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FullJIM Beginner's Manual

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How to use a full simulator of JLC detector is briefly explained in this manual.
This is an updated version of JIM Users' Guide written by N.Hosoda et.al.

I) Introduction

現在 JIM の名を冠するプログラムには fastJIM と fullJIM の 2 種類があります。 fastJIM はスメアリングを用いた簡易シミュレータで、 fullJIM は GEANT を用いたフルシミュレータです。本マニュアルでは fullJIM についてその使用法を説明します。 fastJIM についてはそのマニュアルが別に用意されているのでそちらを参照して下さい。また、 fullJIM そのもののコーディングについては細田氏による「JIM の開発と CVS を用いたプログラム管理」を参照して下さい。

fullJIM の開発は JLC-I レポートを上梓した直後から始まりました。その作業は主として細田氏（現 Spring-8）、神前氏（KEK）、中村氏（神戸大）が、渡部氏（工学院）、石井氏（神戸大）、筆者らの協力で行ないました。開発者レベルではかなり以前から稼動してきましたが、このほど初心者ユーザーにも使用してもらえるようこのマニュアルを作成しました。

fullJIM の走らせ方はほとんどすべて細田氏らによる「JIM Users'Guide」に記載されています。しかしながらその後、バンクの構造やディレクトリの移動などいくつかの基本的な部分の変更がありました。それらの情報を更新することが本マニュアルの目的ですが、マニュアルの完結性のため、変更されていない部分についても再度このマニュアルに掲載しました。マニュアルの構成も上記 Users' Guide とほぼ同一にしました。名称も "Beginners Guide" と変え、より初心者向けのものとしました。

fullJIM のバンク構造は fastJIM と同一になるようにしてあります。（現時点では一部互換でないものも残っていますが。）従って fullJIM に入力する MC イベントファイルと fullJIM の出力を解析するルーチンは fastJIM のものと共通です。これらの MC ファイルや解析ルーチンについては fastJIM のマニュアルを参照して下さい。これらの文書は以下のディレクトリから得ることができます。

「JIM の開発と CVS を用いたプログラム管理」及び「JIM Users' Guide」
on WWW ; http;//www-jlc.kek.jp/subg/offl/index-e.html

「fastJIM Users Manual」及び「fullJIM Beginners Guide」
jlcux1:/proj/soft/users/template/fjim/manual.ps 及び.../jim/manual.ps

II) Install

fullJIM（以下単に jim と記す）のソースプログラム、実行モジュール及び入力ファイルは jlcux 上の

/proj/soft/users/template/jim/src

に置いてあります。また、バンクの説明などは

/proj/soft/users/template/jim/doc

にあります。プログラムは CVS で管理されており、最新の公式バージョンは常に CVS 領域に保管されていますが、上記の領域はそれと同一のものです。誤操作によって上記領域のファイルを破壊してしまっても原本は健在ですから、連絡を頂ければすぐに回復致します。

上記領域にはすでに実行モジュールが存在しますが、これは jlcux 用のものです。 ccjlc での実行についもいずれこのマニュアルを更新して記載しますが、今のところは fastJIM のマニュアルを参照して下さい。 ccjlc そのものの使用法は宮本氏による文書が WWW 上の

http://www-jlc.kek.jp/subg/offl/ccjlc.html

に存在しますのでそちらを参照して下さい。

III) Example

標準の jim を実行する場合には単に上記のディレクトリにある jim を起動します。何らかの理由により jim を改造したい場合は上記のディレクトリより全てのファイルを自分の領域にコピーしてきて、そこで適当な改造を行なって make します。但しこの場合には標準 jim との互換性が無くなり、標準 jim の更新についていけなくなる可能性があります。従って腕に自信の無い場合は標準 jim を使うことをお勧めします。

自分で若干のコーディングをしたい人のために Appendix-E にいくつかのコーディング規約を示します。この規約に従っておくと後で標準 jim との統合がやりやすくなります。

以下標準の jim を実行する場合についてのみ説明します。

１）上記の /proj/soft/users/template/jim/src ディレクトリから自分の作業領域へ 7 個のデータファイル（ input.dat, geant.dat, vxgeom.dat, ctgeom.dat, bcgeom.dat, ecgeom.dat, irgeom.dat ）をコピーします。

２）必要に応じて input.dat と geant.dat を変更します。そのほかの 5 個のファイルは測定器のジオメトリを記述するファイルですから通常は変更する必要は有りません。 input.dat と geant.dat の内容については Appendix-C を参照して下さい。

３）jim を実行します。以下の様にコマンドを打って下さい。標準出力は output.dat に出力されます。

/proj/soft/users/template/jim/src/jim < input.dat > output.dat

４）geant.dat の設定によっては測定器の図やイベントが表示され、 "hit return" のプロンプトが表示されて入力待ちになります。このときはその都度 return キーを押して下さい。

５）実行が終るとシミュレーションの結果のバンク等のファイルができます。できるファイルの名前は input.dat で指定されているものになります。

得られたバンクの中身を解析するプログラムについては fastJIM のマニュアルを参照して下さい。バンクの読み書きに必要なルーチンについての簡単な説明は重複になりますが Appendix-D につけました。詳しい説明は神前氏の作成したマニュアルが WWW 上の神前氏の私的領域にありますので、直接神前氏にそのアドレスを問い合わせて下さい。

IV) Overall Structure of JIM

jim の流れのうちユーザープログラムの部分の流れを Appendix-A に示しました。 GEANT ルーチンまで含めた全体の流れは前出のディレクトリの UPDATE.LOG を見て下さい。フローチャート中の ⟵'file 名' で示されているのは入力ファイルの読み込みで、 ⟶'bank 名' で示されているのはバンクの出力です。

バンクの構造については Appendix-B を、入力ファイルの内容については Appendix-C を見て下さい。

V) JIM Geometry

現在シミュレーションがされている測定器は Vertex Detector (VX), Central Tracker (CT), Barrel Calorimeter (BC), EndCap Calorimeter (EC) の４種です。 (　) 内はその測定器の接頭及び接尾の略称です。また、 Muon Chamber (MU) についてはそのセル構造まで含めてジオメトリが入力されていますが、信号の処理はまだなされていません。ソレノイド、鉄構造、ビームパイプ、マスク、Qマグネット、サポートチューブも JLC-I に記載されたパラメータで取り込んであります。

VX,CT,BC,EC の４つの測定器及び IR 部のジオメトリパラメータは入力ファイル vxgeom.dat 等から入力するようになっていますが、通常はユーザーは変更する必要は有りません。 MU 測定器及びその他の構造体のパラメータは現在のところプログラムに埋め込まれています。これは近々入力ファイルで読み込むように変更する予定です。

座標軸は e^- の進行方向が z 軸の正の向きと定義されます。

VI) Event Generator

jim でシミュレートするイベントは内部で発生させることができます。また外部のファイルに準備しておき、それを読み込むこともできます。このモードは入力ファイル geant.dat の KINE キーワードで切り替えます。

1) Event Generation inside JIM

geant.dat 中の KINE キーワードの１番目 (以下 KINE(1) の様に表す) でどのようなイベントを発生させるかを切り替えます。対応は以下のようになっています。

KINE(1)=1 ; $e^+e^- \to q\bar{q}$ continuum production with LUND.

KINE(1)=2 ; $e^+e^- \to t\bar{t}$ continuum production with LUND. m_t is set 174GeV.

KINE(1)=3 ; $e^+e^- \to H^0 + X$ production with LUND. m_H is set 120GeV.

KINE(1)=4 ; generate single particle. See Appendix-C for detail.

KINE(1)=5 ; reads event from external file. See next subsection.

KINE(1)=6 ; generate plural particles. See Appendix-C for detail.

