NA50

NA50 FRIEND'S GUIDE

Version 2.00/02

Albert ROMANA

June 3, 1995

This document refers to DIMUREC version 3.00/02 and DIMUJET version 4.00/02

Contents

1 TELEPHONE DIRECTORY **1**
1.1 Laboratories . . . 1
1.2 Members . . . 1

2 AVAILABLE EXECS AND FILES **5**
2.1 Public disks . . . 5
2.2 DIMU EXEC (NA50) . . . 5
2.3 OTHER EXECS . . . 6

3 EP FORMAT FOR NA50 **11**
3.1 Introduction . . . 11
3.2 Warning . . . 11
3.3 File structure . . . 11
3.4 Block structure . . . 11
3.5 Block identifier . . . 12
3.6 Physical record header . . . 12

4 DESCRIPTION OF A RAW DATA FILE **13**
4.1 Sequence of blocks . . . 13
4.2 Beginning of run block (id = 20000b , length = 106) . . . 14
4.3 High voltage block (id = 20007b , length = 1954) . . . 15
4.4 ADC threshold block (id = 20006b , length = 292) . . . 15
4.5 Beginning of burst block (id = 20002b , length = 28) . . . 15
4.6 Spectrometer scaler block (id = 210b , length = 516) . . . 16
4.6.1 NIM scaler 1 . . . 16
4.6.2 NIM scaler 2 . . . 16
4.6.3 NIM scaler 3 free . . . 17
4.6.4 NIM scaler 4 trigger gated . . . 17
4.6.5 NIM scaler 5 free . . . 18
4.6.6 NIM scaler 6 trigger gated . . . 18
4.6.7 NIM scaler 7 free . . . 19
4.6.8 ECL scaler 1 free . . . 19
4.6.9 ECL scaler 2 free . . . 19
4.6.10 ECL scaler 3 free . . . 20
4.6.11 ECL scaler 4 free . . . 20
4.6.12 ECL scaler 5 free . . . 21
4.6.13 ECL scaler 6 free . . . 21
4.7 NIM and ECL scalers of upstream detectors (id = 220b, length = 516) . . . 22
4.7.1 ECL scaler 1 (free) . . . 22
4.7.2 ECL scaler 2 (free) . . . 22

4.7.3 ECL scaler 3 (free) . . . 22
4.7.4 ECL scaler 4 (burst gated) . . . 22
4.7.5 ECL scaler 5 (burst gated) . . . 22
4.7.6 ECL scaler 6 (burst gated) . . . 23
4.7.7 ECL scaler 7 (trigger gated) . . . 23
4.7.8 ECL scaler 8 (trigger gated) . . . 23
4.7.9 ECL scaler 8 (trigger gated) . . . 23
4.8 GANIL chamber block (id = 260b , length = 804) . . . 23
4.9 Beam status block (id = 401b, length = 66) . . . 23
4.10 Beginning of event block (id = 20004b , length = 39) . . . 23
4.11 Raw data block (id = 40b , length = NRAW+4) . . . 24
4.11.1 ADC data . . . 24
4.12 End of event block (id = 20005b , length = 6) . . . 25
4.13 End of burst block (id = 20003b, length = 70) . . . 25
4.14 Spectrometer scaler sum block (id = 211b, length = 516) . . . 26
4.15 Sum of scalers for upstream detectors (id = 221b, length = 516) . . . 26
4.16 End of run block (id = 20001b , length = 72) . . . 26

5 DESCRIPTION OF A DATA SPLIT FILE 29
5.1 Sequence of blocks . . . 29
5.2 Reconstruction counters (id = 12001b , length = 200) . . . 30
5.3 Cuts at reconstruction time (id = 12000b , length = 49) . . . 30
5.4 Hit counters (id = 10003b , length = variable) . . . 31
5.5 Hit counters after cleaning (id = 10001b , length = variable) . . . 31
5.6 Projection reconstructed tracks (id = 10101b , length = variable) . . . 32
5.7 Space reconstructed tracks (id = 10100b , length = variable) . . . 32
5.8 Space associated tracks (id = 10102b , length = variable) . . . 32
5.9 Dimuon kinematics (id = 11002b, length = variable) . . . 33

6 ADDITIONAL CONTENT FOR SIMULATION 35
6.1 Introduction . . . 35
6.2 Beam and target block (id = 41000b , length = 36) . . . 35
6.3 Hodoscope block (id = 41040b , length = variable) . . . 36
6.4 Chamber wire block (id = 41041b , length = variable) . . . 36
6.5 Chamber coordinate block (id = 41042b , length = variable) . . . 36
6.6 Muon kinematic block (id = 41001b , length = 52) . . . 36
6.7 Weight block (id = 41002b , length = 24) . . . 36

7 DESCRIPTION OF A DST FILE 39
7.1 Sequence of blocks . . . 39
7.2 Warning . . . 40
7.3 Dimuon kinematics (id = 11002b, length = variable) . . . 40
7.4 Reconstructed and associated tracks in space (id = 10100b , length = variable) . . . 40
7.5 DST first additional block (id = 11004b , length = variable) . . . 41
7.6 DST second additional block (id = 11005b , length = variable) . . . 41

8 DESCRIPTION OF A MICRODST FILE **43**
8.1 Sequence of blocks . . . 43
8.2 Beginning of job block (id = 4100b, length = variable) . . . 44
8.3 Beginning of run block (id = 4101b, length = 9) . . . 44
8.4 Data block for standard data (id = 4102b, length = 2000) . . . 44
8.5 Data block for like-sign data (id = 4102b, length = 2000) . . . 45
8.6 Data block for target data (id = 4102b, length = 2000) . . . 46
8.7 Data block for calorimetry (id = 4102b, length = 2000) . . . 46
8.8 End of run block (id = 4103b, length = 10) . . . 46

9 DESCRIPTION OF THE PARAMETER FILE **47**
9.1 Introduction. . . . 47
9.2 Sequence of blocks . . . 47
9.3 Set-up header block (id = 4000b , length ¿= 11) . . . 48
9.4 Global cut block (id = 4014b , length = 208) . . . 48
9.5 Target block (id = 4002b , length = 17) . . . 48
9.6 Liquid target block (id = 4007b , length = 17) . . . 49
9.7 Dump block (id = 4003b , length = 20) . . . 49
9.8 Magnet block (id = 4004b , length = 20) . . . 49
9.9 Iron wall block (id = 4006b , length = 9) . . . 50
9.10 Constant block (id = 4005b , length = 5) . . . 50
9.11 Proportional chamber block (id = 4100b , length = 221) . . . 50
9.12 Hodoscope block (id = 4040b , length = variable) . . . 50
9.13 Hodoscope P block (id = 4042b , length = 102) . . . 51
9.14 Length difference in S4 and S5 for R3,R4 (id =4043b, length = 36) . . . 52
9.15 Properties of materials block (id = 4012b, length = 180) . . . 52
9.16 Table for matrix check (part one) (id =4010b , length = 1028) . . . 52
9.17 Table for matrix check (part two) (id =4011b , length = 1028) . . . 53
9.18 NA38 first block (id =4014b , length = 90) . . . 53
9.19 NA38 second block (id =4015b , length = variable) . . . 53
9.20 Coefficients for calorimeter (id =4013b , length = 1112) . . . 54
9.21 End of setup block (id =4001b , length = 7) . . . 54

10 DESCRIPTION OF THE CONSTANT FILE **55**
10.1 Description of a calibration block (id = 2101, length = 258) . . . 55
10.2 Description of a pedestal block (id = 2102, length = 212) . . . 55
10.3 Description of a threshold block (id = 2103, length = 244) . . . 56
10.4 Description of a high voltage block (id = 2104, length = 36) . . . 56
10.5 Writing a pedestal file . . . 57

11 DESCRIPTION OF THE SELECT FILE **59**
11.1 Introduction . . . 59
11.2 Contents of the file . . . 59

12 DESCRIPTION OF THE RUNNORMA DATA FILE **61**
12.1 Introduction . . . 61
12.2 Description of the words corresponding to a run . . . 61

13 DESCRIPTION OF THE NA50UTIL CAR **63**

14 DESCRIPTION OF LIBNA50 TXTLIB 77

Chapter 1

TELEPHONE DIRECTORY

1.1 Laboratories

Labo	Telephone	Telefax
ANNECY	(33) 50 09 16 00	(33) 50 27 94 95
BUCAREST	(40) 17 80 70 40	
CAGLIARI	(39) 70 670 833	(39) 70 657 82379
CLERMONT-FERRAND	(33) 73 40 63 63	(33) 73 26 45 98
GENEVE	(41) 22 767 - 61 11	(41) 22 782 48 97
LISBONNE	(351) 1 797 38 80	(351) 1 793 46 31
LYON	(33) 72 44 80 00	(33) 72 44 80 04
MOSCOU	(7) 095 33 30 189	(7) 095 120 84 39
ORSAY	(33) 1 69 41 71 96	(33) 1 69 41 71 96
PALAISEAU	(33) 1 69 33 47 36	(33) 1 69 33 30 02
STRASBOURG	(33) 88 10 - 63 01	(33) 88 10 62 34
TURIN NUCL	(39) 11 6707 386	(39) 11 66 99 579
TURIN H.E.	(39) 11 6707 357	(39) 11 66 99 579

1.2 Members

Name	Telephone
Mme Maria ABREU	(351) 1 797 38 80
Mr. Bruno ALESSANDRO	(39) 11 6707 354
M. Michel ALEXELINE	(33) 50 09 16 42
M. Antonio ALMEIDA	(351) 1 797 38 80
M. Julien ASTRUC	(33) 1 69 41 62 31
Mme Rosemarie AUDRIA	(41) 22 767 46 74
M. Christian BAGLIN	(41) 22 767 58 63
M. Anton BALDIN	INR Moscou
M. Alain BALDIT	(33) 73 40 73 05
M. Marc BEDJIDIAN	(33) 72 44 81 62
M. Frederic BELLAICHE	(33) 72 43 12 27
M. Valdo BISI	(39) 11 6707 356
Mme Venera BOLDEA	IAP Bucarest
Mme Paula BORDALO	(351) 1 797 38 80
M. Amir BORHANI	(33) 1 69 33 31 63
M. Pedro BORRALHO	(351) 1 797 38 80

M. Andre BUSSIERE	(41) 22 767 34 47	
M. Vincent CAPONY	(33) 50 09 16 48	
M. Jean CASTOR	(33) 73 40 73 06	
M. Thierry CHAMBON	(33) 73 40 76 54	
M. Bernard CHAURAND	(33) 1 69 33 31 10	— (33) 1 69 07 81 08
M. Emilio CHIAVASSA	(39) 11 6707 386	
M. Corrado CICALO	(39) 70 670 833	
Mr. Serban CONTANTINESCU	IAP Bucarest	
M. Didier CONTARDO	(33) 72 43 10 65	
M. Wladek DABROWSKI	(39) 11 6707 1	
M. Francois DAUDON	(33) 73 40 73 10	
M. Alessandro DEFALCO	(39) 70 670 833	
M. Giuseppe DELLACASA	(39) 11 6707 385	
Mme Nora DEMARCO	I.N.F.N. Turin	
M. Andre DEVAUX	(33) 73 40 72 96	
Mme Sanda DITA	IAP Bucarest	
M. Olivier DRAPIER	(33) 72 44 84 46	
M. Bruno ESPAGNON	(33) 73 40 72 96	
M. Jacques FARGEIX	(33) 73 40 72 95	
M. Sergei FILIPPOV	INR Moscou	
M. Frederic FLEURET	(33) 1 69 33 31 10	
M. Paul FORCE	(33) 73 40 73 07	
M. Michel FORLEN	(33) 50 09 16 17	
M. Jose GAGO	(351) 1 797 38 80	
M. Mauro GALLIO	I.N.F.N. Turin	
M. Yuri GAVRILOV	INR Moscou	
Mme Claudie GERSCHEL	(33) 1 69 41 71 89	
M. Paolo GIUBELLINO	(41) 22 767 29 18	
Mme Marina GOLUBEVA	INR Moscou	
M. Michel GONIN	(33) 1 69 33 31 53	
M. Philippe GORODETZKY	(33) 88 10 66 42	— Secr. 65 74
M. Mikhail GOTRA	(41) 22 767 41 23	
M. Jean-Yves GROSSIORD	(33) 72 44 84 64	
Melle Paola GUAITA	(39) 11 6707 387	
M. Fedor GUBER	INR Moscou	
M. Alain GUICHARD	(33) 72 44 84 46	
M. Jean-Paul GUILLAUD	(41) 22 767 58 63	
M. Roger HAROUTUNIAN	(33) 72 44 84 64	
M. Denis JOUAN	(33) 1 69 41 62 31	
Mme Tatjana KARAVICHEVA	INR Moscou	
M. Louis KLUBERG	(33) 1 69 33 31 53	— (33) 1 46 04 05 51
M. Roman KOSSAKOWSKI	(33) 50 09 16 48	
M. Alexei KUREPIN	INR Moscou	
M. Valery LAPTEV	INR Moscou	
M. Yves LE BORNEC	(33) 1 69 41 51 99	
M. Pierre LIAUD	(33) 50 09 16 48	
M. Carlos LOURENCO	(41) 22 767 47 04	
M. Lionel LUQUIN	(33) 73 40 72 96	

Melle Maria-Paola MACCIOTTA	(39) 70 670 833
M. Filippo MARTELLI	(39) 11 6707 360
Mme Alberta MARZIARI-CHIESA	(39) 11 6707 368
M. Massimo MASERA	(39) 11 6707 369
M. Alberto MASONI	(39) 70 670 833
M. Nicolas MASSOL	(33) 50 09 16 46
Melle Sandrine MOURGUES	(33) 73 40 72 96
M. Alfredo MUSSO	(39) 11 6707 362
M. Alexei NIKITSKY	INR Moscou
Mme Fairouz OHLSSON-MALEK	(33) 72 43 12 27
Melle Sylvaine PENVERNE	(33) 72 43 10 65
M. Pierre PETIAU	(33) 1 69 33 41 35
Mme Anna PICCOTTI	I.N.F.N. Turin
M. Jean-Rene PIZZI	(33) 72 44 81 62
Mme Wanda PRADO DA SILVA	(39) 11 6707 372
Melle Giovanna PUDDU	(39) 70 670 833
Mme Chantal RACCA	(33) 88 10 64 27
M. Luciano RAMELLO	(41) 22 767 29 17
M. Siocha RAMOS	(351) 1 797 38 80
M. Vladimir RASIN	INR Moscou
M. Pedro RATO-MENDES	(41) 22 767 29 17
M. Guy REINMUTH	(33) 73 40 77 84
M. Andrei RESHETIN	INR Moscou
M. Lodovico RICCATI	(39) 11 6707 357
M. Bertrand RONCEUX	(33) 50 09 16 48
Melle Maria-Silvia SARTORI	(39) 11 6707 360
M. Pierre SATURNINI	(33) 73 40 73 05
M. Enrico SCOMPARIN	I.N.F.N. Turin
M. Sergio SERCI	(39) 70 670 833
M. Sergio da SILVA	(351) 1 797 38 80
M. Peter SONDEREGGER	(41) 22 767 46 70 — Secr. 46 74
M. Xavier TARRAGO	(33) 1 69 41 71 22
M. Petr TEMNIKOV	(39) 70 670 833
M. Gianluca USAI	(39) 70 670 833
M. Joao VARELA	(351) 1 797 38 80
M. Ermano VERCELLIN	(39) 11 6707 362
Mme Nicole WILLIS	(33) 1 69 41 51 82

Chapter 2

AVAILABLE EXECS AND FILES

2.1 Public disks

The public disks for NA50 are :

- At IN2P3 :
  - IBM : NA50SERV 191 (better if you access it as mode G)
  - Basta : /home/na50/na50, alias $GROUP_DIR/na50
  - Anastasie : /afs/in2p3.fr/home/throng/na50/na50, alias $THRONG_DIR/na50
- At CERN :
  - IBM : PUBWF 196 (better if you access it as mode G)
  - Cernsp : /afs/cern.ch/group/wf/na50, alias $GROUP_DIR/na50.

Some of the IBM NA38 execs are still in use for NA50. If they are used in the same way for both experiments, they remain onto the NA38 public disk (NA38SERV 191 at FRCPN11, PUBWF 197 at CERNVM)

The NA38 execs which have changed between NA38 and NA50, as well as new specifically NA50 execs, are on the NA50 public disk (NA50SERV 191 at FRCPN11, PUBWF 196 at CERNVM).

Therefore, it is advised to access the **two** NA38 and NA50 public disks, but with a prior filemode for NA50 than for NA38.

2.2 DIMU EXEC (NA50)

This exec allows you to run either GEADRIV, DIMUJET, DIMUREC or RELMIC or any other FORTRAN or CAR-FILE in a very simple way, with the help of a panel where you just have to fill or modify fields.

For this, you just have to type **DIMU pro** where pro is respectively GEA, JET, REC or MIC, or FOR or CAR. You can also type **DIMU pro_sub** where **sub** is your choice, so that a subsequent call of the same **sub** will prompt you with the same informations as at the previous call (all informations are stored in LASTING GLOBALV in order to become the default values of the next call to DIMU with the same argument(s)).

Finally, you can also call DIMU MOB : with this argument, the cradle and the command car file will be MOBYL CRADLE and MOBYL DATA, which are taken from the NA50 public disk and specially designed for the offline survey of the raw data tapes.

