^2 (from PXFVTX fit)
+4	X)
+5	Y) > coordinates of V0 vertex (cm)
+6	Z)
+7	Flight distance in XY (XYZ since 94) normalized to its error
+8	Angle (in radians) in XY with respect to the line joining to the primary vertex
+9	|p+| coordinate x after the fit (GeV/c)
+10	|p+| coordinate y after the fit (GeV/c)
+11	|p+| coordinate z after the fit (GeV/c)
+12	|p−| coordinate x after the fit (GeV/c)
+13	|p−| coordinate y after the fit (GeV/c)
+14	|p−| coordinate z after the fit (GeV/c)
+15	V^0 suggested mass (GeV/c^2), negative if antiparticle

V0ID BANK

cont.

Up to the version 1.02

	For each hypothesis :	
+1	bits 1-10 :	Number of words
	11-16 :	Kind of fit :
		1 – VTX fit, no mass constraint
		2 – VTX+DIR fit, no mass constraint
		11 – VTX fit, K^0 mass constraint
		12 – VTX+DIR fit, K^0 mass constraint
		21 – VTX fit, Λ mass constraint
		22 – VTX+DIR fit, Λ mass constraint
		31 – VTX fit, $\bar{\Lambda}$ mass constraint
		32 – VTX+DIR fit, $\bar{\Lambda}$ mass constraint
		-1 – fit failed or low probability
	17-23 :	Hypothesis probability $\times$ 100
+2	X)	
+3	Y) > fitted coordinates of the V^0 vertex (cm)	
+4	Z)	
+5	Px)	
+6	Py) > fitted momenta of the V^0 (GeV/c)	
+7	Pz)	
	Impacts for noDIR fits only	
+8	Impact in xy projection (cm)	
+9	Error of xy impact (cm)	
+10	Impact in z (cm)	
+11	Error of z impact (cm)	

Unassociated TE BANK

0	Structural links
0	Reference links
N	Data (format 1I −F)

Link LUTER = LQ(LDTOP-23)

DATA	CONTENT
+1	Number of TE's in OD +
	Number of TE's in FCA×100 +
	Number of TE's in FCB×10000
	For each unassociated TE
+1	Data descriptor and measurement code :
	bits 1 = 0 if coordinates are given as x, y, z
	= 1 if coordinates are given as R, RΦ, z
	2 = 0 if standard coordinates (as above)
	= 1 if non-standard coordinates (u,v,z)
	3 = 1 if coordinate 1 is measured
	4 = 1 if coordinate 2 is measured
	5 = 1 if coordinate 3 is measured
	6 = 1 if t_1 (x or RΦ) is measured
	7 = 1 if t_2 (y or z) is measured
	8 = 1 if θ is measured
	9 = 1 if ϕ is measured
	10 = 1 if 1/P is measured
	11 = 1 if 1/Pt is measured
+2	Coordinate 1 : x or R)
+3	Coordinate 2 : y or RΦ) of TE reference point
+4	Coordinate 3 : z)
+5	θ angle
+6	ϕ angle
+7	1/P or 1/Pt momentum at TE reference point
+8	Length of the Track Element

PXPC BANK

Up to the version 1.02

0	Structural links
3NPH	Reference links
N	Data (format 1I / 1I 8F)

Link LPHOT = LQ(LDTOP-24)

LINKS

	PA banks of the i-th photon decay products
−L1	LQ(LPHOT − 3∗I + 2)
−L2	LQ(LPHOT − 3∗I + 1)
	PA bank of simulated photon (if any)
−L3	LQ(LPHOT − 3∗I)

DATA	CONTENT
+1	Number of converted photons NPH
	For each converted photon :
+1	PXPHOT code −
	Photon converted in front of TPC (mass code 21) :
	−21 – conversion from 2 TPC tracks (type I pair)
	−22 – conversion from 2 TPC trakcs (type II pair)
	−23 – conversion from 2 TPC tracks (type III pair)
	−24 – conversion from 1 TPC track (type I pair)
+2	Px)
+3	Py) > of the converted photon
+4	Pz)
+5	Energy of the photon
+6	Photon track length from Beam Spot to convertion
+7	X)
+8	Y) > position of the conversion vertex
+9	Z)

B tagging BANK

0	Structural links
0	Reference links
30	Data (format −F)

Link LBTAG = LQ(LDTOP-25)

DATA	CONTENT
+1	X)
+2	Y) > coordinates of the Beam position
+3	Z)
+4	X)
+5	Y) > sizes of the the Beam spot (σ)
+6	Z)
+7	bits 1- 8 : Reconstructed primary vertex multiplicity 9-16 : Number of degrees of freedom of the vertex fit
+8	X)
+9	Y) > coordinates of the reconstructed primary vertex fit
+10	Z)
+11	χ^2 of the priamry vertex fit
+12	xx)
+13	xy)
+14	yy) > primary vertex covariance matrix
+15	xz)
+16	yz)
+17	zz)
+18	B tag probability for tracks with neg. imp. parameter
+19	B tag probability for tracks with pos. imp. parameter
+20	B tag probability for all tracks
+21	B tag hemisphere 1 probability for neg. imp. parameters
+22	B tag hemisphere 2 probability for neg. imp. parameters
+23	B tag hemisphere 1 probability for pos. imp. parameters
+24	B tag hemisphere 2 probability for pos. imp. parameters
+25	B tag hemisphere 1 probability for all tracks
+26	B tag hemisphere 2 probability for all tracks
+27	X)
+28	Y) > components of thrust axis vector
+29	Z)
+30	Thrust value

NTRK BANK

Up to the version 1.02

0	Structural links
0	Reference links
N	Data (format 1I –F)

Link LNTRK = LQ(LDTOP-26)

DATA	CONTENT
+1	Number of new tracks from ID-VD pattern recognition
	For each new track :
	PA module MAIN
+1	Particle mass
+2	Px)
+3	Py) > At the closest distance approach to the vertex
+4	Pz)
+5	E, energy
+6	P, momentum (absolute value)
+7	Charge (0=neutral, 1=positive, 2=negative, 3=undefined)
+8	Track length (negative if incoming particle)
+9	Mass code
+10	Impact parameter (with sign): If VC is the distance of the vertex to the curvature center and R the curvature radius with sign opposite to the charge sign, then rp = sign(R)*(|R|-VC)
+11	Error on the impact parameter
+12	not used (=-1.)
+13	not used (= 0.)
+14	not used (=-1.)
+15	χ^2 of the fit of the TK without VD hits
+16	Number of degrees of freedom without VD hits
+17	χ^2 of the VD hits associated with the track
+18	Error on E
+19	Z impact parameter = ZP - ZV, where ZP is the z coordinate of the track extrapolation at the closest distance approach to the vertex in R-Rϕ plane

NTRK BANK

cont.