いずれの場合も KINE(2) が CM Energy(GeV) もしくは生成粒子エネルギーです。 Single-particle generator は当面継続性のため保持しますが、いずれ削除します。 Multi-particle generator をお使い下さい。 m_t 及び m_H は現在のところプログラム gukine.f 中で定義されています。これもいずれ KINE キーワードで入力するように変更します。

2) Read Event from External File

KINE(1)=5 を指定すると外部に用意されたイベントファイルからイベントを読み込みます。用意するファイルの形式は Appendix-B にあるバンク'MCEVENT' でなければなりません。また、バンク'GENHEADER' も用意してください。このようなファイルを作成するプログラムの例が

/proj/phys/simu/jim/sample/lu2bnk.f や

/proj/soft/users/template/generator/pythgen.f

にあります。入力ファイル形式は fullJIM,fastJIM に共通ですから、作成したイベントファイルはどちらの入力としても使うことができます。

ファイル名は input.dat 中の EVT キーワードの引数として与えます。

VII) ZBS Bank System

jim では ZBS という ZEBRA を用いたバンクシステムを採用しています。これは神前さんが作成したもので、マニュアルが jlcux 上の神前さんの私的領域に存在します。欲しい方は直接神前さんにお問い合わせ下さい。解析に必要な部分についての簡単なルーチンの使い方については Appendix-D を参照して下さい。またバンクの構造については Appendix-B を参照して下さい。

VIII) Graphics

入力データファイル geant.dat の SWITCH(4)=1 を指定すると DEBUG キーワードで指定されたイベントについてイベントディスプレイをします。表示の軸は IGDW キーワードで設定します。 IGDW=1 の時は x 軸、 2 は y 軸、 3 は z 軸について垂直な面へのプロジェクションを表示します。キーワード GDUV,GSUV はそれぞれ表示の原点と倍率を設定します。

3 次元表示、ブローアップなど凝ったディスプレイは jim++ を用いて行うことができます。しかしながら現在のところ CVS 管理下にあるバージョンでは jim++ は残念ながら動きません。これは jim の更新の過程で jim++ との互換性が失われたためと思われますが、今のところ原因不明です。再び動くようになった時点でこのマニュアルに使用法を記載します。

IX) Input Data Cards

入出力ファイル名や測定器のジオメトリ、 GEANT へのコントロールカード等は input.dat 等のデータファイルで jim に与えます。その内容については Appendix-C を参照して下さい。

最後に

jim は依然として未完成ですが、なるべく多くの人に使って頂いた方が完成への道が早まると思い今回の公開を致しました。不都合な点、誤り、改良の提案などを多数お寄せ下さい。

jim の更新情報等は jim@jlcux1.kek.jp のメーリングリストに配布されます。未登録の方は神前さんにメールを出して登録してもらうことをお勧めします。

Appendix-A fullJIM のプログラム構造

```
main.f (for jim)   or   gxint321.f (for jim++)
   uginit.f
      alffrd.f ; Initialize FF and read file names <-- input.dat
      geffrd.f ; read GEANT control data           <-- geant.dat
      vxffrd.f ; read VTX geometry data            <-- vxgeom.dat
      ctffrd.f ; read CDC geometry data            <-- ctgeom.dat
      bcffrd.f ; read Barrel-CAL geometry data     <-- bcgeom.dat
      ecffrd.f ; read EndCap-CAL geometry data     <-- ecgeom.dat
      irffrd.f ; read IR  geometry data            <-- irgeom.dat
      ugeom.f  ; calculate geometry. See Appendix-E for Rotaion Matrix definition.
         jimate.f, jitmed.f
         ctgeom.f
         bcgeom.f => further calls bcsub1.f,bcsub2.f,bcsub3.f
         ecgeom.f => further calls ecsub1.f,ecsub2.f
         vxgeom.f
         mugeom.f
         irgeom.f => further calls qcgeom.f, mkgeom.f, bpgeom.f
         sogeom.f
      jstpar.f ; save detector parameters to banks.
         gespar.f   --> 'MCGEPAR'
         vxspar.f   --> 'MCVXPAR'
         ctspar.f   --> 'MCCTPAR'
         bcspar.f   --> 'MCBCPAR'
         ecspar.f   --> 'MCECPAR'
      udraw.f ; Draw detector shape
      vxinit.f
  (grun)
      gukine.f ; Generate events to simulate.
         kilund.f
         kitop.f
         kihigs.f
         kising.f
         kifile.f  <-- reads 'MCEVENT' from an external file.
         kimult.f
         jkzfev.f   --> 'MCEVENT'
         uvtki.f    --> 'MCVERTEX' , 'MCTRACK'
      gutrev.f
         gutrak
            gustep.f ; swim a particle for one step.
               cthits.f ; accumulates CT hit signals.
               bchits.f ; accumulates BC hit signals.
               echits.f ; accumulates EC hit signals.
               vxhits.f ; accumulates VX hit signals.
      gudigi.f ; quantize/merge hits and save into banks
         mcdigi.f   --> 'MCHEADER'
         ctdigi.f   --> 'MCCTHIT'
         bcdigi.f   --> 'MCBEHIT' , 'MCBHHIT'
         ecdigi.f   --> 'MCEEHIT' , 'MCEHHIT'
         vxdigi.f   --> 'MCVXHIT'
         bkdump.f
      guout.f ; fill histograms. See Appendix-E for Hist-ID definition.
         juanal.f
            ctanal.f  --> 'CTTRACK'
         jfilbk.f
            jfilhd.f  --> 'HEADER'
            jfiltk.f  --> 'TRACK'
         vxout.f
  uglast.f
```