Note that the MOBYL DATA is automatically erased by DIMU when the job is sent, so that it will be taken again from the public disk at the next call of DIMU MOB. If you want to read tapes with your own cradle and data cards, it is therefore advised to call DIMU REC instead of DIMU JOB.

DIMU exec is now able to send jobs to be run on Unix machines, Basta and Anastasie at FRCPN11, Cernsp at CERN :

- At FRCPN11, the needed files are sent to your login and the job is submitted to the Unix batch automatically; once the job has finished, the outputs are sent to IBM, so that you can run jobs on Unix without logging at any time on Unix.
- At CERN (and at FRCPN11 if your IBM userid is different from your Unix userid), you cannot send jobs automatically to batch; the needed files are sent to Unix (see the description of TOUNIX EXEC), then you have to login on Unix and to submit your job to the batch; at the end of the job, the output stays on your Unix machine.

2.3 OTHER EXECS

A general description is obtained by doing **HELP NA38 MENU** or **HELP NA50 MENU**. Calling **HELP NA38 execname** or **HELP NA50 execname** gives you directly a short description of the called execname.

BANDE run [runs

Allows to know the tape number on which a given run number is written.

BIBLIO

Allows to consult and/or update the NA38 bibliography file (list of contributed papers in collaboration meetings, conferences, and physics journals.

CREHEX

Reads a parameter file and translates it into hexadecimal words, then writes a "card image" file from the hexadecimal.

CREPAR

Reads a "card image" file of hexadecimal words and writes an EP-formatted parameter file.

CUMHIS

Merges n files of histograms (as created by HSTORE) onto a single file.

CUMUL

Merges several (PE ou GE) tapes (or cartridge) onto a single (GE) tape (or cartridge).

DHEXA

Converts from decimal into hexadecimal any decimal number.

FAX

Gives the FAX numbers of the collaboration labs.

GOLD [msg

Quick call for GONE (HOLD msg

HEXAD

Converts from hexadecimal into decimal any hexadecimal number.

LIFI nat [fnpar] [ftpar] [fmpar]

Allows a quick lecture of a parameter, or contant file.

nat is either :
PAR for parameter file, or
CON for the whole ADC constant file, or
PED for pedestal block in the constant file
CAL for calibration block in the constant file
THR for threshold block in the constant file
LAS for laser block in the constant file
and :
fnpar = filename of the file (default = PARAMS, or CONSTADC)
ftpar = filetype of the file (default = NA50, or FILE)
fmpar = filemode of the file (default = G)

MAILX nam

Same as MAIL but more convenient when mailing to a distribution list (doesn't print the receivers in the header of the mail).

MYCOMP fn1 ft1 fm1 fn2 ft fm2

Compares two files, fn1 ft1 fm1 and fn2 ft2 fm2.

MYCOP fn ft fm

Copies onto A-disk any file from a different disk.

OUT fn ft [fm], [dest], [fm dest] (options

Prints any file (quick call for XPRINT or XSCRIPT).

fn (ft) is the filename (filetype) of the file (mandatory); fm is the filemode (default = *)

Special treatment is done if the filetype is SCRIPT, SGML, TEX, LATEX, METAFILE, LISTPS, PS or EPS.

Default options can be set with **OUT (SET**.

QLNA38 [labdisk

Looks who has linked the labdisk disk (def = NA38)

RECOPY [fnamout fnamin]

Copies the names of a given (fnamin) NAMES file onto the fnamout NAMES. (default for fnamin = NA38, default for fnamout = userid); when a nickname is duplicate, the content of the fnamin NAMES file is taken.

REGIME

Reaccesses all disks which have been modified since their initial access.

R119 cmd [spoolid ([printer

Allows several commands related to the printer (def = R119 in building 582) R119 q gives the status of the printer and the queued files R119 c spoolid cancels the file with id spoolid

SELECT Ryy ft fm

Calls CUMSEL FORTRAN which reads the selection file SELECT ft fm.

The last two digits of the year of the data taking must be specified by yy.

SORTNAM [fnnam]

Sorts a NAMES file in alphabetic order on the basis of the family name.

SWAP mode1 mode2

Replaces a disk which is accessed as mode "mode1" with the disk accessed as mode "mode2" and vice-versa.

STICKER [fnnames]

Prints the list of the collaboration members in a format suited for stickers. fnnames is the filename of the NAMES file to be printed (default = userid NAMES)

TAPES

Reads (and optionnally modifies) the content of the LYOTAP (CERTAP) SCRIPT G file, status of the tapes at FRCPN11 (CERNVM), as well as the TMS database.

TEL nam [fnnames] (opt1 opt2

Gives the phone number of any person(s), provided it exists in the fnnames NAMES file (default for fnnames = userid) nam is either a nickname, an userid, a family name or ALL. Options for selection criteria and/or destination of output are available.

TITRES

Creates a new parameter file.

TMS_E cmd VID1 [VID2]

Gives TMS informations about a given tape (or tapes if VID2 is also given). cmd can be LIS or QUE (QUE gives tha current status of the tape).

TOANAS fn ft [fm] [remote_name] [(cdir]

Quick call for TOUNIX ANAST fn ft [fm] [remote_name] [(cdir].

TOBASTA fn ft [fm] [remote_name] [(cdir]

Quick call for TOUNIX BASTA fn ft [fm] [remote_name] [(cdir].

TOSP2 fn ft [fm] [remote_name] [(cdir]

Quick call for TOSP2 BASTA fn ft [fm] [remote_name] [(cdir].

TOUNIX site fn ft [fm] [remote_name] [(cdir]

Sends a fn ft fm file from CERNVM (FRCPN11) to the same userid on a given Unix site. The transfer is done using ftp, therefore your Unix password is needed. If you wish, your Unix password is stored in your LASTING GLOBALV (please check that your LASTING GLOBALV is in A0 mode). If not, your Unix password will be asked on each time your call TOUNIX, then it will be deleted. FRCPN11 (CERNVM).

TOVM fn ft fm [userid]

Sends a fn ft fm file from CERNVM (FRCPN11) to a given userid at FRCPN11 (CERNVM).

TOVMM fn ft fm

Sends a fn ft fm file from CERNVM (FRCPN11) to the same userid at FRCPN11 (CERNVM).

XLIST fnpam [fmpam]

Creates a listing of a Pam-File source and puts it on a new temporary disk.

XM nf cmd

Reproduces nf times the same command cmd.

XPATCHY fnpam [fmpam], [fmpam, fncrd], [fmpam, fnc

Interactive call of YPATCHY. fnpam = filename of the Pam-File (filetype = CAR) fmpam = filemode of the Pam-File (default = A) fncrd = filename of the cradle (filetype = CRADLE) fmcrd = filemode of the cradle (default = A) When the cradle contains two +PAM. commands, the second pam-file is NA50UTIL.

XTOBCD fnpam [fmpam]

Creates a source (filetype = CARDS) from a Pam-file. fnpam = filename of the Pam-File (filetype = PAM) fmpam = filemode of the Pam-File (default = A)

XTOBIN fncrd [fmcrd]

Creates a Pam-file from a source (filetype = CARDS). fncrd = filename of the cards file (filetype = CARDS) fmcrd = filemode of the cards file (default = A)

Chapter 3

EP FORMAT FOR NA50

3.1 Introduction

During the processing of the data, information has to be stored, or transferred from one program to another, or from one computer to another. It is convenient to use a common format to write this information (raw data, parameters, simulated events, DST's, etc...), either on disk or on magnetic tape. The standard format that we are using is the EP format package which is summarised below.

Units are GeV, cm, radians unless particular specifications.

3.2 Warning

The following description refers to the NA50 versions, DIMUREC version 3 and DIMUJET version 4, RELMIC version 2 and GEADRIV version 2.

3.3 File structure

A file consists of a number of physical records, each N words of 16 bits, and beginning with a 12-word Header (see below). Inside a file, data are grouped into logical records called blocks. A block may spread over several physical records; at the end of a run (in the case of physics events) or of a file, the remaining of the physical record is filled with zeroes.

The number of words N is 1800 for the parameter and the constant files, it is 16380 for the data files (raw, simulated, split, DST and microDST).

3.4 Block structure

A block contains four or more words and has the following structure:

- the first word is the length of the block (L = 4 means an empty block)
- the second word is the block identifier (described below).
- the third word is the block header length (4)
- the fourth word is the block sequence number.
- then follow N words of data, with N = L - 4.

A word is an 2 bytes integer IW, with $0 \leq IW \leq 2^{16}$. Its signification is :

0	$\rightarrow$	0	$2^{15}+1$	$\rightarrow$	- 32767
1	$\rightarrow$	1	$2^{16}-1$	$\rightarrow$	- 1
$2^{15}-1$	$\rightarrow$	32767	2^{16}	$\rightarrow$	overflow

Unless otherwise stated, the information is given in 2-bytes integer. Some information requires more then one word (4-bytes integers or characters) : it is then transmitted on several consecutive 2-bytes words and notified in the description below (I4 or An, n being the number of characters : one character is encoded on 8 bits, the translation from integers to character variables is done by the CHAFRN function (LIBNA50).

In the B-O-R, HV, scaler, B-O-B, E-O-B and E-O-R blocks, all integers are 4-bytes long. Character variables appear in the B-O-R block.

3.5 Block identifier

Each block is uniquely defined by its identifier. The identifiers have the following meaning :

Description	ID (octal)	bit
serial number of the block	1 - 37b	0 - 4
raw data	+ 40b	5
reconstructed tracks	+ 100b	6
pattern units, scalers	+ 200b	7
burst monitors	+ 400b	8
kinematics	+ 1000b	9
calibration	+ 2000b	10
geometric parameters	+ 4000b	11
data summary	+ 10000b	12
control	+ 20000b	13
simulation	+ 40000b	14
bit 15 is reserved		

3.6 Physical record header

Each physical record begins with a Physical Record Header, which consists of the following 12 words:

1. length of the physical record (= 6750 or 16380)
2. length of the physical record header (= 12)
3. physical record sequence number
4. pointer to beginning to first block
5. run number (or version number)
6. record identifier (= 0)
7. first physical record identifier field (= 29954)
8. second physical record identifier field (= 31280)
9. number of physical records following this one, with zero length header
10. tape format version number (= 8012)
11. logical record word length in bits (= 16)
12. length of standard physical record header (= 12)

Chapter 4

DESCRIPTION OF A RAW DATA FILE

4.1 Sequence of blocks

A raw data file has the following structure :

1. Beginning of run (id = 8192 = 20000b)
2. New detector high voltages (id = 8199 = 20007b)
3. Thresholds for pileup CAB (id = 8198 = 20006b)
4. Beginning of burst (id = 8194 = 20002b)
5. NIM and ECL scalers (id = 136 = 210b)
6. NIM and ECL scalers for new detectors (id = 144 = 220b)
7. CAB scalers (id = 146 = 222b)
8. GANIL chambers (id = 176 = 260b)
9. Laser and BH information (id = 143 = 217b)
10. Beginning of event (id = 8196 = 20004b)
11. Raw data (id = 32 = 40b)
12. GO TO B-O-E for the next event
13. End of burst (id = 8195 = 20003b)
14. GO TO B-O-B for the next burst
15. NIM and ECL scalers [run sum] (id = 137 = 211b)
16. NIM and ECL scalers for new detectors [run sum] (id = 145 = 221b)
17. CAB scalers [run sum] (id = 147 = 223b)
18. Laser and BH information [run sum] (id = 142 = 223b)

19. End of run (id = 8193 = 20001b)

20. GO TO B-O-R for the next run, if any

4.2 Beginning of run block (id = 20000b , length = 106)

5	NRUN	Run number	I4
7	RUNTYP	Run type	A16
15	RUNSTY	Run sub-type	A16
23	RUNDAY	Date (yyyymmdd)	I4
25	RUNTIM	Time	I4
27	NSETUP	Setup Version number	I4
29	NVERON	Online Version number	I4
31	NPER	Period	I4
33	NSPS	Sub-period	A4
35	BTYP	Beam type	A8
39	IMOM	Beam momentum	I4
41		Gate	I4
43		Cycle	I4
45	FIELD	Magnet Current	I4
47	HALLPR	Hall Voltage	I4
49	XCALON	Calo X Coordinate	I4
51	YCALON	Calo Y Coordinate	I4
53	NZHTAR	Target Atomic Number	I4
55	NSUBTG	SubTarget Configuration	I4
57		SubTarget Dimensions	3I4
63	TARLEN	First SubTarget Dimensions	3I4
69	TRITYP	Trigger type	A16
77	TRISTY	Trigger subtype	A16
85		Cut Set mask	I4
		1 - Matrix cut code (Mass Region)	
		2 - Maximum allowed Raw data words	
		3 - Maximum allowed Hodoscope data words	
		4 - Minimum Triggers to classify a burst as empty	
87		Prescaling Set mask	I4
89		Trigger switch Number	I4
91	ITRTP	Trigger switch set	I4
		gene (100000b), LED (110000b), P1P2 (1000b)	
		T3 (2000b), special (4000b), laser (12000b)	
		dimuon (1b), special (3b), 1A (10b), 1B (20b) ,1C (40b), 1D (100b)	
93		Unit	I4
95		Label	A8
99		Serial number	I4
101		Flag	I4
103		Maximum Physical Records	I4
105		Maximum Logical Records	I4

4.3 High voltage block (id = 20007b , length = 1954)

This section has still to be updated.

5-20	1-8	Cathode projection y	8I4
21-36	9-16	Cathode projection u	8I4
37-52	17-24	Cathode projection v	8I4
53-68	25-32	Beam-killer projection y	8I4
69-84	33-40	Beam-killer projection u	8I4
85-100	41-48	Beam-killer projection v	8I4
101-102	49	Guirlande projection y	I4
103-104	50	Guirlande projection u	I4
105-106	51	Guirlande projection v	I4
107-490	52-243	R1 (6 sextants, 32 scintillators)	
491-874	244-435	R2 (6 sextants, 32 scintillators)	
875-1162	436-579	R3 (6 sextants, 24 scintillators)	
1163-1546	580-771	R4 (6 sextants, 32 scintillators)	
1547-1642	772-819	S1 (6 sextants, 8 scintillators)	
1643-1738	820-867	S2 (6 sextants, 8 scintillateurs)	
1739-1748	868-872	Calorimeter sextant 1	
1749-1758	873-879	Calorimeter sextant 2	
1759-1768	880-884	Calorimeter sextant 3	
1769-1778	885-889	Calorimeter sextant 4	
1779-1788	890-894	Calorimeter sextant 5	
1789-1798	895-899	Calorimeter sextant 6	
1799-1866	900-931	Target	
1867-1898	932-947	Beam hodoscope 1	
1899-1926	948-961	Beam hodoscope 2	
1927-1934	962-966	B.I.	
1935-1942	967-970	B.O.	
1943-1944	971	O.B.S.	
1945-1946	972	O.B.J.	
1947-1948	973	Laser 2012	
1949-1950	974	Laser 2020	
1951-1952	975	TTSJ	
1953-1954	976	counter before Ganil chambers	

4.4 ADC threshold block (id = 20006b , length = 292)

This block should be deleted...

