NA50

DIMUJET USER'S GUIDE

Version 2.00/02

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January 16, 1997

This document refers to the NA50 simulation program DIMUJET, version 4.00/01

Contents

Chapter 1

INTRODUCTION

1.1 DIMU Exec

DIMUJET is easily sent to batch or to Basta, or can run interactively with DIMU Exec (**DIMU JET**). For more information about DIMU Exec, see NA50 FRIEND'S GUIDE.

1.2 LIBNA50 TXTLIB

LIBNA50 TXTLIB is on the NA50 public disk : see the section "FILES" below for its location and NA50 FRIEND'S GUIDE for a complete description.

It allows the reading and the decoding of the geometrical parameters, PARAMS NA50, and fills the corresponding commons, as well as the hardware parameters read in CONSTADC NA50.

1.3 NA50UTIL CAR

DIMUJET CAR needs the call of another CAR file, named NA50UTIL, in which are defined some commons and quantities involved in the different NA50 programs (see NA50 FRIEND'S GUIDE).

1.4 FILES

The official NA50 files needed for the simulation program DIMUJET are :

- On IBM :
  - At CERNVM, under userid PUBWF, disk 196.
  - At FRCPN11, under userid NA50SERV, disk 191.

  They are the following (fn ft):

Filename	**Filemode**	**Description**
DIMUJET	CAR	: DIMUJET Pam-file
NA50UTIL	CAR	: NA50UTIL Car-file
LIBNA50	TXTLIB	: NA38 Library
PARAMS	NA50	: Parameter file
DIMUJET	LATEX or PS:	This documentation

- On UNIX :
  - On cernsp, under directory $GROUP_DIR/na50, alias /afs/cern.ch/home/throng/group/wf/na50.

- On Basta, under directory $GROUP_DIR/na50, alias /home/na50/na50.
- On Anastasie, under directory $THRONG_DIR/na50, alias /afs/in2p3.fr/home/throng/na50/na50.

They are the following (fn ft):

Filename	Description
dimujet.car	: DIMUJET Car-file
na50util.car	: NA50UTIL Car-file
libna50_hp.a	: NA50 Library under HP
libna50_rs.a	: NA50 Library under AIX
params.na50	: Parameter file
dimujet.latex	: This documentation (subdirectory manuals)

1.5 CRADLE

Minimum cradle(s)to run DIMUJET can be :

```
+USE,NA50CDKS,NA50BLDA.
+USE,*system,*NORMAL.
+USE,STNDUSER.   To select a standard set of histograms.
+USE,*PRIMARY.   For a normal dimuon generation, or
+USE,QUICKBKG.   For like sign muons generation using some histograms, or
+USE,EXTERNAL.   to get dimuons from an external file (see RELGEN)
+EXE.
+PAM,11,T=C.     (NA50UTIL-CAR on the DIMU second panel)
+PAM,12,T=C.     (DIMUJET-CAR on the DIMU first panel)
+QUIT.
```

Cradle to run DIMUJET with an internal call of DIMUREC (event-per-event reconstruction) using option RECSIM :

```
+USE,NA50CDKS,NA50BLDA.
+USE,*system,*NORMAL.
+USE,STNDUSER.   To select a standard set of histograms.
+USE,*PRIMARY.   For a normal dimuon generation, or
+USE,QUICKBKG.   For like sign muons generation using some histograms, or
+USE,EXTERNAL.   to get dimuons from an external file (see RELGEN) and
+USE,RECSIM.     to request the event-per-event reconstruction.
+EXE.
+PAM,11,T=C.     (NA50UTIL-CAR on the DIMU second panel)
+PAM,12,T=C.     (DIMUREC-CAR on the DIMU second panel)
+PAM,13,T=C.     (DIMUJET-CAR on the DIMU first panel)
+QUIT.
```

where system can be IBM, VAX or UNIX.

Chapter 2

DESCRIPTION OF THE DIMUJET CAR FILE

2.1 Patchs and Decks

P = STORY	1	
P = INSTAL	2	
P = INSTAL_R	3	
P = *IBM	4	
P = *UNIX	5	
P = *VAX	6	
P = *NORMAL	7	
P = *CLUSTER	8	
P = *DIMUONS	9	
P = *DISPLAY	10	
P = *PRIMARY	11	
P = FULL	12	
P = *CHARM	13	
P = *LASTMOD	14	
P = COMDECKS	15	
P = DESCRIBE	16	
	17	D = ROUTIN
	18	D = COMCOM
	19	D = COUNTS
	20	D = OPTIONS
P = DIMUJET	21	
	22	D = MAIN
	23	D = BLKDAT
	24	D = BEGRUN
	25	D = BODRIT
	26	D = CRONIN
	27	D = DEBUG
	28	D = DECAY
	29	D = DEFBEA
	30	D = DIGIT
	31	D = DISPI
	32	D = DSDMDY
	33	D = DSIGDY
	34	D = DSIGPT

	35	D = ELOSS
	36	D = ENDRUN
	37	D = EVENT
	38	D = EXTMUL
	39	D = FINISH
	40	D = GENBDF
	41	D = GENDIM
	42	D = GENER
	43	D = GKCUTS
	44	D = GMOLIE
	45	D = GMUL
	46	D = HISBUK
	47	D = HISFIL
	48	D = HITCH
	49	D = HITR
	50	D = HITS
	51	D = HFCPD
	52	D = INIT
	53	D = KINBDF
	54	D = MAKNOR
	55	D = MAKSLI
	56	D = NORMWT
	57	D = PROCES
	58	D = PROJCT
	59	D = PROLON
	60	D = PTFOPI
	61	D = PXPYPZ
	62	D = INITPY
	63	D = RANVRT
	64	D = READCD
	65	D = RECONS
	66	D = REFROT
	67	D = RELBAC
	68	D = RELGEN
	69	D = RNDMN
	70	D = SETGEO
	71	D = TRACE
	72	D = TRIGGER
	73	D = USER
	74	D = WRITEV
	75	D = YMAXLB
P = INDEX	76	

2.2 History

VERSION: 1.00/02 15/02/84

Add P=*LASTMOD,D=STORY
Add P=*CYBER
P=DIMGENER,D=DSIDPT: protection added
P=DIMGENER,D=GENER: protection added
P=INSTAL,D=NORD500: new version
VERSION: 2.00/01 10/10/85 NEW VERSION
Add D=PJ850710 in P=*LASTMOD
Add D=MODMUL in P=*LASTMOD
VERSION:2.00/02 12/12/85
Add P=TWOTAPES
Add P=BBBARCOR,P=BBBARUNC,P=DIPSICOR,P=DIPSIUNC,P=PSIK
VERSION:3.00/00 NA38 VERSION

VERSION:3.00/01
Add P=*NA38
VERSION:3.00/02 30/06/86
Add P=THERMIC
Take into account differences between CERNVM and FRCPN11
Add new comdecks
VERSION:3.00/03 23/04/87 c.. Modify material properties
Add proton-nucleus empirical cross-sections
Add beam nucleus fermi motion
Add option NORSK and suppress option ND500
VERSION:3.00/04 20/04/88
Include BACKSIM option
Include QUICKBKG option
Include REINTER option
Include MUDECAY option
Delete DIMGENER patch
Delete DIMUSER patch
Delete *CYBER option
VERSION:3.00/05 20/07/88
Delete *NA38 option
Include *IN2P3 option
VERSION:3.00/06 14/02/89
Delete COMPARE option
Delete SIMPLE option
Delete GEOMET (now taken from LIBNA38)
Add subroutine SETGEO
Correct subroutine EVENT for MUDECAY option
HBOOK4 version for histograms
VERSION:3.00/07 19/05/89
Modify Call NYSTRK (FIELD,INSIDE)
Delete FIELD subroutine, now in LIBNA38 TXTLIB with F(i) = -F(i)
VERSION:3.00/08 30/06/90
Add option DIMUONS to create microDST with PLAB only
Selete *CDC and *WORD60 options

Selete *WORD32 option (IBM option becomes specific)
Include *VAX option
Delete *IN2P3 and UNIFORM option
Include EMPIRIC option (empirical continuum)
Replace UPSILON by PSIPRIM option
Correct to have either active or heavy target
VERSION:3.00/09 23/05/93
Include choice for variable generation (M,y) or (Rt,xf) or (x1,x2)
Allows to read an external file for dimuon parameters (EXTERNAL option and IFLGEN > 4)
Modify structure functions and include PDFLIB (IFLSTR)
Suppress EMPIRIC option (replaced by IFLGEN flag)
VERSION:4.00/01 07/11/94 NA50 VERSION
Include the use of NA50UTIL CAR
Modify READCD to read alphanumeric cards
Include multiple scattering from Molier (as default)
Modify structure of B-O-R block (for NA50 acquisition)
Modify EVENT to allow non-cylindrical volumes (R. Mazini)
Modify GENER in order to have ds/dMdy per sqrt(s) bins
Replace BORIT, FERTAR and FERION by BODRIT called for any object
Deletes NORSK option
Suppresses DRELLYAN option (replaced by IFLRES = 0)
Suppresses PSI and PSIPRIM options (replaced by IFLRES)
Defines PDFLIB parameters by command card PDF
Deletes ACCONLY,ONETAPE,TWOTAPES and MICROGEN options (replaced by parameters in the command card WRITE)
Deletes DDREJECT option
Replaces obsolete random routines by RANLUX (R. Mazini)
Introduces new routine for multiple scattering (id)
Introduces a call PYTHIA for charm generation (id)
VERSION:4.00/02 03/06/95
Modifs to allow DIMUJET for calling DIMUREC (RECSIM option) :
Changed COMMONs are CONST, CTHIT, FLAGS, ICOUNT, KINEMA, LFILES, RAWDAT, SUBTAR
Blank COMMON is added for IWS
Changed routine names are INIT, FINISH, BEGRUN, ENDRUN READCD, PROCES, HISBUK, HISFIL
DIMUREC routines called by INIT, PROCES and FINISH
Creates common and logical for Ntuple creation
VERSION:4.00/03 02/02/96
Brings some modifications for a better compatibility
with DIMUREC
VERSION:4.00/04 18/11/96
Brings some modifications for a better compatibility
with DIMUREC

Chapter 3

DESCRIPTION OF THE PROGRAM

PROGRAM DIMUJE

SIMULATION OF THE NA50 DIMUON EXPERIMENT.