Appendix-B fullJIM のバンク構造

```
*****************************************************************
*
*     Banks described in this documents are ;
*           GENHEADER; Information of Generator.
*           MCHEADER ; Information of MC program and conditions.
*           MCEVENT  ; MC information on generated particles.
*           MCVERTEX ; List of vertices pointed by vertex pointer in MCTRACK.
*           MCTRACK  ; List of tracks with pointers to MCVERTEX and MCEVENT.
*           MCVXHIT  ; Data of VTX hits.
*           MCCTHIT  ; Data of CDC hits.
*           MCCTHIT-TRACK ; Pointer from track# to hit#.
*           CTTRACK  ; Results of track fitting
*           HEADER   ; Parameters used in track fitting
*           TRACK    ; Track parameters obtained by fitting
*           MCBEHIT  ; Data of Barrel-EM  CAL hits.
*           MCBHHIT  ; Data of Barrel-HAD CAL hits.
*           MCEEHIT  ; Data of EndCap-EM  CAL hits.
*           MCEHHIT  ; Data of EndCap-HAD CAL hits.
*           MCGEPAR  ; GEANT parameters.
*           MCVXPAR  ; VTX geometrical parameters.
*           MCCTPAR  ; CDC geometrical parameters.
*           MCBCPAR  ; Barrel CAL geometrical parameters.
*           MCECPAR  ; EndCap CAL geometrical parameters.
*
*           Updated on 3-Sep-1996, Y.Fujii
*
*****************************************************************
*     +-------------------------+                               *
*     | Bank Name  :  GENHEADER |                               *
*     +-------------------------+                               *
*                                                               *
*     Contents    : Information of Genarator
*     Created in  : Generator Program using KZBCR1. No action in jim *
*     Record Type : 1-dim. fixed length segment                 *
*     Version     : Release 1.0  1995-May-10                    *
*                                                               *
*****************************************************************
*(1) Contents in the Master Segment
*---------------------------------------------------------------------
*  DATA                          CONTENTS
*---------------------------------------------------------------------
* CDATA(1)   Name of Generator ( CHARACTER*4 )
* IDATA(2)   Generater Version #
* IDATA(3)   DATE ( yymmdd )
* IDATA(4)   TIME ( hhmmss )
* IDATA(5)   Event #
* IDATA(6)   # of perticles
* IDATA(7)   Flug for Initial State Radiation
* IDATA(8)   Flug for Beam Schtrahlung
* RDATA(9)   CMS Energy
* RDATA(10)  Px of Positoron
* RDATA(11)  Py
* RDATA(12)  Pz
* RDATA(13)  Energy
* RDATA(14)  Helicity
* RDATA(15)  Px of Electron
* RDATA(16)  Py
* RDATA(17)  Pz
* RDATA(18)  Energy
```

```
* RDATA(19)  Helicity
*-------------------------------------------------------------------
C
C
*********************************************************************
*     +-------------------------+                                   *
*     | Bank Name  :  MCHEADER  |                                   *
*     +-------------------------+                                   *
*                                                                   *
*     Contents    : Summary of information about a generated events *
*                   at the event generator stage.                   *
*     Crearted in : mcdigi.f  using  KZBCR1                         *
*     Record Type : 1-dim. fixed length segment                     *
*     Version     : Release 1.0  1994-Jun-28                        *
*                                                                   *
*********************************************************************

(1) Contents in the Master Segment
    Master segment = segment # 0
---------------------------------------------------------------------
  DATA                            CONTENTS
---------------------------------------------------------------------
 IDATA(1)   Run number (=0 <-- Monte Carlo data)
 IDATA(2)   Event number
 IDATA(3)   Event type ( = KINE(1) in geant.dat )
 IDATA(4)   Radiative correction('off'=0,'on'=1)
 IDATA(5)   Total # of vertices in this event
 IDATA(6)   Total # of final tracks in this event
 IDATA(7)   Total # of all tracks in this event including unstables
  DATA(8)   Total energy of this event (GeV) ; presently 2*Ebeam
  DATA(9)   Magneic field (KGauss)
  DATA(10)  Beam energy (GeV)
---------------------------------------------------------------------

(2) Contents in the Data Segment
---------------------------------------------------------------------
  DATA                            CONTENTS
---------------------------------------------------------------------
 No entry in the data record
---------------------------------------------------------------------
*
*
*********************************************************************
*     +-------------------------+                                   *
*     | Bank Name  :  MCEVENT   |                                   *
*     +-------------------------+                                   *
*                                                                   *
*     Contents    : Information of all particles at the event       *
*                   generation stage are stored.  The history of an *
*                   event (ex. the hadronization steps, decay chains*
*                   etc) can be traceable by this bank.             *
*                   See HEPEVT common of LUND74 manual for precise  *
*     Crearted in : jkzfev.f  using  KZBCR1                         *
*     Record Type : 1-dim. fixed length segment                     *
*     Version     : Release 1.0  1994-Jun-28                        *
*                                                                   *
*********************************************************************

(1) Contents in the Master Segment
    Master segment = segment # 0
```



```
---------------------------------------------------------------------
  DATA                            CONTENTS
---------------------------------------------------------------------
 IDATA(1)   Event number
 IDATA(2)   Total number of particles generated in an event generator.
            The particles in intermediate states are also included.
---------------------------------------------------------------------

(2) Contents in the Data Segment
    Segment # = particle #
---------------------------------------------------------------------
  DATA                            CONTENTS
---------------------------------------------------------------------
 IDATA(1)    Status flag (1=stable, 2=decayed. ISTHEP in HEPEVT of LUND)
 IDATA(2)    Particle code (LUND code)
 IDATA(3)    Pointer to the position where the moter is stored.
 IDATA(4)    Pointer to the second mother ( used to specify mothers of string )
 IDATA(5)    Pointer to the position of the first daughter
 IDATA(6)    Pointer to the position of the last daughter
 IDATA(7)    Not Used
  DATA(8)    X-component of the momentum of i-th particle (GeV)
  DATA(9)    Y-component of the momentum of i-th particle (GeV)
  DATA(10)   Z-component of the momentum of i-th particle (GeV)
  DATA(11)   Total energy (GeV)
  DATA(12)   Mass (GeV)
  DATA(13)   Production vertex x position, in cm
  DATA(14)   Production vertex y position, in cm
  DATA(15)   Production vertex z position, in cm
  DATA(16)   Production time, in cm/c
  DATA(17)   Charge
  DATA(18)   Life (c*tau)
  DATA(19)   Not Used
  DATA(20)   Not Used
---------------------------------------------------------------------
*
*
*.*****************************************************************
*.    +-------------------------+                                  *
*.    | Bank Name  :  MCVERTEX  |                                  *
*.    +-------------------------+                                  *
*.                                                                 *
*.    Contents    : List of Vertices                               *
*.    Created in  : uvtki.f  using  KZBCR1                         *
*.    Record Type : 1-dim. variable length segment                 *
*.    Version     : Release 1.0  25-Mar-1996                       *
*.                                                                 *
*.*****************************************************************
*.
*.(1) Contents in the Master Segment
*.    Master segment = segment # 0
*.-----------------------------------------------------------------
*.  DATA                          CONTENTS
*.-----------------------------------------------------------------
*. IDATA(1)      # of vertecies
*.-----------------------------------------------------------------
*.
*.(2) Contents in the Data Segment
*.    Segment # = serial number of vertices
*.-----------------------------------------------------------------
*.  DATA                          CONTENTS
```

```
*.------------------------------------------------------------------
*. RDATA(1)      vertex X position in mm
*. RDATA(2)      vertex Y position in mm
*. RDATA(3)      vertex Z position in mm
*. RDATA(4)      production time in mm/c
*.------------------------------------------------------------------
*.
*.
*.*****************************************************************
*.     +-----------------------+                                  *
*.     | Bank Name  :  MCTRACK  |                                  *
*.     +-----------------------+                                  *
*.                                                                *
*.     Contents    : List of Tracks
*.     Created in  : uvtki.f  using  KZBCR1                       *
*.     Record Type : 1-dim. variable length segment               *
*.     Version     : Release 1.0  25-Mar-1996                     *
*.                                                                *
*.*****************************************************************
*.
*.(1) Contents in the Master Segment
*.    Master segment = segment # 0
*.------------------------------------------------------------------
*.  DATA                           CONTENTS
*.------------------------------------------------------------------
*. IDATA(1)      # of Tracks ( stable particle only. Even Ks is excluded.)
*.------------------------------------------------------------------
*.
*.(2) Contents in the Data Segment
*.------------------------------------------------------------------
*.  DATA                           CONTENTS
*.------------------------------------------------------------------
*. RDATA(1)      momentum px (GeV)
*. RDATA(2)      momentum py (GeV)
*. RDATA(3)      momentum pz (GeV)
*. RDATA(4)      energy   E  (GeV)
*. RDATA(5)      mass        (GeV)
*. IDATA(6)      particle ID (LUND code)
*. IDATA(7)      particle ID (GEANT code)
*. IDATA(8)      pointer to MCVERTEX serial vertex   number (=segment#)
*. IDATA(9)      pointer to MCEVENT  serial particle number (=segment#)
*.------------------------------------------------------------------
*.
*.
*********************************************************************
*     +-----------------------+                                    *
*     | Bank Name  :  MCVXHIT  |                                    *
*     +-----------------------+                                    *
*                                                                  *
*     Contents    : List of vertex chamber hits on tracks which the  *
*                   JIM generated.                                 *
*.    Created in  : vxdigi.f  using  KZBCR1                        *
*     Record Type : 1-dim. fixed length segment                    *
*     Version     : Release 1.0  1994-Jul-07                       *
*                                                                  *
*********************************************************************

(1) Contents in the Master Segment
    Master segment = segment # 0
--------------------------------------------------------------------
```



```
  DATA                           CONTENTS
--------------------------------------------------------------------
 IDATA(1)   Total number of generated tracks ( including unstables )
 IDATA(2)   Total number of hits
--------------------------------------------------------------------

(2) Contents in the Data Segment
    Segment # = hits #
--------------------------------------------------------------------
  DATA                           CONTENTS
--------------------------------------------------------------------
 IDATA(1)    Track # of i-th hit
 IDATA(2)    Layer # most inner=1,middle=2,outer=3
 IDATA(3)    Z direction cell # from +z side
 IDATA(4)    Phi direction cell # from phi=0
 IDATA(5)    Particle code (LUND code)
  DATA(6)    X position of hit (cm) ( not quantized by pixel size )
  DATA(7)    Y position of hit (cm) ( not quantized by pixel size )
  DATA(8)    Z position of hit (cm) ( not quantized by pixel size )
  DATA(9)    Momentum of i-th particle (GeV)
  DATA(10)   Energy loss (KeV)
--------------------------------------------------------------------
*.
*.
*********************************************************************
*     +-----------------------+                                    *
*     | Bank Name  :  MCCTHIT  |                                    *
*     +-----------------------+                                    *
*                                                                  *
*     Contents    : List of central tracker hits on tracks which the *
*                   JIM generated.                                 *
*.    Created in  : ctdigi.f  using  KZBCR1                         *
*     Record Type : 1-dim. fixed length segment                    *
*     Version     : Release 1.0  1994-Jun-28                       *