+20	Error on ZP
+21	Polar angle of the point of closest approach to the vertex
+22	X)
+23	Y) > Coordinates of the first measured point of the track
+24	Z)
+25	χ^2 of the fit of the TK
+26	Number of degrees of freedom

PA module TRAC

+1	ε impact parameter	
+2	z impact parameter	
+3	θ angle	
+4	ϕ angle	
+5	1./R (R - radius of the curvature)	
+6	Weight matrix for these parameters :	$\varepsilon - \varepsilon$
+7		$z - \varepsilon$
+8		$z - z$
+9		$\varepsilon - \theta$
+10		$z - \theta$
+11		$\theta - \theta$
+12		$\varepsilon - \phi$
+13		$z - \phi$
+14		$\theta - \phi$
+15		$\phi - \phi$
+16		$\varepsilon - 1/R$
+17		$z - 1/R$
+18		$\theta - 1/R$
+19		$\phi - 1/R$
+20		$1/R - 1/R$

V0TK BANK

0	Structural links
0	Reference links
N	Data (format 1I −F)

Link LV0TK = LQ(LDTOP-27)

DATA	CONTENT	
+1	Number of reconstructed V^0's	
+2	Number of words per V^0 neutral track	
	For each reconstructed V^0:	
+1	ε impact parameter	
+2	z impact parameter	
+3	θ angle	
+4	ϕ angle	
+5	Weight matrix for these parameters :	$\varepsilon - \varepsilon$
+6		$z - \varepsilon$
+7		$z - z$
+8		$\varepsilon - \theta$
+9		$z - \theta$
+10		$\theta - \theta$
+11		$\varepsilon - \phi$
+12		$z - \phi$
+13		$\theta - \phi$
+14		$\phi - \phi$

PVS BANK

0	Structural links
0	Reference links
N	Data (format ∗I / 2I 4F)

Link LPVS = LQ(LDTOP-28)

DATA	CONTENT
+1	Number of simulated vertices
	For each simulated vertex :
+1	bits 1- 8 : Index of outgoing PA
	9-16 : Index of incoming PA
	For each simulated vertex :
+1	TANAGRA identifier of the TV bank
+2	bits 1- 9 : Number of outgoing particles
	10 : Status bits − dummy vertex
	11 : secondary vertex
	12 : secondary hadronic vertex
	13 : vertex with simulation data
+3	Mass code of the origin particle
	Special cases : 0. for primary vertex
	999. for dummy vertex
+4	X)
+5	Y) > coordinates of the vertex
+6	Z)

STSH BANK

0	Structural links
NPA	Reference links
N	Data (format ∗I −F)

Link LSTSH = LQ(LDTOP-29)

LINKS

	Reconstructed PA bank of the i-th ST track
−L	LQ(LSTSH − I)

DATA	CONTENT
+1	Total number of SH and ST tracks + 4
+2	Number of SH tracks without matching ST's × 1000 + Number of words for each SH
+3	Number of SH tracks with matching ST's × 1000 + Number of words for each STSH
+4	Number of ST tracks without matching SH's × 1000 + Number of words for each ST
+5	Type of continuum event generated with matrix element option (MSTJ(120) in LUND)

For each SH non associated with ST

+1	bits	1- 8 :	Index of daugther particle
		9-16 :	Index of mother particle
		17-24 :	Index of sister particle

For each SH associated with ST

+1	bits	1- 8 :	Index of daugther particle
		9-16 :	Index of mother particle
		17-24 :	Index of sister particle
+2	bits	1- 8 :	Index of end vertex PV in bank PVS(28)
		9-16 :	Index of PV in bank PVS(28)

For each ST non associated with SH

+1	bits	1- 8 :	Index of end vertex PV in bank PVS(28)
		9-16 :	Index of PV in bank PVS(28)

STSH BANK

cont.

	For each SH non associated with ST
+1	Particle mass code
+2	Particle mass value
+3	Px
+4	Py
+5	Pz
+6	E
+7	Charge from LUND
+8	K(I,1) = 10000×KS + KH (LUND convention)
+9	KF (LUND convention)
+10	z of fragmentation
+11	Decay mode in LUND

	For each associated SH and ST
+1	Mass label
+2	Particle mass
+3	Px
+4	Py
+5	Pz
+6	E
+7	Track length
+8	Mass code
+9	Impact parameter in Rϕ
+10	Impact parameter in Z
+11	ϕ polar angle at closest approach
+12	Charge from LUND
+13	K(I,1) = 10000×KS + KH (LUND convention)
+14	KF (LUND convention)
+15	z of fragmentation
+16	Decay mode in LUND

STSH BANK

cont.

	For each ST non associated with SH
+1	Mass label
+2	Particle mass
+3	Px
+4	Py
+5	Pz
+6	E
+7	Charge (DELPHI convention)
+8	Track length
+9	Mass code
+10	Impact parameter in Rϕ
+11	Impact parameter in Z
+12	ϕ polar angle at closest approach

EFLO BANK

0	Structural links
0	Reference links
N	Data (format −F)

Link LEFLO = LQ(LDTOP-30)

DATA	CONTENT
	Energy flow information
	Global variables for the event
+1	Number of global event words
+2	Normally computed total energy
+3	Total energy where jet energies are forced to E_{beam}
+4	Total energy at less than 40° to the beam pipe
+5	Missing energy
+6	Angle wrt the beam of thrust (in degrees)
+7	Total unassociated elm. energy in the event
+8	Total unassociated had. energy in the event
+9	Had. energy excess in charged showers
+10	Elm. energy excess in charged showers
+11	Total energy excess in charged showers
+12	Estimate of energy in FCA/FCB
+13	Total charged energy
+14	$M^2_{missing}$ restricted to select "good" events
+15	Thrust
	Jet analysis
+1	Number of jets found + 100 × number of words per jet
	For each jet
+1	Multiplicity (including neutrals)
+2	Momentum in x direction, in GeV/c
+3	Momentum in y direction, in GeV/c
+4	Momentum in z direction, in GeV/c
+5	Energy, in GeV
+6	Invariant mass, in GeV/c^2
+7	Elm. shower energy, in GeV
+8	Had. shower energy, in GeV

EFLO BANK

cont.

