JADE Computer Note No. 32
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VTX INI must be changed for VTX ch pipe!
done in VTXpre

How to use the Vertex fit program

The Vertex program package contains 9 routines:

VTXINI	initialisation
VTXPRE(IH,IP)	preparation
VTXSRC	vertex search
VTXEE	photon conversions
VERTEX	vertex fit
VTXPNT	support routines
VTXAFT	track correction
VTXBNK(IP)	'GVTX' bank creation (needs BOSLIB)
SMINVD	matrix inversion

These routines communicate via COMMON/CWORK1/X(2103). VTXPRE needs the 'HEAD' and 'PATR' banks, the pointers to these banks are passed via subroutine arguments. The results appear in /CWORK1/, and if one calls VTXBNK(IP), in bank 'GVTX'. The routines may be copied from F11LHO.JADEGS or linked from F11LHO.JADEGL.

The track and vertex parameters used in the package are described in a source comment in subroutine VERTEX.
This comment is given below:

```
C*
C*    INPUT PARAMETERS IN /CWORK1/ (MM, MEV, RADIANS)
C*    ===============
C*    NT      = TOTAL NR OF TRACKS OF EVENT
C*    IT(1) =           FLAG (0 = TRACK INCOMPLETE OR BAD, NOT USED
C*                            1 = GOOD, BUT DO NOT USE IN VERTEXFIT
C*                            2 = GOOD)
C*    T( 2) = +-R       RADIUS(+ MEANS ANTICLOCKWISE LOOKING TO -Z)
C*       3  = PHI       AZIMUTH AT POINT XT,YT,ZT
C*       4  = THETA     POLAR ANGLE TO XY-PLANE(0=VERTICAL TO BEAM)
C*       5  = XT        .
C*       6  = YT        . FIRST MEASURED POINT ON TRACK
C*       7  = ZT        .
C*       8  = DPHI      ERROR OF PHI
C*       9  = DTHETA    ERROR OF THETA
C*      10  = DXT       .
C*      11  = DYT       . ERROR OF XT,YT,ZT
C*      12  = DZT       .
C*      13  = NPT       NUMBER OF POINTS ON TRACK (INTEGER)
C*      14  = 0.        NOT USED ON INPUT
C*      15  = 0.        NOT USED ON INPUT
C*     16-30            FOR INTERNAL USE (SEE BELOW)
C*    (31-60)           2. TRACK
C*     .....            ........
C*
C*    OUTPUT PARAMETERS IN /CWORK1/ (MM, MEV, RADIANS)
C*    ================
C*    FOR TRACKS WITH IT(1) GT 0
C*    IT(1) =           FLAG (3 = TRACK WAS USED IN VERTEXFIT)
C*    T( 3) = PHI       AZIMUTH AT POINT XT,YT,ZT
C*       5  = XT        .
C*       6  = YT        . POINT ON TRACK NEAREST TO VERTEX
C*       7  = ZT        .
C*      10  = DXT       .
C*      11  = DYT       . ERROR OF XT,YT,ZT
C*      12  = DZT       .
C*      14  = NV        NUMBER OF VERTEX TO WHICH TRACK BELONGS (I)
C*      15  = S         EXTRAPOLATED ARC LENGTH (USUALLY NEGATIVE)
C*    ALL OTHER T'S ARE UNCHANGED
C*
C*    NV      = TOTAL NUMBER OF VERTICES
C*    IV(1) =           FLAG (0 = NO VERTEX FIT
C*                            1 = BAD VERTEX FIT
C*                            2 = VERTEX OF 1- OR COLLINEAR 2-PRONG
C*                            3 = GOOD VERTEX FIT
C*                            4 = E+E- PAIR VERTEX
C*                            5 = ISOLATED SINGLE TRACK VERTEX)
C*
C*    V( 2) = X         .
C*       3  = Y         . VERTEX COORDINATES
C*       4  = Z         .
C*       5  = DX        .
C*       6  = DY        . ERROR OF X,Y,Z
C*       7  = DZ        .
C*    IV(8) = NTR       NUMBER OF TRACKS USED IN VERTEX FIT
C*    V( 9) = CHI2      CHISQARE OF FIT (N.D.F. = 2*NTR-3)
C*    IV(10)= NTRALL    NUMBER OF TRACKS BELONGING TO THIS VERTEX
C*     (11-20)          2. VERTEX
C*
C*       .....         .........
C*
C*
```

Another way to obtain the results is to call VTXBNK(IP). This routine creates a bank 'GVTX' with the same number as the corresponding 'PATR' bank with pointer IP. The results are stored in the following order: NV, V(1... 10*NV), NT, T(1... 15*NT)

The V-array is ordered such that the first vertex is the one nearest to the beam.