*                                                                  *
*********************************************************************

(1) Contents in the Master Segment
   Master segment = segment # 0
--------------------------------------------------------------------
  DATA                           CONTENTS
--------------------------------------------------------------------
 IDATA(1)   Total number of generated tracks (including unstables and neutrals)
 IDATA(2)   Total number of hits
--------------------------------------------------------------------

(2) Contents in the Data Segment
    Segment # = hits #
--------------------------------------------------------------------
  DATA                           CONTENTS
--------------------------------------------------------------------
 IDATA(1)    Track # of i-th hit
 IDATA(2)    Encoded Wire No.
             (wire# counted from inner side)*1000 + wire# counted from phi=0
  DATA(3)    Drift time
  DATA(4)    Energy Deposit (KeV)
 IDATA(5)    Left-right ambiguity (+1=+phi side of anode wire,-1=-phi)
 IDATA(6)    Particle code (LUND code)
  DATA(7)    Drift length (cm)
  DATA(8)    x position of hit (cm)
```

```
  DATA(9)    y position of hit (cm)
  DATA(10)   Z position of hit (cm)
  DATA(11)   Time of flight (nsec)
  DATA(12)   X-component of the momentum of i-th particle (GeV)
  DATA(13)   Y-component of the momentum of i-th particle (GeV)
  DATA(14)   Z-component of the momentum of i-th particle (GeV)
-------------------------------------------------------------------------
*.
*.
*************************************************************************
*     +------------------------------+                                  *
*     | Bank Name  :  MCCTHIT-TRACK  |                                  *
*     +------------------------------+                                  *
*                                                                       *
*     Contents    : Pointer from track# to hit # on a track.            *
*.                   List of serial hit # of N-hits on i-th track      *
*.    Created in  : ctdigi.f  using  KZBCR0                             *
*     Record Type : 1-dim. fixed length segment                         *
*     Version     : Release 1.0  1996-Mar-28                            *
*                                                                       *
*************************************************************************

(1) Contents in the Master Segment
   Master segment = segment # 0
-------------------------------------------------------------------------
  DATA                            CONTENTS
-------------------------------------------------------------------------
 IDATA(1)   Total number of tracks (including unstables and neutrals)
-------------------------------------------------------------------------

(2) Contents in the Data Segment
    Segment # = track #
-------------------------------------------------------------------------
  DATA                            CONTENTS
-------------------------------------------------------------------------
 IDATA(N)    List of serial hit # of N-hits on this track (track#=seg#)
-------------------------------------------------------------------------
*.
*.
*************************************************************************
*     +------------------------+
*     | Bank Name  :  CTTRACK  |
*     +------------------------+
*                                                                       *
*     Contents    : Results of r-phai and r-z track fitting             *
*.    Created in  : ctanal.f  using  KZBCR1                             *
*     Record Type : 1-dim. fixed length segment                         *
*     Version     : Release 0.0  1996-Mar-13 ; tentative version        *
*                                                                       *
*************************************************************************

(1) Contents in the Master Segment
   Master segment = segment # 0
-------------------------------------------------------------------------
  DATA                            CONTENTS
-------------------------------------------------------------------------
 IDATA(1)   Total number of tracks (stable charged only)
-------------------------------------------------------------------------

(2) Contents in the Data Segment
```



```
    Segment # = track #
-------------------------------------------------------------------------
  DATA                            CONTENTS
-------------------------------------------------------------------------
  DATA(1)
  DATA(2)
  DATA(3)
  DATA(4)
  DATA(5)
  DATA(6)
  DATA(7)
  DATA(8)
  DATA(9)
  DATA(10)
  DATA(11)
  DATA(12)
  DATA(13)  r-phai fit ; Closest approach to the Z-axis
  DATA(14)  r-phai fit ; Phai angle of the center of the track circle
  DATA(15)  r-phai fit ; signed 1/R, R=radius of the track circle
  DATA(16)  r-phai fit ; reduced chi-sqr
 IDATA(17)  r-phai fit ; number of hits
  DATA(18)  r-z    fit ; z0 = intercept of fitted line
  DATA(19)  r-z    fit ; slope of fitted line
  DATA(20)  r-z    fit ; reduced chi-sqr
 IDATA(21)  r-z    fit ; number of hits
  DATA(22)  r-phai fit ; Error Matrix
  DATA(23)               //
  DATA(24)               //
  DATA(25)  r-z    fit ; Error Matrix
  DATA(26)               //
  DATA(27)  r-phai fit ; Error Matrix
  DATA(28)               //
  DATA(29)
  DATA(30)
  DATA(31)  r-phai fit ; Error Matrix
  DATA(32)
  DATA(33)
  DATA(34)
  DATA(35)
  DATA(36)  r-z    fit ; Error Matrix
-------------------------------------------------------------------------
*.
*.
*************************************************************************
*     +------------------------+
*     | Bank Name  :  HEADER  |
*     +------------------------+
*                                                                       *
*     Contents    : Parameters refered in tracking                      *
*.    Created in  : jfilhd.f  using  KZBCR1                             *
*     Record Type : 1-dim. fixed length segment                         *
*     Version     : Release 0.0  1996-Mar-13 ; tentative version        *
*                                                                       *
*************************************************************************

(1) Contents in the Master Segment
   Master segment = segment # 0
-------------------------------------------------------------------------
  DATA                            CONTENTS
-------------------------------------------------------------------------
```

```
 IDATA(1) = 0
 IDATA(2) = 0
 IDATA(3)   Event Number
  DATA(4)   Beam Energy
  DATA(5)   Magnetic Field
 IDATA(6)-IDATA(20) = 0
-----------------------------------------------------------------------
*.
*.
************************************************************************
*     +---------------------+
*     | Bank Name  :  TRACK  |
*     +---------------------+
*                                                                      *
*     Contents    : Fitted results of track parameters                 *
*.    Created in  : jfiltk.f  using  KZBCR1                            *
*     Record Type : 1-dim. fixed length segment                        *
*     Version     : Release 0.0  1996-Mar-13 ; tentative version       *
*                                                                      *
************************************************************************

(1) Contents in the Master Segment
   Master segment = segment # 0
-----------------------------------------------------------------------
  DATA                            CONTENTS
-----------------------------------------------------------------------
 IDATA(1) = Number of tracks (stable charged only)
 IDATA(2)-IDATA(5) = 0
-----------------------------------------------------------------------

(2) Contents in the Data Segment
    Segment # = track #
-----------------------------------------------------------------------
  DATA                            CONTENTS
-----------------------------------------------------------------------
  DATA(1)   Px of the track
  DATA(2)   Py
  DATA(3)   Pz
  DATA(4)   P
  DATA(5)   Charge
  DATA(6)   r-phai fit ; Closest approach to the Z-axis
  DATA(7)   r-phai fit ; Phai angle of the center of the track circle
  DATA(8)   r-phai fit ; reduced chi-sqr
 IDATA(9)   r-phai fit ; number of hits
  DATA(10)  r-z    fit ; z0 = intercept of fitted line
  DATA(11)  r-z    fit ; reduced chi-sqr
 IDATA(12)  r-z    fit ; number of hits
  DATA(13)  = 0
  DATA(14)  serial track number
  DATA(15)-DATA(20) = 0
-----------------------------------------------------------------------
*.
*.
*.*********************************************************************
*.     +-----------------------+                                      *
*.     | Bank Name  :  MCBEHIT  |                                      *
*.     +-----------------------+                                      *
*.                                                                    *
*.     Contents    : List of Barrel Calorimeter hits on tracks which  *
*.                   the JIM generated.                               *
```



```
*.     Created in  : bcdigi.f  using  KZBCR0
*.     Record Type : 1-dim. variable length segment                   *
*.     Version     : Release 1.0  1995-Apr-21                         *
*.                                                                    *
*.*********************************************************************
*.
*.(1) Contents in the Master Segment
*.    Master segment = segment # 0
*.-------------------------------------------------------------------
*.  DATA                            CONTENTS
*.-------------------------------------------------------------------
*. IDATA(1)   Total number of hit blocks
*.-------------------------------------------------------------------
*.
*.(2) Contents in the Data Segment
*.    Segment # = hits #
*.-------------------------------------------------------------------
*.  DATA                            CONTENTS
*.-------------------------------------------------------------------
*. IDATA(1)      Cell Id # (1000*ITHETA+IPHI)
*.  DATA(2)      Total Energy of the Cell ( GeV )
*.  DATA(3)      Time of Flight ( psec )
*. IDATA(4)      # of Contributed Track
*.
*. IDATA(3*I+2)  Contributed Track #  |
*.  DATA(3*I+3)  Deposit Energy       + I = 1, 5
*.  DATA(3*I+4)  Time of Flight       |       Variable Length
*.-------------------------------------------------------------------
*.
*.
*.*********************************************************************
*.     +-----------------------+                                      *
*.     | Bank Name  :  MCBHHIT  |                                     *
*.     +-----------------------+                                      *
*.                                                                    *
*.     Contents    : List of Barrel Calorimeter hits on tracks which  *
*.                   the JIM generated.                               *
*.     Created in  : bcdigi.f  using  KZBCR0
*.     Record Type : 1-dim. fixed length segment                      *
*.     Version     : Release 1.0  1995-Apr-21                         *
*.                                                                    *
*.*********************************************************************
*.
*.(1) Contents in the Master Segment
*.    Master segment = segment # 0
*.-------------------------------------------------------------------
*.  DATA                            CONTENTS
*.-------------------------------------------------------------------
*. IDATA(1)   Total number of hit blocks
*.-------------------------------------------------------------------
*.
*.(2) Contents in the Data Segment
*.    Segment # = hits #
*.-------------------------------------------------------------------
*.  DATA                            CONTENTS
*.-------------------------------------------------------------------
*. IDATA(1)        Cell # (1000*ITHETA+IPHI)
*.  DATA(2)        Deposit Energy in PMT1 ( GeV )
*.  DATA(3)        Deposit Energy in PMT2 ( GeV )
*.  DATA(4)        Time of Flight ( nsec )
```

```
*. IDATA(5)        # of Contributed Track
*.
*. IDATA(4*I+2)    Contributed Track #     |
*.  DATA(4*I+3)    Deposit Energy (PMT1)   + I = 1,5
*.  DATA(4*I+4)    Deposit Energy (PMT2)   |    Variable Length
*.  DATA(4*I+5)    Time of Flight          |
*.-------------------------------------------------------------------
*.
*.
*.*******************************************************************
*.     +------------------------+                                    *
*.     | Bank Name  :  MCEEHIT  |                                    *
*.     +------------------------+                                    *
*.                                                                   *
*.     Contents    : List of Endcap Calorimeter hits on tracks.      *
*.     Created in  : ecdigi.f  using  KZBCR0
*.     Record Type : 1-dim. variable length segment                  *
*.     Version     : Release 1.0  1995-Apr-21                        *
*.                                                                   *
*.*******************************************************************
*.
*.(1) Contents in the Master Segment
*.   Master segment = segment # 0
*.-------------------------------------------------------------------
*.  DATA                           CONTENTS
*.-------------------------------------------------------------------
*. IDATA(1)   Total number of hit blocks
*.-------------------------------------------------------------------
*.
*.(2) Contents in the Data Segment
*.   Segment # = hits #