4.5 Beginning of burst block (id = 20002b , length = 28)

5	IBURST	burst number	I4
7	BURHUR	burst time (hh)	
8	BURMIN	burst time (mm:ss)	
9		absolute burst number (Hw readout)	I4
11		number of empty bursts until now	I4
13		number of events in burst	I4

15		maximum event size	I4
17		burst quality flag	I4
19	FIELD	magnet current (ACM)	I4
21	HALLPR	Hall probe voltage	I4
23		reserved	I4
25		reserved	I4
27		reserved	I4

4.6 Spectrometer scaler block (id = 210b , length = 516)

5-228	SCALR	NIM scalers : 7 modules, 16 channels each (1 channel = 2 words)	I4
229-420	SCALR	ECL scalers : 6 modules, 16 channels each (1 channel = 2 words)	I4
421-516		free	

4.6.1 NIM scaler 1

scal nb	**SCALR ( )**	**description**
1	(1)	bursts
2	(2)	Σ(BH1 + BH2) "burst gated"
3	(3)	master acquisition (direct output from magic box)
4	(4)	master without deadtime (direct output from magic box)
5	(5)	master unbiased (direct output from magic box)
6	(6)	TSJ SOS
7	(7)	TSJ
8	(8)	T0J
9	(9)	start acquisition (**????**)
10	(10)	reset magic box (old reset acquisition)
11	(11)	trigger gate (for all scalers trigger gated)
12	(12)	strobe hodoscopes
13	(13)	strobe MWPC
14	(14)	Argonion 1 "burst gated"
15	(15)	Argonion 2 "burst gated"
16	(16)	Argonion 3 "burst gated"

4.6.2 NIM scaler 2

scal nb	**SCALR ( )**	**description**
1	(17)	telescope HJ trigger gated
2	(18)	telescope HJ burst gated
3	(19)	telescope HJ free running
4	(20)	telescope HS trigger gated
5	(21)	telescope HS burst gated
6	(22)	telescope HS free running

7	(23)	telescope V trigger gated
8	(24)	telescope V burst gated
9	(25)	telescope V free running
10	(26)	free
11	(27)	free
12	(28)	trigger without jitter TSJ 2μ
13	(29)	trigger without jitter TSJ
14	(30)	trigger laser out of MB
15	(31)	trigger laser in MB
16	(32)	trigger hits in burst

4.6.3 NIM scaler 3 free

scal nb	**SCALR ( )**	**description**
1	(33)	telescope triple HJ 1 *2del*3del
2	(34)	telescope triple HJ 1 *2 *3del
3	(35)	telescope triple HJ 1 *2del*3
4	(36)	telescope triple HJ 1del*2 *3
5	(37)	telescope triple V 1 *2del*3del
6	(38)	telescope triple V 1 *2 *3del
7	(39)	telescope triple V 1 *2del*3
8	(40)	telescope triple V 1del*2 *3
9	(41)	telescope triple HS 1 *2del*3del
10	(42)	telescope triple HS 1 *2 *3del
11	(43)	telescope triple HS 1 *2del*3
12	(44)	telescope triple HS 1del*2 *3
13	(45)	F R E E
14	(46)	Argonion 1 "free running"
15	(47)	Argonion 2 "free running"
16	(48)	Argonion 3 "free running"

4.6.4 NIM scaler 4 trigger gated

scal nb	**SCALR ( )**	**description**
1	(49)	= same
2	(50)	=
3	(51)	=
4	(52)	= as
5	(53)	=
6	(54)	=
7	(55)	= NIM scaler 3
8	(56)	=
9	(57)	=
10	(58)	= but
11	(59)	=
12	(60)	= trigger gated

13	(61)	free
14	(62)	Argonion 1 trigger gated
15	(63)	Argonion 2 trigger gated
16	(64)	Argonion 3 trigger gated

4.6.5 NIM scaler 5 free

scal nb	**SCALR ( )**	**description**
1	(49)	= same
1	(65)	single/64 telescope HJ 1
2	(66)	single/64 telescope HJ 2
3	(67)	single/64 telescope HJ 3
4	(68)	single/64 telescope V 1
5	(69)	single/64 telescope V 2
6	(70)	single/64 telescope V 3
7	(71)	single/64 telescope HS 1
8	(72)	single/64 telescope HS 2
9	(73)	single/64 telescope HS 3
10	(74)	free
11	(75)	free
12	(76)	free
13	(77)	free
14	(78)	free
15	(79)	free
16	(80)	free

4.6.6 NIM scaler 6 trigger gated

scal nb	**SCALR ( )**	**description**
1	(81)	= same
2	(82)	=
3	(83)	= as
4	(84)	=
5	(85)	= NIM scaler 5
6	(86)	=
7	(87)	= but
8	(88)	=
9	(89)	= trigger gated
10	(90)	free
11	(91)	free
12	(92)	free
13	(93)	free
14	(94)	free
15	(95)	free
16	(96)	free

4.6.7 NIM scaler 7 free

scal nb	SCALR ( )	description
1	(97)	OR PT superbin half sextant 1a
2	(98)	OR PT superbin half sextant 2a
3	(99)	OR PT superbin half sextant 3a
4	(100)	OR PT superbin half sextant 4a
5	(101)	OR PT superbin half sextant 5a
6	(102)	OR PT superbin half sextant 6a
7	(103)	OR PT superbin half sextant 1b
8	(104)	OR PT superbin half sextant 2b
9	(105)	OR PT superbin half sextant 3b
10	(106)	OR PT superbin half sextant 4b
11	(107)	OR PT superbin half sextant 5b
12	(108)	OR PT superbin half sextant 6b
13	(109)	free
14	(110)	free
15	(111)	free
16	(112)	free

4.6.8 ECL scaler 1 free

scal nb	SCALR ( )	description
1	(113)	PT superbin A half sextant 1a
2	(114)	PT superbin B half sextant 1a
3	(115)	PT superbin C half sextant 1a
4	(116)	PT superbin D half sextant 1a
5	(117)	PT superbin A half sextant 1b
6	(118)	PT superbin B half sextant 1b
7	(119)	PT superbin C half sextant 1b
8	(120)	PT superbin D half sextant 1b
9	(121)	PT superbin A half sextant 2a
10	(122)	PT superbin B half sextant 2a
11	(123)	PT superbin C half sextant 2a
12	(124)	PT superbin D half sextant 2a
13	(125)	PT superbin A half sextant 2b
14	(126)	PT superbin B half sextant 2b
15	(127)	PT superbin C half sextant 2b
16	(128)	PT superbin D half sextant 2b

4.6.9 ECL scaler 2 free

scal nb	SCALR ( )	description
1	(129)	PT superbin A half sextant 3a

2	(130)	PT superbin B half sextant 3a
3	(131)	PT superbin C half sextant 3a
4	(132)	PT superbin D half sextant 3a
5	(133)	PT superbin A half sextant 3b
6	(134)	PT superbin B half sextant 3b
7	(135)	PT superbin C half sextant 3b
8	(136)	PT superbin D half sextant 3b
9	(137)	PT superbin A half sextant 4a
10	(138)	PT superbin B half sextant 4a
11	(139)	PT superbin C half sextant 4a
12	(140)	PT superbin D half sextant 4a
13	(141)	PT superbin A half sextant 4b
14	(142)	PT superbin B half sextant 4b
15	(143)	PT superbin C half sextant 4b
16	(144)	PT superbin D half sextant 4b

4.6.10 ECL scaler 3 free

scal nb	**SCALR ( )**	**description**
1	(145)	PT superbin A half sextant 5a
2	(146)	PT superbin B half sextant 5a
3	(147)	PT superbin C half sextant 5a
4	(148)	PT superbin D half sextant 5a
5	(149)	PT superbin A half sextant 5b
6	(150)	PT superbin B half sextant 5b
7	(151)	PT superbin C half sextant 5b
8	(152)	PT superbin D half sextant 5b
9	(153)	PT superbin A half sextant 6a
10	(154)	PT superbin B half sextant 6a
11	(155)	PT superbin C half sextant 6a
12	(156)	PT superbin D half sextant 6a
13	(157)	PT superbin A half sextant 6b
14	(158)	PT superbin B half sextant 6b
15	(159)	PT superbin C half sextant 6b
16	(160)	PT superbin D half sextant 6b

4.6.11 ECL scaler 4 free

scal nb	**SCALR ( )**	**description**
1	(161)	T_{ij} 1 2
2	(162)	T_{ij} 3 4
3	(163)	T_{ij} 5 6
4	(164)	T_{ij} 1 3
5	(165)	T_{ij} 1 5
6	(166)	T_{ij} 2 4
7	(167)	T_{ij} 2 6

8	(168)	T_{ij} 3 5
9	(169)	T_{ij} 4 6
10	(170)	T_{ij} 1 6
11	(171)	T_{ij} 3 6
12	(172)	T_{ij} 2 3
13	(173)	T_{ij} 2 5
14	(174)	T_{ij} 4 5
15	(175)	T_{ij} 1 4
16	(176)	free

4.6.12 ECL scaler 5 free

scal nb	**SCALR ( )**	**description**
1	(177)	OR V half sextant 1a
2	(178)	OR V half sextant 1b
3	(179)	OR V half sextant 2a
4	(180)	OR V half sextant 2b
5	(181)	OR V half sextant 3a
6	(182)	OR V half sextant 3b
7	(183)	OR V half sextant 4a
8	(184)	OR V half sextant 4b
9	(185)	OR V half sextant 5a
10	(186)	OR V half sextant 5b
11	(187)	OR V half sextant 6a
12	(188)	OR V half sextant 6b
13	(189)	free
14	(190)	free
15	(191)	free
16	(192)	free

4.6.13 ECL scaler 6 free

scal nb	**SCALR ( )**	**description**
1	(193)	PT*V half sextant 1a
2	(194)	PT*V half sextant 1b
3	(195)	PT*V half sextant 2a
4	(196)	PT*V half sextant 2b
5	(197)	PT*V half sextant 3a
6	(198)	PT*V half sextant 3b
7	(199)	PT*V half sextant 4a
8	(200)	PT*V half sextant 4b
9	(201)	PT*V half sextant 5a
10	(202)	PT*V half sextant 5b
11	(203)	PT*V half sextant 6a
12	(204)	PT*V half sextant 6b
13	(205)	free

14	(206)	free
15	(207)	free
16	(208)	spill

4.7 NIM and ECL scalers of upstream detectors (id = 220b, length = 516)

This section has probably still to be updated... at least about scaling factor.

4.7.1 ECL scaler 1 (free)

channel	word nb	meaning	scaling
(1)-(8)	5-20	beam hodoscope left < S	16
(9)-(16)	21-36	beam hodoscope right < S	16

4.7.2 ECL scaler 2 (free)

channel	word nb	meaning	scaling
(1)-(6)	37-48	beam hodoscope bottom < S	16
(7)-(12)	49-60	beam hodoscope top < S	16
(13)	61-62	BH int left	
(14)	63-64	BH int right	
(15)	65-66	BH int left-right coincidence	
(16)	67-68	empty	

4.7.3 ECL scaler 3 (free)

channel	word nb	meaning	scaling
(1)-(4)	69-76	BI < S	16
(5)-(16)	77-100	empty	

4.7.4 ECL scaler 4 (burst gated)

channel	word nb	meaning	scaling
(1)-(16)	101-132	same content as ECL scaler 1 but burst gated	

4.7.5 ECL scaler 5 (burst gated)

channel	word nb	meaning	scaling
(1)-(16)	133-164	same content as ECL scaler 2 but burst gated	

4.7.6 ECL scaler 6 (burst gated)

channel	word nb	meaning	scaling
(1)-(16)	167-196	same content as ECL scaler 3 but burst gated	

4.7.7 ECL scaler 7 (trigger gated)

channel	word nb	meaning	scaling
(1)-(16)	197-228	same content as ECL scaler 1 but trigger gated	

4.7.8 ECL scaler 8 (trigger gated)

channel	word nb	meaning	scaling
(1)-(16)	229-260	same content as ECL scaler 2 but trigger gated	

4.7.9 ECL scaler 8 (trigger gated)

channel	word nb	meaning	scaling
(1)-(16)	261-292	same content as ECL scaler 3 but trigger gated	

4.8 GANIL chamber block (id = 260b , length = 804)

This section has still to be updated

4.9 Beam status block (id = 401b, length = 66)

5		burst number	I4
7-66		See Michael Clayton's paper	

4.10 Beginning of event block (id = 20004b , length = 39)

5	IEVENT	event number	I4

What is written below has still to be updated...

9	IEVBUR	event number in burst	I4
11	IVECAB	FEP version	I4
13	PUBHFL	FEP BH pileup flag	
14	SYNCFL	FEP synchrone flag	
15	TIJAFL	FEP Tij cut flag	
21	IEVTFL	rejection flag	
22	LGTRFL	length cut flag	
24	WNFLFL	wrong flags flag	
25	CABDDR	CD and DD flag	

26	ETCUFL	Et cut flag
27	PIUPFL	calo pileup flag
36-39		event error counts

4.11 Raw data block (id = 40b , length = NRAW+4)

5	P_0	pointer to hodoscope data
6-13	P_1 - P_8	pointers to PC_1 - PC_8 data
14	P_9	pointer to ADC branch
15	P_10	pointer to multiplicity branch
16-24		free
		($P_i = 0$ if branch i is missing)
P_0	32818	hodoscope data flag
P_0+1		1st hodoscope data word
P_1	32819	PC_1 flag
P_1+1		1st PC_1 word
P_2	32820	PC_2 flag
P_2+1		1st PC_2 word
P_3	32821	PC_3 flag
P_3+1		1st PC_3 word
P_4	32822	PC_4flag
P_4+1		1st PC_4 word
P_5	32823	PC_5 flag
P_5+1		1st PC_5 word
P_6	32824	PC_6 flag
P_6+1		1st PC_6 word
P_7	32825	PC_7 flag
P_7+1		1st PC_7 word
P_8	32826	PC_8 flag
P_8+1		1st PC_8 word
P_9	32827	ADC data flag
P_9+1		1st ADC data word
P_9	32828	multiplicity flag
P_9+1		1st multiplicity data word
NRAW+4		last raw data word

4.11.1 ADC data

This section has still to be verified...

All words have to be masked with FFFh (= 4095d)

word	name	meaning or comment	scaling
0		NA38 branch flag (32827)	-
1-24	CALADC	calo in time ADC	-
25-40	EARADC	calo out of time ADC	-
41-42		empty	-
43	NORLAS	laser normalisaiton? ADC	-
44	DIOLAS	laser diode ADC	-

45	FILTRL	laser filter ADC	-
46	IEVTIE	event time in burst (ramp)	-
47		RESLC2	-
48		RESLC3	-
49-52	BINADC	beam in ADC	-
53-64		free	-
65-128	ZDCADC	ZDC ADC	-
129-136	ZDCTDC	ZDC TDC (to be verified)	-
137-158	TGTADC	target blade ADC (left, right, antihalo)	-
159-160		free	-
161-168	BHLADC	beam hodoscope left ADC	-
169-176	BHRADC	beam hodoscope right ADC	-
177-184	BHBADC	beam hodoscope bottom ADC	-
185-190	BHTADC	beam hodoscope top ADC	-
191-192	BHTADC	BH int ADC (left, right)	-
192-199	BHLTDC	beam hodoscope left TDC	-
200-207	BHRTDC	beam hodoscope right TDC	-
208-215	BHBTDC	beam hodoscope bottom TDC	-
216-221	BHTTDC	beam hodoscope top TDC	-
222-223	BHTTDC	BH int TDC (left, right)	-
224-232		free	-

4.12 End of event block (id = 20005b , length = 6)

N.B. This block is absent in the new acquisition version. However, it is filled by DIMUREC when writing a split or a DST.

5	event number	I4

4.13 End of burst block (id = 20003b, length = 70)

5	burst word count	I4
7	mean evt size	I4
9	mean Tx time	I4
11	number of recorded events	I4
13	first event number	I4
15	last event number	I4
17	number of flagged events	I4
19	number of truncated events	I4
21	number of events in error	I4
23	number of events in BOE error	I4
25	number of events with timeout	I4
27	number of events in overrun error	I4
29	number of events with LAPP flag	I4
31	number of hodoscope errors	I4
33	hodoscope error flag	I4
35	number of chamber errors	I4
37	chamber error flag	I4

39-52	free	
53	number of ADC errors	I4
55	ADC error flag	I4
57	number of multiplicity errors	I4
59	multiplicity error flag	I4
61	total number of errors	I4
63	burst error flag	I4
65-70	free	

4.14 Spectrometer scaler sum block (id = 211b, length = 516)

Same content as the block id = 210b, but summed over the whole run.

4.15 Sum of scalers for upstream detectors (id = 221b, length = 516)

Same content as the block id = 220b, but summed over the whole run.

4.16 End of run block (id = 20001b , length = 72)

5		run number	I4
7		run date (yymmdd	I4
9	BURHUR	end of run time (hh)	
10	BURMIN	end of run time (mmss)	
11		total number of bursts	I4
13		number of not empty bursts	I4
15		number of seen bursts	I4
17		number of bursts ok on tape	I4
19		number of flagged bursts	I4
21		number of bad bursts	I4
23		number of bursts in overflow	I4
25		number of bursts with bad partition	I4
27		absolute burst number of 1st Hw burst	I4
29		absolute burst number of last Hw burst	I4
31		average event size	I4
33		total number of events in good bursts	I4
35		number of recorded events	I4
37		maximum allowed raw data words	I4
39		average raw data words	I4
41		maximum allowed hodoscope words	I4
43		average hodoscope words	I4
45		number of flagged events	I4
47		number of truncated events	I4
49		number of events in error	I4
51		number of events in error in BOE	I4
53		number of events with timeout	I4
55		number of events in overrun error	I4
57		number of flagged events in error	I4
59		number of hodoscope errors	I4

61	number of chamber errors	I4
63	number of ADC errors	I4
65	number of multiplicity errors	I4
67	total number of errors	I4
69	total number of EOB enable	I4
71	number of bytes written on tape	I4

Chapter 5

DESCRIPTION OF A DATA SPLIT FILE

5.1 Sequence of blocks

A data split file has the following structure :

1. Beginning of run (id = 20000b)
2. Reconstruction counters (id = 12001b)
3. Cuts at the reconstruction time (id = 12000b)
4. New detector high voltages (id = 20007b)
5. Beginning of burst (id = 20002b)
6. NIM and ECL scalers (id = 210b)
7. NIM and ECL scalers for new detectors (id = 220b)
8. CAB scalers (id = 222b)
9. Beginning of event (id = 20004b)
10. Raw data (id = 40b)
11. Hit counters (id = 10003b)
12. Hit counters after cleaning (id = 10001b)
13. Offline reconstructed tracks in projection (id = 10101b)
14. Offline reconstructed tracks in space (id = 10100b)
15. Offline associated tracks in space (id = 10102b)
16. Dimuon kinematics (id = 11002b)
17. End of event (id = 20005b)
18. GO TO 9 for the next event
19. End of burst (id = 20003b)

20. GO TO 5 for the next burst

21. NIM and ECL scalers [run sum] (id = 210b)
22. NIM and ECL scalers for new detectors [run sum] (id =220b)
23. CAB scalers [run sum] (id = 223b)
24. End of run (id = 20001b)

25. GO TO 1 for the next run, if any

N.B. Here we only describe the new blocks with respect to raw data file blocks.

5.2 Reconstruction counters (id = 12001b , length = 200)

The description of the reconstruction counters (NCOUNT) is given in DIMUREC user's guide.