This program generates interactions in the target, a dimuon is created and decays, generating two muons which are followed through the apparatus.
Interactions of tracks with the detectors are recorded.
Energy loss, multiple scattering, trigger conditions and output tape writing are optional.
The program is steered by command cards (see subroutine READCD).

LOGICAL FILES :

LFIN	= input (1)
LFOUT	= output (2)
LFHIS	= save histograms (3)
LFTIM	= execution time output (4)
LFTERM	= terminal unit (6)
LFPAR	= geometric parameters (7)
LFHGEN	= histogram input (QUICKBKG) (12)
LFRIN	= input file for random number(13)
LFROUT	= output file from random number(14)
LFTIN(1)	= input tape when EXTERNAL (41)
LFTOUT(I)	= result output (50+I)
I = 1	= accepted events (51)
I = 2	= all generated events (52)
I = 3	= microDST, accepted (53)
I = 4	= microDST, generated (54)

The reference frame is right-handed, with the Z-axis along the beam direction.
Units : energy, momentum, mass : GeV, GeV/c, GeV/c^2
length : CM
angle : radian

SUBROUTINE ROUTIN
Brief description of all routines.
SUBROUTINE COMCOM
List of all variables in common blocks, with a short description of each.

BLOCK DATA

Initialize constants of general use
- -file names
- -flags
- -default values
- -event counters
- -information for file i/o
- -physical constants
- -apparatus geometry

SUBROUTINE BEGRUN_JET

Beginning of run

FUNCTION BODRIT (P)

Generate an isotropic fermi motion for the projectile and/or the target nucleus with the Fermi gas model of E.J. Moniz "a la Bodek and Ritchie" for heavy nucleus target (A¿25) or with the Hulten wave function for the deuterium (called by HBFUN1)

FUNCTION CRONIN (PT)

Cronin effect for ratio K+ over K- versus pt for a tungsten nucleus

SUBROUTINE PDEBUG

Debug print-out of selected events.

SUBROUTINE DECAY (PIN,PPROD,AMAS,POU,EOU)

Compute decay of pion and kaon
From Joao Varela 1984/85
Change for LORENB instead of LOREN4 (01/06/88) some trouble when momentum is very high in this case LOREN4 computes in a false way the mass which is known use of double precision variables to compute QDREF(4) (06/06/88) use of double precision variables to compute QDOUT(4) (21/06/88)

SUBROUTINE DEFBEA

Define beam parameters, prints beam and target parameters.

SUBROUTINE DIGIT

Digitization of hodoscopes and chambers information.

FUNCTION DSDMDY (DIMMAS,Y)

Differential cross section for proton-induced Drell Yan events,
steered by IFLGEN (choice of variables) and PDF (choice of structure functions or empirical expression)

FUNCTION DISPI (RTAU1,XF)

Differential cross section for pi- or pi+ Drell Yan events 9*s/4*pi*alpha**2 * d2(sigma)/d(xf)*d(sqrt(tau)) (nanobarn) for pi+ or pi- Drell Yan events

FUNCTION DSIGPT(PT)

Pt distribution for dimuons (depends on generation option)

FUNCTION DSIGDY(Y)

Y distribution for dimuons (depends on generation option)

SUBROUTINE ELOSS (DX,ISLOST,MAT)

Energy loss calculation for muons,including losses by ionization, bremsstrahlung and pair creation. Straggling is simulated with a Landau distribution for ionization loss and by a 1/e distribution for the others.
Input parameters : dx = thickness of matter traversed mat = type of matter traversed
Output parameter : islost = 1 if particle stops

SUBROUTINE ENDRUN

End of run

SUBROUTINE ERREC (NERROR)

Error recovery routine (IBM only)

SUBROUTINE ERRINI

Initialisation of error recovery (IBM only)

SUBROUTINE EVENT

Track the particles through the apparatus.
Check whether the particle leaves the apparatus or is absorbed in the matter.

SUBROUTINE EXTMUL (PTGO)

Extract multiplicities of primary and secondary hadrons

SUBROUTINE FINISH_JET

Print run summary, edit histograms, terminate run.

SUBROUTINE GENBDF (IGO)

Generate the decay of two mesons (pi or k) into muons

SUBROUTINE GENDIM (IGO,JPART)

Generate a dimuon event from HIJET data.
Receive the vertex position, compute the total energy of the interaction and the dimuon momentum in the c.m. frame.
Generate the dimuon decay in the Collins-Sopper frame, and compute the daughters' momenta in the lab. frame.

SUBROUTINE GENER (IGO)

Generate a dimuon event :
Generate the vertex position in the target, compute the total energy of the interaction and the dimuon momentum in the c.m. frame.
Generate the dimuon decay in the Collins-Sopper frame, and compute the daughters' momenta in the lab. frame.

SUBROUTINE GKCUTS (IFAIL)

SUBROUTINE GMUL (SL,MAT,PINIT)

Compute the deviation angle and the position displacement due to multiple scattering.
Input parameters : sl = thickness of matter traversed mat = type of matter traversed pinit = initial momentum

SUBROUTINE HISBUK_JET

User's routine for histogram booking.

SUBROUTINE HISFIL_JET (IGO)

User's routine for histogram filling.
IGO = 1 : filling after generation
IGO = 2 : filling after tracking
IGO = 3 : filling after trigger

SUBROUTINE HITCH (IP,ICH)

Intersection of track ip with the planes of chamber ich.
Compute coordinates and wire numbers in the three planes.

SUBROUTINE HITR_JET (IR)

Intersection of the track with the r counter ir.
Compute sextant number and scintillator number.

SUBROUTINE HITS (IR)

Intersection of the track with the p counter ir.
Compute the sextant and the scint. number

SUBROUTINE HFCPD (ID,OPT)

SUBROUTINE INIT_JET

Run initialization :
Compute numerical constants and kinematics, initialize i/o files.

SUBROUTINE KINBDF

Compute kinematical variables for background dimuons

SUBROUTINE MAKNOR (ID)

SUBROUTINE MAKSLI

SUBROUTINE NORMWT (ID,W,NW)

Computes weights for generated variables
WNORM are different event by event

SUBROUTINE PROCES_JET

Process given number of events

SUBROUTINE PROJCT (Z)

Straight line propagation up to plane z.

SUBROUTINE PROLON (XL,PROB)

Computes the decay point of an hadron and track the particle until this decay point (called by GENBDF).

FUNCTION PTFOPI (PT)

Pt distribution for dimuons

SUBROUTINE PXPYPZ (AMAS,Y,PT,PHI,POU)

Compute px,py,pz from m,y,pt,phi

SUBROUTINE RANVRT

Initialise, then generate the primary vertex (called by PROCES_JET)

SUBROUTINE READCD_JET

Read the command cards in format : A3,A7,7F10.3
The cards can appear in any order, except for the last one, which must be 'end'.
Only the first three letters of the keyword are checked.

AIR -	reject iron events	
BEA -	beam definition	
	1st parameter :	beam mass (def : proton mass)
	2nd parameter :	beam momentum (def : 160.)
	3rd parameter :	beam momentum spread
	4th parameter :	beam divergence in x-direction (def : 0)
	5th parameter :	beam divergence in y-direction (def : 0)
	6th parameter :	rms of beam divergence in x (def : 0)
	7th parameter :	rms of beam divergence in y (def : 0)
BKG -	background generation	
	1st parameter :	1 = requested decays from pi
		2 = requested decays from kaon
		3 = requested decays from pi and kaon
	2nd parameter :	1 = requested decays from negativ particles
		2 = requested decays from positiv particles
		3 = requested decays from negativ and positiv particles
	3rd parameter :	1 = first generation of particles
		2 = second generation of particle
		3 = first and second generation
CUT -	cuts on :	
	1st parameter :	max dimuon transverse momentum
	2nd parameter :	minimum momentum of parent
	3rd parameter :	maximum momentum of parent