*.-------------------------------------------------------------------
*.  DATA                           CONTENTS
*.-------------------------------------------------------------------
*. IDATA(1)      Cell Id # (1000*IR+IPHI)
*.  DATA(2)      Total Energy of the Cell ( GeV )
*.  DATA(3)      Time of Flight ( psec )
*. IDATA(4)      # of Contributed Track
*.
*. IDATA(3*I+2)  Contributed Track #  |
*.  DATA(3*I+3)  Deposit Energy       + I = 1, 5
*.  DATA(3*I+4)  Time of Flight       |       Variable Length
*.-------------------------------------------------------------------
*.
*.*******************************************************************
*.     +------------------------+                                    *
*.     | Bank Name  :  MCEHHIT  |                                    *
*.     +------------------------+                                    *
*.                                                                   *
*.     Contents    : List of Endcap Calorimeter hits on tracks.      *
*.     Created in  : ecdigi.f  using  KZBCR0
*.     Record Type : 1-dim. variable length segment                  *
*.     Version     : Release 1.0  1995-May-5                         *
*.                                                                   *
*.*******************************************************************
*.
*.(1) Contents in the Master Segment
*.    Master segment = segment # 0
*.-------------------------------------------------------------------
*.  DATA                           CONTENTS
```



```
*.-------------------------------------------------------------------
*. IDATA(1)   Total number of hit blocks
*.-------------------------------------------------------------------
*.
*.(2) Contents in the Data Segment
*.    Segment # = hits #
*.-------------------------------------------------------------------
*.  DATA                           CONTENTS
*.-------------------------------------------------------------------
*. IDATA(1)        Cell # (1000*IR+IPHI)
*.  DATA(2)        Deposit Energy in PMT1 ( GeV ) ; EC-HAD cells are also
*.  DATA(3)        Deposit Energy in PMT2 ( GeV ) ; read-out with 2-PMTs.
*.  DATA(4)        Time of Flight ( nsec )
*. IDATA(5)        # of Contributed Track
*.
*. IDATA(4*I+2)    Contributed Track #     |
*.  DATA(4*I+3)    Deposit Energy (PMT1)   + I = 1,5
*.  DATA(4*I+4)    Deposit Energy (PMT2)   |    Variable Length
*.  DATA(4*I+5)    Time of Flight          |
*.-------------------------------------------------------------------
*.
*.
*.*******************************************************************
*.     +------------------------+                                    *
*.     | Bank Name  :  MCGEPAR  |                                    *
*.     +------------------------+                                    *
*.                                                                   *
*.     Contents    : Information of GEANT Parameters are stored.     *
*.     Created in  : gespar.f  using  KZBCR1
*.     Record Type : 1-dim. fixed length segment                     *
*.     Version     : Release 1.0  1995-May-10                        *
*.                                                                   *
*.*******************************************************************
*.
*.(1) Contents in the Master Segment
*.    Master segment = segment # 0
*.-------------------------------------------------------------------
*.  DATA                           CONTENTS
*.-------------------------------------------------------------------
*. IDATA(1)  GEANT Version #
*. IDATA(2)  IPAIR = Control Variable for the e-pair production.
*. IDATA(3)  ICOMP = Control Variable for the Compton scattering
*. IDATA(4)  IPHOT = Control Variable for the photoelectric effect
*. IDATA(5)  IPFIS = Control Variable for the gamma induced nuclear fission
*. IDATA(6)  IDRAY = Control Variable for the delta-ray producton process
*. IDATA(7)  IANNI = Control Variable for the positoron annichilation prosecc
*. IDATA(8)  IBREM = Control Variable for the bremsstrahlung process
*. IDATA(9)  IHADR = Control Variable for the hadronic interaction process
*. IDATA(10) IMUNU = Control Variable for the mu-nuclear interaction process
*. IDATA(11) IDCAY = Control Variable for the decay in flight process
*. IDATA(12) ILOSS = Control Variable for the energy loss process
*. IDATA(13) IMULS = Control Variable for the energy loss process
*. RDATA(14) CUTGAM= Kinetic Energy cut Threshold for gamma
*. RDATA(15) CUTELE= Kinetic Energy cut Threshold for electron
*. RDATA(16) CUTNEU= Kinetic Energy cut Threshold for newtral hadron
*. RDATA(17) CUTHAD= Kinetic Energy cut Threshold for charged hadron
*. RDATA(18) CUTMUO= Kinetic Energy cut Threshold for muon
*. RDATA(19) BCUTE = Kinetic Energy cut Threshold for electron brems.
*. RDATA(20) BCUTM = Kinetic Energy cut Threshold for muon brems.
*. RDATA(21) DCUTE = Kinetic Energy cut Threshold for electron delta ray
```

```
*. RDATA(22) DCUTM = Kinetic Energy cut Threshold for muon or hadron delta ray
*. RDATA(23) PPCUTM= Total Energy cut Threshold for e-pair production by muon
*. RDATA(24) TOFMAX= TOF cut
*.------------------------------------------------------------------------
*.
*.
*.************************************************************************
*.     +-------------------------+                                      *
*.     | Bank Name  :  MCVXPAR   |                                      *
*.     +-------------------------+                                      *
*.                                                                      *
*.     Contents    : Information of VTX Parameters are stored.          *
*.     Created in  : vxspar.f  using  KZBCR1
*.     Record Type : 1-dim. fixed length segment                        *
*.     Version     : Release 1.0  1995-May-10                           *
*.                                                                      *
*.************************************************************************
*.
*.(1) Contents in the Master Segment
*.    Master segment = segment # 0
*.------------------------------------------------------------------------
*.  DATA                          CONTENTS
*.------------------------------------------------------------------------
*. IDATA(1)   Number of Layers
*.  DATA(2)   Depletion Layer Thickness
*.  DATA(3)   Pixel Size (cm)
*.  DATA(4)   Radial Position of the 1st Layer
*.  DATA(5)   Radial Position of the 2nd Layer
*.  DATA(6)   Radial Position of the 3rd Layer
*.  DATA(7)   Half Z-Length of the 1st Layer
*.  DATA(8)   Half Z-Length of the 2nd Layer
*.  DATA(9)   Half Z-Length of the 3rd Layer
*.  DATA(10)  Silicon Thickness
*.------------------------------------------------------------------------
*.
*.
*.************************************************************************
*.     +-------------------------+                                      *
*.     | Bank Name  :  MCCTPAR   |                                      *
*.     +-------------------------+                                      *
*.                                                                      *
*.     Contents    : Information of CDC Parameters are stored.          *
*.     Created in  : ctspar.f  using  KZBCR1
*.     Record Type : 1-dim. fixed length segment                        *
*.     Version     : Release 1.0  1995-May-10                           *
*.                                                                      *
*.************************************************************************
*.
*.(1) Contents in the Master Segment
*.    Master segment = segment # 0
*.------------------------------------------------------------------------
*.  DATA                          CONTENTS
*.------------------------------------------------------------------------
*. IDATA(1)   Number of Super-Layers
*. IDATA(2)   Number of Anode-Wires in a Cell
*.  DATA(3)   Outer Radius (cm)
*.  DATA(4)   Inner Radius (cm)
*.  DATA(5)   Half Z-Length of Outer CFRP Wall (cm)
*.  DATA(6)   Z-coodinate of an Endplate Point used to define EP Shape
*.  DATA(7)   R-coodinate of an Endplate Point used to define EP Shape
```



```
*.  DATA(8)   Length of super cell for phi direction (cm)
*.  DATA(9)   Length of super cell for R direction   (cm)
*.  DATA(10)  Thickness of CFRP Wall (cm)
*.  DATA(11)  Thickness of Endplate  (cm)
*.------------------------------------------------------------------------
*.
*.
*.************************************************************************
*.     +-------------------------+                                      *
*.     | Bank Name  :  MCBCPAR   |                                      *
*.     +-------------------------+                                      *
*.                                                                      *
*.     Contents    : Information of Barrel Calorimeter Geometrical      *
*.                   Parameters are stored.                             *
*.     Created in  : bcspar.f  using  KZBCR0
*.     Record Type : 1-dim. fixed length segment                        *
*.     Version     : Release 1.0  1995-Apr-18                           *
*.                                                                      *
*.************************************************************************
*.
*.(1) Contents in the Master Segment
*.    Master segment = segment # 0
*.------------------------------------------------------------------------
*.  DATA                          CONTENTS
*.------------------------------------------------------------------------
*. IDATA(1)   FLAG to select calorimeter type (See bcsub?)
*. IDATA(2)   # of Towrs in Theta Direction
*. IDATA(3)   # of Towrs in Phi Direction
*.  DATA(4)   Half Length of Calorimeter System in Z Axis.
*.  DATA(5)   ...................
*.  DATA(6)   Thickness of EM Scintillator Plate.
*.  DATA(7)   Thickness of HAD Scintillator Plate.
*.  DATA(8)   Depth of a Calorimeter Towor.
*.  DATA(9)   Size of Calorimeter Towor.
*.  DATA(10)  Depth of EM part
*.  DATA(11)  Tickness of WLS Plate.
*.  DATA(12)  Tilt Angle of Tower in Phi axis.
*.------------------------------------------------------------------------
*.
*.(2) Contents in the Data Segment
*.    Total # of segment = 6
*.------------------------------------------------------------------------
*. Subsegment #   TYPE   # DATA        Comment
*.-------------------------------------------------------------
*.       1          R    2*NPHI     EM Cal X Position
*.       2          R    2*NPHI     EM Cal Y Position
*.       3          R    2*NTHE     EM Cal Z Position
*.       4          R    NPHI       HAD Cal X Position
*.       5          R    NPHI       HAD Cal Y Position
*.       6          R    NTHE       HAD Cal Z Position
*.-------------------------------------------------------------
*.  DATA                          CONTENTS
*.------------------------------------------------------------------------
*.  DATA(1)   Position of Calorimeter Cell.
*.------------------------------------------------------------------------
*.
*.************************************************************************
*.     +-------------------------+                                      *
*.     | Bank Name  :  MCECPAR   |                                      *
*.     +-------------------------+                                      *
```

```
*.                                                                    *
*.     Contents    : Information of Endcap Calorimeter Geometrical    *
*.                   Parameters are stored.                           *
*.     Created in  : ecspar.f  using  KZBCR0                          *
*.     Record Type : 1-dim. fixed length segment                      *
*.     Version     : Release 1.0  1995-Apr-18                         *
*.                                                                    *
*.********************************************************************
*.
*.(1) Contents in the Master Segment
*.    Master segment = segment # 0
*.------------------------------------------------------------------
*.  DATA                          CONTENTS
*.------------------------------------------------------------------
*. IDATA(1)   FLAG to select calorimeter type (See bcsub?)
*. IDATA(2)   Number of Divisions in R-direction (=NRdiv)
*. IDATA(3)   Inner Radius of EC CAL Front Face
*.  DATA(4)   Outer Radius of EC CAL Front Face
*.  DATA(5)   Inner Radius of EC CAL Rear  Face
*.  DATA(6)   Outer Radius of EC CAL Rear  Face
*.  DATA(7)   Z-position of EC Front Face
*.  DATA(8)   Depth of a Calorimeter Towor.
*.  DATA(9)   Depth of EM part
*.  DATA(10)  Thickness of EM  Scintillator Plate.
*.  DATA(11)  Thickness of HAD Scintillator Plate.
*.  DATA(12)  Size of Calorimeter Towor.
*.------------------------------------------------------------------
*.
*.(2) Contents in the Data Segment
*.    Total # of segment = Number of R-divisions (=NRdiv)
*.------------------------------------------------------------------
*. Subsegment #   TYPE   # DATA        Comment
*.---------------------------------------------------------------
*.       1          R    NPHI       Number of Division in Phai of 1st  ring.
*.       i          R    NPHI       Number of Division in Phai of i-th ring.
*.   NRdiv          R    NPHI       Number of Division in Phai of last ring.
*.---------------------------------------------------------------
*.  DATA                          CONTENTS
*.------------------------------------------------------------------
*.  DATA(1)   Position of Calorimeter Cell.
*.------------------------------------------------------------------
*.
*.********************************************************************
```