5.3 Cuts at reconstruction time (id = 12000b , length = 49)

word	name	meaning or comment	scaling
5	IRAWMX	maximum length of raw data block	-
6	MAXCO	maximum number of hits in hodoscope branch	-
7	MAXMWH	maximum number of wires in chamber branch	-
8	MASCIN	maximum number of hit scintillators per sextant	-
9	MCOMB	maximum number of associations per sextant	-
10	MAXVER	address of hit scint.	-
11	MBVER	sextant combinations	-
12	MINTR	multiplicity cut flag (NA10)	-
13-14	LOGTEL	logical number of telescope (tel)	-
15-16	IASSTY	association type (0=proj, 1=space) (tel)	-
17	KONSPA	fwd-bwd constraint in magnet (0=no, 1=yes)	-
18	KRECUP	recuperation level for 3rd missing track	-
19	NBRECU	minimum number of spots to build the missing projection	-
20-21	MXPLAN	maximum number of planes (tel)	-
22	MXPROJ	maximum number of projections	-
23	NTRMX	maximum number of tracks per projection	-
24	MINSOZ	minimum number of spots to build a projection	-
25	MXSPOT	maximum number of spots used per half-projection	-
26	MXTRPR	maximum number of reconstructed tracks in projection	-
27	MXTRSP	maximum number of reconstructed tracks in space	-
28	MXASS	maximum number of possible associations	-
29-30	ROADPR	coefficient for road width in projection (tel)	100
31-32	ROADSP	road width in space association (tel)	100
33-34	ROADRE	road width in space assoc. recovery (tel)	100
35-36	ROADMA	multip. coefficient for road width	

		in magnet (air or iron)	100
37-38	CDACUT	cut on fwd-bwd closest distance	
		of approach (air or iron)	100
39-40	ZCRCUT	cut on z fwd-bwd track intersection (air or iron)	1
41-42	DPHCUT	cut on ϕ fwd - ϕ bwd of track (air or iron)	10
43	DCIBLE	lateral size of target for constrained reconstruction	1
44	CUTZV	cut on z coordinate of vertex	1
45-46	RMAGTO	tolerance on coil radius in SPACPR (air or iron)	1
47	ANGMIN	bwd minimum projection angle in PTRAK1	1000
48	ANGMAX	bwd maximum projection angle in PTRAK1	1000
49	RMGTPR	tolerance on r in the magnet in PTRAK1	1

5.4 Hit counters (id = 10003b , length = variable)

word	name	meaning or comment	scaling
5	NTCO	total number of scintillators hit	-
6	NSEXT	number of hit sextants (hodo)	
		(R1,R2,R3,R4,V,PT,P1,P2,P1·P2)	-
	IASEXT	address of hit sextants (hodo)	-
	NSCINT	number of hit scint. (sext, hodo)	-
	IPSCIN	pointer to 1st scint. (sext, hodo)	-
	IASCIN	address of hit scint.	-
	ISXTCB	sextant combinations	-
	MCUTFL	multiplicity cut flag (NA10)	-
	IUNBFL	unbiased event flag	-
	ITCOUN	T-counters (T, sext)	-
	ITTYPE	trigger type flag	-
	IADCR2	obsolete	-
	IRAWLG	raw data block length	-

5.5 Hit counters after cleaning (id = 10001b , length = variable)

word	name	meaning or comment	scaling
5	MGSEX	total number of good sextants	-
6	IGSEXT	address of good sextants	-
	KWSEXT	quality factor (sext)	
		(1=complete,2=recovered,0=unsatisfied matrix)	-
	NCOMB	number of V, R3, R4, PT combinations	-
	NGSCIN	number of hit scint. (sext, hodo)	-
	IGSCIN	address of hit scint. (nb,sext,hodo)	-
	ITRKCB	V, R3, R4, PT combinations (sext)	-
	ITIJCL	good sextant combinations	-

5.6 Projection reconstructed tracks (id = 10101b , length = variable)

word	name	meaning or comment	scaling
5	NBTRPR	number of reconstructed tracks (halfplane,tel)	-
6+N	ATRPR	angle (track,halfplane,tel)	10000
7+N	DATRPR	error on angle (track,halfplane,tel)	100000
8+N	XTRPR	abscissa (track,halfplane,tel)	100
9+N	DXTRPR	error on abscissa (track,halfplane,tel)	10000
10+N	ZTRPR	corresponding z (track,halfplane,tel)	1
11+N	CHI2PR	χ^2 of linear fit (track,halfplane,tel)	10000
12+N	IUSPRO	multiplicity of spot (track,halfplane,tel)	-

where N = 7 $\cdot$ (NBTRPR(halfplane,tel) - 1)

5.7 Space reconstructed tracks (id = 10100b , length = variable)

word	name	meaning or comment	scaling
5	NBTRSP	number of reconstructed tracks (tel)	-
6+N	NTSPOT	total number of spots (tel)	-
7+N	NOSEXT	sextant number (track,tel)	-
8+N	IHITSP	validation by hodoscope (track,tel)	-
9+M+N	ATRSP	tan(angle α,β,γ) (track,angle,tel)	10000
10+M+N	DATRSP	error on angle (track,angle,tel)	100000
11+M+N	XTRSP	coordinate (x,y,z) (track,coord,tel)	100,100,1
12+M+N	DXTRSP	error on coordinate (track,coord,tel)	10000
21+N	TYPTRK	air or iron word (character*3) (track,tel)	-
22+N	ISEXSP	address of sextant hit (track,first hodo,tel)	
		first hodo = R1 for telescope 1, R3 for telescope 2	-
24+N	ISEXSP	address of sextant hit (track,2nd hodo,tel)	
		2nd hodo = R2 for telescope 1, R4 for telescope 2	-
25+N	ISCISP	address of scint. hit (track,hodo,tel)	-
(26-29)+N	IQSP	reconstruction flag (4 16-bit words) (track,tel)	-
(30-33)+N	IQSPB	reconstruction flag (4 16-bit words) (track,tel)	-
34+N	CHI2SP	χ^2 (track,tel)	-

where N = (NBTRSP - 1) $\cdot$ 29 and M = 4 $\cdot$ (J - 1) , with J = track number

5.8 Space associated tracks (id = 10102b , length = variable)

word	name	meaning or comment	scaling
5	NBTRK	number of bwd-fwd associated tracks	-
6+N	LOGSPA	logical number of track (track number,tel 1)	-
7+N	LOGSPA	logical number of track (track number,tel 2)	-
8+N	PTRSP	momentum at magnet entrance (track)	100
9+N	DPTRSP	error on PTRSP (track)	100

10+N	PTRF	momentum at vertex (track)	100
11+N	DPTRF	error on PTRF (track)	100
12+N	TYPT	air or iron word (character*3) (track)	-

where N = 7 · (NBTRK -1)

5.9 Dimuon kinematics (id = 11002b, length = variable)

word	name	meaning or comment	scaling
5	NBDIMU	number of dimuons of any sign	-
6+N		IPDIMU, OSLS, ACCGLO(dimuon number)	-
7+N	DIMASS	mass of dimuon (dimuon number)	1000
6+N+I+L	PARDIM	Px, Py, Pz of muon I (dimuon number)	2 1000, 100
6+N+I+L+1	CCIBLE	x, y, z of vertex of muon I (dimuon number)	id
18+N+J	VERDIM	x, y, z1, z2 of dimuon (dimuon number)	2 1000, 2 100
23+N	XDIM	x_F of dimuon (dimuon number)	10000
24+N	PTDIM	P_T of dimuon (dimuon number)	1000
24+N+J	PDIMCM	c-m-s 4-momentum (coord,dimuon)	1000
29+N	COSTCM	c-m-s cosine (θ) (dimuon)	10000
30+N	PHICM	c-m-s ϕ (dimuon)	1000
31+N	COSTGJ	G.J. cosine (θ) (dimuon)	10000
32+N	PHIGJ	G.J. ϕ (dimuon)	1000
33+N	COSTCS	C.S. cosine (θ) (dimuon)	10000
34+N	PHICS	C.S. ϕ (dimuon)	1000
35+N	COSTUC	U.ch. cosine (θ) (dimuon)	10000
36+N	PHIUC	U.ch. ϕ (dimuon)	1000
35+N+I+J	PGJ	G.J. 4-momentum (coord,track,dimuon)	1000
35+N+I+J+1	PCS	C.S. 4-momentum (coord,track,dimuon)	1000
35+N+I+J+2	PUC	U.ch. 4-momentum (coord,track,dimuon)	1000
35+N+I+J+3	PLAB	lab 4-momentum (coord,track,dimuon)	1000
44+L	PBEAD	beam in dimuon rest frame (coord,dimuon)	10000
44+L+1	PTGTD	target in dimuon rest frame (coord,dimuon)	10000
50+N	RAPID	rapidity (dimuon)	1000

Where :

- N = 45 · (NVERT-1)
- I runs from 1 to 2 (individual muon)
- J runs from 1 to 4 (four-momentum or x, y, z1, z2)
- L runs from 1 to 3 (x, y, z coordinates)

Chapter 6

ADDITIONAL CONTENT FOR SIMULATION

6.1 Introduction

We only describe here the aditional blocks used for a simulated file; this file can be either a raw data (simulated) file or a split (simulated) file; the additional blocks are inserted in the sequence after the beginning of event block. The additional blocks are the following :

1. Beam and target block (id = 41000b)
2. Hodoscope block (id = 40040b)
3. Chamber wire block (id = 40041b)
4. Chamber coordinate block (id = 40042b)
5. Muon kinematic block (id = 41001b)
6. Weight block (id = 41002b)

6.2 Beam and target block (id = 41000b , length = 36)

word	name	meaning or comment	scaling
5-8	PBEAM	beam momentum (P_x,P_y,P_z,P)	10,100, 10,100
9-12	PTGT	target momentum (P_x,P_y,P_z,P)	4*1000
13-15	VTX	vertex coordinates (x,y,z)	3*100
16	ETOTAL	total energy	100
17	DIMMAS	dimuon mass	1000
18	ISPIN	dimuon spin	-
19	XDIM	dimuon Feynman-x	10000
20	PTDIM	dimuon P_T	1000
21-24	PDIMCM	dimuon momentum in c.m. (P_x,P_y,P_z,E)	4·1000
25	COSTCM	cosine (azimuthal dimuon angle in c.m.)	1000
26	PHICM	dimuon polar angle in c.m.	1000
27-30	PGJ	momentum of decay product 1 (P_x,P_y,P_z,P)	4·100
31-34	PGJ	momentum of decay product 2 (P_x,P_y,P_z,P)	4·100
35	COSTGJ	cosine (azimuthal angle of positive μ in G.J. frame)	1000
36	PHIGJ	polar angle of positive μ in G.J. frame	1000

6.3 Hodoscope block (id = 41040b , length = variable)

word	name	meaning or comment	scaling
5-...	NSXTMC	number of hit sextants (hodo)	-
	IASXMC	taddress of hit sextant (number,hodo)	-
	NSCTMX	number of hit scintillators (sext,hodo)	-
	IASCMC	address of scintillator hit (number,sext,hodo)	-

6.4 Chamber wire block (id = 41041b , length = variable)

word	name	meaning or comment	scaling
5-...	MWIRE	number of hit wire (particle,chamber,plane)	-

6.5 Chamber coordinate block (id = 41042b , length = variable)

word	name	meaning or comment	scaling
5-...	COORMC	number of hit wire (particle,chamber,plane)	-

6.6 Muon kinematic block (id = 41001b , length = 52)

word	name	meaning or comment	scaling
5-12	DMUONS	description of jst muon (I,J,K) at position k	
		j = 1 for first muon, k = 1 at target	
		i refers to :	
		x	100
		y	100
		z	10
		P_x	1000
		P_y	1000
		P_z	100
		P	100
		charge	-
13-20	DMUONS	description of 1st muon at end of absorber (k = 2)	
21-28	DMUONS	description of 1st muon at beg. of iron wall (k = 3)	
29-52	DMUONS	same as 5-28 for 2nd muon (j = 2)	

6.7 Weight block (id = 41002b , length = 24)

word	name	meaning or comment	scaling
5-20	WGHTMC	simulation weights (see DIMUJET)	
22	MCPHSP	flag of accepted event by phase space	-

23	MCTRIG	flag of accepted event by trigger	-
24	MCACPT	flag of geometrically accepted event	-

Chapter 7

DESCRIPTION OF A DST FILE

7.1 Sequence of blocks

A DST file has the following structure :

1. Beginning of run (id = 20000b)
2. Beginning of burst (id = 20002b)
3. Beginning of event (id = 20004b)
4. Dimuon kinematic block (id = 11002b)
5. Associated track block (id = 10102b)
6. DST first additional block (id = 11004b)
7. DST second additional block (id = 11005b)
8. End of event (id = 20005b)
9. GO TO 3 for the next event
10. End of burst (id = 20003b)
11. GO TO 2 for the next burst
12. NIM and ECL scalers [run sum] (id = 211b)
13. NIM and ECL scalers for new detectors [run sum] (id =221b)
14. CAB scalers [run sum] (id = 223b)
15. GO TO 1 for the next run, if any

N.B. The blocks related to the kinematics and to the reconstructed tracks in space are different than the ones written on a split file, they will therefore be described again below.

7.2 Warning

The lecture of a DST file with DIMUREC is enabled by the option RDDST (return code = 31 if option RDDST not selected)

7.3 Dimuon kinematics (id = 11002b, length = variable)

word	name	meaning or comment	scaling
5	NBDIMU	number of dimuons of any sign	-
6+N		IPDIMU, OSLS, ACCGLO(dimuon number)	-
7+N	DIMASS	mass of dimuon (dimuon number)	1000
6+N+I+L	PARDIM	Px, Py, Pz of muon I (dimuon number)	2 1000, 100
6+N+I+L+1	CCIBLE	x, y, z of vertex of muon I (dimuon number)	id
18+N+J	VERDIM	x, y, z1, z2 of dimuon (dimuon number)	2 1000, 2 100
23+N	XDIM	x_F of dimuon (dimuon number)	10000
24+N	PTDIM	P_T of dimuon (dimuon number)	1000
25+N	COSTCM	c-m-s cosine (θ) (dimuon)	10000
26+N	PHICM	c-m-s ϕ (dimuon)	1000
27+N	COSTCS	G.J. cosine (θ) (dimuon)	10000
28+N	PHICS	G.J. ϕ (dimuon)	1000
29+N	RAPID	rapidity (dimuon)	1000

Where :

- N = 24 $\cdot$ (NVERT-1)
- I runs from 1 to 2 (individual muon)
- J runs from 1 to 4 (four-momentum or x, y, z1, z2)
- L runs from 1 to 3 (x, y, z coordinates)

7.4 Reconstructed and associated tracks in space (id = 10100b , length = variable)

word	name	meaning or comment	scaling
5	NBTRK	number of associated tracks	-
6+M		LOGSPA, TYPT of track (track nb)	-
7+M	PTRF	nature of the track (track nb)	-
8+M	PTRSP	momentum at the vertex (track nb)	100
9+M		superbin, sextant, ACCFL, MAGNOK	-
10+M		NBTRSP(Bwd), NBTRSP(Fwd)	-
10+M+N+1		XTRSP(1)	100
10+M+N+2		XTRSP(2)	100
10+M+N+3		XTRSP(3)	10
10+M+N+4		ATRSP(1)	10000
10+M+N+5		ATRSP(2)	10000
16+M+N+1		ISEXSP, ISCISP of track 1	-

16+M+N+2	ISEXSP, ISCISP of track 2	-
18+M+N+1	ISEXSP, ISCISP of track 1, image	-
19+M+N+2	ISEXSP, ISCISP of track 2, image	-

where :

- M = goes with NBTRK
- N goes with NBTRSP(ITEL)

7.5 DST first additional block (id = 11004b , length = variable)

word	name	meaning or comment	scaling
5	ITTYPE	trigger type (3 words)	-
6	IRAWLG	raw data block length	-
7	NTCO	number of hodoscope words	-
8	NTCOR	number of hodoscope words (R1,R2,R3,R4)	-
9-12	NVSEL	NVSEL, direct and image	-
13	FPILUP		-
14		NOJITR,SOJITR,ZOJITR,TWOSYN,NICALO	-
15		NOCIBI, NOCIBR	-
16		ETOTRC	10
17		ETONEC	10

The signification of the FPILUP word is the following :

- bit 1 : NIBHAD > 1
- bit 2 : NIBO = 1
- bit 3 : NIBO = 3
- bit 4 : NIBHAD > 2
- bit 5 : NIBHAD = 2 and NOCIBR > 0
- bit 6 : NIBHAD = 2 and NOCIBR = 0
- bit 7 : NIBHAD > 1 or number of ions in PU BI out of time ¿ 1
- bit 8 : bit 4 or bit 5
- bit 9 : more than 1 signal in calo out-of-time windows
- bit 10 : NOCIBI = 0

7.6 DST second additional block (id = 11005b , length = variable)

The whole content of the ADC block

Chapter 8

DESCRIPTION OF A MICRODST FILE

8.1 Sequence of blocks

A microDST file has the following structure :

1. Beginning of job (id = 4100b)
2. Beginning of run (id = 4101b)
3. Block of data (id = 4102)
4. GO TO 3 for the next set of events
5. End of run (id = 4103b)
6. GO TO 2 for the next run

The block of data is filled with a given number of events (depending on the size of an event). Each data block starts with a logical record header (4 words), then follow several sub-blocks, each sub-block corresponding to one event, as described below.

There are foreseen at the present time, one standard microDST, together with several additional microDST's for special studies.