JETSET-like track information

+1	Number of charged tracks	+
	$1000 \times$ number of showers	+
	$1000000 \times$ number of Elephant neutral tracks	+
+2	Number of words per track	

For each track

+1	Px, momentum in the x direction, in GeV/c
+2	Py, momentum in the y direction, in GeV/c
+3	Pz, momentum in the z direction, in GeV/c
+4	E, energy, in GeV
+5	m, mass, in GeV/c^2
+6	Electromagnetic energy of the track
+7	Hadronic energy of the track
+8	charge (Delphi convention)

$\boxed{\text{DSTR BANK}}$

0	Structural links
$5N_{D^*}$	Reference links
N	Data (format 1I−F)

Link LDSTR = LQ(LDTOP-31)

LINKS	
	PA banks of the i-th D^* decay products
−L1	LQ(LDSTR − 5∗I + 4) to slow π
−L2	LQ(LDSTR − 5∗I + 3) to K from D^0
−L3	LQ(LDSTR − 5∗I + 2) to π from D^0
−L4	LQ(LDSTR − 5∗I + 1) to π from D^0 (if any)
−L5	LQ(LDSTR − 5∗I) to π from D^0 (if any)

DATA	CONTENT
	Reconstructed D^* candidates
+1	Number of reconstructed D^* + 100×number of words per D^*
	For each D^* candidate
+1	D^* candidate type : 1 D^* normal 11 D^0 mass side band 21 (D^*−D^0) mass side band
+2	D^* momentum
+3	Probability of the D^0 vertex fit
+4	X)
+5	Y) ⇒ coordinates of the D^0 vertex
+6	Z)
+7	XY flight distance of the D^0 vertex
+8	$\cos(\theta)$ of K in the D^0 rest frame
+9	D^0 mass (negative for antiparticle)
+10	(D^*−D^0) mass
+11	Px)
+12	Py) ⇒ refitted momentum of the slow π
+13	Pz)
+14	Px)
+15	Py) ⇒ refitted momentum of the K from D^0
+16	Pz)

$\boxed{\textbf{DSTR BANK}}$

cont.

+17	Px)	
+18	Py)	$\Rightarrow$ refitted momentum of the π from D^0
+19	Pz)	
+20	Px)	
+21	Py)	$\Rightarrow$ refitted momentum of the π from D^0 (if any)
+22	Pz)	
+23	Px)	
+24	Py)	$\Rightarrow$ refitted momentum of the π from D^0 (if any)
+25	Pz)	

RIFA BANK

0 Structural links
0 Reference links
N Data (format −B)

Link LRIFA = LQ(LDTOP-41)

DATA	CONTENT
	Individual photon information in RIFA subdetector
+1	bits 1- 2 : Subdetector identifier (=0)
	3-12 : Number of tracks
	For each track
+1+i	Tanagra identifier of the i-th track
	For each track and radiator
+1	bits 1- 1 : Radiator identifier (liquid=0, gas=1)
	2-11 : Track index in the list of track identifiers
	12-21 : Number of photons to follow
	22-32 : Number of photons before background rejection
+2	bits 1- 6 : Sector number for liquid radiator/mirror
	7- 9 : Liquid radiator/mirror number
	10-20 : Quality word
	21-31 : Fitted background for the best hypothtesis
	For the 5 best hypotheses
+2+j	bits 1-15 : Expected number of photons (units 0.001)
	16-22 : Fitted probability (units 0.01)
	For each photon
+1	bits 1-12 : θ_C (units 0.25mrad in liquid, 0.025 mrad in gas)
	13-22 : ϕ_C (units $\pi/512$)
	23-32 : Conversion probability (units 0.00125)
+2	bits 1- 8 : σ_C (units 0.125mrad)
	9-22 : Photon identifier
	23-27 : Photon quality word
+3	bits 1-10 : log *Jacobian*
	11-21 : $d\theta/dx_{loc}$ derivative w.r.t. track (units mrad/mm)
	22-32 : $d\theta/dy_{loc}$ derivative w.r.t. track (units mrad/mm)

RIBA BANK

0	Structural links
0	Reference links
N	Data (format −B)

Link LRIBA = LQ(LDTOP-41)

DATA	CONTENT
	Individual photon information in RIBA subdetector
+1	bits 1- 2 : Subdetector identifier (=1)
	3-12 : Number of tracks
	For each track
+1+i	Tanagra identifier of the i-th track
	For each track and radiator
+1	bits 1- 1 : Radiator identifier (liquid=0, gas=1)
	2-11 : Track index in the list of track identifiers
	12-21 : Number of photons to follow
	22-32 : Number of photons before background rejection
+2	bits 1- 6 : Sector number for liquid radiator/mirror
	7- 9 : Liquid radiator/mirror number
	10-20 : Quality word
	21-31 : Fitted background for the best hypothtesis
	For the 5 best hypotheses
+2+j	bits 1-15 : Expected number of photons (units 0.001)
	16-22 : Fitted probability (units 0.01)
	For each photon
+1	bits 1-12 : θ_C (units 0.25mrad in liquid, 0.025 mrad in gas)
	13-22 : ϕ_C (units $\pi/512$)
	23-32 : Conversion probability (units 0.00125)
+2	bits 1- 8 : σ_C (units 0.125mrad)
	9-22 : Photon identifier
	23-27 : Photon quality word
+3	bits 1-10 : log *Jacobian*
	11-21 : $d\theta/dx_{loc}$ derivative w.r.t. track (units mrad/mm)
	22-32 : $d\theta/dy_{loc}$ derivative w.r.t. track (units mrad/mm)

RIBC BANK

0	Structural links
0	Reference links
N	Data (format −B)

Link LRIBC = LQ(LDTOP-41)

DATA	CONTENT
	Individual photon information in RIBC subdetector
+1	bits 1- 2 : Subdetector identifier (=2)
	3-12 : Number of tracks
	For each track
+1+i	Tanagra identifier of the i-th track
	For each track and radiator
+1	bits 1- 1 : Radiator identifier (liquid=0, gas=1)
	2-11 : Track index in the list of track identifiers
	12-21 : Number of photons to follow
	22-32 : Number of photons before background rejection
+2	bits 1- 6 : Sector number for liquid radiator/mirror
	7- 9 : Liquid radiator/mirror number
	10-20 : Quality word
	21-31 : Fitted background for the best hypothtesis
	For the 5 best hypotheses
+2+j	bits 1-15 : Expected number of photons (units 0.001)
	16-22 : Fitted probability (units 0.01)
	For each photon
+1	bits 1-12 : θ_C (units 0.25mrad in liquid, 0.025 mrad in gas)
	13-22 : ϕ_C (units $\pi/512$)
	23-32 : Conversion probability (units 0.00125)
+2	bits 1- 8 : σ_C (units 0.125mrad)
	9-22 : Photon identifier
	23-27 : Photon quality word
+3	bits 1-10 : log *Jacobian*
	11-21 : $d\theta/dx_{loc}$ derivative w.r.t. track (units mrad/mm)
	22-32 : $d\theta/dy_{loc}$ derivative w.r.t. track (units mrad/mm)