Appendix-C fullJIM の入力データ

```
------------------------------------------------------------------------------
input.dat ; File Names for Parameter Input. Names are user-re-definable.

Keyword   Parameter     Meaning
GEAN     'geant.dat'    file name which contains GEANT control parameters
VX       'vxgeom.dat'   file name which contains VX geometry parameters
CT       'ctgeom.dat'   file name which contains CT geometry parameters
BC       'bcgeom.dat'   file name which contains BC geometry parameters
EC       'ecgeom.dat'   file name which contains EC geometry parameters
IR       'irgeom.dat'   file name which contains IR geometry parameters
PS       'jim.ps'       Postscript file to output graphics
BNK      'jim.bnk'      Output bank file name
HBK      'jim.hbook'    HBOOK output file name
EVT      'higgs.evn'    Input 4-vector file that is created by other generator.

------------------------------------------------------------------------------
geant.dat ; GEANT Control Keywords

Keyword   Meaning
TRIGGER   Number of event to simulate.
DEBUG     control event range/frequency for debug output.
          (1) First event to debug.
          (2) Last event to debug.
          (3) Frequency control to specify every N event.
SWITCH    control debug output type.
          (3)=1 write each parameter and swimming process.
          (4)=1 draw detctor and display events.
          (5)=1 dump bank contents.

KINE      control event source to simulate,
    KINE(1) ; Event Generator Code (integer)
           =1 KILUND Generates e+e- --> Hadrons with the LUND generator.
                     CMS Energy is set by 2nd variable on KINE data card.
           =2 KITOP  Generates a TOP quark event with LUND generator.
                     TOP MASS is set at 174 GeV.
           =3 KIHIGS Generates a HIGGS event. (Not Available Yet)
           =4 KISING Call single particle generator (useful for debugging
                      and testing)
           =5 KIFILE Reads Event from FILE Specified in 'input.dat'
           =6 KIMULT Call plural particle generator
    KINE(2) ; Center of mass Energy (GeV)
    KINE(3) ; Encoded Particle Code (used only when KINE(1)=4 or 6)
    KINE(4) ; Encoded Theta         (used only when KINE(1)=4 or 6)
    KINE(5) ; Encoded Phai          (used only when KINE(1)=4 or 6)

    when KINE(1)=4 then
         KINE(3)=particle code (LUND) + 1000*Icon
                 Icon=0 ; fixed direction,
                 Icon=1 ; random direction range from 9deg. to 171deg.
                 Icon=2 ; random direction range from 40deg. to 140deg.
         KINE(4)=theta angle when Icon=0
         KINE(5)=phi   angle when Icon=0

    when KINE(1)=6 then
         KINE(3)=particle code (LUND) + 1000*Nunber of particles
         KINE(4)=THETAmin + 1000*THETAmax
         KINE(5)=PHAImin  + 1000*PHAImax

CUTS    cut-off energy (GeV) to terminate particle swim.
```

```
IGDW    event display axis control. IGDW=1 cut perpendicular to x-axis, 2=y, 3=z
GDUV    location of detector origin on the display window.
GSUV    scale factor to display
GDCT    Location of cut-off plane for cross section view
IGPR    Graphics output ; 1=output to PS file & screen, 0=screen, -1=PS file
MFLD    Magnetic field (KiroGauss)
IGAT    GEANT tracking parameter control word = IGAUTO in /GCTRAK/
```