	4th parameter :	maximum z of next interaction
	5th parameter :	minimum angle (x or y) of parent
	6th parameter :	maximum angle (x or y) of parent
	7th parameter :	minimum energy of individual muon
DEB -	debug print-out	
	1st parameter :	first event to be printed
	2nd parameter :	last event to be printed
	3rd parameter :	maximum number of pathological events to be printed (def :10)
	4th parameter :	number of accepted events (geometry) to be printed
	5th parameter :	number of accepted events (trigger) to be printed
	6th parameter :	print-out of PYTHIA statistics (option *CHARM only)
DIM -	dimuon generation	
	1st parameter :	choice of variables for generation 1 = (M,y), 2 = (Rt,xf), 3 = (x1,x2)
	2nd parameter :	choice of : 0 = Drell-Yan 1 = psi, 2 = psi' ¿ 2 : some low mass empirical generations
	3rd parameter :	minimum dimuon mass or variable, as defined by the 1st parameter
	4th parameter :	maximum dimuon mass, if greater than 1st parameter
	5th parameter :	minimum dimuon y (def : -2)
	6th parameter :	maximum dimuon y, if greater than ymin
	7th parameter :	minimum dimuon Pt (def : 0)
	8th parameter :	maximum dimuon Pt, if greater than Ptmin
	9th parameter :	minimum dimuon cos(teta*) (def = -1.)
	10t parameter :	maximum dimuon cos(teta*)
ENE -	energy loss requested	
FIE -	magnetic field factor	
	1st parameter :	factor multiplying the field (def : 1)
FRA -	dimuon frame : G-J or C-S	
	1st parameter :	frame of generation 1 = G.J., 2 = C.S. (def : 2)
HIJ -	selection of HIJET tracks	
	1st parameter :	number of the interaction
HIS -	print histograms	

HST -	store histograms	
	1st parameter :	HISTDO not called if negative
	2nd parameter :	store only id's between 1st and 2nd par.
MOT -	generates a Fermi momentum for the nucleon	
	1st parameter :	cut-off of nucleon momentum (def: 4)
	2nd parameter :	atomic number of incident particle (def: 1 = proton)
	3rd parameter :	Drell-Yan generation per sqrt(s) bins
MUL -	multiple scattering requested	
	1st parameter :	request for Rossi parametrisation
NTU -	Ntuple histogram storage request The content of the histogram(s) is to be filled by user	
PDF -	choice of structure function for projectile and target	
	1st parameter :	EMPIRIC, DIMUJET or PDFLIB PARAM(1)
	2nd parameter :	PDFLIB value
	3rd parameter :	PDFLIB set
	4th parameter :	same as 1st parameter for projectile unless projectile is pion or kaon
	5th parameter :	same as 2nd parameter for projectile if..
	6th parameter :	same as 3rd parameter for projectile if..
PRO -	process events	
	1st parameter :	number of events to process (def : 1000000)
	2nd parameter :	nb. of accepted evts requested (def : 1000000)
PYT -	Pythia command card	
	1st parameter : (def : 1 = pp)	collision type (1=pp, 2=pn, 3=np, 4=nn)
	2nd parameter :	c quark mass (def : 1.5)
	3rd parameter :	number of charmed particles 1=D; 2=D,D0; 3=D,D0,Ds; 4=D,D0,DS,LAMBDAc 5= D,D0,Ds,LAMBDAc,XIc (def : 3)
	4th parameter :	Kt distribution form isside hadrons 1 = gaussian 2 = exponential (def ; 1)
	5th parameter :	Kt distribution width (def : 0.8)
	6th parameter :	
	7th parameter :	
	8th parameter :	partons distributtion library 1 = Pythia, 2 = PDFLIB (def : 2)
	9th parameter :	partons distribution set for Pythia 1 to 9 (def : 9) for PDFLIB (def : GRV LO)

RAN - random number generator initialization
1st parameter : if 1, random number is to be read on file
if zero, reads on the following card the
initial random number, in format
2(9X,Z11) on IBM and UNIX, F20.0 on VAX

REC - recovery from system error requested
1st parameter : maximum number of recoveries (def : 10)

RUN - run number for this execution
1st parameter : run number (def : 1)

SET - set-up version
1st parameter : set-up number (def : 0)
2nd parameter : print-out flag (def : false.)

TAR - characteristics of requested target (no default)
1st parameter : target matter index (see matter
indices in comcom)
Following card = pattern of subtargets (24I1)

TIM - time limit
1st parameter : maximum execution time (inter)
2nd parameter : minimum left time

TIT - enter global title
Following card (format A80) global title

TRI - validation by the trigger requested for accept

WRI - write results on output file
1st parameter : write accepted events (raw data type)
2nd parameter : write generated events (raw data type)
3rd parameter : write accepted events (microdst type)
4th parameter : write generated events (microdst type)

END - last command card : this card must be present

SUBROUTINE RECONS

Makes a quick mass reconstruction starting from DMUMC at the end of absorber (Performs Pdedx correction, multiple scattering correction and mass calculation)

SUBROUTINE REFROT (XREF,PPROD,VECIN,VECROT)

From Joao Varela 1984/85
Rotacao de referencial: eixo x coinc. c/ movimento eixos paralelos ao ref. do lab.

SUBROUTINE RELBAC (IGO)

SUBROUTINE RELGEN

Lecture des parametres cinematiques du dimuon sur un fichier externe

SUBROUTINE SETGEO_JET

Modifie eventuellement la geometrie et definit les successives tranches d'absorbeur avant pc1.

SUBROUTINE TRACE (ISLOST)

Track particle through magnetic toroid
Input parameter : ch = particle charge
Output parameters : inside = .false. if tracking fails
ISLOST = 1 if particle absorbed

SUBROUTINE TRIGGR

Check whether event satisfies trigger conditions.

SUBROUTINE USER_JET (IGO)

Dummy subroutine for user's own calculations.
IGO = 0 : enter at initialization
IGO = 1 : enter after generation
IGO = 2 : enter after tracking
IGO = 3 : enter after trigger
IGO = 4 : enter at termination

SUBROUTINE WRITEV

Fill the output buffer for each event

FUNCTION YMAXLB (AMAS)

Return maximum value for variable y in the lab for particle with mass amas

Chapter 4

DESCRIPTION OF ALL VARIABLES

SUBROUTINE COMCOM

FLAGS FOR PI AND K DECAYS

```
      COMMON /BACKGD/ FLKAPI,FLPLMO,FLSEPR,NBHADR(8),VTXPAR(3,2),DVERT
     1   ,DHADRN(5,2),DSECDR(5,2),NBHPRI(2),NBHSEC(2)
     2   ,ATARBK,ABEABK,PBEABK,ETLOBK,ETHIBK,PARBBK
      INTEGER FLKAPI,FLPLMO,FLSEPR
```

FLKAPI
FLKAMO
FLPLMO
FLSEPR
BNHADR
VTXPAR
DVERT
DHADRN
DSECDR
NBHPRI
NBHSEC
ATARBK
ABEABK
PBEABK
ETLOBK
ETHIBK
PARBBK

BACKGROUND : FLAGS FOR DEBUG PRINT-OUT

```
      COMMON /BACKFL/ BACFLG(10)
      LOGICAL BACFLG
```

BACFLG

BACKGROUND : SELECTION CRITERIA TO ACCEPT TRACKS

```
      COMMON /COUPUR/ PTCUT,EMUMIN
     1   ,   TETMIN,TETMAX,IGENMI,PMINHI,PMAXHI,ZINTHI
```

PTCUT	dimuon transverse momentum cut
IGENHI	maximum number of the interaction
PMINHI	minimum Pz of the track
PMAXHI	maximum Pz of the track
ZINTHI	maximum z of next interaction
TETMIN	minimum angle of track
TETMAX	maximum angle of track
EMUMIN	minimum energy of individual muon

HITS IN HODOSCOPES

```
      COMMON /HITSR/ MXCTMC,NSXTMC(11),IASXMC(6,11),NSCTMC(6,11)
     1  ,IASCMC(4,6,11)
```

NSXTMC	number of hit sextants (hodo)
IASXMC	address of hit sextant (number,hodo)
NSCTMC	number of hit scintillators (sext,hodo)
IASCMC	address of hit scintillator (number,sext,hodo)
	(hodo = R1,R2,R3,R4,V,PT,P1,P2,PP)

AT USER'S CONVENIENCE

```
      COMMON /DUMMY/ DUM(50)
      DIMENSION IDUM(50)
      EQUIVALENCE (DUM(1),IDUM(1))
```

DUM	free

ACCEPTANCE AND TRIGGER INFORMATION

```
      COMMON /EVTRIG/ OUTSI(2,15),DEADJ(2,15),ELOS(2,5),MFAIL(2)
     1  ,INFER(2),INSIDE,DEAD,LTRIG
      LOGICAL LTRIG,OUTSI,ELOS,DEAD,DEADJ,MFAIL,INFER,INSIDE
```

OUTSID	outside the apparatus (particle)
ELOST	lost by energy loss (particle)
LTRIG	accepted by trigger (event)

PROGRAM STEERING FLAGS

```
      COMMON /FLAGC/ EXITFL,TIMEXE,TIMLIM,HISTOS,ISTOS(7)
     1  ,DEBFL,IDEBI,IDEBF,PATHO,MAXPAT,NPAT,ENLOSS,MUSCAT
     2  ,FIELD,FIELDF,TRIGFL,HSTOR,ISTOR(4),BKGFL,NTUPLE(2)
      LOGICAL EXITFL,HISTOS,DEBFL,PATHO,ENLOSS,MUSCAT
     1  ,TRIGFL,HSTOR,BKGFL,NTUPLE
      PARAMETER (NWNTUP = 3)
      COMMON /NTUPL/ IDNTU,VARNTU(NWNTUP),TAGNTU(NWNTUP)
```

```
      CHARACTER*8 TAGNTU
      COMMON /FLAGJ/ IPASS,LASRUN,LENDRN,MODEVT,PYTHIA,PRPYST
     3  ,IDEBAC,IDEBTR,PRGEOM,FERMI,SPREAD,ETOBIN
     4  ,AIRFL,LBEGRN
      LOGICAL PRGEOM,LENDRN,FERMI,SPREAD,PYTHIA,PRPYST
     1  ,ETOBIN,AIRFL,LBEGRN,LASRUN
```