RIFC BANK

0	Structural links
0	Reference links
N	Data (format −B)

Link LRIFC = LQ(LDTOP-41)

DATA	CONTENT
	Individual photon information in RIFC subdetector
+1	bits 1- 2 : Subdetector identifier (=3)
	3-12 : Number of tracks
	For each track
+1+i	Tanagra identifier of the i-th track
	For each track and radiator
+1	bits 1- 1 : Radiator identifier (liquid=0, gas=1)
	2-11 : Track index in the list of track identifiers
	12-21 : Number of photons to follow
	22-32 : Number of photons before background rejection
+2	bits 1- 6 : Sector number for liquid radiator/mirror
	7- 9 : Liquid radiator/mirror number
	10-20 : Quality word
	21-31 : Fitted background for the best hypothtesis
	For the 5 best hypotheses
+2+j	bits 1-15 : Expected number of photons (units 0.001)
	16-22 : Fitted probability (units 0.01)
	For each photon
+1	bits 1-12 : θ_C (units 0.25mrad in liquid, 0.025 mrad in gas)
	13-22 : ϕ_C (units $\pi/512$)
	23-32 : Conversion probability (units 0.00125)
+2	bits 1- 8 : σ_C (units 0.125mrad)
	9-22 : Photon identifier
	23-27 : Photon quality word
+3	bits 1-10 : log *Jacobian*
	11-21 : $d\theta/dx_{loc}$ derivative w.r.t. track (units mrad/mm)
	22-32 : $d\theta/dy_{loc}$ derivative w.r.t. track (units mrad/mm)

PXTD BANK

0	Structural links
0	Reference links
N	Data (format −I)

Link LPXTD = LQ(LDTOP-42)

DATA	CONTENT
	VFT Pixel data
+1	Number of hits in the event
	For each hit
+1	Module number (crown number + 1000 × raquette)
+2	X)
+3	Y) ⇒ cluster coordinates × 10000 (Delphi frame)
+4	Z)
+5	X) ⇒ cluster coordinates × 10000 (local frame)
+6	Z)
+7	Tanagra identifier of the track
+8	Number of pixels in the cluster + 100 × number of simulated hits
	For each pixel
+1	Address of the pixel : bits 1- 8 : column 9-16 : row

STTD BANK

0	Structural links
0	Reference links
N	Data (format −I)

Link LSTTD = LQ(LDTOP-43)

DATA	CONTENT
	VFT Ministrip data
+1	Number of hits in the event
	For each hit
+1	Module number
+2	Cluster local coordinate × 10000
+3	Error of cluster local coordinate × 10000
+4	Tanagra identifier of the track
+5	Number of strips in the cluster + 100 × number of simulated strips
+6	First strip in the cluster
	For each strip
+1	bits 1-10 : noise in the strip 11-20 : signal in the strip

SOR PILOT RECORD
DAS blocklet(0.0)

+1	Wordcount	(12)
+2	Identifier (bits 1- 4)	(0)
	Error code (bits 5-32)	(usualy FF10)
+3	Sub-identifier	(0)
+4	Record type 11 SOR (Start Of Run)	
	61 BOF (Beginning Of File)	
+5	Experiment number	
+6	Run number	
+7	File sequence number	
+8	T2 (trigger level 2) event number =-11	
+9	Event number = 1	
+10	Event date (format 'yymmdd')	
+11	Event time (format 'hhmmss')	
+12	Wordcount	(12)

SOS Status

At the start of each run of Monte Carlo data a special Start of simulation (SOS) data record is written. It is preceded by one Pilot record blocklet DAS of a record type 16.

The SOS data record contains the generation and simulation parameters for all events of the run which follows in a ZEBRA structure shown on the figure below.