---

vxgeom.dat ; Vertex Detector Geometry Data

Keyword	Parameter	Meaning
SITK	300E-4	Si thickness (cm)
DLTK	30E-4	Depletion Layer thickness (cm)
PXCL	25E-4	Pixcel size (cm)
NLAY	3	Number of layers
RVX	2.5 4.0 7.5	Radius of each layer (cm)
ZVX	7.5 15.0 22.5	Half Z length of each layer (cm)

---

ctgeom.dat ; Central Tracker Geometry Data

Keyword	Parameter	Meaning
CTMO	230.0	Outer radius (cm)
CTMI	30.0	Inner radius (cm)
CTMZ	230.0	half Z length of outer CFRP wall (cm)
EPX1	213.0	Z point of end-plate (cm)
EPY1	70.0	R point of end-plate (cm)
		:Define end-plate curve to calculate hyperboric curve that pass (CTMZ,CTMO) and (EPX1,EPY1).
NSCE	20	# of super-layers
NDCE	5	# of anode wires in a super cell
PLSC	5.0	Half-size of a super cell along phi direction (cm)
RLSC	7.0	Size of a super cell along R direction (cm)
RLUN	1.4	Space between axial super-layer and stereo super-layer (cm)
TCYL	0.5	Thickness of CFRP wall (cm)
TENP	5.0	Thickness of end-plate (cm)

---

bcgeom.dat ; Barral Calorimeter Geometry Data

Keyword	Parameter	Meaning
BCSW		Module Size Definition Method
	BCSW=1	DTHETA constant option.
	BCSW=2	DZ constant option.
	BCSW=3	Module size constant option
BRIN	250.0	Inner radius (cm)
BZL	800.0	Full Z-Length (cm) ; only to define BC master volume.
BZI	350.0	Half Z-length at the inner surface of BC.
BTSE	0.1	Thickness of EM-Scintillator (cm)
BTSH	0.2	Thickness of HAD-Scintillator (cm)
BBL	140.0	Depth of Tower (cm)
BBS	20.0	Tower Size at the inner surface (cm).
BDEM	20.0	Depth of EM part (cm)
BNTH	25	# of division in THETA direction
BNPH	64	# of division in PHI direction
BTLG	0.5	Tickness of WLS plate (cm).
BTLT	3.0	Telt Angle in phi (degree).

Note) Some parameters are not used depending on which BCSW are specified.

---

ecgeom.dat ; Endcap Calorimeter Geometry Data

Keyword	Parameter	Meaning
BCSW		Phai-division Method
	BCSW=1	Divide into 16 at the center ring
	BCSW=2	Divide into 16 at the inner-most ring
ERI1	25.0	Inner radius at the front face (cm)
ERO1	230.0	Outer radius at the front face (cm)
ERI2	25.0	Inner radius at the the rear end (cm)
ERO2	300.0	Outer radius at the the rear end (cm)
EZI	300.0	Z Positoin of Front Face (cm).
EBL	140.0	Total Thickness (cm)
EDEM	20.0	Depth of EM part (cm)
ETSE	0.1	Thickness of EM-Scintillator (cm)
ETSH	0.2	Thickness of HAD-Scintillator (cm)
EBSZ	20.0	Block Size at the front face (cm)

---

irgeom.dat ; Interaction Region Geometry Data
QC=Q-Magnet, MK=Mask, BP=Beam Pipe,
ST=Support Tube, CS=Compensation Solenoid

Keyword	Parameter	Meaning
CROS	0.004	Crossing Angle (rad) ; +value = rotate toward +x direction.
QCXY	(x,y)*8sets	Coordinate of 7-points indicating pole shape + outer octagon.
QC1Z	250.0 490.0	Z location of QC1 front and rear face
QC2Z	520.0 760.0	Z location of QC2 front and rear face
QCLX	5.300 9.000	X coordinates of QC coil
QCLY	0.500 2.100	Y coordinates of QC coil
MKTH	0.150 0.200	Theta range (rad) of mask cone
MKR1	3.500	Inner radius of mask (cm) at front face of cone
MKR2	25.00	Outer radius of mask (cm) at rear end of cone
MKZ3	180.0	Z(cm) location of mask cylindorical part end point
BPRI	0.500 5.000	Inner radii (cm) of central(Be) and outer(Al) beam pipe
BPTK	0.050 0.100	Thickness(cm) of central(Be) and outer(Al) beam pipe
BPZP	z1 z2 z3	Central part ends at z1, z2~z3=Al part, z1~z2=connecting cone.
STUB	r1 r2 z	Inner and Outer radii, and half-z length of support tube.
CSRZ	r1 r2 z1 z2	Inner and Outer radii, and z-range of compensation solenoid