Standard and additional microDST's differ only by the content of the block of data. The type of the microDST is given by the word IMODST in the beginning of job block :
IMODST =

1. standard microDST
2. microDST for global cut study
3. microDST for target algorithm study
4. microDST for calorimetry study
5. microDST for like-sign study

8.2 Beginning of job block (id = 4100b, length = variable)

word	name	meaning or comment	scaling
5	NVERS	offline (DIMUREC) creation date	-
6	NVERSM	μDST version number	-
7	IDAY	creation date	
8		nb of words + SIMUFL * 128 + IMODST * 1024	

In the standard microDST are added the following words :

word	name	meaning or comment	scaling
9		EVTSEL, AIRFER, SIMUFL	
10	CUTMA1	low mass cut	100
11	CUTMA2	high mass cut	100
12	PRBCUT(1)	cut on Pdtarg	100
13	PRBCUT(2)	cut on dphi	100
14	PRBCUT(3)	cut on dmag	100
15	PRBCUT(4)	cut on all	100
16		fiducial cuts, DD cut, VR3R4, CIBICU, CIBRCU, PILUCU, UNVERT	

8.3 Beginning of run block (id = 4101b, length = 9)

word	name	meaning or comment	scaling
5	NRUN	run number	-
6	NSETUP	setup version number	-
7	NZHTAR	atomic number of target	-
8	CNORM(1)	luminosity	10^{-5}
9	FIELD	magnetic field	100

8.4 Data block for standard data (id = 4102b, length = 2000)

word	name	meaning or comment	scaling
1	IEVENT	less significant bits	
2		IEVENT (most significant bits) + IEVTIM	
3	P_{x1}	P_x of first muon at the vertex	1000
4	P_{y1}	P_y of first muon at the vertex	1000
5	P_{z1}	P_z of first muon at the vertex	100
6	P_{x2}	P_x of second muon at the vertex	1000
7	P_{y2}	P_y of second muon at the vertex	1000
8	P_{z2}	P_z of second muon at the vertex	100
9	FLAGS	see description below	-
10	ZVERT2	z coord of vertex	100
11		sextant number and P_t superbins for both muons	-

12	FPILUP		
13		NOJITR,SOJITR,ZOJITR,NICALO,NIBO,TWOSYN	
14	OBSCHI	χ^2 of OB signals w.r.t. reference	100
15	OBGRAV	OB barycenter	
17	OBKOLM	OB Kolmogorov test	
18-22	RNGCOR	e.m. energy per ring	10

For simulated data, the words 12 to 22 are replaced by the following words 12 to 18 :

word	**name**	**meaning or comment**	**scaling**
12	DMMC	dimuon generated mass	1000
13	XFMC	dimuon generated Feynman-x	10000
14	PTMC	dimuon generated transverse momentum	1000
15	PHCMMC	dimuon genrated ϕ in c.m.s.	1000
16	PHCSMC	dimuon generated ϕ in C.S. frame	1000
17	CTCSMC	dimuon generated cosine θ in C.S. frame	10000
18	ETOTMC	available c.m. energy	10

Then you add 22 (18 for simulated data) to the above word number for the next event. The variable FLAGS is defined as follows :

- bits 1 to 6 : NOCIBI NVSEM = 3 a 7 2 bits PIPRFL proton 1 bit PIPRF2 sextuple 1 bit IOSLS = 1 a 3 2 bits
- bits 7 and 8 : NVSEL
- bit 9 : 1 if PIPRFL = 0 (Cerenkovs)
- bit 10 : 1 if PIPRFL + PIPEAR + PIPLAT = 0
- bits 11 and 12 : 1 if $\mu^+\mu^-$, 2 if $\mu^+\mu^+$, 3 if $\mu^-\mu^-$

8.5 Data block for like-sign data (id = 4102b, length = 2000)

This section has still to be updated

word	**name**	**meaning or comment**	**scaling**
1	P_{x1}	P_x of first muon at the vertex	1000
2	P_{y1}	P_y of first muon at the vertex	1000
3	P_{z1}	P_z of first muon at the vertex	100
4	P_{x2}	P_x of second muon at the vertex	1000
5	P_{y2}	P_y of second muon at the vertex	1000
6	P_{z2}	P_z of second muon at the vertex	100
7	FLAGS	see description above	-
8-12	RNGCOR	e.m. energy per ring	10
13-14	PTRSP	momentum of each muon at the magnet	100
15	XTRSP(1,1)	x of first muon at z = XTRSP(1,3)	100

16	XTRSP(1,2)	y of first muon at z = XTRSP(1,3)	100
17	MPILUP	10 bits of FPILUP, 5 bits of MCUTFL	-
18	IEVTIE	event time in burst + IEVENT (msb)	-
19		NOJITR SOJITR ZOJITR NIBHTD NI2040 MOCIBI NIBO SYNCFL	
20	XTRSP	z coord. of first muon in Fwd tel.	10
21-23	XTRSP	x, y and z coord. of muon 2 in Fwd tel.	2·100,10
24-25	ATRSP	α and β of muon 1 in Fwd tel.	10000
26-27	ATRSP	α and β of muon 2 in Fwd tel.	10000
28	PIONS	sum of tgt ADC from NOCIBI + 3 to NOCIBI + 6	1
29	ISBIN	Pt superbin (bits 1 to 4 for muon 1, 5 to 8 for muon 2	-
30	MAX2I	target algorithm information	-

Then you add 30 to the above word number for the next event.

8.6 Data block for target data (id = 4102b, length = 2000)

This section has still to be updated.

word	**name**	**meaning or comment**	**scaling**
1	IEVENT	less significant bits	
2		IEVENT (most significant bits) + IEVTIM	
3-26		packed 32 target ADC's	

Then you add 26 to the above word number for the next event.

8.7 Data block for calorimetry (id = 4102b, length = 2000)

This section has still to be updated.

word	**name**	**meaning or comment**	**scaling**
1	IEVENT	less significant bits	
2		IEVENT (most significant bits) + IEVTIM	
3-26		packed 32 calo ADC's	

Then you add 26 to the above word number for the next event.

8.8 End of run block (id = 4103b, length = 10)

word	**name**	**meaning or comment**	**scaling**
5-6	LEVRUN	last event number	-
7	CNORM	normalisation factor	10^{-33}
8		empty	

Chapter 9

DESCRIPTION OF THE PARAMETER FILE

9.1 Introduction.

This chapter has still to be updated. This file contains the various set-ups successively used, each set-up being defined by 30 blocks. The position of the center of a detector D in the laboratory system is defined by the vector POSDET (I,D) :

- for I = 1,3 POSDET(I,D) contains x,y,z;
- for I = 4,6 POSDET(I,D) contains the angles α ,β, γ.

9.2 Sequence of blocks

The parameter file has the following structure :

1. Set-up header (id = 2048 = 4000b)
2. Global cuts (id = 2060 = 4014b)
3. Target block (id = 2050 = 4002b)
4. Hydrogen target block (id = 2055 = 4007b)
5. Dump block (id = 2051 = 4003b)
6. Magnet block (id = 2052 = 4004b)
7. Wall block (id =2054 = 4006b)
8. Constants (id = 2053 = 4005b)
9. Proportional chamber block (id = 2112 = 4100b)
10. Hodoscope block (id = 2080 = 4040b)
11. P-hodoscope block (id = 2082 = 4042b)
12. Length difference in sext 4 and 5 for R3 and R4 (id = 2083 = 4043b)
13. Properties of materials (id = 2058 = 4012b)
14. Table for matrix check (part 1) (id = 2056 = 4010b)
15. Table for matrix check (part 2) (id = 2057 = 4011b)

16. New (NA38) detectors (part 1) (id = 2062 = 4014b)
17. New (NA38) detectors (part 2) (id = 2063 = 4015b)
18. Coefficients for calorimeter (id = 2059 = 4013b)
19. End of set-up (id = 2049 = 4001b)

9.3 Set-up header block (id = 4000b , length ¿= 11)

word	name	meaning or comment	scaling
5	ISETUP	set-up number	-
6	IDATE	date of validity (ddmmy , y=year-1980)	-
7	ITIME	starting time of validity	-
8		date of creation	-
9		time of creation	-
10	NBEAM	momentum of the incident beam	-
	IGBEAM	nature of the incident beam	-
11	NSYST	number of different systems during this set-up version	-
12-18	SYSMIC	Alphanumeric definition of system 1 (if NSYST ¿ 0)	-
19	NSYFRN	First run of this system	-
20	NSYLRN	Last run of this system	-
21-30		same as 12-20 if NSYST ¿= 2, etc... Or :	
21-??		Alphanumeric comments on changes on this setup	

9.4 Global cut block (id = 4014b , length = 208)

word	name	meaning or comment	scaling
5-64	SIGTGT	sigma for target cut	100
65-124	SIGMAG	sigma for magnet cut	100
125-184	SIGPHI	sigma for delta phi in magnet cut	10000
185-196	CUTCO1	coefficients for cut	1000
197-208	CUTCO2	coefficients for cut	1000

9.5 Target block (id = 4002b , length = 17)

word	name	meaning or comment	scaling
5-10	POSDET	x, y, z, α, β, γ at center (I,2)	$3{\cdot}10^3$, $3{\cdot}10^5$
11	ZTARMN	z of beginning of target	100
12	ZTARMX	z of end of target	100
13	TARRAD	target radius	10
14	ZNOTAR	target atomic charge (Z)	10
15	ANOTAR	target atomic mass(A)	100
16	RHOTAR	target density	10

17	ZSA	target Z/A ratio	100000

9.6 Liquid target block (id = 4007b , length = 17)

word	name	meaning or comment	scaling
5-10	POSDET	x, y, z, α, β, γ at center (I,1)	$3{\cdot}10^3$, $3{\cdot}10^5$
11	ZHYDMN	z of beginning of liquid target	100
12	ZHYDMX	z of end of liquid target	100
13	HYDRAD	liquid target radius	10
14	ZNOHYD	liquid target atomic charge (Z)	10
15	ANOHYD	liquid target atomic mass(A)	100
16	RHOHYD	liquid target density	10
17	ZSAHYD	liquid target Z/A ratio	100000

9.7 Dump block (id = 4003b , length = 20)

word	name	meaning or comment	scaling
5-10	POSDET	x, y, z, α, β, γ at center (I,3)	$3{\cdot}10^3$, $3{\cdot}10^5$
11	AIABS	internal angle	10000
12	AEABS	external angle	10000
13	RHCABS	carbon density	100
14	RHIABS	iron density	100
15	BEGABS	z of beginning of absorber	10
16	ENDCAR	z of end of carbon	10
17	ENDFER	z of end of iron	10
18	ENDABS	z of end of absorber	10
19	ZLDMP	total length of dump	10
20	ZCDMP	z of middle of dump	10

9.8 Magnet block (id = 4004b , length = 20)

word	name	meaning or comment	scaling
5-10	POSDET	x, y, z, α, β, γ at center (I,4)	$3{\cdot}10^3$, $3{\cdot}10^5$
11	BEGTOR	z of beginning of toroid	10
12	SLOTB	z of beginning of slot	10
13	ENDTOR	z of end of toroid	10
14	SLOTE	z of end of slot	10
15	RITOR	internal radius	10
16	RETOR	external radius	10
17	AOSLOT	opening angle of one slot (degree)	10
18	ABSLOT	angle between two slots (degree)	10

19	ZMED	z of middle of magnet	10
20	DSLOT	r at middle of magnet	10

9.9 Iron wall block (id = 4006b , length = 9)

word	name	meaning or comment	scaling
5	BEGW1	z of beginning of first wall	10
6	ENDW1	z of end of first wall	10
7	BEGW2	z of beginning of second wall	10
8	ENDW2	z of end of second wall	10
9	RHIWAL	density of iron wall	10

9.10 Constant block (id = 4005b , length = 5)

word	name	meaning or comment	scaling
5	PIOV90(4)	π to telescope ratio	-

9.11 Proportional chamber block (id = 4100b , length = 221)

word	name	meaning or comment	scaling
5-10	POSDET	x, y, z, α, β, γ of chamber PC1 (I,7)	usual
11-16	POSDET	x, y, z, α, β, γ of chamber PC2 (I,8)	"
17-22	POSDET	x, y, z, α, β, γ of chamber PC3 (I,9)	"
23-28	POSDET	x, y, z, α, β, γ of chamber PC4 (I,10)	"
29-34	POSDET	x, y, z, α, β, γ of chamber PC5 (I,11)	"
35-40	POSDET	x, y, z, α, β, γ of chamber PC6 (I,12)	"
41-46	POSDET	x, y, z, α, β, γ of chamber PC7 (I,13)	"
47-52	POSDET	x, y, z, α, β, γ of chamber PC8 (I,14)	"
53-76	ZPOCH	z position (gap,chamber)	10
77-100	YPOCH	position of first wire (view,chamber)	100
101-124	NOMCH	number of active wires (gap,chamber)	-
125-148	IADCH	address in RMH of 1st active wire (gap,ch)	-
149-172	YMAXCH	position of last wire (view,chamber)	100
173-196	DMINCH	lower limit of key hole (gap,chamber)	100
197-220	DMAXCH	upper limit of key hole (gap,chamber)	100
221	DSECCH	tan(angle of dead sector)	10000

9.12 Hodoscope block (id = 4040b , length = variable)

word	name	meaning or comment	scaling
5-10	POSDET	x, y, z, α, β, γ of hodo R1 (I,15)	usual
11-16	POSDET	x, y, z, α, β, γ of hodo R2 (I,16)	"

17-22	POSDET	x, y, z, α, β, γ of hodo R3 (I,17)	"
23-28	POSDET	x, y, z, α, β, γ of hodo R4 (I,18)	"
29-34	POSDET	x, y, z, α, β, γ of hodo V (I,19)	"
35-40	SENCO	direction of axis (sextant)	100
41..56	DZPOCO	displacement of even scint. w.r.t. the 1st one (hodo)	100
42..57	YPOCO	distance from center to the first one (hodo)	100
43..58	TOLCO	tolerance on scint. size (hodo)	100
44..59	NOMCO	number of active scint. per sextant (hodo)	-
45..60	PHICO	angular overlap of two sextants (hodo)	100
61..81	ZPOCO	z position of 1st scint. (sextant,hodo)	100
62..82	XPOCO	position of scint. end opposite to the photomultiplier (sext,hodo)	100
63..83	ANGCO	angle of sextant axis w.r.t. y axis (sext,hodo)	100
64..84	DYPOCO	displacement of 1st scint (sextant,hodo)	100
85..	YINFCO	lower limit of logical scint.(sext.,hodo)	100
86..	YSUPCO	upper limit of logical scint. (sext.,hodo)	100
87..	XLENCO	half-length of scint.(sext.,hodo)	100
	IADCO	RMH address of 1st scint. (sextant,hodo)	-
	IADVCO	RMH address of V counter (sextant)	-
	IAPTCO	RMH address of P_T bin (sextant)	-
	IALOCO	different addresses : (1) = 1st word of sextant combinations (2) = address of multiplicity flag (3) = address of prescaling flag (4) = 1st address of T-counters of R2 (5) = 1st address of T-counters of R4 (6) = 1st address of trigger type flags (7) = spare module (8) = ADC of R2 (9)...(10) = free (11)-(20) = flag of each branch (21)...(31) = free (32) = last address in hodoscope branch	

9.13 Hodoscope P block (id = 4042b , length = 102)

word	name	meaning or comment	scaling
5-10	POSDET	x, y, z, α, β, γ of hodo P1 (I,21)	usual
11-16	POSDET	x, y, z, α, β, γ of hodo P2 (I,22)	"
17-28	ZPOS	z position (sext,hodo)	10
29-30	DZPOS	displacement of even scint.w.r.t. the odd ones	10
31-42	NOMS	number of scint. (sext,hodo)	-
43.45	YINFS	lower limit in sext. axis direction (hodo)	10
44.46	YSUPS	upper limit in sext. axis direction (hodo)	10
47..75	AGS	coeff. for left limit of scint.	10000

48..76	BGS	coeff.for left limit of scint.	10000
49..77	ADS	coeff. for right limit of scint.	10000
50..78	BDS	coeff. for right limit of scint.	10000
79-96	IADPCO	RMH addresses	
		79-84 1st RMH address of (sextant,P1)	
		85-90 1st RMH address of (sextant,P2)	
		91-96 1st RMH address of (sextant,P1·P2)	-
97-102	NUMPCO	order of numbering of counters (sextant)	-

9.14 Length difference in S4 and S5 for R3,R4 (id =4043b, length = 36)

word	**name**	**meaning or comment**	**scaling**
5-36	DXLENC		10

9.15 Properties of materials block (id = 4012b, length = 180)

word	**name**	**meaning or comment**	**scaling**
5-20	ZNO	atomic charge	100
21-36	ATNO	atomic mass	100
37-52	DENSIT	density	1000
53-68	ABSLG	absorption length	100
69-86	RADG	radiation length	100
87-102	EPROB	coefficients for ELOSS	10**4
103-118	XSI	coefficients for ELOSS	10**5
119-136	AVL	coefficients for ELOSS	10**4
137-152	CODPDX	coefficients for PDEDX	10**5
153-168	CODPDX	coefficients for PDEDX	10**4
169-184	CODPDX	coefficients for PDEDX	10**5

N.B. The materials are the following : H2, C, Al, Fe, Cu, W, U, D2, calorimeter, wood around target, BeO, C (with a different density), copper+fiber calorimeter, Al2O3, vacuum, air.