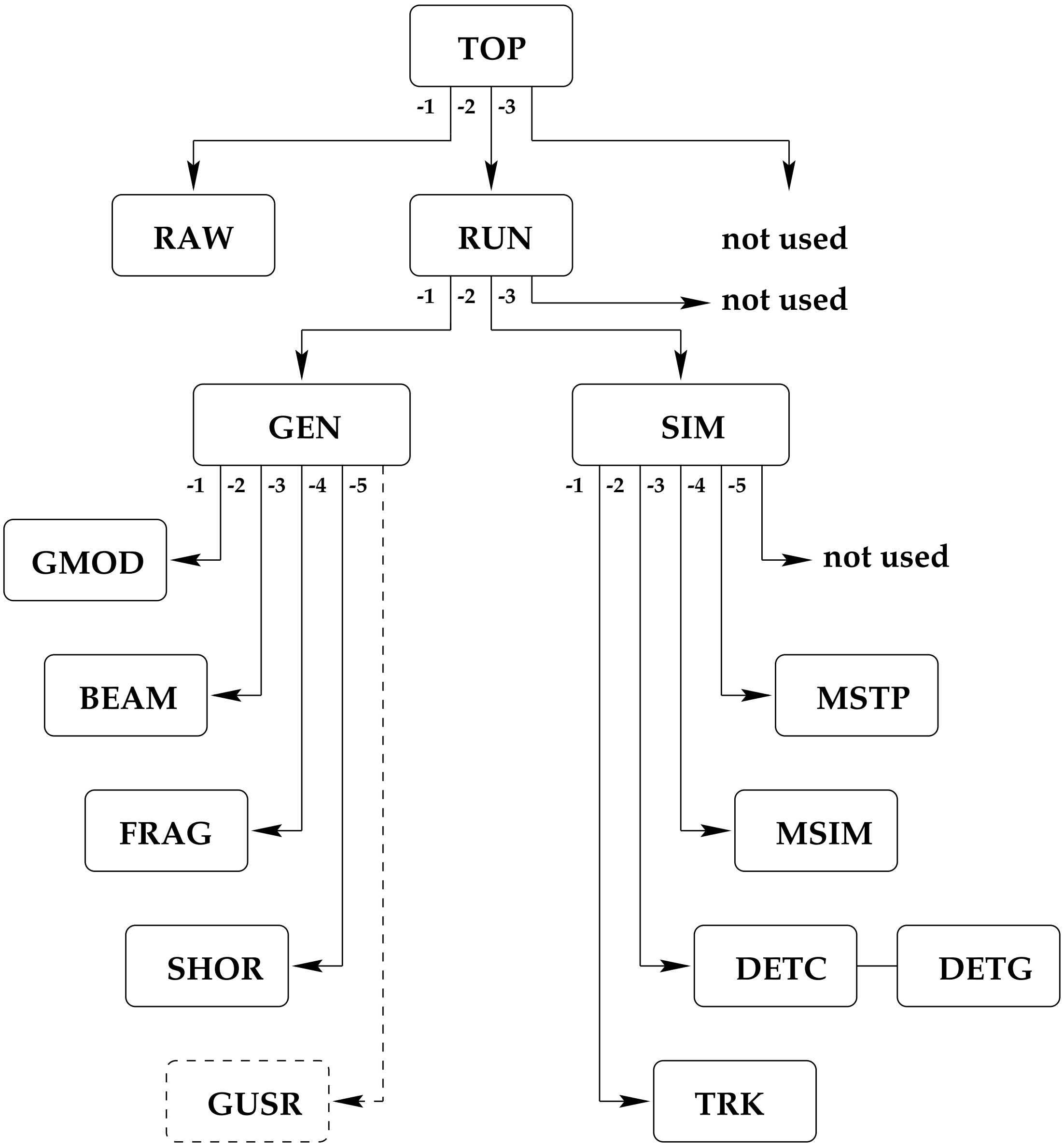

Figure 1: Structure of the start of simulation data record

SOS PILOT RECORD
DAS blocklet(0.0)

+1	Wordcount	(14)
+2	Identifier (bits 1- 4)	(0)
	Error code (bits 5-32)	(usualy FF10)
+3	Sub-identifier	(0)
+4	Record type : 16 SOS (Start Of Simulation)	
+5	Experiment number	
+6	Run number	
+7	File sequence number	
+8	Not used (=-11)	
+9	Event number	
+10	Event date (format 'yymmdd')	
+11	Event time (format 'hhmmss')	
+12	Processing status	
+13	Calibration status	
+14	Wordcount	(14)

TOP BANK

3	Structural links
0	Reference links
0	Data

Link LTOP

LINKS

-1	RAW raw data header bank
-2	RUN start of simulation run record
-3	Not used

TOP bank for the Delphi ZEBRA structure

DATA CONTENT

None

RUN BANK

3	Structural links
0	Reference links
71	Data (format –I)

Link LRUN = LQ(LTOP-2)

LINKS

-1	GEN header bank for generation
-2	SIM header bank for simulation
-3	Not used

DATA	CONTENT	
+1	Generation mode	(IGENER)
+2	Simulation mode	(ISIMUL)
+3	Sequence for generation	(ISSEDG(1))
+4	Counter 1 for generation	(ISSEDG(2))
+5	Counter 2 for generation	(ISSEDG(3))
+6	Sequence for simulation	(ISSEDG(1))
+7	Counter 1 for simulation	(ISSEDG(2))
+8	Counter 2 for simulation	(ISSEDG(3))
+9	Date of run (format 'yymmdd')	
+10	Time of run (format 'hhmmss')	
+11	Laboratory identifier (as in DTOP)	
+12	DELSIM version	
+13	DELSIM cradle date	
+14	DELSIM cradle time	
+15	DELSIM library creation date	
+16	DELSIM library creation time	
+17	MODSIM cradle date	
+18	MODSIM cradle time	
+19	MODSIM library creation date	
+20	MODSIM library creation time	
+21	VDSIM cradle date	
+22	VDSIM cradle date	
+23	VDSIM cradle time	

RUN BANK

cont.

+24	IDSIM	cradle date
+25	IDSIM	cradle date
+26	IDSIM	cradle time
+27	TPCSIM	cradle date
+28	TPCSIM	cradle date
+29	TPCSIM	cradle time
+30	RICHSIM	cradle date
+31	RICHSIM	cradle date
+32	RICHSIM	cradle time
+33	ODSIM	cradle date
+34	ODSIM	cradle date
+35	ODSIM	cradle time
+36	HPCSIM	cradle date
+37	HPCSIM	cradle date
+38	HPCSIM	cradle time
+39	TOFSIM	cradle date
+40	TOFIIM	cradle date
+41	TOFSIM	cradle time
+42	HACSIM	cradle date
+43	HACSIM	cradle date
+44	HACSIM	cradle time
+45	MUBSIM	cradle date
+46	MUBIIM	cradle date
+47	MUBSIM	cradle time
+48	FCASIM	cradle date
+49	FCASIM	cradle date
+50	FCASIM	cradle time
+51	SATSIM	cradle date
+52	SATIIM	cradle date
+53	SATSIM	cradle time
+54	LUMSIM	cradle date
+55	LUMSIM	cradle date
+56	LUMSIM	cradle time
+57	FCBSIM	cradle date
+58	FCBIIM	cradle date
+59	FCBSIM	cradle time

RUN BANK

cont.

+60	EMFSIM	cradle date
+61	EMFSIM	cradle date
+62	EMFSIM	cradle time
+63	MUFSIM	cradle date
+64	MUFIIM	cradle date
+65	MUFSIM	cradle time
+66	HOFSIM	cradle date
+67	HOFSIM	cradle date
+68	HOFSIM	cradle time
+69	VABSIM	cradle date
+70	VABIIM	cradle date
+71	VABSIM	cradle time

GEN BANK

5	Structural links
0	Reference links
0	Data

Link LGEN = LQ(LRUN-1)

LINKS

-1	GMOD model parameters
-2	BEAM beam parameters
-3	FRAC fragmentation model parameters
-4	SHOR short living particles
-5	GUSR user generator parameters
	or
	Not used

Header bank for event generation

DATA CONTENT

None

GMOD BANK

0	Structural links
0	Reference links
L	Data (format −F)

Link LGMOD = LQ(LGEN-1)

Generator model parameters

DATA	CONTENT
	For generator IGENER = 1
	($e^+e^- \to Z^0$ / $\gamma \to q\overline{q}$ / l^+l^-)
+1	Number of parton families
+2	Flag for the GSW parameters calculation
	If GSW flag = 0 (Born level) :
+3	$\mathrm{Sin}(\theta)^2$ in SU(2)×U(1)
+4	Constant for calculation of Z^0 mass
+5	Not used (=0.)
	If GSW flag = 1 (1 loop correction) :
+3	Z^0 mass used to calculate GSW parameters
+4	q_t mass used to calculate GSW parameters
+5	H^0 mass used to calculate GSW parameters
+6	Flag for energy generation −
	= 0 : no fixed energy
	= 1 : fixed energy and no radiative corrections
+7	Flag for γ generation from the initial state electrons −
	= 0 : no generation
	= 1 : γ generation
	Lepton/quark selection for Z^0 decay (0 or 1):
+8	ν_e $\overline{\nu}_e$
+9	e^+ e^-
+10	q_u $\overline{q}_u$
+11	q_d $\overline{q}_d$

GMOD BANK

cont.