ENLOSS	energy loss requested
MUSCAT	multiple scattering requested
HISTOS	histogramming requested
NTUPLE	flag of ntuple histogram(s)
NWNTUP	number of words in Ntuple
VARNTU	variables filled in Ntuple
TAGNTU	variable names filled in Ntuple
EXITFL	end of job
TRIGFL	trigger rejection requested
IDEBI	first event for debug print-out
IDEBF	last event for debug print-out
DEBFL	debug requested
TIMEXE	maximum execution time (for interactive purpose)
TIMLIM	mimimum left time before recovery
MODEVT	modulo of IEVENT to check time limit
LENDRN	end-of-run condition
FIELD	field factor
FIELDF	field sign
PATHO	pathological event flag
NPAT	current number of pathological events
MAXPAT	maximum number of patho events to be printed
IDEBAC	debug accepted events (geometry)
IDEBTR	debug accepted events (trigger)
PRGEOM	print geometry parameters
PYTHIA	pythia flag
PRPYST	print-out of Pythia statistics
FERMI	Fermi motion requested
ETOBIN	Drell-Yan generation per sqrt(s) bins requested
SPREAD	momentum spread requested
AIRFL	accept only "air" events

HISBOOK : COMMON FOR HBOOK4

```
      PARAMETER (NHMEM = 300000)
      COMMON /PAWC/ HMEM (NHMEM)
```

NHMEM	number of words in common PAWC
HMEM	words of common PAWC

HIJET : DESCRIPTION OF ACCEPTED TRACKS

```
      PARAMETER (MTOPRI = 400)
      COMMON /HIJET/ NTOPRI,NEVSTU
     1  ,IDPAR(MTOPRI),XXPAR(MTOPRI),YYPAR(MTOPRI),ZZPAR(MTOPRI)
     2  ,PXPAR(MTOPRI),PYPAR(MTOPRI),PZPAR(MTOPRI),ENPAR(MTOPRI)
     3  ,IGEPAR(MTOPRI),XLPAR(MTOPRI)
```

MTOPRI	maximum number of accepted tracks per event
NTOPRI	number of accepted tracks per event
NEVSTU	number of studied tracks = sum(NTOPRI)
IDPAR	HIJET identifier (track)
XXPAR	x-coord of creation (track)
YYPAR	y-coord of creation (track)
ZZPAR	z-coord of creation (track)
PXPAR	Px (track)
PYPAR	Py (track)
PZPAR	Pz (track)
IGEPAR	number of the interaction (track)
XLPAR	distance before next interaction (track)

EVENT COUNTERS

```
      COMMON /ICOUNC/ NRUN,NSETUP,NEVENT,IEVENT,ACCEPT(2),IPART
      LOGICAL ACCEPT
      PARAMETER (MXCOUN = 80)
      COMMON /ICOUNJ/ NVERSJ,NVERJA,MAXEV,MAXACC,ICOUNT(MXCOUN)
      CHARACTER*8 NVERJA
      COMMON /ICOUN1/ KEVENT,IMUMIN,JMUMIN,IPROCS,JPROCS
      COMMON /ICOUN2/ ISEED(2),LUX,PASS1
```

NRUN	run number
NSETUP	parameter version number
MAXEV	maximum number of events to process
MAXACC	requested maximum number of accepted events
IEVENT	current event number
NEVENT	current event number for reconstruction
ACCEPT	accepted by apparatus (EVENT or reconstruction)
IPART	number of particles in the current event
NVERSJ	program version date (DDMMY)
NVERJA	program version
ICOUNT	acceptance counters (per event)
ISEED	initial random number (RSEED for VAX)
LUX	luxuary level for random number generation
KEVENT	number of primary interactions
IMUMIN	minimum index for loop in PROCES (option MUDECAY)
JMUMIN	in case of recovery

EVENT GENERATION KINEMATICS

```
      COMMON /GENPAR/ VTXMC(3),DMASS(2),CH(2),PDIMLB(5)
     1  ,DIMMAS,RAPIMC,PTDIMC,CTCSMC,PHCSMC,XFMC,RTAU,TAU
     2  ,PDCMMC(4),CTCMMC,PHCMMC,PCSMC(4,2),PLBMC(4,2),REMDIM
     3  ,DMUMC(8,4,2),ATRMC(2,3,2),XTRMC(2,3,2),PTRMC(2)
      COMMON /KINEMC/ IMOM,RUNTYP,RUNSTY,BTYPE,TRITYP,TRISTY
      CHARACTER RUNTYP*16,BTYPE*8,TRITYP*16,RUNSTY*16,TRISTY*16
      PARAMETER (MCNWGT = 25)
      COMMON /WGTS/ WGHTMC(MCNWGT),WNORM(MCNWGT),FIXWGT(MCNWGT)
      COMMON /DIMGEN/ GBEMAS,GPBEAM(5),GTGMAS,GPTGT(5),GCDM(4),GETOTCM
     1  ,GIBEAM,SBEAM,ZNOBEA,ANOBEA,BEAMCH,BMATNB,TARLGT
     2  ,NTBIN,DIVBM(3),SIGDBM(2),MATCIB,PTGTMA
     3  ,IFLGEN,FLGEN(2,3),IFLRES,VALMIN(2),VALMAX(2)
     4  ,DIMMIN,DIMMAX,YMIN,YMAX,PTMIN,PTMAX,TSTMIN,TSTMAX,IFRAME
      INTEGER GIBEAM
      CHARACTER*2 FLGEN
      COMMON /PDFDAT/ VALEUR(2),NSET(2),PDFPAR(2)
      COMMON /PDFTRS/ PARAM(20),VALUES(20)
      CHARACTER PARAM*20,NSET*4,PDFPAR*8
      REAL*8 VALUES
      COMMON /W50517/ N6
      PARAMETER (NXXLT = 150,NYXLT = 50)
      PARAMETER (NXMPS = 100,NYMPS = 10,NXMKS = 30,NYMKS = 10)
      COMMON /KINEBG/ HNXL(8,NYXLT),HNYPT(8),HNMPS(NYMPS),HNMKS(NYMKS)
```

GPBEAM	beam lab. 5-vector (PX,PY,PZ,E,P)
GBEMAS	beam particle mass if not ion, else nucleon mass
GIBEAM	beam type (pi, K, p, pbar, O, S, Pb)
ZNOPRO	beam atomic number
ANOPRO	beam atomic mass
BMATNB	beam ion mass for Fermi in the projectile
BEAMCH	beam particle charge
SBEAM	beam rms spread at target
DIVBM	components of beam direction (X,Y,Z)
SIGDBM	rms of beam divergence (X,Y)
GPTGT	target lab. 5-vector (PX,PY,PZ,E,P)
GTGMAS	target particle mass
PTGTMA	maximum target lab momentum (if Fermi motion)
PDIMLB	dimuon lab 5-vector (PX,PY,PZ,E,P)
VTXMC	vertex coordinates (X,Y,Z)
GETOTCM	total energy (sqrt(S))
DIMMAS	dimuon mass
RTAU	dimuon sqrt of tau
REMDIM	reconstructed dimuon mass
PTDIMC	dimuon transverse momentum in c.m.
PDCMMC	dimuon momentum in c.m. (PX,PY,PZ,E)
CTCMMC	cosine of dimuon azimutal angle in c.m.
PHCMMC	dimuon polar angle in c.m.

CTCSMC	cos of +ve particle azimutal angle in C-S frame
PHCSMC	+ve particle polar angle in C-S frame
CH	charge of dimuon decay products
PCSMC	momentum of dimuon decay products (PX,PY,PZ,P) in C-S frame
PLBMC	momentum of dimuon decay products (PX,PY,PZ,P) in lab frame
XFMC	dimuon X Feynman
RAPIMC	dimuon pseudo-rapidity
DMUMC	muon kinematics at selected positions first index : X,Y,Z,PX,PY,PZ,P,CH 2nd index : 1 : store at Z = VERTEX 2 : store at Z = ENDABS 3 : store at Z = BEGW1 4 : not used 3rd index: particle number
ATRMC	angle of track (part.,coord,tel)
XTRMC	coord. of track (part.,coord,tel)
PTRMC	track momentum (part.) after absorber
VALMIN	minimum value for generation (see IFLGEN)
VALMAX	maximum value for generation (see IFLGEN)
DIMMIN	minimum dimuon mass for variable mass generation
DIMMAX	maximum dimuon mass for variable mass generation
YMIN	minimum dimuon Y for variable mass,Y generation
YMAX	maximum dimuon Y for variable mass,Y generation
PTMIN	minimum dimuon Pt for Pt generation
PTMAX	maximum dimuon Pt for Pt generation
TSTMIN	minimum dimuon cos(teta*) at generation
TSTMAX	maximum dimuon cos(teta*) at generation
IFLGEN	choice of variables for generation 1 = (M,y) (def), 2 = (rtau,xf), 3 = (x1,x2) N.B. If IFLRES.GT.0, IFLGEN is set to one
FLGEN	name of chosen variables for generation
IFLRES	choice of dimuons (0 = DY, 1 = psi, 2 = psi' 3 = phi, 4 = rho, 5 = omega)
PARAM (1)	choice of structure functions for generation blank = empiric, other = PDFLIB
VALUES(1)	choice of structure functions for PDFLIB
NSET	comment on PDFLIB structure functions
TAU	M**2/S
NTBIN	number of intervals in beam energy distribution
MCNWGT	number of weights
WGHTMC	weight for variable I Sans option MUDECAY : I=1,15 : cos theta*, tgt mom, beam mom, XF, PT, mass, Z vtx, R vtx, PHI vtx, phicm dim, phimu in dim ref, cos theya tgt, phi tgt, theta beam, phi beam