9.16 Table for matrix check (part one) (id =4010b , length = 1028)

word	**name**	**meaning or comment**	**scaling**
5-1028	VR3R4	coefficient = f (V,R4)	
		bits 1 - 2 : P_T superbin - 1	
		bits 3 - 26 : = 1 if R3 is allowed	
		bits 27- 31 : P_T bin - 1	
		bit 32 : sign of P_T bin	
		(one coefficient needs 2 words)	-

9.17 Table for matrix check (part two) (id =4011b , length = 1028)

word	name	meaning or comment	scaling
5-1028	VR3R4	coefficient = f (V,R4)	-

9.18 NA38 first block (id =4014b , length = 90)

word	name	meaning or comment	scaling
5..10	RIBIBO	entrance radius of BIBO (BI,BO)	1000
6..11	ROBIBO	exit radius of BIBO (BI,BO)	1000
7..12	ZIBIBO	entrance z of BIBO (BI,BO)	100
8..13	ZOBIBO	exit z of BIBO (BI,BO)	100
9..14	PHI34	angle of limit between quadrants 3 and 4	1000
15-17	ZPOSBH	z position of BH planes	1
18..29	NSCIBH	number of scint. in BH (plane)	-
19..30	XHWIBH	half width in x of BH (x,plane)	1000
20..31	XHWIBH	half width in x of BH (x,plane)	1000
21..39	YWIDBH	width in y of BH scint. (sc.,plane)	1000
40	NTGTAT	number of active targets	-
41..60	ZINTGT	z at entrance of subtarget	100
42..61	ZOUTGT	z at exit of subtarget	100
43..62	MATTGT	material of subtarget	-
63	EXXTGT	extension in x of subtargets	1000
64	EXYTGT	extension in y of subtargets	1000
65	RINTAT	internal radius of active scint.	1000
66	REXTAT	external radius of active scint.	1000
67..90	ZINAT	z of beginning of active scint.	100

9.19 NA38 second block (id =4015b , length = variable)

word	name	meaning or comment	scaling
5..33	YINFCA	lower edge of calo sector (sext,ring)	1000
6..34	YSUPCA	upper edge of calo sector (sext,ring)	1000
35	PH36CA	angle of limit between sext 3 and 6	1000
36	ZINCA	z of entrance of calo	100
37	ZOUTCA	exit z of calo	100
38	MATCAL	index of material of calorimeter	-
39	XCENCA	x position of center of calo	1000
40	YCENCA	y position of center of calo	1000
41	XCALCA	x position of center of calo to calibrate	1000
42	YCALCA	y position of center of calo to calibrate	1000
43	NADABS	number of additional absorbers	-
44..54	ZINABS	z of entrance of new absorber	100
45..55	ZOUABS	z of exit of new absorber	100
46..56	RINABS	internal radius of new absorber	1000

47..57	REXABS	external radius of new absorber	1000
48..58	MATABS	index of material of new absorber	-

N.B. The block length depends on the number of additional absorbers.

9.20 Coefficients for calorimeter (id =4013b , length = 1112)

word	name	meaning or comment	scaling
5-124	FNTOUR	neutral fraction for uranium subtargets	1000
125-244	FCTOUR	charged fraction for uranium subtargets	1000
245-364	ETAMUR	average eta for uranium subtargets	1000
365-508	BOETUR	eta boundaries for uranium subtargets	1000
509-532	SOMGUR	sum of gaussian for uranium subtargets	1000
533-556	SOMSUR	sum of gaussian for uranium subtargets	1000
557	X0GAUR	mean value of rapidity distribution (uranium)	1000
558	SIGAUR	st. deviation of rapidity distribution (uranium)	1
559-1112		same for copper	

9.21 End of setup block (id =4001b , length = 7)

word	name	meaning or comment	scaling
5	ISETUP	set-up number	-
6-7	empty		

Chapter 10

DESCRIPTION OF THE CONSTANT FILE

The constant file includes informations for pedestals, calibration of electromagnetic calorimeter, ZDC calibration, thresholds, laser and constants for multiplicity detector (some blocks are not yet implemented, the others have to be updated...)

Format is RECFM U BLKSIZE 3600.

Each type of information has the same block identifier.

For each type of information, there is one block per group of runs which all have the same constants.

10.1 Description of a calibration block (id = 2101, length = 258)

word	name	meaning or comment	scaling
2		block identifier (2101 = 4065o)	-
5	IFCRUN	first run of validity	-
7	ILCRUN	last run of validity	-
8	NRUREF	reference run for calorimeter constants	-
10		day of the first run	-
11		month of the first run	-
12		year of the first run	-
13-42	CALCAL	radiation damage coefficients	10000
43-72	CALREF	reference calibration constants	10000
73-102	HVREF	reference high voltage values	-
183-214	TGTCAL	active target correction constants	-

10.2 Description of a pedestal block (id = 2102, length = 212)

word	name	meaning or comment	scaling
2		block identifier (2102 = 4066o)	-
5	IFPRUN	first run of validity	-
6		empty	
7	ILPRUN	last run of validity	-
8-9		empty	
10		day of the first run	-
11		month of the first run	-
12		year of the first run	-
13	LSTPED	laser target PM2012 pedestal	-

14	EVTPED	event in time pedestal	-
15	DIOPED	laser diode pedestal	-
16	LSCPED	laser calo PM2012 pedestal	-
17-24	EARPED	out of time calo pedestal	-
25-54	CALPED	calorimeter pedestals	-
55-68	HLTPED	and HRTPED : BH TDC corrections	-
69-84		empty	
85-89	RNGPED	calorimeter ring pedestals (not used)	-
90-97	H1LPED	BH1-left pedestals	-
98-105	H1RPED	BH1-right pedestals	-
106-112	H2LPED	BH2-left pedestals	-
113-119	H2RPED	BH2-right pedestals	-
120-123	BINPED	BI pedestals	-
124-127	BO6PED	BO 60 ns pedestals	-
128-159	TGTPED	active target pedestals	-
188-191	BOUPED	BO pedestals	-
192-212	empty		

10.3 Description of a threshold block (id = 2103, length = 244)

word	**name**	**meaning or comment**	**scaling**
2		block identifier (2103 = 4067o)	-
5	IFCRUN	first run of validity	-
7	ILCRUN	last run of validity	-
10		day of the first run	-
11		month of the first run	-
12		year of the first run	-
103-110	THR1L1	BH1-left low threshold	-
111-118	THR1R1	BH1-right low threshold	-
119-126	THR2L1	BH1-left high threshold	-
127-134	THR2R1	BH1-right high threshold	-
135-142	THR1B2	BH2-bottomlow threshold	-
143-150	THR1T2	BH2-top low threshold	-
151-158	THR2B2	BH2-bottom high threshold	-
159-166	THR2T2	BH2-top high threshold	-
167-174	BITHRS	BI low and high thresholds	-
231-232	BHTDCW	BH TDC window limits	-

10.4 Description of a high voltage block (id = 2104, length = 36)

word	**name**	**meaning or comment**	**scaling**
2		block identifier (2104 = 4070o)	-
5	IFCRUN	first run of validity	-
7	ILCRUN	last run of validity	-
10		day of the first run	-

11		month of the first run	-
12		year of the first run	-
13-36	IHVOL	Calo high voltages	-

10.5 Writing a pedestal file

When DIMUREC finds a pedestal run, it calls the routines HBKPED, HFIPED and OUTPED, where the words 5 and 10 to 212 are written onto a temporary pedestal file.

The merging of all the individual pedestal files is performed via LIFI CRP exec, calling CUMPED FORTRAN.

The values of HLTPED and HRTPED are inserted in the CUMSEL fortran program.

Chapter 11

DESCRIPTION OF THE SELECT FILE

11.1 Introduction

The SELECT file is written at the reconstruction time if option FICHIER is selected.

Format is not EP, but FBA (RECFM FBA LRECL 300)

It contains all summed information concerning a given run and allows the creation of the RUN-NORMA DATA file, including run selection and luminosity.

11.2 Contents of the file

Record	name	meaning or comment
1	NVERS	DIMUREC version number
	NVERSS	scaler file version number (4 for DIMUREC version 9)
	IDATE	date of job
	NSETUP	set-up number
	NTGTOT	number of subtarget positions
	BID1	spare word
	BID2	spare word
2	NRUN	run number
	ITRTP	trigger type
	IBEAM	beam type and momentum
	FIELD	field
	NBURSR	number of active bursts
	IBURST	last burst number
	NB2RUN	number of rejected bursts
	NBAEVT	number of rejected events (by CAB or VME or DECODE)
	NEVRUN	number of events in active bursts
	LEVRUN	last event number in run
	NEVERT	number of events with at least one vertex
	NDIMOS	number of opposite sign dimuons
	NDIMLS	number of like sign dimuons
	NEVGBH	same as NEVERT with NIBHAD = 1
	NEVGBI	same as NEVERT with NIBIAD = 1
	NEVLAS	number of laser events
	MSUM(13)	number of ψ's (mass between 2.7 and 3.5)
	ERRMHR(3)	number of recovered branch 11
	ERRMHR(4)	number of recovered other branches
	ERRMHR(5)	number of evts with LASPU = 1 and LSRPU = 4

3	NNCIBI	number of events with NOCIBI = 1,2,...,NTGTOT
	NNCIBR	number of events with NOCIBR = 1,2,...,NTGTOT
4	EPS2MU	offline reconstruction efficiency
	ALUMI(I,1)	scalers free (I = 1 to 6 = BH1, BH2, BI, HJ, HS, V)
	ALUMI(I,2)	scalers burst gated (I = 1 to 6 as above)
	ALUMI(I,3)	scalers trigger gated (I = 1 to 6 as above)
	ALUMI(I,4)	scaler sum (I = 1 to 2 = BH1, BH2)
	RNGCAL(5)	sum of contents of calo ring ADC's
	VARENF	sum of 5 first bins in ETONEU histogram
	VARMAX	maximum of ETONEU histogram
	EPBARG	argonium
	EFFBH	BH efficiency (total, BH1, BH2)
	DEFFBH	error on EFFBH (total, BH1, BH2)
	NEVCAL	number of events with no pileup flash calo
5	CERSCA	Cerenkov scalers (scalers 10-12 NIM 5 and 10-12 NIM 8)
	TSJSCA	Trigger without jitter scalers (6,7,8 and 3 NIM 1)
	NEVPR1	number of events with proton sextuple zero
	NEVPR2	number of events with proton flag
	NEVPR3	number of events with C2 intime,early,late = 0
	NEVPR4	number of events with C2 v.e. and v.l. also = 0

Chapter 12

DESCRIPTION OF THE RUNNORMA DATA FILE

12.1 Introduction

The RUNNORMA DATA file is written after reconstruction by the study of the SELECT file.

Format is cards, FBA (RECFM FBA LRECL 94)

It contains all summed information concerning a given run including run selection and luminosity.

Each run has 9 words, called CNORM, as described below.

12.2 Description of the words corresponding to a run

Record	name	meaning or comment
	CNORM(1)	BH1 burst gated (corrected by prescaling factor 16)
	CNORM(2)	BH1 efficiency
	CNORM(3)	BH2 burst gated (corrected by prescaling factor 16)
	CNORM(4)	BH2 efficiency
	CNORM(5)	livetime (t.g./b.g., averaged over the 3 telescopes)
	CNORM(6)	EPS2MU (chamber reconstruction efficiency from DIMUREC)
	CNORM(7)	Nb. of active bursts
	CNORM(8)	luminosity
	CNORM(9)	selection flag

N.B. : Luminosity is defined as :

$$16 \;.\; 0.5\,(BH1/EFF1 + BH2/EFF2)\;.\;\text{livetime}\;.\;EPS2MU$$

16 being the prescaling factor of the BH scalers.

N.B. : The selection flag is :

- 0 for irrecoverably bad runs
- 1 for runs which are useful for unnormalized distributions and comparizons
- 2 for runs which are useful also for cross-section determination

Chapter 13

DESCRIPTION OF THE NA50UTIL CAR

NA50UTIL Version 1.00/02 Date 950505 NA50 (A. Romana)

HISTORY.
This file has to be called in any NA50 cradle invoking
DIMUJET, DIMUREC, GEADRIV or RELMIC in order to :
get the same definition for some commons (+USE,NA50CDKS)
and the content of some variables of these commons(+USE,NA50BLDA)
Implemented today are :
—-> The geometry commons (comdeck GEOMETRY)
—-> The commons of logical units (values are defined in programs)
—-> The commons of block identifiers (comdecks IOBLKS and MASKS)
—-> The common of branch and scaler block sizes (read in parameter file)
—-> The common of raw data block sizes (read in parameter file)

Version 1.00/02, created 95/05/05
Change SYSTEM into SYSMIC for Unix compatibility
Corrects the maximum number of subtargets and the number of em
calo rings

+KEEP,SETUPC.
List of all variables in NA50UTIL common blocks,
with a short description of each of them.

NA38 GEOMETRY FOR BIBO,BH AND ACTIVE TARGET

+SEQ,ACTTGT...
+SEQ,BEAMH...
+SEQ,BIBO...

PHI34	angle between quadrants 3 and 4 of quartz
RIBIBO	external radius of quartz at entrance
ROBIBO	external radius of quartz at exit
ZIBIBO	Z position of entrance side of quartz
ZOBIBO	Z position of exit side of quartz
ZPOSBH	Z position of entrance of B.H. i (3=retractable)
NSCIBH	number of scintillators in B.H. i

XHWIBH	half-width (left,right) for B.H. j
YWIDBH	vertical width of scintillator i for B.H. j
NTGTOT	total number of subtarget positions
ZINTGT	Z position of entrance of subtarget i
ZOUTGT	Z position of exit of subtarget i
MATTGT	index of material of subtarget i
EXXTGT	extension in X of subtargets
EXYTGT	extension in Y of subtargets

GEOMETRICAL DEFINITION OF SUCCESSIVE ABSORBERS (build in DEFBOR)

+SEQ,BORNES.

MAXBOR	maximum number of successive absorbers
MAXTRA	maximum number of transverse slices
NBORNE	actual number of successive absorbers
NTRSLI	actual number of transverse slices for absorber
ZBORNE	Z of entrance of each absorber
RBORNE	internal and external radii of each slice
MBORNE	index of material of each absorber, slice
AZBORN	alphanumeric ZBORNE

SIZE OF BLOCK FOR UPSTREAM DETECTORS (read in parameter file)

+SEQ,ADCSIZ.

NWADC	number of words in QDC-TDC branch

CONSTANTS FOR UPSTREAM DETECTORS (from CONSTADC NA50)

+SEQ,ADCCON.
EARPED Calo ADC pedestals out of time (pileup)
CALPED Calo ADC pedestals (ring,sextant)
BHLPED BH upstream left ADC pedestals
BHRPED BH upstream right ADC pedestals
HLTPED BH left TDC correction
HRTPED BH right TDC correction
HBTPED BH bottom TDC correction
HTTPED BH top TDC correction
BHBPED BH downstream left ADC pedestals
BHTPED BH downstream right ADC pedestals
TGTPED Active target scintillator ADC pedestals
BINPED Beam-in ADC pedestals
LASPED Laser pedestals
ZDCPED Zero degree calorimeter pedestals
ZDCPRN Constants to redefine ZDCPED(1 to 4)
IFRZDC First run of application of ZDCPRN
NRZDCP Number of runs for application of ZDCPRN
PEDMOY mean value of pedestals (if pedestal run)
CALCAL Calo ADC calibration (ring,sextant)

TGTCAL Active target scintillator ADC calibration
ZDCCAL Zero degree calorimeter calibration
THR1L1 first threshold for BH1 left
THR1R1 first threshold for BH1 right
THR2L1 second threshold for BH1 left
THR2R1 second threshold for BH1 right
THR1B2 first threshold for BH2 left
THR1T2 first threshold for BH2 right
THR2B2 second threshold for BH2 left
THR2T2 second threshold for BH2 right
BHTDCW BH TDC window (1,2 large, 3,4 narrow window lim.)
BHLPEA channel of maximum for BH TDC left (plane 1)
BHRPEA channel of maximum for BH TDC right (plane 1)
BHBPEA channel of maximum for BH TDC bottom (plane 2)
BHTPEA channel of maximum for BH TDC top (plane 2)
BITHR1 first threshold for Beam in
BITHR2 second threshold for Beam in

CALORIMETER VARIABLES

+SEQ,CALDAT.

CALREF	reference calibration coefficients
HVREF	high voltage reference table
NRUREF	reference run for calo damage slopes
RAPLIM	pseudorapidity cut for transverse energy
CALCOF	calibration coefficients from high voltages
BVOLT	coefficients to compute CALCOF
DELTAT	delta eta (ring,subtarget)
EFSTOT	efficiency coef for total energy (ring,subtarget)
EFSTRA	efficiency coef for trans energy (ring,subtarget)
SOMLTR	
SOMLTO	
RCHNEU	charged to neutral ratio (def : 2)
FNETOT	fraction of neutral in energy (ring,subtarget)
FCHTOT	fraction of charged in enery (ring,subtarget)
BORETA	eta boundaries (ring,subtarget)
ETAMOY	average eta (ring,subtarget)
SOMGTO	sum of gaussian (extrapolation in eta-range)
SOMGTR	same for transverse energy (subtarget)
X0GAUS	mean value of gaussian (extrap. eta range)
SIGAUS	sigma of gaussian (extrapol. in eta range)
ETONEU	total energy
ETOTRA	total transverse energy (between 1.7 and 4.1)
ETONEC	neutral energy (corrected for charged particles)
ETOTRC	neutral transverse energy (idem)
ENECOR	energy summed over the run (ring,subtarget)
ENECOS	energy summed over the job (ring,subtarget)
NCOCIB	number of counts per subtarget

DEDETO	dE/d(eta) per ring
DEDETR	d(E transverse)/d(eta) per ring
DEDETC	dE/d(eta) per ring (corrected for charged)
DEDTRC	d(E transverse)/d(eta) per ring (idem)

COEFFICIENTS FOR CALORIMETER (read in parameter file)

+SEQ,COECAL.