+12	$\nu_\mu\ \overline{\nu}_\mu$
+13	$\mu^+\ \mu^-$
+14	$q_c\ \overline{q}_c$
+15	$q_s\ \overline{q}_s$
+16	$\nu_\tau\ \overline{\nu}_\tau$
+17	$\tau^+\ \tau^-$
+18	$q_t\ \overline{q}_t$
+19	$q_b\ \overline{q}_b$
+20	$\chi^+\ \chi^-$
+21	$\nu_\chi\ \bar{\nu_\chi}$
+22	$q_h\ \bar{q_h}$
+23	$q_l\ \bar{q_l}$

For generator IGENER = 2
($e^+e^- \to Z^0 \to Z^0\ H^0 \to q\overline{q}\ /\ l^+l^-$)

+1 Number of parton families
+2 Flag for the GSW parameters calculation

If GSW flag = 0 (Born level) :

+3 $\mathrm{Sin}(\theta)^2$ in SU(2)×U(1)
+4 Constant for calculation of Z^0 mass
+5 Not used (=0.)

If GSW flag = 1 (1 loop correction) :

+3 Z^0 mass used to calculate GSW parameters
+4 q_t mass used to calculate GSW parameters
+5 H^0 mass used to calculate GSW parameters

+6 Flag for energy generation –
= 0 : no fixed energy
= 1 : fixed energy and no radiative corrections
+7 Flag for γ generation from the initial state electrons –
= 0 : no generation
= 1 : γ generation
+8 H^0 mass

GMOD BANK

cont.

	Lepton/quark selection for H^0 decay (0 or 1):
+9	$\nu_e\ \overline{\nu}_e$
+10	$e^+\ e^-$
+11	$q_u\ \overline{q}_u$
+12	$q_d\ \overline{q}_d$
+13	$\nu_\mu\ \overline{\nu}_\mu$
+14	$\mu^+\ \mu^-$
+15	$q_c\ \overline{q}_c$
+16	$q_s\ \overline{q}_s$
+17	$\nu_\tau\ \overline{\nu}_\tau$
+18	$\tau^+\ \tau^-$
+19	$q_t\ \overline{q}_t$
+20	$q_b\ \overline{q}_b$
+20	$\chi^+\ \chi^-$
+21	$\nu_\chi\ \bar{\nu_\chi}$
+22	$q_h\ \bar{q_h}$
+23	$q_l\ \bar{q_l}$
	Lepton/quark selection for Z^0 decay (0 or 1):
+25	$\nu_e\ \overline{\nu}_e$
+26	$e^+\ e^-$
+27	$q_u\ \overline{q}_u$
+28	$q_d\ \overline{q}_d$
+29	$\nu_\mu\ \overline{\nu}_\mu$
+30	$\mu^+\ \mu^-$
+31	$q_c\ \overline{q}_c$
+32	$q_s\ \overline{q}_s$
+33	$\nu_\tau\ \overline{\nu}_\tau$
+34	$\tau^+\ \tau^-$
+35	$q_t\ \overline{q}_t$
+36	$q_b\ \overline{q}_b$
+37	$\chi^+\ \chi^-$
+38	$\nu_\chi\ \bar{\nu_\chi}$
+39	$q_h\ \bar{q_h}$
+40	$q_l\ \bar{q_l}$

GMOD BANK

cont.

	For generator IGENER = 3
	($e^+e^- \to Z^0$ / $\gamma \to H^+H^- \to q\overline{q}$ / l^+l^-)
+1	Number of parton families
+2	Flag for the GSW parameters calculation
	If GSW flag = 0 (Born level) :
+3	$\mathrm{Sin}(\theta)^2$ in SU(2)×U(1)
+4	Constant for calculation of Z^0 mass
+5	Not used (=0.)
	If GSW flag = 1 (1 loop correction) :
+3	Z^0 mass used to calculate GSW parameters
+4	q_t mass used to calculate GSW parameters
+5	H^0 mass used to calculate GSW parameters
+6	Flag for energy generation –
	= 0 : no fixed energy
	= 1 : fixed energy and no radiative corrections
+7	Flag for γ generation from the initial state electrons –
	= 0 : no generation
	= 1 : γ generation
+8	H^0 mass
	Lepton/quark selection for H^+ decay (all 1):
+9	ν_e $\overline{\nu}_e$
+10	e^+ e^-
+11	q_u $\overline{q}_u$
+12	q_d $\overline{q}_d$
+13	ν_μ $\overline{\nu}_\mu$
+14	μ^+ μ^-
+15	q_c $\overline{q}_c$
+16	q_s $\overline{q}_s$
+17	ν_τ $\overline{\nu}_\tau$
+18	τ^+ τ^-
+19	q_t $\overline{q}_t$
+20	q_b $\overline{q}_b$

GMOD BANK

cont.