		Avec option MUDECAY :
	1	multiplicities of primary pions and kaons
	2	multiplicities of secondary pions
	3	multiplicities of secondary kaons
	4	Y and PT of 1st decaying hadron
	5	interaction length of 1st decaying hadron
	6	Y and PT of 2nd decaying hadron
	7	interaction length of 2nd decaying hadron
	8	nature of 1st interacting hadron giving a secondary vertex
	9	Y and PT of 1st interacting hadron ...
10	interaction length of 1st interacting hadron ...	
11	nature of 2nd interacting hadron giving a	secondary vertex
12	Y and PT of 2nd interacting hadron ...	
13	interaction length of 2nd interacting hadron ...	
14	primary vertex	
15 to 20	not used	
21	multiplicity for this event	
22	decay of first hadron (Probability of decay	before interaction)
23	decay of second hadron	
24	first secondary interaction vertex (if any)	
25	second secondary ... (if any)	
	WNORM	normalisation factor (max. weight=1.)
	IFRAME	dimuon rest frame Gottfried-Jackson (1) Collins-Sopper (def 2)
	MATCIB	target material for common MATTER
	TARLGT	integrated length of target (active or heavy)

LOGICAL UNITS

```
      PARAMETER (MXLUIN = 1, MXLUOU = 7)
      COMMON /LFILEC/ LFTIN(MXLUIN)
     1  ,LFTAPS,NTOUT,NTAPES,NMIC,LFTOUT(MXLUOU),TAPOUT(MXLUOU)
      COMMON /EPBUFF/ IBUF(8190),OBUF(8190,MXLUOU)
      INTEGER OBUF,TAPOUT
      COMMON /LFILEJ/ LFRIN,LFROUT,LFHGEN
```

LFIN	input file (card reader)
LFOUT	output file (printer)
LFTIN	data input file (BACKSIM or EXTERNAL)
LFTIM	time file (used for dayfile)
LFTERM	terminal unit (used with RECSIM)
LFRIN	input file for random number initialization
LFROUT	output file from random number generation
LFHIST	histogram saving file

LFNTUP	logical unit for ntuple
LFHGEN	histogram from hadronic collisions file
LFPAR	geometric parameter file
LFTOUT(1)	result output (accepted events)
LFTOUT(2)	result output (all events)
LFTOUT(3)	result microdst (accepted events)
LFTOUT(4)	result microdst (generated events)
TAPOUT	writing on a given tape requested
IWS	working space
OBUF	output data and parameter files buffer

GLOBAL TITLE

```
COMMON /MCTIT/ LENTIT,MTITLE
CHARACTER*80 MTITLE
```

LENTIT	title length
TITLE	title

CURRENT PARTICLE PARAMETERS

```
COMMON /MULSCT/ PIN(8),OMCMOL,CHCMOL,ENERGY,TH,MOLIER
LOGICAL MOLIER
```

PIN	current particle position, momentum and mass (X, Y, Z, PX, PY, PZ, P, charge*mass)

HITS IN WIRE CHAMBERS

```
COMMON /MWHIJ/ NWIRMC(2,8,3),WCORMC(2,8,3)
```

NWIRMC	number of wire hit (part,chamber,gap)
WCORMC	coord. of hit (part,chamber,gap) Y,U,V axis
IDELTA	clusters (0=no,-1=prev.,1=next wire)

PYTHIA INTERNAL COMMONS AND COMMON FOR COMMAND CARD

```
COMMON /LUDAT1/ MSTU(200),PARU(200),MSTJ(200),PARJ(200)
SAVE /LUDAT1/
COMMON /LUDAT2/ KCHG(500,3),PMAS(500,4),PARF(2000),VCKM(4,4)
SAVE /LUDAT2/
COMMON /LUDAT3/ MDCY(500,3),MDME(2000,2),BRAT(2000),KFDP(2000,5)
SAVE /LUDAT3/
COMMON /LUDATR/ MRLU(6),RRLU(100)
SAVE /LUDATR/
COMMON /LUJETS/ N,KPY(4000,5),PPY(4000,5),VPY(4000,5)
```

```
SAVE /LUJETS/
COMMON /PYINT1/ MINT(400),VINT(400)
COMMON /PYPARS/ MSTP(200),PARP(200),MSTI(200),PARI(200)
SAVE /PYPARS/
COMMON /PYSUBS/ MSEL,MSUB(200),KFIN(2,-40:40),CKIN(200)
SAVE /PYSUBS/
COMMON /PYTDAT/ COLTYP,NCHARM,ICHARM(8),IKT,WKT,NPDFCH,IPA(2)
INTEGER COLTYP
```

COLTYP	nucleon-nucleon collision type
NCHARM	number of charmed particles
ICHARM	Pythia code for charmed particles
IKT	parton distribution form inside hadron
WKT	parton distribution width
LIB	parton distribution function library
NPDFCH	PDFLIB choice (NGROUP*1000+NSET) If 0, PYTHIA
IPA	muon identifier

RECOVERY

```
COMMON /RECCOM/ LFPRIN,RESCUE,MAXREC,NEVREC,RECVAL(5),IRECWD(5)
LOGICAL RESCUE
```

LFPRIN	logical output file for recovery messages
RESCUE	recovery requested
MAXREC	maximum number of recoveries
NEVREC	event number at recovery time
RECVAL	real quantities to print at recovery time
IRECWD	integer quantities to print at recovery time

PATTERN OF ACTIVE SUBTARGETS

```
COMMON /SUBTAC/ ISUBTG(12),NOCIBI,NOCIBF,NOCIBF
COMMON /SUBTAJ/ NTGTAT,TARMN,TARMX
```

NTGTAT	number of actually present subtargets
NOCIBI	number of the interacting subtarget
ISUBTG	position of present subtargets

COORDINATES OF TRACKS AFTER EACH DETECTOR

```
COMMON /TRKDET/ XTRDET(7,15,2)
```

XTRDET	coordinates (coord,detector,track) coord : x,y,z,px,py,pz,p*charge detector : r1,r2,r3,r4,pc1-pc8,p1,p2,magnet

Chapter 5

DESCRIPTION OF THE AVAILABLE OPTIONS

5.1 +USE,*NORMAL IMPLIES :

+USE,COMDECKS_JET.
+USE,DIMUJET.

5.2 DRIVING AVAILABLE OPTIONS

BACKSIM	to read a HIJET tape and track secondaries
*CHARM	to call Pythia to generate charmed decays
EXTERNAL	to read an external file with dimuon parameters
MUDECAY	to simulate decays of hadrons
*PRIMARY	generation of primary particles
QUICKBKG	to read histos of secondaries
RECSIM	to call DIMUREC at the end of each event : the 1st car-file is NA50UTIL, then DIMUJET, then DIMUREC (DIMUREC in the 1st panel of DIMU XEDIT)
REINTER	to simulate reinteractions of hadrons

5.3 REMARKS

The option *PRIMARY inhibits the options BACKSIM, QUICKBKG, REINTER and MUDECAY.

Each generation option inhibits the other ones.

5.4 OTHER AVAILABLE OPTIONS

CLUSTER	to generate clusters in the chambers (12.82: of hits have 2 wires)
DIMUONS	to write a microdst with plab only

STNDUSER	to select standard set of histograms

No default generation is activated, therefore the user must select one of the possible options or write his own generation functions.

Chapter 6

DESCRIPTION OF THE PROGRAM COUNTERS

1	out of acceptance
2	range out in target
3	range out in absorber
4	range out in hodoscopes
5	range out in toroid
6	range out in iron wall
7	less than 2 V's
8	less than 2 PT's
9	D-D combinations
10	tracking through magnet fails
11	accepted events with 1 muon in iron
12	accepted events with 2 muons in iron
14	at least one muon flying backwards
17	accepted events in air (trigger)
19	accepted events (geometry)
20	accepted events in air (geometry)
21	outside R1
22	outside R2
23	outside R3
24	outside R4
25	outside PC1
26	outside PC2
27	outside PC3
28	outside PC4
29	outside PC5
30	outside PC6
31	outside PC7
32	outside PC8
33	outside P1
34	outside P2
35	outside magnet
36	$P < dx.dP/dx$ min (acceptance rapide)
41	dead R1
42	dead R2

43	dead R3
44	dead R4
45	dead PC1
46	dead PC2
47	dead PC3
48	dead PC4
49	dead PC5
50	dead PC6
51	dead PC7
52	dead PC8
53	dead P1
54	dead P2
55	dead magnet
56-60	free
61	number of Pythia collisions
62-64	number of Pythia collisions with 0,1,2 muons