NTGTMA	number of target materials
NTGTCA	number of subtarget positions
FNTOUR	neutral fraction for uranium subtargets
FCTOUR	charged fraction for uranium subtargets
BOETUR	eta boundaries for uranium subtargets
ETAMUR	average eta for uranium subtargets
X0GAUR	mean value of rapidity distribution (uranium)
SIGAUR	st. deviation of rapidity distribution (uranium)
FNTOCU	neutral fraction for copper subtargets
FCTOCU	charged fraction for copper subtargets
BOETCU	eta boundaries for copper subtargets
ETAMCU	average eta for copper subtargets
X0GACU	mean value of rapidity distribution (copper)
SIGACU	st. deviation of rapidity distribution (copper)

SOME PHYSICAL CONSTANTS

RMMU	muon mass
RMMU2	squared muon mass
RMP	proton mass
RMP2	squared proton mass
RMN	neutron mass
RMN2	squared neutron mass
RMEL	electron mass
RMKA	kaon mass
RMPI	pion mass
RMPSI	Psi mass
RMPSIP	Psi prime mass
RMPHI	Phi mass
RMRHO	Rho mass
RMOMEG	Omega mass
CLITE	speed of light (cm/s)
PI	3.141592
RADDEG	180 / pi
DEGRAD	pi / 180
TWOPI	2 pi
SIN60	sqrt (3) / 2
SQRT2	sqrt (2)
SQRT3	sqrt (3)
SQRT2I	1 / sqrt (2)

SQRT3I	1 / sqrt (3)
THIRD	1 / 3
THIRTY	pi / 6

GEOMETRY TRANSLATORS FOR MATERIAL PROPERTIES

+SEQ,FIXMT.

FNFMAT	translator for NFIX of material properties
FFLMAT	translator for FLON of material properties

COMMON TO COMPUTE DETR/DETA

+SEQ,GAUETR.

CONOGA	amplitude of the dETR/deta gaussian
ETAAVE	mean value of the gaussian (depends on system)
STADEV	sigma of the gaussian
SIGCOU	cut on the sigma of the gaussian (def. : 6.)
BORET1	lower limit of eta
BORET2	upper limit of eta
ETRC12	transverse energy between BORET1 and BORET2

GEOMETRY FOR ABSORBERS IN FRONT OF THE NA10 ABSORBER

+SEQ,GEOABS.

NADABS	number of additional absorbers
ZINABS	Z position of entrance of new absorber i
ZOUABS	Z position of exit of new absorber i
MATABS	index of material of new absorber i
RINABS	internal radius of new absorber j at Zin and out
REXABS	external radius of new absorber j at Zin and out

GEOMETRY FOR CALORIMETER

+SEQ,GEOCAL.

NRINGS	number of rings of calorimeter
YINFCA	coord of lower side of sector j,sextant i of cal.
YSUPCA	coord of upper side of sector j,sextant i of cal.
PHCA36	phi angle between sextants 3 and 6 of calorimeter
ZINCA	Z position of entrance of calorimeter
ZOUTCA	Z position of exit of calorimeter
PH36CA	Phi of intersection of sextants 3 and 6
MATCAL	index of material of calorimeter
RINCAL	internal radius of calorimeter
REXCAL	external radius of calorimeter
XCENCA	X position of center of calorimeter
YCENCA	Y position of center of calorimeter
XCALCA	X position of center of calorimeter (calibration)
YCALCA	Y position of center of calorimeter (calibration)

NPZDC	number of parts in ZDC
ZINZDC	Z position of entrance of zero degree calorimeter
ZOUZDC	Z position of exit of zero degree calorimeter
REXZDC	external radius of zero degree calorimeter
ZDCCEX	x-coordinate of the centers of each quadrant
ZDCCEY	y-coordinate of the centers of each quadrant

CHAMBER GEOMETRY

+SEQ,GEOMCH.

ZPOCH	Z position of chambers (plane,chamber)
YPOCH	y,u,v position of first wire (",")
NOMCH	number of wires (",")
IADCH	RMH address of first wire (",")
YMAXCH	y,u,v position of last wire (",")
DMINCH	y,u,v position of dead center lower limit (",")
DMAXCH	y,u,v position of dead center upper limit (",")
DSECCH	tangent of chamber dead sector half angle

HODOSCOPE GEOMETRY

+SEQ,GEOMCO.

SENCO	scint. numbering direction (sextant))
DZPOCO	displacement of even scint. w.r.t. first (hodo)
YPOCO	y,u,v position of first scint. (hodo)
TOLCO	tolerance on impact (hodo)
NOMCO	number of active scint. (hodo)
ZPOCO	Z-position of first scint. (sext,hodo)
XPOCO	position of scint. end opposite to PM (",")
ANGCO	angle of sextant axis w.r.t. x axis (",")
IADCO	RMH address of first scint. (",")
IAPTCO	RMH address of PT superbin A
PHICO	
IALOCO	RMH address of additional modules
YINFCO	lower limit of scint. (scint.,hodo)
YSUPCO	upper limit of scint. (",")
XLENCO	half-length of scint. (",")
DXLENC	difference in counter length for S4,5 in R3,4
PHIDCO	angle of dead sector in R3,R4, sext. 4 and 5
DYPOCO	displacement of first counter (sext,hodo)
IFLRAW	flags of branches in raw data block

PROPERTIES OF MATERIALS (indices are given in parameter file)

+SEQ,GEOMAT.

ZNO	atomic number
ATNO	atomic mass
DENSIT	density (g/cm**3)

RADLG	radiation length (g/cm**2)
RADL0	radiation lenght (cm)
ABSLG	absorption length (g/cm**2)
ABSL0	absorption length (cm)
EPROB	coefficients used in ELOSS (DIMUJET)
XSI	coefficients used in ELOSS (DIMUJET)
AVL	coefficients used in ELOSS (DIMUJET)
CODPDX	coefficients used in PDEDX

GEOMETRY FOR MULTIPLICITY DETECTOR

+SEQ,GEOMD.

NPLMD	number of planes of multiplicity detector
ZINMD	Z position of entrance of plane i
ZOUMD	Z position of exit of plane i
RINMD	internal radius of plane i
REXMD	external radius of plane i

GEOMETRY OF HODOSCOPES S

+SEQ,GEOMS.

ZPOS	Z-position (sext,hodo)
DZPOS	displacement of even scint. w.r.t. odd ones (hodo)
NOMS	number of active scint. (sext,hodo)
YINFS	lower limit in the sextant axis direction (hodo)
YSUPS	upper limit in the sextant axis direction (hodo)
AGS	coefficient for left limit (scint.,hodo)
BGS	"
ADS	coefficient for right limit (scint.,hodo)
BDS	"
IADPCO	RMH address of first scint. (sextant,hodo)
NUMPCO	sens of numbering of scint. (sextant)

TARGETS, ABSORBER, TOROID AND WALLS GEOMETRY

+SEQ,GEOMTD.

NTARG	number of non-active targets
ZTARMN	Z-position of beginning of target
ZTARMX	Z-position of end of target
TARRAD	radius of target
ZNOTAR	target atomic number
ANOTAR	target atomic mass
RHOTAR	target density
MATTAR	material index of target
ZSA	Z/A of the target
BEGABS	Z-coord of beginning of absorber
ENDCAR	Z-coord of end of carbon part of absorber
ENDABS	Z-coord of end of absorber

AIABS	internal angle of absorber
AEABS	external angle of absorber
RHCABS	density of carbon in absorber
RHIABS	density of iron in absorber
BEGTOR	Z-coord of beginning of toroid
SLOTB	Z-coord of beginning of iron slots
DSLOT	Z-coord of middle of iron slots
ENDTOR	Z-coord of end of toroid
SLOTE	Z-coord of end of iron slots
RITOR	internal radius of toroid air gap
RETOR	external radius of toroid air gap
AOSLOT	angular extent of iron slots
ABSLOT	angle between slot axes
BEGW1	Z-coord of beginning of 1st iron wall
ENDW1	Z-coord of end of 1st iron wall
BEGW2	Z-coord of beginning of 2nd iron wall
ENDW2	Z-coord of end of 2nd iron wall
RHIWAL	density of iron in walls
POSDET	positions and angles of detectors (X,Y,Z,alpha,beta,gamma ; detector)
ZLDMP	absorber length
ZCDMP	Z-coord of center of absorber
ENDFER	Z-coord of end of iron part in absorber
ZMED	Z of median plane in magnet
ZMGIN	not used
ZMGOUT	not used
NTRABS	number of longitudinal slices in NA10 absorber
ALGDMP	length of each longitudinal slice of NA10 absorber
RINDMP	internal radius of carbon in each slice
REXDMP	external radius of carbon in each slice
MATCAF	index of material of each slice in mu acceptance region (mainly carbon)
MATPLU	index of material of each slice in plug
REXFON	index of material of iron outside mu acceptance
NBORNE	number of materials in absorber (up to 40)
NTRSLI	number of transverse slices in each step
MBORNE	index of material of each (step, slice)
ZBORNE	Z-coord of limits of each material
AZBORN	Alphanumeric Z-coord of limits of each material
RBORNE	Rint and Rext of each material

GEOMETRY FOR SIMULATION

+SEQ,GEOSIM.

XBESPR	average and sigma of X-beam spread
YBESPR	average and sigma of Y-beam spread
ABESPR	average and sigma of alpha-beam divergence
BBESPR	average and sigma of beta-beam divergence

ZBESPR	focus of divergence

HIGH VOLTAGE BLOCK

+SEQ,HVSIZ.

MWHVOL	maximum number of words
NWHVOL	actual number of words
IPWHV	pointer to 1st HV word for upstream detectors

CHAINING INPUT/OUTPUT INFORMATION

+SEQ,INFTAP.

NTAPI	number of input units
NTAPO	number of output units
IFSEQ	first fseq of each input file
IFSEQ	last Fseq of each input file
CHAIN	flag of requested chaining of each input file
NCHAIN	number of volumes to chain
COMAND	alphanumeric command for VMCMS
TAPEFN	volume filename when file is staged
TAPEFT	filetype when file is on disk
TAPEFM	volume filemode when file is staged
LABELD	logical of labelled volume
MULTIF	logical of multifile volume
CCPN	logical of node.eq.FRCPN11

BLOCK IDENTIFIERS AND RECORD LENGTHS

+SEQ,IOBLKS.

MSIGN	value added to negative integers for file I/O
MMAX	biggest integer absolute value for file I/O
LRCIN	record length of data input file
LRCPAR	record length of parameter file
LRCONS	record length of constant file
LRCOUT	record length of data output file
IDBRUN	beginning-of-run block ident
IDERUN	end-of-run block ident
IDBEV	beginning-of-event block ident
IDEEV	end-of-event block ident
IDBTGT	beam and target block ident
IDMUK	muon kinematics simulation block ident
IDHODS	hodoscope simulation block ident
IDWCHS	wire chamber simulation block ident
IDCCH	wire chamber coord (simulation) block ident
IDRAW	raw data block ident
IDBBUR	beginning-of-burst block ident
IDEBUR	end-of-burst block ident
IDTRAK	on-line reconstructed tracks block ident

IDBEAM	beam link information block ident
IDSCAL	NIM and ECL scaler block ident
IDSCAT	NIM and ECL scaler sum block ident
IDSCIN	hit hodoscope block ident
IDTRSP	track in space block ident
IDTRPR	projected track block ident
IDASSP	space associated track block ident
IDCHIT	COMMON CTHIT block ident
IDKINE	kinematical parameter block ident
IDCUT	cuts and parameters (LCUT) block ident
IDKUR	COMMON CURIEU block ident
IDTRPM	2-spots projected track block ident
IDWGHT	generation weigth block ident
IDLASE	laser information block ident
IDLASR	laser information block (end of run) ident
IDDST	data summary block ident
IDDST2	data summary NA38 block ident
IDHVOL	high voltage block ident (NA38)
IDPUBH	thresholds for pileup CAB block ident
IDSCNA	new scaler (NA38) block ident
IDSCNS	new scaler (NA38) (sum) block ident
IDCABA	CAB scaler block ident (NA38)
IDCABS	CAB scaler (sum) block ident (NA38)
IDGANI	GANIL block ident (NA38)
IDBKG	background block ident (NA38)
IDBGEO	blocks for the file of geometrical parameters
IDMICR	blocks for microDST

LOGICAL UNITS FOR FILES

+SEQ,LFILE.

MXLUIN	maximum number of input logical units
MXLUOU	maximum number of output logical units
LFIN	logical unit of command cards
LFTAPS	logical unit of input/output information
LFOUT	logical unit of output file
LFTIN	logical unit of input tape(s)
LFPAR	logical unit of parameter file
LFCONS	logical unit of adc constant file
LFTMS	logical file for tape management system

POINTERS FOR RAW DATA

+SEQ,POINTERS.

MPRAW	maximum number of branches in raw data block
NPRAW	actual number of branches in raw data block
APRAW	name of branches in raw data block
IPRAW(1)	position of pointer for hodoscope branch

IPRAW(2.)	position of pointers for chamber branch
IPRAW(10)	position of pointer for ADC branch
IPRAW(11)	position of pointers for multiplicity block(s)
IPLUM	position of pointers for luminosity
IPLUM(1)	position of pointer for empty burst
IPLUM(2)	position of pointer for BH1 or Argo1 (t.g.)
IPLUM(3)	position of pointer for BH1 or Argo1 (b.g.)
IPLUM(4)	position of pointer for BH1 or Argo1 (free)
IPLUM(5)	position of pointer for BH2 or Argo2 (t.g.)
IPLUM(6)	position of pointer for BH2 or Argo2 (b.g.)
IPLUM(7)	position of pointer for BH2 or Argo2 (free)
IPLUM(8)	position of pointer for BI or Argo3 (t.g.)
IPLUM(9)	position of pointer for BI or Argo3 (b.g.)
IPLUM(10)	position of pointer for BI or Argo3 (free)
IPLUM(11)	position of pointer for tel H.J. (t.g.)
IPLUM(12)	position of pointer for tel H.J. (b.g.)
IPLUM(13)	position of pointer for tel H.J. (free)
IPLUM(14)	position of pointer for tel H.S. (t.g.)
IPLUM(15)	position of pointer for tel H.S. (b.g.)
IPLUM(16)	position of pointer for tel H.S. (free)
IPLUM(17)	position of pointer for tel V. (t.g.)
IPLUM(18)	position of pointer for tel V. (b.g.)
IPLUM(19)	position of pointer for tel V. (free)
IPLUM(20)	pointer for delayed free tel (12 scalers)
IPLUM(21)	pointer for delayed t.g. tel (12 scalers)
IPLUM(22)	pointer for sigma(BH1+BH2) free
IPLUM(23)	pointer for sigma(BH1+BH2) b.g.
IPADC	position of pointers for ADC block
IPADC(1)	position of pointer for em calorimeter
IPADC(2)	position of pointer for pileup calorimeter
IPADC(3)	position of pointer for laser
IPADC(4)	position of pointer for beam-in
IPADC(5)	position of pointer for ZDC ADC
IPADC(6)	position of pointer for ZDC TDC
IPADC(7)	position of pointer for target
IPADC(8)	position of pointer for BH ADC
IPADC(9)	position of pointer for BH TDC
IPADC(10)	position of pointer for OB
IPADC(11)	position of pointer for BO

MASKS FOR BLOCK IDENTIFIERS

+SEQ,MASKS.

MKSIMU	mask for simulation blocks
MKCONT	mask for control blocks
MKDST	mask for DST blocks
MKPARA	mask for parameter blocks
MKCALI	mask for calibration blocks

MKKINE	mask for kinematic blocks
MKMONI	mask for monitor blocks
MKPUSC	mask for pattern unit and scaler blocks
MKTRAK	mask for reconstructed track blocks
MKRAW	mask for raw data block

PT AND MATRIX DEFINITIONS

+SEQ,MATRIX.

IVR3R4	table for CHMTRX (V,R4) bits: 1,2 PT superbin -1 3-26 set to 1 if corresponding R3 is allowed 27-31 PT-bin -1 32 sign of PT-bin

POINTERS FOR STANDARD MICRODST

+SEQ,MICPOI.

JCSTAN	pointers from IWS to variables for standard mDST
JCSIMU	pointers from IWS to variables for simulated mDST

SIZE OF RAW DATA BLOCKS (read in parameter file)

+SEQ,RAWSIZ.

IRAMWX	maximum number of words in raw data block
NWBOR	number of words in beginning of run block
NWBOB	number of words in beginning of burst block
NWBOE	number of words in beginning of event block
NWEOE	number of words in end of event block
NWEOB	number of words in end of burst block
NWEOR	number of words in end of run block

NA38 GEOMETRY FOR SCINTILLATORS AROUND ACTIVE TARGET

+SEQ,SCITGT.

NTGTSC	number of scintillators around active target
RINTAT	internal radius of ring-scintillator i
REXTAT	external radius of ring-scintillator i
ZINAT	Z position of entrance of ring-scintillator i
DEPTAT	lenght of any ring-scintillator

SET-UP CONSTANTS

+SEQ,SETUP

IDATV	date of parameter file version
IGBEAM	beam momentum (integer)

NBEAM	beam type (see ABEAM)
ABEAM	alphanumeric possible beam types
ABTYP	alphanumeric possible beam types
ARGPRO	conversion factor from argonium to protons
MSYST	maximum number of systems (parameter)
NSYST	actual number of systems
ISYST	current system number
NSYFRN	first run of each system
NSYLRN	last run of each system
SYSMIC	system names

GEOMETRICAL PARAMETERS FOR GLOBAL CUT

+SEQ,SIGCUT.