Appendix-D バンクのアクセスルーチン

```
C*************************************************************************
C
C     Bank data generated by fjim are obtained in your analysis
C     routine by calling following routines.
C     See document 'BANK' for detailed bank data configuration.
C
C     UPDATED on 3-Sep-1996,  Y.Fujii
C
C*************************************************************************
C
C     Following routines are described in order of execution.
C          KZINIT ; Initialization
C          JUALLC ; File Alloaction
C          KZFILE ; File Open
C          KZREAD ; Read One Event from the file to a Bank.
C          KZGET0 ; Read Data from the Bank to Local Buffer.
C          KZGET1 ; Read Data from the Bank to Local Buffer.
C          KZGET2 ; Read Data from the Bank to Local Buffer.
C          KZECLR ; Clear Bank.
C          KZEND  ; Termination
C
C          KZNSEG ; Get number of total segments in a bank
C          KZNSSG ; Get number of total sub-segments in a segment of a bank
C          KZLSEG ; Get length of a segment of a bank
C
C*************************************************************************
C     Initialization
C
C          CALL KZINIT ; argument = NONE. Call First.
C
C*************************************************************************
C     File Allocation
C
C          CALL JUALLC(LU,'file-name',1,IERR)
C                      LU    = Logical Unit Number
C                     'file-name' = Bank-file name which fjim generated.
C                      IERR  = Error code.
C
C*************************************************************************
C     Open File
C
C          CALL KZFILE(LU)
C                      LU = Logical Unit Number declared in JUALLC.
C
C*************************************************************************
C     Dummy Read of Parameter Record. Need to do once before reading event.
C
C          CALL KZREAD(LU,IERR)
C                      LU    = Logical Unit Number declared in JUALLC.
C                      IERR  = Error code. 0=Normal End, 1=END of FILE, 2=Error.
C
C*************************************************************************
C
C +do i=1,Nevent ; Repeat calling following routines for Nevent times.
C |
C |     CALL KZREAD(LU,IERR) ; Read one event from the file. See below.
C |
C |     CALL KZGET           ; Read data records from the bank. See below.
C |
```



```
C |     CALL KZECLR          ; Clear the bank. See below.
C |
C +enddo
C
C*************************************************************************
C     Ending Process
C
C          CALL KZEND(0)
C
C*************************************************************************
C
C     Following routines should be called each event.
C
C*************************************************************************
C     Read Event Data from a file to a bank. Do once a event.
C
C          CALL KZREAD(LU,IERR)
C                      LU    = Logical Unit Number declared in JUALLC.
C                      IERR  = Error code. 0=Normal End, 1=END of FILE, 2=Error.
C
C*************************************************************************
C     Get Data from the bank to local buffers.
C     Do as many times as you need to get all your necessary data.
C
C          CALL KZGET1('MCEVENT',ISEG,NWORD,BUFFER)
C                       input,input,input,output
C               'MCEVENT' ; BANK name. See BANK document for contents.
C                ISEG     ; Segment number. 0=master segment.
C                NWORD    ; Number of words to read out.
C                BUFFER(NOWRD) ; Local buffer to store data.
C                                An array bigger than or equal to NWORD.
C
C     And similarly, for other banks,
C          CALL KZGET1('GENHEADER',ISEG,NWORD,BUFFER)
C          CALL KZGET1('MCHEADER',ISEG,NWORD,BUFFER)
C          CALL KZGET1('MCEVENT',ISEG,NWORD,BUFFER)
C          CALL KZGET1('MCVERTEX',ISEG,NWORD,BUFFER)
C          CALL KZGET1('MCTRACK',ISEG,NWORD,BUFFER)
C          CALL KZGET1('MCVXHIT',ISEG,NWORD,BUFFER)
C          CALL KZGET1('MCCTHIT',ISEG,NWORD,BUFFER)
C          CALL KZGET0('MCBEHIT',ISEG,NWORD,BUFFER)
C          CALL KZGET0('MCEEHIT',ISEG,NWORD,BUFFER)
C          CALL KZGET0('MCBHHIT',ISEG,NWORD,BUFFER)
C          CALL KZGET0('MCEHHIT',ISEG,NWORD,BUFFER)
C          CALL KZGET1('MCGEPAR',ISEG,NWORD,BUFFER)
C          CALL KZGET1('MCVXPAR',ISEG,NWORD,BUFFER)
C          CALL KZGET1('MCCTPAR',ISEG,NWORD,BUFFER)
C          CALL KZGET0('MCECPAR',ISEG,NWORD,BUFFER)
C          CALL KZGET0('MCBCPAR',ISEG,NWORD,BUFFER)
C
C     There are three routines to get data ; KZGET0, KZGET1, KZGET2.
C     Banks which are created with KZBCR0 should be read with KZGET0.
C     Banks which are created with KZBCR1 should be read with KZGET1.
C     Banks which are created with KZBCR2 should be read with KZGET2.
C     Thus you should use KZGET0/1 in the way as shown above.
C
C     See sample programs getxxx.f saved in /proj/soft/users/template/analysis.
C
C*************************************************************************
C     User Analysis Routines shoule be called here, after
```

```
C     KZGET routines and before KZECLR routines.
C*********************************************************************
C     Clear the bank.
C
C          CALL KZECLR ; No argument.
C
C*********************************************************************
C     Utility Routines
C
C     KZNSEG('BANK NAME',Nseg) ; Nseg=number of total segments in 'BANK NAME'.
C     KZNSSG('BANK NAME',Iseg,Nsubseg) ; Nsubseg=number of total sub-segments
C                                        in a segment Iseg of 'BANK NAME'.
C     KZLSEG('BANK NAME',Iseg,Lseg) ; Lseg=Length of a segment Iseg of 'BANK NAME'.
C
C*********************************************************************
```


Appendix-E jim のコーディング規約

1) Detector Name Abbreviation

All the detectors and structures have their own abbreviation of two characters. Presently followings are already defined.

- VX ; Vertex Detector
- CT ; Central Tracker
- BC ; Barrel Calorimeter
- EC ; Endcap Calorimeter
- PS ; PreShower Detector of EM CAL
- SP ; Silicon Pad of EM CAL
- MU ; Muon Detector
- BM ; Beam Monitor

- IR ; Interaction Region
  - QC ; IR Q-magnets
  - MK ; Masks
  - BP ; Beam Pipe
  - CS ; Compensation Solenoids
  - ST ; Support Tube

- SO ; Superconducting Solenoid

Common areas and subroutines should be named as CTxxxx where xxxx is arbitrary. On th contraly global variables should be named as xxxxCT. This is to leave option to use the first character of variables to indicate Integer or Real.

Volumes names are also recommended to use these abbreviation characters. However volumes names can only have four characters, and sometimes you need to use all four of them. Thus you should be very careful to avoid duplicate naming.

2) Histogram Identifyer

HBOOK ID numbers should be numbered as follows.

- System use = 1xxx
- VX related = 3xxx
- CT related = 4xxx
- BC related = 5xxx
- EC related = 6xxx
- MU related = 7xxx
- IR related = 8xxx

3) Rotation Matrix

Rotation matrix numbers should be numbered as follows.

- System use = 1xxx
- VX related = 3xxx
- CT related = 10000-40000
- BC related = 5xxx
- EC related = 6xxx
- MU related = 7xxx
- IR related = 8xxx