Chapter 7

ALPHABETICAL INDEX OF VARIABLES

Variable	type	common	comdeck
ABEABK	REAL	BACKGD	BACKGD1
ABSBUR	LOGICAL	FLAGS	FLAGR
ACCEPT	LOGICAL	ICOUNC	ICOUNC
ACCGLO	LOGICAL	KINEMR	KINEMR
ACODE	CHARACTER	CONCOD	CODES
AIRFL	LOGICAL	FLAGJ	FLAGJ
ALAIR	CHARACTER	CONST	CONSTP
ALAPF	CHARACTER	CONST	CONSTP
ALFER	CHARACTER	CONST	CONSTP
ALIGFL	LOGICAL	FLAGS	FLAGR
ALPHAN	REAL	CONST	CONSTP
ALTER	REAL	ALTER	ALTERN
AMAT	REAL	CONCOD	CODES
ANOBEA	REAL	DIMGEN	KINEMJ
APROJ	REAL	JETDAT	JETDA1
ARGO	LOGICAL	KINEMR	KINEMR
ATARBK	REAL	BACKGD	BACKGD1
ATARG	REAL	JETDAT	JETDA1
ATRMC	REAL	GENPAR	GENPAR
BACFLG	LOGICAL	BACKFL	BACKFL1
BEAMAS	REAL	BEATGT	KINEMR
BEAMCH	REAL	DIMGEN	KINEMJ
BIDON	REAL	WORKLO	WORKLO
BKGFL	LOGICAL	FLAGC	FLAGC
BMATNB	REAL	DIMGEN	KINEMJ
BRAT	REAL	LUDAT3	PYDAT1
BTYPE	REAL	KINEMC	KINEMC
CALETR	LOGICAL	FLAGS	FLAGR
CALIFL	LOGICAL	FLAGS	FLAGR
CCIBLE	REAL	KINEMR	KINEMR
CDM	REAL	BEATGT	KINEMR
CH	REAL	GENPAR	GENPAR
CHAT	REAL	CONCOD	CODES
CHCMOL	REAL	MULSCT	MULSCT
CHOIX	LOGICAL	FLAGS	FLAGR

CKIN	REAL	PYSUBS	PYDAT1
CMUREF	REAL	KINEMR	KINEMR
CNORM	REAL	KINEMR	KINEMR
COLTYP	INTEGER	PYTDAT	PYDAT2
CORSUP	REAL	HIBOKR	HISBOKR
COSTCM	REAL	KINEMR	KINEMR
COSTCS	REAL	KINEMR	KINEMR
COSTGJ	REAL	KINEMR	KINEMR
COSTUC	REAL	KINEMR	KINEMR
CTCMMC	REAL	GENPAR	GENPAR
CTCSMC	REAL	GENPAR	GENPAR
DEAD	LOGICAL	EVTRIG	EVTRIG
DEADJ	LOGICAL	EVTRIG	EVTRIG
DEBFL	LOGICAL	FLAGC	FLAGC
DECADC	LOGICAL	FLAGS	FLAGR
DECMUL	LOGICAL	FLAGS	FLAGR
DEFEXE	LOGICAL	FLAGS	FLAGR
DHADRN	REAL	BACKGD	BACKGD1
DIMASS	REAL	KINEMR	KINEMR
DIMMAS	REAL	GENPAR	GENPAR
DIMMAX	REAL	DIMGEN	KINEMJ
DIMMIN	REAL	DIMGEN	KINEMJ
DIVBM	REAL	DIMGEN	KINEMJ
DMASS	REAL	GENPAR	GENPAR
DMUMC	REAL	GENPAR	GENPAR
DSECDR	REAL	BACKGD	BACKGD1
DUM	REAL	DUMMY	DUMMY
DVERT	REAL	BACKGD	BACKGD1
ELOS	LOGICAL	EVTRIG	EVTRIG
EMUMIN	REAL	COUPUR	COUPUR
ENERGY	REAL	MULSCT	MULSCT
ENESUP	REAL	HIBOKR	HISBOKR
ENLOSS	LOGICAL	FLAGC	FLAGC
ENPAR	REAL	HIJET	HIJET1
EORBLK	LOGICAL	FLAGS	FLAGR
EPILUP	LOGICAL	FLAGS	FLAGR
ETHIBK	REAL	BACKGD	BACKGD1
ETLOBK	REAL	BACKGD	BACKGD1
ETOBIN	LOGICAL	FLAGJ	FLAGJ
ETOTAL	REAL	BEATGT	KINEMR
ETRSUP	REAL	HIBOKR	HISBOKR
EXITFL	LOGICAL	FLAGC	FLAGC
FERMI	LOGICAL	FLAGJ	FLAGJ
FIELD	REAL	FLAGC	FLAGC
FIELDF	REAL	FLAGC	FLAGC
FIXWGT	REAL	WGTS	KINEMC
FLGEN	CHARACTER	DIMGEN	KINEMJ
FLKAPI	INTEGER	BACKGD	BACKGD1

FLPLMO	INTEGER	BACKGD	BACKGD1
FLRDHV	LOGICAL	FLAGS	FLAGR
FLSEPR	INTEGER	BACKGD	BACKGD1
GBEMAS	REAL	DIMGEN	KINEMJ
GCDM	REAL	DIMGEN	KINEMJ
GETOTCM	REAL	DIMGEN	KINEMJ
GIBEAM	INTEGER	DIMGEN	KINEMJ
GPBEAM	REAL	DIMGEN	KINEMJ
GPTGT	REAL	DIMGEN	KINEMJ
GTGMAS	REAL	DIMGEN	KINEMJ
HALLPR	REAL	FLAGS	FLAGR
HISTOD	LOGICAL	FLAGS	FLAGR
HISTOS	LOGICAL	FLAGC	FLAGC
HMEM	REAL	PAWC	HISBOKC
HNMKS	REAL	KINEBG	KINEBG
HNMPS	REAL	KINEBG	KINEBG
HNXL	REAL	KINEBG	KINEBG
HNYPT	REAL	KINEBG	KINEBG
HODOS	LOGICAL	FLAGS	FLAGR
HSTO	REAL	FLAGS	FLAGR
HSTOR	LOGICAL	FLAGC	FLAGC
IASCMC	INTEGER	HITSR	HITSR
IASXMC	INTEGER	HITSR	HITSR
IBEAM	INTEGER	BEATGT	KINEMR
IBUF	INTEGER	EPBUFF	LFILEC
ICHARM	INTEGER	PYTDAT	PYDAT2
ICOUNT	INTEGER	ICOUNJ	ICOUNJ
IDCAL	INTEGER	HIBOKR	HISBOKR
IDDIM1	INTEGER	HIBOKR	HISBOKR
IDDIM2	INTEGER	HIBOKR	HISBOKR
IDEBAC	INTEGER	FLAGJ	FLAGJ
IDEBF	INTEGER	FLAGC	FLAGC
IDEBI	INTEGER	FLAGC	FLAGC
IDEBTR	INTEGER	FLAGJ	FLAGJ
IDNTU	INTEGER	NTUPL	FLAGC
IDPAR	INTEGER	HIJET	HIJET1
IDTAR	INTEGER	HIBOKR	HISBOKR
IERRMH	INTEGER	COUNTS	ICOUNR
IEVBUR	INTEGER	ICOUNR	ICOUNR
IEVENT	INTEGER	ICOUNC	ICOUNC
IEVTIM	INTEGER	ICOUNR	ICOUNR
IFAIL	INTEGER	COUNTS	ICOUNR
IFEVE	INTEGER	FLAGS	FLAGR
IFLGEN	INTEGER	DIMGEN	KINEMJ
IFLRES	INTEGER	DIMGEN	KINEMJ
IFRAME	INTEGER	DIMGEN	KINEMJ
IFRUN	INTEGER	ICOUNR	ICOUNR
IFRUNJ	INTEGER	ICOUNR	ICOUNR

IGEAN	INTEGER	CONCOD	CODES
IGEPAR	INTEGER	HIJET	HIJET1
IKT	INTEGER	PYTDAT	PYDAT2
ILEVE	INTEGER	FLAGS	FLAGR
IMOM	INTEGER	KINEMC	KINEMC
IMUMIN	INTEGER	ICOUN1	ICOUN1
INFER	LOGICAL	EVTRIG	EVTRIG
INSEC	LOGICAL	MAGNAC	MAGNAC
INSIDE	LOGICAL	EVTRIG	EVTRIG
INSLOT	LOGICAL	MAGNAC	MAGNAC
IPA	INTEGER	PYTDAT	PYDAT2
IPART	INTEGER	ICOUNC	ICOUNC
IPASS	INTEGER	FLAGJ	FLAGJ
IPDIMU	INTEGER	KINEMR	KINEMR
IPROCS	INTEGER	ICOUN1	ICOUN1
IRAW	INTEGER	RAWDAT	RAWDAP
IRECOV	INTEGER	COUNTS	ICOUNR
IRECWD	INTEGER	RECCOM	RECCOM
ISEED	INTEGER	ICOUN2	ICOUN2
ISRUN	INTEGER	FLAGS	FLAGR
ISTO	INTEGER	FLAGS	FLAGR
ISTOR	INTEGER	FLAGC	FLAGC
ISTOS	INTEGER	FLAGC	FLAGC
ISUBTG	INTEGER	SUBTAC	SUBTAC
ISXCB	INTEGER	ICOUNR	ICOUNR
ITRTP	INTEGER	ICOUNR	ICOUNR
IWS	INTEGER		BLANK
JFLAG	INTEGER	ALTER	ALTERN
JMUMIN	INTEGER	ICOUN1	ICOUN1
JPROCS	INTEGER	ICOUN1	ICOUN1
J100	INTEGER	HIBOKR	HISBOKR
J27	INTEGER	HIBOKR	HISBOKR
J35	INTEGER	HIBOKR	HISBOKR
J40	INTEGER	HIBOKR	HISBOKR
KCHG	INTEGER	LUDAT2	PYDAT1
KEVENT	INTEGER	ICOUN1	ICOUN1
KFDP	INTEGER	LUDAT3	PYDAT1
KFIN	INTEGER	PYSUBS	PYDAT1
KITTEL	INTEGER	COUNTS	ICOUNR
KPY	INTEGER	LUJETS	PYDAT1
KURTMP	INTEGER	COUNTS	ICOUNR
LASRUN	LOGICAL	FLAGJ	FLAGJ
LBEGRN	LOGICAL	FLAGJ	FLAGJ
LCUT	INTEGER	ICOUNR	ICOUNR
LENDRN	LOGICAL	FLAGJ	FLAGJ
LENTIT	INTEGER	MCTIT	MCTIT
LEVRUN	INTEGER	ICOUNR	ICOUNR
LFCALO	INTEGER	LFILER	LFILER