The vertex package needs several constants in COMMON/CVTXC/ which are initialized in VTXINI and listed below. They may be changed by the user.

```
      SUBROUTINE VTXINI
C*800124*DITTMANN*************************************************
C*                                                               *
C* I N I T I A L I S A T I O N   O F   X Y Z   V E R T E X   F I T *
C*                                                               *
C*      TO BE CALLED ONCE AND BEFORE FIRST CALL TO VTXPRE, VERTEX *
C*****************************************************************
      COMMON /CVTXC/ XB,YB,ZB,RTANK,DTANK,XOINN,SIGX0,SIGZ0,PNTMIN,
     *               DISTB,COLL2,NITER,DSCONV,PRCUT,IREJTR,EEDPMN,
     *               EEDPMX,EEDTMX,EEDRMX,SEMAX,SIMAX,SIGFAC
C
C        MEAN VERTEX COORDINATES
      XB = 0.
      YB = 0.
      ZB = 0.
C        OUTER RADIUS OF INNER TANK WALL
      RTANK = 174.
C        OUTER DISTANCE BEAM PIPE TO TANK WALL
      DTANK = 50.
C        RADIATION LENGTH BETWEEN BEAM AND FIRST WIRE
      XOINN = 0.16
C        MEAN TRACK RESIDUAL IN XY AND ZR PLANE
      SIGX0 = 0.55
      SIGZ0 = 30.
C        ARTIFICIAL FACTOR TO ACCOUNT FOR SYSTEMATIC ERRORS
      SIGFAC = 2.0
      SIGX0 = SIGX0 * SIGFAC
      SIGZ0 = SIGZ0 * SIGFAC
C        MINIMUM NUMBER OF POINTS IN XY AND Z TRACK
      PNTMIN = 5.
C        MAXIMUM DISTANCE OF TRACKS TO AVERAGE BEAM
C        USED IN PRIMARY VERTEX SEARCH
      DISTB = 20.
C        MAXIMUM OPENING ANGLE OF COLLINEAR 2-PRONGS
      COLL2 = 0.98
C        MAXIMUM NUMBER OF ITERATIONS IN VERTEX FIT
      NITER = 7
C        CONVERGENCE PARAMETER
      DSCONV = 0.1
C        MINIMUM PROBABILITY FOR GOOD VERTEX
      PRCUT = 0.001
C        REJECT BAD TRACKS DURING VERTEX FIT (0=NO, 1=YES)
      IREJTR = 1
C        EE PAIRS: MINIMUM AND MAXIMUM MEASURED PHI DIFFERENCE (RADIAN)
      EEDPMN = -0.07
      EEDPMX =  0.6
C        EE PAIRS: MAXIMUM THETA DIFFERENCE (STD.DEV.)
      EEDTMX = 3.
C        EE PAIRS: MAXIMUM DISTANCE WHERE TRACKS ARE PAPALLEL (STD.DEV.)
      EEDRMX = 3.
C        MAXIMUM TRACK EXTRAPOLATION AND INTRAPOLATION
      SEMAX = -200.
      SIMAX = 25.
C
      RETURN
      END
```

The vertex package may be used in three different ways.
For each one an example is given below:

1. FULL VERTEX SEARCH

```
      .
      CALL VTXINI
      .
      IH = ...        (POINTER TO 'HEAD' BANK)
      IP = ...        (POINTER TO 'PATR' BANK)
      CALL VTXPRE(IH,IP)
      CALL VTXSRC
      CALL VTXAFT
      CALL VTXBNK(IP)
      .
```

2. VERTEX FIT FOR SELECTED TRACKS (SAY 3 AND 6)

```
      COMMON /CWORK1/ NT,T(1500),NV,V(200)
      .
      I1 = 3
      I2 = 6
      .
      CALL VTXPRE(IH,IP)
      N = 0
      J = 0
      DO 1 I=1,NT
      IF(IT(J+1).EQ.0) GOTO 1      (THIS CAN HAPPEN IF VTXPRE FINDS
      IT(J+1) = 1                   THIS TRACK TO BE TOO BAD)
      IF(I.NE.I1 .AND. I.NE.I2) GOTO 1
      N = N + 1
      IT(J+1) = 2
    1 J = J + 30
      IF(N.NE.2) GOTO ...
      NV = 1
      CALL VERTEX                  (OR ANY OTHER NUMBER BETWEEN 1 AND 20)
      CALL VTXAFT
      .
```

3. SEARCH FOR PHOTON CONVERSIONS ONLY

```
      .
      CALL VTXPRE(IH,IP)
      NV = 0
      CALL VTXEE
      IF(NV.EQ.0) GOTO ...
      L = 0
      DO 2 I=1,NV
      J = 0
      K1 = 0

      DO 1 K=1,NT
      IF(IT(J+14).EQ.I .AND. K1.NE.0) K2=K
      IF(IT(J+14).EQ.I .AND. K1.EQ.0) K1=K
    1 J = J + 30
      .
    2 L = L + 10                   (K1,K2 ARE THE TWO TRACK NUMBERS OF VERTEX I)
      .
```

4. GRAPHICS

VX 0 main vertex (automatic with CDTL 27)

VX 1 all vertices

VX 2 e^+e^- vertices

VX 3 creation of bank 'GVTX' (can be looked at with BW command)