+21	$\chi^+\ \chi^-$
+22	$\nu_\chi\ \bar{\nu_\chi}$
+23	$q_h\ \bar{q_h}$
+24	$q_l\ \bar{q_l}$
	Lepton/quark selection for H^- decay (all 1):
+25	$\nu_e\ \overline{\nu}_e$
+26	$e^+\ e^-$
+27	$q_u\ \overline{q}_u$
+28	$q_d\ \overline{q}_d$
+29	$\nu_\mu\ \overline{\nu}_\mu$
+30	$\mu^+\ \mu^-$
+31	$q_c\ \overline{q}_c$
+32	$q_s\ \overline{q}_s$
+33	$\nu_\tau\ \overline{\nu}_\tau$
+34	$\tau^+\ \tau^-$
+35	$q_t\ \overline{q}_t$
+36	$q_b\ \overline{q}_b$
+37	$\chi^+\ \chi^-$
+38	$\nu_\chi\ \bar{\nu_\chi}$
+39	$q_h\ \bar{q_h}$
+40	$q_l\ \bar{q_l}$
	For generator IGENER = 4
	($e^+e^- \rightarrow \gamma + \gamma \rightarrow q\overline{q}\ /\ l^+l^-$)
+1	Number of parton families
+2	Flag for the GSW parameters calculation
	If GSW flag = 0 (Born level) :
+3	$\mathrm{Sin}(\theta)^2$ in SU(2)×U(1)
+4	Constant for calculation of Z^0 mass
+5	Not used (=0.)
	If GSW flag = 1 (1 loop correction) :
+3	Z^0 mass used to calculate GSW parameters
+4	q_t mass used to calculate GSW parameters
+5	H^0 mass used to calculate GSW parameters

GMOD BANK

cont.

+6	Flag for energy generation –
	= 0 : no fixed energy
	= 1 : fixed energy and no radiative corrections
+7	Flag for γ generation from the initial state electrons –
	= 0 : no generation
	= 1 : γ generation
+8	Selected modifications –
	= 0 : vertex modification
	= 1 : exchange of an hypothetical heavy electron
+9	QED cut-off parameter
+10	Minimum value of Cos(θ)
+11	Maximum value of Cos(θ)

For generator IGENER = 5
(single/few particle generation)

For each particle :

+1	Particle code
+2	Minimum particle momentum (GeV/c)
+3	Maximum particle momentum (GeV/c)
+4	Minimum value of θ (degrees)
+5	Maximum value of θ (degrees)
+6	Minimum value of ϕ (degrees)
+7	Maximum value of ϕ (degrees)
+8	Minimum value of X coordinate (cm)
+9	Maximum value of X coordinate (cm)
+10	Minimum value of Y coordinate (cm)
+11	Maximum value of Y coordinate (cm)
+12	Minimum value of Z coordinate (cm)
+13	Maximum value of Z coordinate (cm)

BEAM BANK

0	Structural links
0	Reference links
3	Data (format −F)

Link LBEAM = LQ(LGEN-2)

Beam parameters

DATA	CONTENT
+1	Mean value of the beam energy
+2	Spread (width) of the beam energy
+3	Flag for energy distribution -
	= 1 : goussian
	= 2 : constant

FRAG BANK

0	Structural links
0	Reference links
L	Data (format −F)

Link LFRAG = LQ(LGEN-3)

Fragmentation model parameters

DATA	CONTENT
+1	Fragmentation model[1]−
	= 1 : LUND model
	For the LUND model[2]
+2	LUND program version
+3	Flag for gluon radiation−
	= 1 : no gluon generation
	= 2 : gluon generation allowed
	Utility functions
+4	MSTU(1)
⋮	⋮
+66	MSTU(63)
+67	MSTU(111)
⋮	⋮
+74	MSTU(118)
+75	MSTU(161)
+76	MSTU(162)
+77	MSTU(181)
⋮	⋮
+81	MSTU(185)
	Standard model parameters
+82	PARU(1)
⋮	⋮
+138	PARU(57)
+139	PARU(101)
+140	PARU(102)

FRAG BANK

cont.

+141	PARU(111)
⋮	⋮
+144	PARU(114)
+145	PARU(121)
	Physics assumptions
+146	MSTJ(1)
⋮	⋮
+197	MSTJ(52)
+198	MSTJ(101)
⋮	⋮
+209	MSTJ(112)
+210	PARJ(1)
⋮	⋮
+302	PARJ(93)
+303	PARJ(121)
⋮	⋮
+321	PARJ(139)
	Flavour treatment parameters
+322	PARF(1)
⋮	⋮
+401	PARF(80)
+402	PARF(101)
⋮	⋮
+426	PARF(125)
	Particle decay parameters
	For each particle allowed to decay
+427+N	Lund code KC of the particle (MDCY(KC,1) = 1)

[1]At present only the LUND fragmentation scheme is implemented.

[2]The selection of LUND parameters in the bank is taken from the main common blocks of the JETSET/PHYTIA program. They are described in details elsewhere [5].

SHOR BANK

0	Structural links
0	Reference links
L	Data (format –I)

Link LSHOR = LQ(LGEN-4)

Short living particle parameters

DATA	CONTENT
+1	Flag defining if the short living particles have given ST (simulated track) banks - = 0 : ST banks not created = 1 : ST banks created
+2	Number of short living particles[1]
	For each particle
+1	Particle code (Delphi convention)

[1]The selection of the short living particles in DELSIM after November 1990 is usualy done by internal LUND flags and the number of the short living particles in this bank is expected to be zero for the simulation after that date.

GUSR BANK

0	Structural links
0	Reference links
N	Data (format −F)

Link LGUSR = LQ(LGEN-5)

User generator model parameters

DATA	CONTENT
	Unknown[2]

[1] This bank is lifted and filled if IGENER = 99, i.e. in case of a generator model choosen by the user and different from the existing menu.

[2] The exact format and content of the bank is defined by the user and depend on its generation model.

SIM BANK

5	Structural links
0	Reference links
0	Data

Link LGEN = LQ(LRUN-1)

LINKS

-1	TRK tracking parameters
-2	DET detector description parameters
-3	MSIM simulated modules
-4	MSTP modules stopping the tracking
-5	Not used

Header bank for event simulation

DATA CONTENT

None

TRK BANK

0	Structural links
0	Reference links
22	Data (format −F)

Link LTRK = LQ(LSIM-1)

Tracking parameters

DATA	CONTENT
	Constants for the tracking
+1	Starting value of the step size (cm)
+2	Maximum allowed value of the step size (cm)
+3	Precision on the length for convergence (cm)
+4	Maximum variation of momentum dP/P per step
+5	Current momentum at which the track stops (GeV/c)
+6	Maximum magnetic field error per step
+7	Maximum value of total track length (used to control the field variation per step)
+8	Minimum value of (1.−length/max.tot.length)
+9	Multiple scattering flag − = 0 : no multiple scattering = 1 : simulate multiple scattering = 2 : compute multiple scattering matrix = 3 : simulate multiple scattering (Moliere)
+10	Minimum track momentum (GeV/c) for hadrons
+11	Minimum track momentum (GeV/c) for e and γ
	Active secondary processes :
+12	Delta-ray production
+13	Bremsstralung
+14	Pair production
+15	Compton scattering
+16	Decay of unstable particles
+17	Hadronic interactions
+18	Positron annihilation
+19	Photoelectric effect
+20	Number of simulated modules
+21	Number of modules stopping the tracking
+22	Current in the coil