LFHGEN	INTEGER	LFILEJ	LFILEJ
LFMETA	INTEGER	LFILER	LFILER
LFPEDO	INTEGER	LFILER	LFILER
LFPRIN	INTEGER	RECCOM	RECCOM
LFRIN	INTEGER	LFILEJ	LFILEJ
LFROUT	INTEGER	LFILEJ	LFILEJ
LFSCA	INTEGER	LFILER	LFILER
LFSEL	INTEGER	LFILER	LFILER
LFTAPS	INTEGER	LFILEC	LFILEC
LFTIN	INTEGER	LFILEC	LFILEC
LFTOUT	INTEGER	LFILEC	LFILEC
LFTRM	INTEGER	LFILER	LFILER
LISTEV	LOGICAL	FLAGS	FLAGR
LISTRN	LOGICAL	FLAGS	FLAGR
LSTBLK	INTEGER	ICOUNR	ICOUNR
LSTRUN	INTEGER	FLAGS	FLAGR
LTRIG	LOGICAL	EVTRIG	EVTRIG
LUX	INTEGER	ICOUN2	ICOUN2
MATCB	INTEGER	JETDAT	JETDA1
MATCIB	INTEGER	DIMGEN	KINEMJ
MAXACC	INTEGER	ICOUNJ	ICOUNJ
MAXEV	INTEGER	ICOUNJ	ICOUNJ
MAXPAT	INTEGER	FLAGC	FLAGC
MAXREC	INTEGER	RECCOM	RECCOM
MCACPT	LOGICAL	FLAGS	FLAGR
MCPHSP	LOGICAL	FLAGS	FLAGR
MDCY	INTEGER	LUDAT3	PYDAT1
MDME	INTEGER	LUDAT3	PYDAT1
MFAIL	LOGICAL	EVTRIG	EVTRIG
MGFAIL	LOGICAL	MAGNAC	MAGNAC
MINBIA	LOGICAL	ICOUNR	ICOUNR
MINT	INTEGER	PYINT1	PYDAT1
MODEVT	INTEGER	FLAGJ	FLAGJ
MOLIER	LOGICAL	MULSCT	MULSCT
MRLU	INTEGER	LUDATR	PYDAT1
MSEL	INTEGER	PYSUBS	PYDAT1
MSTI	INTEGER	PYPARS	PYDAT1
MSTJ	INTEGER	LUDAT1	PYDAT1
MSTP	INTEGER	PYPARS	PYDAT1
MSTU	INTEGER	LUDAT1	PYDAT1
MSUB	INTEGER	PYSUBS	PYDAT1
MTITLE	CHARACTER	MCTIT	MCTIT
MULFLG	LOGICAL	FLAGS	FLAGR
MUSCAT	LOGICAL	FLAGC	FLAGC
MXCTMC	INTEGER	HITSR	HITSR
N	INTEGER	LUJETS	PYDAT1
NACCDB	INTEGER	FLAGS	FLAGR
NBDIMS	INTEGER	KINEMR	KINEMR

NBDIMU	INTEGER	KINEMR	KINEMR
NBEST	INTEGER	KINEMR	KINEMR
NBHADR	INTEGER	BACKGD	BACKGD1
NBHPRI	INTEGER	BACKGD	BACKGD1
NBHSEC	INTEGER	BACKGD	BACKGD1
NBINM	INTEGER	HIBOOK	HIBOOK
NBINPT	INTEGER	HIBOOK	HIBOOK
NBINTS	INTEGER	HIBOOK	HIBOOK
NBINV1	INTEGER	HIBOOK	HIBOOK
NBINV2	INTEGER	HIBOOK	HIBOOK
NBINY	INTEGER	HIBOOK	HIBOOK
NBLOCS	INTEGER	ICOUNR	ICOUNR
NBURPR	INTEGER	FLAGS	FLAGR
NCALIB	INTEGER	FLAGS	FLAGR
NCHARM	INTEGER	PYTDAT	PYDAT2
NCOUNT	INTEGER	COUNTS	ICOUNR
NDEBA	INTEGER	FLAGS	FLAGR
NDEBF	INTEGER	FLAGS	FLAGR
NDEBI	INTEGER	FLAGS	FLAGR
NEVENT	INTEGER	ICOUNC	ICOUNC
NEVREC	INTEGER	RECCOM	RECCOM
NEVRUN	INTEGER	ICOUNR	ICOUNR
NEVSTU	INTEGER	HIJET	HIJET1
NFBUR	INTEGER	FLAGS	FLAGR
NFEVE	INTEGER	FLAGS	FLAGR
NITTEL	INTEGER	COUNTS	ICOUNR
NLBUR	INTEGER	FLAGS	FLAGR
NLEVE	INTEGER	FLAGS	FLAGR
NMIC	INTEGER	LFILEC	LFILEC
NOCIBF	INTEGER	SUBTAC	SUBTAC
NOCIBI	INTEGER	SUBTAC	SUBTAC
NOCIBR	INTEGER	SUBTAR	SUBTRR
NOCICE	INTEGER	SUBTAR	SUBTRR
NOCIOV	INTEGER	SUBTAR	SUBTRR
NOHALO	LOGICAL	SUBTAR	SUBTRR
NOSLS	INTEGER	KINEMR	KINEMR
NPAT	INTEGER	FLAGC	FLAGC
NPDFCH	INTEGER	PYTDAT	PYDAT2
NPER	INTEGER	ICOUNR	ICOUNR
NRBOB	INTEGER	RAWDAT	RAWDAP
NRBOE	INTEGER	RAWDAT	RAWDAP
NRBOR	INTEGER	RAWDAT	RAWDAP
NRCODE	INTEGER	ICOUNR	ICOUNR
NREOE	INTEGER	RAWDAT	RAWDAP
NRUN	INTEGER	ICOUNC	ICOUNC
NRWADC	INTEGER	RAWDAT	RAWDAP
NSCTMC	INTEGER	HITSR	HITSR
NSET	INTEGER	PDFDAT	KINEMJ

NSETUP	INTEGER	ICOUNC	ICOUNC
NSPS	INTEGER	ICOUNR	ICOUNR
NSTEPH	INTEGER	HIBOKR	HISBOKR
NSTOLD	INTEGER	FLAGS	FLAGR
NSUBTG	INTEGER	SUBTAR	SUBTRR
NSXTMC	INTEGER	HITSR	HITSR
NTAPES	INTEGER	LFILEC	LFILEC
NTBIN	INTEGER	DIMGEN	KINEMJ
NTGBKG	INTEGER	SUBTAR	SUBTRR
NTGTAT	INTEGER	SUBTAJ	SUBTAJ
NTHIT	INTEGER	MWHIR	MWHIR
NTOPRI	INTEGER	HIJET	HIJET1
NTOUT	INTEGER	LFILEC	LFILEC
NTRIGG	INTEGER	ICOUNR	ICOUNR
NTUPLE	LOGICAL	FLAGC	FLAGC
NVERJA	CHARACTER	ICOUNJ	ICOUNJ
NVEROF	INTEGER	ICOUNR	ICOUNR
NVERON	INTEGER	ICOUNR	ICOUNR
NVERRA	INTEGER	ICOUNR	ICOUNR
NVERSJ	INTEGER	ICOUNJ	ICOUNJ
NVERSM	INTEGER	ICOUNR	ICOUNR
NVERSR	INTEGER	ICOUNR	ICOUNR
NVERSS	INTEGER	ICOUNR	ICOUNR
NVSEL	INTEGER	KINEMR	KINEMR
NWIRMC	INTEGER	MWHIJ	MWHIJ
NYVEOF	INTEGER	ICOUNR	ICOUNR
NZHTAR	INTEGER	KINEMR	KINEMR
N0CIBF	INTEGER	SUBTAC	SUBTAC
N0SELD	INTEGER	COUNTS	ICOUNR
N6	INTEGER	W50517	KINEMJ
OBUF	INTEGER	EPBUFF	LFILEC
OMCMOL	REAL	MULSCT	MULSCT
OSLS	INTEGER	KINEMR	KINEMR
OUTSI	LOGICAL	EVTRIG	EVTRIG
PARAM	REAL	PDFTRS	KINEMJ
PARBBK	REAL	BACKGD	BACKGD1
PARDIM	REAL	KINEMR	KINEMR
PARF	REAL	LUDAT2	PYDAT1
PARI	REAL	PYPARS	PYDAT1
PARJ	REAL	LUDAT1	PYDAT1
PARP	REAL	PYPARS	PYDAT1
PARU	REAL	LUDAT1	PYDAT1
PASS1	REAL	ICOUN2	ICOUN2
PASS1	REAL	ICOUN2	ICOUN3
PATHO	LOGICAL	FLAGC	FLAGC
PATREC	LOGICAL	FLAGS	FLAGR
PBEABK	REAL	BACKGD	BACKGD1
PBEAD	REAL	KINEMR	KINEMR