SIGTGT	sigma of DTAR distributions (mom,icvdv)
SIGMAG	sigma of DMAG distributions (mom,icvdv)
SIGPHI	sigma of DPHI distributions (mom,icvdv)
CUTCO1	adhoc parameters (target = U) (mom,icvdv)
CUTCO2	adhoc parameters (target = Cu) (mom,icvdv)
CUTCOR	adhoc coefficient for cuts (cut,icvdv)
PMCVDV	Value of momentum for interpolation (mom,icvdv)
DTGTMX	displacement wrt centre of target (mom,icvdv)
DTGTMY	displacement wrt centre of target (mom,icvdv)
	ICVDV = 1 (conv), 2 (div) for direct track
	ICVDV = ICVDV + 2 for image track

SIZE OF SCALER BLOCKS (read in parameter file)

+SEQ,SCASIZ.

NSCAL(1)	number of words in spectrometer scalers
NSCAL(2)	number of words in upstream det scalers
NMECL(1)	number of ECL modules in spectrometer scalers
NMECL(2)	number of ECL modules in new detector scalers
NMNIM(1)	number of NIM modules in spectrometer scalers
NMNIM(2)	number of NIM modules in new detector scalers
IPNIM(1)	pos of 1st NIM scaler in spectrometer scalers
IPNIM(2)	pos of 1st NIM scaler in new detector scalers
IPECL(1)	pos of 1st ECL scaler in spectrometer scalers
IPECL(2)	pos of 1st ECL scaler in new detector scalers
NSNIM	number of scalers in a NIM scaler
NSECL	number of scalers in an ECL scaler

BLOCK DATA UTIDAT

Content of some of the variables defined in the commons

Chapter 14

DESCRIPTION OF LIBNA50 TXTLIB

LIBNA50 VERSION 1.00/02 DATE 950603 NA50 (A. ROMANA)

HISTORY.
Start from LIBNA38 FORTRAN, created 12/09/93
Define pilot patches *IBM, *VAX and *UNIX.
Include patches COMDECKS and LIBNA50
Delete routines ACPTMU, CODAGE, DECODA, JUCOM1,KUCOMP
Uses comdecks defined in NA50UTIL CAR
TXTLIB to be created with CRELIB exec and LIBNA50 CRADLE,
where the system (*IBM, *VAX or *UNIX) has to be defined
Modifies I/O interactive routines to run onto UNIX.
Introduces a PATCH DUMMY with dummy routines in order
to avoid undefined names when using GRAFLIB (not X11 version)
Version 1.00/02 (Created 95/06/03)
Change SYSTEM into SYSMIC for Unix compatibility
Increase the number of output tapes (INITRX)
Corrects the number of subtargets and em calo rings
Corrects calls of the WORD function for Unix compatibility
Includes subroutine RDADCC for common usage in DIMUREC and
RELMIC
Modifies GEOMET and PRIGEO for reading history comments on
parameter file

SUBROUTINE AUTHOR

SUBROUTINE CIRCLE

SUBROUTINE CUT

SUBROUTINE DEFPAT

SUBROUTINE DEFPEN

SUBROUTINE NEWPEN

SUBROUTINE PAPER

SUBROUTINE PENCLR

SUBROUTINE PLOT

SUBROUTINE PLOTS

SUBROUTINE SETPAT

SUBROUTINE SYMBOL

SUBROUTINE TONCLR

SUBROUTINE TONE

SUBROUTINE TONFLG

SUBROUTINE VPOPT

FUNCTION ARCSH(X)
Gives hyperbolic arc cosine of X

FUNCTION AMASG (IDG)
Returns the mass corresponding to a Geant identifier (called by DIMUJET)

FUNCTION BICSPL (ANG,R)
Routine to define the ACM magnetic field (called by RFIELD)

SUBROUTINE CALCUL (N,RNGCOR)
Calculates de/deta and energy from calorimeter (called by DIMUREC and RELMIC)

CHARACTER*4 FUNCTION CHAFRN (N,M)
Translate integers into character variables (Sergio table) (called by DIMUREC)

CHARACTER*4 FUNCTION CHAFRE (N,M)
Translate integers into EBCDIC characters

FUNCTION CHARGG (IDG)
Returns the charge corresponding to a Geant identifier

CHARACTER*10 FUNCTION CHDATE (IMOT,IFORM)
Gives the current date (called by RELMIC)

CHARACTER*8 FUNCTION CHTIME (IMOT,IFORM)
Gives the current time (called by RELMIC)

SUBROUTINE CINEM (PLB,CDM,PBEAM,POUT)

Computes the kinematical parameters of the dimuon (called by RELMIC)
PLB(8) = Px, Py, Pz, E for first, then second muon
WARNING : first muon must be positive, second negative
for like-sign, randomise before calling CINEM
POUT(5) = Masse, y, Pt, cos(theta) and phi in frame IFR
CDM(4) = Quadrivector of center of mass system

SUBROUTINE CLECT (LU,MESUT,VAR)
Prompts a message on the terminal and waits for a character answer (called by DIMUREC, GEADRIV)
LU —> logical unit for output on terminal (LU - 1 = input)
MESUT —> message (max 64 characters, ended with $)
VAR —> character variable (max 71 characters)

FUNCTION CODEG (IDG)
Gives the code corresponding to a Geant identifier (called by GEADRIV)

SUBROUTINE COORD (I,N,IFAIL)
Computes the 3 indices associated to sextant I (called by DIMUREC)

SUBROUTINE DECADC (INFCO,PRFL,IWS)
Decodes ADC constants (COMMONS ADCCON and HIVOLT) from IWS

SUBROUTINE DEFBOR (IGO,LFOUT,FLEXIT)
Defines the subsequent absorber slices, filling the common BORNES : Called by DIMUJET (IGO = 1, in the stream of the beam)and DIMUREC (IGO = 2, opposite to the beam stream)
LFOUT logical unit for print-out
FLEXIT logical return code

REAL FUNCTION DILAN (ALMAX)
Generation of Landau-distributed random numbers by 4-point interpolation in the previously-tabulated inverse cumulative distribution (called by DIMUJET) (adapted from CERN library routine GENLAN, G903)

REAL FUNCTION DINLAN (ALMAX)
Landau distribution (called by DIMUJET)
R random number between 0 and 1
DINLAN random number Landau distributed

SUBROUTINE DMPBLK (IWS,LFOUT,IO)
Dump of one block (in octal if IO = 8) (called by DIMUREC)

SUBROUTINE EFFION
Routine used in target algorithm (NA38) (called by HREFF)

SUBROUTINE ERREC (IRETCD,IERNO,X,Y)
Subroutine to handle errors ocurring during execution time (called by DIMUREC, DIMUJET)

SUBROUTINE ERRINI
Subroutine to initialize recovery subroutine

SUBROUTINE ETRGAU (NCIB)
Subroutine to calculate transverse energy between two eta limits (called by DIMUREC, RELMIC)

SUBROUTINE FIELDL (P,FIELDF,INSIDE)
Parametrization of the ACM magnetic field : (called by GEADRIV, NYSTRK) This routine uses RFIELD to get R*BPHI as a function of R, phi and z in the lab system.

SUBROUTINE FILEFI (F1,F2)
Routine used in target algorithm (NA38) (called by EFFION)

SUBROUTINE FINISE
Dummy entry for ERREC (FINISH)

SUBROUTINE FITGA (N)
Gaussian fit of dEt / deta (called by ETRGAU)

SUBROUTINE FLOTIN (A,NC,NM)
Gives the characteristic and the mantissa of a real variable (called by DIMUREC)
A = real variable
NC = characteristic *32767 (integer)
NM = mantissa (integer)

REAL FUNCTION FLON (M,F)
Convert M in a signed floating number multiplied by F (called by DIMUREC and RELMIC)

FUNCTION GAUETB(X)
Routine to fit dE / deta (called by SOMG)

FUNCTION GAUFTO (X)
Routine to fit dE / deta (called by DIMUREC, RELMIC)

FUNCTION GAUFTR (X)
Routine to fit dE / deta (called by DIMUREC, RELMIC)

SUBROUTINE GEOMET (LFPAR,NSETUP,LFOUT)
Read geometric parameters from the parameter file specified by the set-up version number and fill-in the geometry common blocks. (called by DIMUJET, DIMUREC, GEADRIV, RELMIC)

SUBROUTINE GMOL4 (Y,X,VAL,ARG,EPS,IER)

```
*****************************************************************
* *
* ROUTINE TAKEN FROM IBM SCIENTIFIC SUBROUTINE PACKAGE *
* *
* 4 POINT CONTINUED FRACTION INTERPOLATION *
```

* Y=INTERPOLATED VALUE FOR THE ARGUMENT X . *
* VAL=VALUE ARRAY . *
* ARG=ARGUMENT ARRAY . *
* EPS=DESIRED ACCURACY . *
* OUTPUT ERROR PARAMETER IER = 0 ACCURACY O.K. *
* = 1 ACCURACY CAN NOT BE TESTED *
* IN 4TH ORDER INTERPOLATION . *
* = 2 TWO IDENTICAL ELEMENTS IN THE *
* ARGUMENT ARRAY . *
* *
* ==>Called by : GMOLIE *
* Author M.S. Dixit NRCC Ottawa ********* *
* *
****

———————————————————————

SUBROUTINE HGROUP (ID,NGR)
Rebins histogram ID from N to N/NGR bins (called by P. Force?)

SUBROUTINE HREFF (KSYS,HTOTRX) 1' subroutine inoperante, toutes les efficacites mises a 1 !'//)

FUNCTION HULTHE (P)
Fermi momentum of a nucleon (not called!)

FUNCTION JUCOMP (A,CODES,N)
Returns the location of a string in a character array (called by DIMUJET, DIMUREC, RELMIC)

INTEGER FUNCTION IFRCHI (Y)
Translates ASCII 4-character string into integer 32bit word (not called!)

INTEGER FUNCTION IFRCHN (Y)
Translates Nord ASCII 4-character string into integer 32bit word (called by DIMUREC)

SUBROUTINE ILECT (LU,MESUT,NVAR,IVAR)
Prompts a message on the terminal and waits for an integer answer (called by DIMUREC, GEADRIV)
LU —> logical unit
MESUT —> message (max 64 characters, ended with $)
VAR —> array of integer variables
NVAR —> number of variables

SUBROUTINE INICAL (LFOUT)
Initialises the dE/deta calculation of elctromagnetic calorimeter (called by DIMUREC, RELMIC)

SUBROUTINE INITRX (LFOUT,IRC,LFREAD)
Reads information from READEC COMMAND, then defines FILEDEF

SUBROUTINE INTEGR (FONCT,BORNE,SOM)
Integration routine, used for dE / deta calculation (called by DIMUREC)

SUBROUTINE INTETO (BORNE,SUM)
Initialisation routine for dE / deta calculation (called by INICAL)

SUBROUTINE INTETR (BORNE,SUM)
Initialisation routine for dE / deta calculation (called by INICAL)

CHARACTER*20 FUNCTION LEFT (NAME,NCHA,CHAL)
Returns the NCHA left characters of a string NAME, padded with CHAL (not called!)

INTEGER FUNCTION LPOS (STRING,NAME,I1)
Returns the position of the string STRING (length I1) in string NAME (called by INITRX)

SUBROUTINE LINFIP (N,VAR,X,Z,X0,SL,CHI2,DX0,DSL,Z0)
Linear fit with error calculation (called by DIMUREC)
Returns the point of minimum error with :

SUBROUTINE LORENS (PLAB,BETA,GAMMA,PCM)
Lorentz transformation (called by CINEM)

SUBROUTINE LORENZ (P1,P2,PLAB,PCM)
Lorentz transformation (not called!)

SUBROUTINE LUTERM (LU,IFLAG)
Defines the logical unit for input/output on terminal (IBM) (called by CLECT, ILECT, RLECT)

CHARACTER*20 FUNCTION MINUSC (ALPHA,LENGT)
Translates uppercase into lowercase (called by GEADRIV)

CHARACTER*20 FUNCTION MINUSI (ALPHA,LENGT)
Translates uppercase into lowercase, except the first character (called by GEADRIV)

SUBROUTINE MULSCA (PIN,SL,MAT,PINIT)
Compute the deviation angle and the position displacement due to multiple scattering (called by DIMUJET)
Input parameters : pin = x,y,z,px,py,pz,p of the track
sl = thickness of matter traversed
mat = type of matter traversed
pinit = initial momentum

SUBROUTINE NEXTPI (IFILE,LU,LFOUT,IRC)
Reads the next file (when information was given through REXX)

INTEGER FUNCTION NFIX (X,F)
Convert X*F in a rounded, positive integer NFIX (called by DIMUJET, DIMUREC, TITRES)

LOGICAL FUNCTION NOYES (LU,COMM)
Prompts a message and waits for an answer, yes or no (default = no) (called by DIMUREC)
LU = logical unit

INTEGER FUNCTION NSXTAN (X,Y)
Gives the sextant number from the X and Y coordinates of the track

SUBROUTINE NYSTRK (FIELDF,INSIDE)
Runge-Kutta method for tracking a particle through a magnetic field to a desired end plane perpendicular to one of the coordinate axes. (called by DIMUJET, DIMUREC)
Uses Nystroem algorithm (see Handbook Nat. Bur. of Standards, procedure 25.5.20)
For background see dd-75/22 (G. Shiel)
Origin M. Metcalf '75, status = tested
User routine called : FIELDL (P,FIELDF,INSIDE) (puts field in F in /MGNTXM/)

Input parameters :
pin(7) : initial co-ords, direction cosines, mom*charge
fin : co-ordinate of end plane (must be perpendicular to one of the principal axes)
idir : 1,2 or 3 representing the principal axis which intersects the end plane
hst : step size (to track in negative sense, use hst negative)

Output parameters :
ifail : 0 if o.k., 2 if track pointed in wrong direction
pout(7) : final co-ords, direction cosines and momentum

SUBROUTINE PRIADC (INFCO)
Prints the calibration constants for adc's
Prints the pedestals
Prints the thresholds
Prints high voltages

SUBROUTINE PRIGEO (NSETUP,LFOUT)
Print geometric parameters from the parameter file (called by SETGEO, to be called by DIMUJET, GEADRIV, DIMUREC)

SUBROUTINE PRJTOZ (XIN,XOUT,Z)
Straight line propagation up from position to plane Z

SUBROUTINE RDADCC (NRUN,INFCO,PRFL)
Reads the calibration constants for ADC's
Reads the pedestals
Reads the thresholds
Reads high voltages (values on tape are wrong)

SUBROUTINE REROT (R,CPHI,SPHI,X,XR)

Rotation of -phi, given by cos (phi) and sin (phi) (called by DIMUREC)

FUNCTION RFIELD (R,PHI,ZL)
Parametrization of the ACM magnetic field (called by FIELDL, DIMUREC)
Gives R*BPHI as a function of R,PHI,Z in the lab sys. (phi is defined with respect to an iron axis $f.i. x!)

CHARACTER*8 FUNCTION RIGHT (NAME,NCHA,CHAL)
Returns the NCHA right characters of a string NAME, padded with CHAL (called by DIMUREC)

SUBROUTINE RLECT (LU,MESUT,NVAR,VAR)
Prompts a message on the terminal and waits for a real answer (called by GEADRIV)
LU —> logical unit for output terminal (LU -1 = input)
MESUT —> message (max 64 characters, ended with $)
VAR —> array of real variables
NVAR —> number of variables

SUBROUTINE ROTAT (N,X,NROT)
Rotation of N times 60 degrees until the point belongs to the first sextant of the magnet (called by DIMUREC)

SUBROUTINE ROTATE (CTETA,STETA,CPHI,SPHI,POUT)
Space rotation (not called)

SUBROUTINE ROTMAT (R,M,Y)
Generate the rotation matrix R (not called!)
Input parameters : M = rotation axis
Y = rotation angle
Output parameter : R = rotation matrix

SUBROUTINE SERIE
Routine used in target algorithm (NA38) (called by EFFION)

SUBROUTINE SOMG (GAUETB,BO1,BO2,S)
Routine used in dE / deta calculation (called by ETRGAU)

FUNCTION SPIN1 (COSX)
Cos (THETA) distribution for spin 1 particles(called by DIMUJET)

SUBROUTINE SPLPNT (I1,I2,PAR1,PAR2,XX,YY,TOTCHK)
Routine to spline the magnetic field (called by BICSPL)

REAL FUNCTION SMXINF (XMOY,SIG,BORNE)
Routine to give the limits of the dE / deta function (called by INTETO, INTETR)

SUBROUTINE TAMBOV (C1,C2,I1,I2,N,PHI,K,NK,TOTCHK,NM,PAR1,PAR2)
Routine to handle the ACM magnetic field (called by BICSPL)

SUBROUTINE TARGEF (HTOTRX,LFOUT,CUTCIB,CUTPIL)
Computes efficiency of NA38 target algorithm as a function of the transverse energy (called by RELMIC)

SUBROUTINE TRASLO (IMOT,AMOT)
Translates integer into character*6 (called by DMPBLK)

CHARACTER*12 FUNCTION WORD (CVAR,N)
Returns the Nth word of string CVAR (called by DIMUREC)

LOGICAL FUNCTION YESNO (LU,COMM)
Prompts a message and waits for an answer, yes or no (default = yes) (called by DIMUREC)
LU = logical unit