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JADE - Computer Note 3

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STATUS OF MONTE-CARLO and OFF-LINE PROGRAMS

I.1 Monte-Carlo Events

Monte-Carlo generated test events with pions only are available for :

a) jet model

b) phase space model

c) two photon events.

All these events are calculated for beam energies of 15 GeV, about 4000 events of each type are available.

The data format has been described in a note which was distributed on June 6, 1976.

Remark : The data format will be changed at some time, because the present format has turned out to be inconvenient.

I.2 Monte-Carlo tracking routines

Tracking routines for charged particles are available to track through the central detector, central lead glass array and the muon filter. A tracking routine for photons has also been implemented.

I.2.1 Tracking through the drift chambers

Charged particles are tracked through the central detector drift chambers;

a) the wire coordinates are approximately correct;

b) the magnetic field is 5 kGauss;

c) a tilt angle of the wire acceptance of 7.5^{o} is assumed;

d) one clock is assumed for a group of 8 wires;

e) no smearing and multiple scattering is assumed.

I.2.2 Lead glass arrays

a) the energy deposit for photons and electrons is fitted to an empirical shower profile,

b) all other particles are assumed to be minimum ionizing. The energy deposit is 5.83 MeV/cm.

c) Yamada in Tokyo is working on a more sophisticated program to simulate tracks in the lead glass arrays.

I.2.3 Photon tracking.

For photons conversion in the beam pipe and the inner wall of the tank is taken into account.

Electron pairs are produced with correct energy and angular distributions. Photons which convert in the coil and the outer wall of the tank are assumed to continue in the same direction as electrons, however.

I.2.4 Muon filter.

Muons are tracked through the muon filter without nuclear interaction. A brief outline of the procedure is as follows :

a) The chambers and muon-filter concrete blocks are in an approximately correct final configuration.

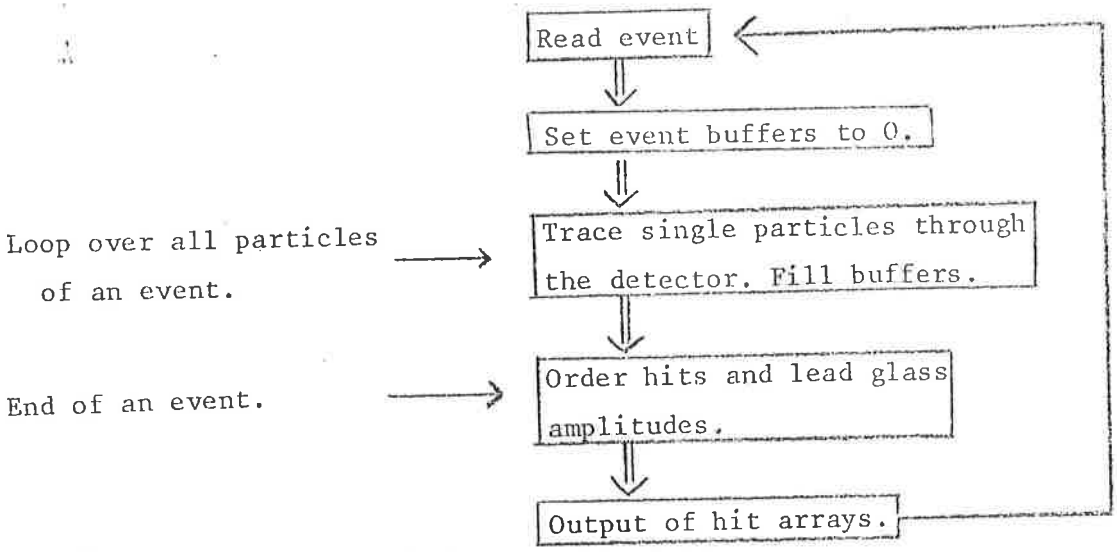
b) Bending of the tracks is performed in the magnet yoke (inner steel shielding).

c) The tracking is performed in a step-by-step manner with the length of material traversed (concrete, iron) at each step being calculated. Thus it is easy to insert Coulomb scattering interactions and decays.

d) The hits registered are ordered according to some preliminary version of the readout scheme.

I.3 Structure of the Monte-Carlo program.