PBEAM	REAL	BEATGT	KINEMR
PCMMAX	REAL	KINEMR	KINEMR
PCS	REAL	KINEMR	KINEMR
PCSMC	REAL	GENPAR	GENPAR
PDCMMC	REAL	GENPAR	GENPAR
PDFPAR	REAL	PDFDAT	KINEMJ
PDIMCM	REAL	KINEMR	KINEMR
PDIMLB	REAL	GENPAR	GENPAR
PGJ	REAL	KINEMR	KINEMR
PHCMMC	REAL	GENPAR	GENPAR
PHCSMC	REAL	GENPAR	GENPAR
PHICM	REAL	KINEMR	KINEMR
PHICS	REAL	KINEMR	KINEMR
PHIGJ	REAL	KINEMR	KINEMR
PHIUC	REAL	KINEMR	KINEMR
PIN	REAL	MULSCT	MULSCT
PLAB	REAL	KINEMR	KINEMR
PLBMC	REAL	GENPAR	GENPAR
PMAS	REAL	LUDAT2	PYDAT1
PPY	REAL	LUJETS	PYDAT1
PRFL	LOGICAL	FLAGS	FLAGR
PRGEOM	LOGICAL	FLAGJ	FLAGJ
PRIBUR	LOGICAL	FLAGS	FLAGR
PRPYST	LOGICAL	FLAGJ	FLAGJ
PTCUT	REAL	COUPUR	COUPUR
PTDIM	REAL	KINEMR	KINEMR
PTDIMC	REAL	GENPAR	GENPAR
PTGT	REAL	BEATGT	KINEMR
PTGTD	REAL	KINEMR	KINEMR
PTGTMA	REAL	DIMGEN	KINEMJ
PTMAX	REAL	DIMGEN	KINEMJ
PTMIN	REAL	DIMGEN	KINEMJ
PTRMC	REAL	GENPAR	GENPAR
PUC	REAL	KINEMR	KINEMR
PXPAR	REAL	HIJET	HIJET1
PYPAR	REAL	HIJET	HIJET1
PYTHIA	LOGICAL	FLAGJ	FLAGJ
PZPAR	REAL	HIJET	HIJET1
RAPID	REAL	KINEMR	KINEMR
RAPIMC	REAL	GENPAR	GENPAR
RDRAW	LOGICAL	FLAGS	FLAGR
RDSPLT	LOGICAL	FLAGS	FLAGR
RDSTFL	LOGICAL	FLAGS	FLAGR
RECVAL	REAL	RECCOM	RECCOM
REJBUR	LOGICAL	FLAGS	FLAGR
REMDIM	REAL	GENPAR	GENPAR
RESCUE	LOGICAL	RECCOM	RECCOM
RHOD	REAL	CONST	CONSTP

RRLU	REAL	LUDATR	PYDAT1
RSEED	REAL	ICOUN2	ICOUN3
RTAU	REAL	GENPAR	GENPAR
RUNDAY	INTEGER	ICOUNR	ICOUNR
RUNHUR	INTEGER	ICOUNR	ICOUNR
RUNLAS	LOGICAL	ICOUNR	ICOUNR
RUNMIN	INTEGER	ICOUNR	ICOUNR
RUNMON	INTEGER	ICOUNR	ICOUNR
RUNPED	LOGICAL	ICOUNR	ICOUNR
RUNSTY	REAL	KINEMC	KINEMC
RUNTYP	REAL	KINEMC	KINEMC
RUNYER	INTEGER	ICOUNR	ICOUNR
SBEAM	REAL	DIMGEN	KINEMJ
SECIN	REAL	MAGNAC	MAGNAC
SECOUT	REAL	MAGNAC	MAGNAC
SIGDBM	REAL	DIMGEN	KINEMJ
SIMUFL	LOGICAL	FLAGS	FLAGR
SPREAD	LOGICAL	FLAGJ	FLAGJ
SS	REAL	JETDAT	JETDA1
TAGNTU	CHARACTER	NTUPL	FLAGC
TAPOUT	REAL	LFILEC	LFILEC
TARGET	LOGICAL	FLAGS	FLAGR
TARLEN	REAL	BEATGT	KINEMR
TARLGT	REAL	DIMGEN	KINEMJ
TARMN	REAL	SUBTAJ	SUBTAJ
TARMX	REAL	SUBTAJ	SUBTAJ
TAU	REAL	GENPAR	GENPAR
TEL	CHARACTER	CONST	CONSTP
TGTMAS	REAL	BEATGT	KINEMR
TH	REAL	MULSCT	MULSCT
TIME	REAL	ICOUNR	ICOUNR
TIMEXE	REAL	FLAGC	FLAGC
TIMLIM	REAL	FLAGC	FLAGC
TRIGFL	LOGICAL	FLAGC	FLAGC
TRISTY	REAL	KINEMC	KINEMC
TRITYP	REAL	KINEMC	KINEMC
TSTADC	LOGICAL	FLAGS	FLAGR
TSTMAX	REAL	DIMGEN	KINEMJ
TSTMIN	REAL	DIMGEN	KINEMJ
VALEUR	REAL	PDFDAT	KINEMJ
VALMAX	REAL	DIMGEN	KINEMJ
VALMIN	REAL	DIMGEN	KINEMJ
VALUES	REAL	PDFTRS	KINEMJ
VARNTU	REAL	NTUPL	FLAGC
VCKM	REAL	LUDAT2	PYDAT1
VERDIM	REAL	KINEMR	KINEMR
VERTEX	LOGICAL	FLAGS	FLAGR
VINT	REAL	PYINT1	PYDAT1

VPY	REAL	LUJETS	PYDAT1
VTXMC	REAL	GENPAR	GENPAR
VTXPAR	REAL	BACKGD	BACKGD1
WCORMC	REAL	MWHIJ	MWHIJ
WGHTMC	REAL	WGTS	KINEMC
WKT	REAL	PYTDAT	PYDAT2
WNORM	REAL	WGTS	KINEMC
XDATE	REAL	ICOUN2	ICOUN3
XDIM	REAL	KINEMR	KINEMR
XFMC	REAL	GENPAR	GENPAR
XLPAR	REAL	HIJET	HIJET1
XTIME	REAL	ICOUN2	ICOUN3
XTRDET	REAL	TRKDET	TRKDET
XTRMC	REAL	GENPAR	GENPAR
XXPAR	REAL	HIJET	HIJET1
YMAX	REAL	DIMGEN	KINEMJ
YMIN	REAL	DIMGEN	KINEMJ
YYPAR	REAL	HIJET	HIJET1
ZNOBEA	REAL	DIMGEN	KINEMJ
ZPROJ	REAL	JETDAT	JETDA1
ZTARG	REAL	JETDAT	JETDA1
ZZPAR	REAL	HIJET	HIJET1

Chapter 8

ORGANIGRAMME

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DIMUJE
——> INIT_JET
        ——>     READCD_JET
        ——>     GEOMET
        ——>     SETGEO_JET
                ——>     DEFBOR
        ——>     DEFBEA
        ——>     GENER
                ——>     ARCSH
                ——>     CINEM
                ——>     RELGEN
                        ——>     FLON
                        ——>     NEXTPI
        ——>     GENDIM
                ——>     DISPI
        ——>     GENBDF
                ——>     HFCPD
                ——>     MAKSLI
                        ——>     MAKNOR
                ——>     YMAXLB
                ——>     NORMWT
                ——>     PXPYPZ
                ——>     PROLON
                        ——>     PROJCT
                        ——>     ELOSS
                        ——>     GMUL
                                ——>     GMOLIE
                                        ——>     GMOL4
                ——>     DECAY
                ——>     KINBDF
                ——>     GKCUTS
        ——>     INITPY
        ——>     WORD
        ——>     INITRX
        ——>     HISBUK_JET
        ——>     USER_JET
——> PROCES_JET
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        ———->       RELBAC
                    ———->       FLON
        ———->       BEGRUN_JET
                    ———->       IFRCHN
                    ———->       NFIX
        ———->       RANVRT
        ———->       GENBDF
        ———->       GENDIM
        ———->       GENER
        ———->       USER_JET
        ———->       EVENT
                    ———->       PROJCT
                    ———->       ELOSS
                    ———->       GMUL
                    ———->       HITCH
                                ———->       PROJCT
                    ———->       HITR_JET
                                ———->       PROJCT
                    ———->       HITS
                                ———->       PROJCT
                    ———->       TRACE
                                ———->       PROJCT
                                ———->       NYSTRK
                                ———->       ELOSS
                                ———->       GMUL
        ———->       TRIGGR
        ———->       RECONS
        ———->       DIGIT
        ———->       PDEBUG
                    ———->       DIGIT
        ———->       WRITEV
                    ———->       NFIX
                    ———->       DIGIT
        ———->       ENDRUN
———-> FINISH_JET
        ———->       USER_JET
        ———->       ENDRUN
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