DETG BANK

0	Structural links
0	Reference links
L	Data (format −I)

Link LDETG = LQ(LSIM-2)

Geometry Data Base selected parameters

DATA	CONTENT
	General Data Base dates and levels
+1	Data Base validity date
+2	Data Base validity time
+3	Data Base edit date
+4	Data Base edit time
+5	Level of geometry description
+6	Not used (=0)
⋮	⋮
+10	Not used (=0)
	Module Data Base requests
+11	Number of requested modules
	For each module
+1	Module name
+2	Validity date
+3	Validity time
+4	Level of geometry description : 0 - no geometry data for this module 1 - average geometrical description only 2 - complete geometrical description ⋮ ⋮ n - geometrical description down to the n-th level
+5	Edit date
+6	Edit time

$\boxed{\text{DETG BANK}}$

cont.

Module Data Base actually loaded

+N	Number of loaded modules
	For each module
+1	Module name
+2	Validity start date
+3	Validity start time
+4	Validity end date
+5	Validity end time
+6	Level of geometry description : 0 - no geometry data for this module 1 - average geometrical description only 2 - complete geometrical description ⋮ ⋮ n - geometrical description down to the n-th level
+7	First edit date
+8	First edit time
+9	Last edit date
+10	Last edit time

DETC BANK

0	Structural links
0	Reference links
L	Data (format –I)

Link LDETC = LQ(LSIM-2)

Calibration Data Base selected parameters

DATA	CONTENT
	General Data Base dates and levels
+1	Data Base validity date
+2	Data Base validity time
+3	Data Base edit date
+4	Data Base edit time
+5	Level of sensing device data
+6	Not used (=0)
⋮	⋮
+10	Not used (=0)
	Module Data Base requests
+11	Number of requested modules
	For each module
+1	Module name
+2	Validity date
+3	Validity time
+4	Level of sensing device data : 0 - no sensing device data for this module 1 - top-level description only 2 - complete sensing device description ⋮ ⋮ n - sensing device description down to the n-th level
+5	Edit date
+6	Edit time

DETC BANK

cont.

Module Data Base actually loaded

+N	Number of loaded modules
	For each module
+1	Module name
+2	Validity start date
+3	Validity start time
+4	Validity end date
+5	Validity end time
+6	Level of sensing device data :
	0 - no sensing device data for this module
	1 - top-level description only
	2 - complete sensing device description
	⋮ ⋮
	n - sensing device description down to the n-th level
+7	First edit date
+8	First edit time
+9	Last edit date
+10	Last edit time

MSIM BANK

0	Structural links
0	Reference links
N_D	Data (format −H)

Link LMSIM = LQ(LSIM-3)

Modules with detailed simulation

DATA	CONTENT
+1	Name of detector module 1
$\vdots$	$\vdots$
$+N_D$	Name of detector module N_D

Naming conventions for Detector modules :

Name	Detector module
VD	Vertex detector
ID	Inner detector
TPC	Time projection chamber
RIB	Barrel RICH
OD	Outer detector
HPC	Barrel electromagnetic calorimeter
TOF	Time of flight counter
HAB	Barrel hadron calorimeter
MUB	Barrel muon chamber
FCA	Forward chamber A
RIF	Forward RICH
SAT	Small angel tagger
LUM	Luminosity monitor (VSAT)
FCB	Forward chamber B
EMF	Forward electromagnetic calorimeter
HAF	Forward hadron calorimeter
MUF	Forward muon chamber
HOF	Forward hodoscope

MSTP BANK

0	Structural links
0	Reference links
N_D	Data (format $-$H)

Link LMSTP = LQ(LSIM-4)

Modules stopping the track simulation

DATA	CONTENT
+1	Name of detector module 1
$\vdots$	$\vdots$
$+N_D$	Name of detector module N_D

Naming conventions for Detector modules :

Name	Detector module
VD	Vertex detector
ID	Inner detector
TPC	Time projection chamber
RIB	Barrel RICH
OD	Outer detector
HPC	Barrel electromagnetic calorimeter
TOF	Time of flight counter
HAB	Barrel hadron calorimeter
MUB	Barrel muon chamber
FCA	Forward chamber A
RIF	Forward RICH
SAT	Small angel tagger
LUM	Luminosity monitor (VSAT)
FCB	Forward chamber B
EMF	Forward electromagnetic calorimeter
HAF	Forward hadron calorimeter
MUF	Forward muon chamber
HOF	Forward hodoscope

EOS PILOT RECORD
DAS blocklet(0.0)

+1	Wordcount	(20)
+2	Identifier (bits 1- 4)	(0)
	Error code (bits 5-32)	(FF10)
+3	Sub-identifier	(0)
+4	Record type : 56 EOS (End Of Simulation)	
+5	Experiment number	
+6	Run number	
+7	File sequence number	
+8	Event number	
+9	Event number	
+10	Event date (format 'yymmdd')	
+11	Event time (format 'hhmmss')	
+12	Total number of events in the run	
+13	Sequence for generation (ISSEDG(1))	
+14	Counter 1 for generation (ISSEDG(2))	
+15	Counter 2 for generation (ISSEDG(3))	
+16	Sequence for simulation (ISSEDG(1))	
+17	Counter 1 for simulation (ISSEDG(2))	
+18	Counter 2 for simulation (ISSEDG(3))	
+19	Integrated luminosity of the run	
+20	Wordcount	(20)

References

[1] "ZEBRA User Guide", CERN Program Library, J.Zoll

[2] "PHDST Package Description, Version 3.00", N.Smirnov and V.Perevozchikov, **DELPHI 92-118 PROG 189 Rev 3**, 5 September 1994

[3] "DELPHI Pilot Record Description", Y.Sacquin, **DELPHI 91-90 PROG 177**, 23 September 1991
"DELPHI DST Content, Version 3.36", Y.Sacquin, **DELPHI 94-161 PROG 210 Rev 1**, 20 December 1996

[4] "DELANA – Delphi Analysis Package", User's Guide Version 3.4, **DELPHI 89-67 PROG 142**, 10 July 1989

[5] "PYTHIA 5.6 and JETSET 7.3, Physics and Manual", T.Sjostrand, CERN-TH.6488/92