The Monte-Carlo program is structured as follows :



The following output formats are available :

a) Wire arrays :

Pointers (4)	Wire array WARR (max. 6000)

All quantities are INTEGER*2.

Pointer (1) - points to the last word in the wire array.
Pointer (2) - points to the first word of the first ring (usually 1).
Pointer (3) - points to the first word in the second ring.
Pointer (4) - points to the first word in the third ring.

WARR (1) - number of hits on a wire.
WARR (2) - wire number
WARR (3) - left amplitude
WARR (4) - right amplitude
WARR (5) - drift time.

Items 3 - 5 are repeated as many times as there are hits on the specific wire.

These data are also available on direct access files for testing purposes.

b) Test array :

Pointers (40)	ARRAY (max. 12.000)

All quantities are INTEGER*2.

Pointer (1) - points to the last word in ARRAY
Pointer (2) - number of tracks
Pointer (3) - points to the first word of the first track

. .
. .
. .
. .
. .

Pointer (n) - points to the first word of the n^{th} track.

ARRAY :

1^{st} word - wire number
2^{nd} word - drift time
3^{rd} word - R in 0.1 mm
4^{th} word - ϕ in 0.1 mrad (ϕ may be negative or positive)
5^{th} word - Z in mm
6^{th} word - left amplitude.

Word 1 - 6 is repeated as often as there are wires hit for a specific track.

c) Lead glass array :

Pointer (1)	ARRAY (max. 12.000)

All quantities are INTEGER*2.

Pointer - points to the last word in ARRAY
1^{st} word - block number
2^{nd} word - energy in MeV.

d) Muon filter array :

At the moment this contains

Pointers (13)	DATA ARRAY (max. 1680)

Pointers are all I * 4

DATA ARRAY is I * 2

DATA ARRAY = HMUDAT (1680)

Pointer (1)	IWP	points to last word of DATA ARRAY
Pointer (2)	IWDFC1 (1)	Pointer to the first word in faces
.	.	1 .... 6 of the muon filter (see JADE-
.	.	Note No. 9) on IMUDAT.
.	.	
(7)	(6)	= 0 if no words written for the face.
Pointer (8)	NFCWDS (1)	No. of (I * 2) words on IMUDAT
.	.	for faces 1 ..... 6 of the muon filter.
.	.	
.	.	
(13)	(6)	

IMUDAT (1)	Chamber No.	)
(2)	Drift time (clock pulses)	) for firs hit
(3)	Longitudinal time (clock pulses)	)
.		
.		
.		
.		
(3I - 2)	Ditto for the I^{th} hit	
(3I - 1)		
(3I)		
.		
.		
.		
.		

II. IPS display routines.

The following display routines are available which can be used for event scanning.

a) R,ϕ view of the detector with tracks and mirror images.

b) R,ϕ view with fitted parabola through high energy tracks, option to clear mirror points of successfully fitted tracks. Option to clear points belonging to a track so that only 'problematic' points are left on the screen.

c) Y,Z view with tracks.

d) Lead glass array unrolled with pulse heights.

e) μ-chamber display.

III. Pattern Recognition.

The following routines are available :

a) The PLUTO pattern recognition program has been modified to the JADE geometry. It recognizes tracks in jet events.

b) Z-vertex finding routine (Steffen scheme).

c) A routine to store track information in a format similar to that described in JADE-Note No. 9a.

IV. Future work.

None of the routines is in its final state and development work is in progress. In case library routines have been copied by outside users, it has to be made sure that they still correspond to the latest version.

Work in the next few months will proceed on the following lines :

a) - improve tracking through the central detector (include multiple scattering and dE/dx losses)
   - update geometrical parameters
   - include end caps.

b) Trigger studies by Monte-Carlo.

c) Set up interactive track fitting with IPS.

d) Work on pattern recognition.

e) Multiple Coulomb scattering & energy loss and crude interactions will be inserted before the generated data are used in order to test out muon-filter pattern recognition strategies.

Remark :

The interactive removal and addition of chamber hits on the IPS screen with subsequent reanalysis of the tracks and display will be available soon. This scheme will provide a powerful tool to study and develop pattern recognition programs because the results are immediately available and it is not necessary to go through the procedure of submitting special jobs for each change.