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TP Bank Format
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;
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                  Format of the Generation 8 TP Banks
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   This note explains the contents of the TP summary banks produced
   by the TP program version 8. (This version is the one that prod-
   uces Generation 8 MH datasets but the program is able to process
   all types of events as well.)  The output of earlier versions of
   the TP program can be found in JADE Computer Note 24A.


   Changed lines are indicated by <<

   This note can be listed by submitting the job
                       'JADEPR.TEXT(JADECN80)'



     There are 3 banks to store the fully analysed results. They are

'TPEV'      which contains summary information for the whole event,

'TPTR'/n    a series of banks, each of which contains information about
            a single particle. (Neutral particles included.)

'TPVX'/n    a series of banks, each of which contains information about
            a found vertex. 'TPVX'/1 summarises the primary vertex and
            subsequent 'TPVX' banks summarise other vertices found.


@
     Variables in each bank are described in the following, where IDATA,
ADATA  and  HDATA are INTEGER*4,  REAL and INTEGER*2 words respectively,
equivalenced to the common /BCS/.  The index in the brackets is counted
from the  BOS  pointer.   Notice  that  the index for the I*2 variables
increases  twice  as fast as the others  and that the  BOS  pointer for
the I*2  variables  must be multiplied by 2.  In the following the  two
kinds of indices are treated separately.

 IDATA,ADATA:   'NAME',  NO.,NEXTP,LNGTH,    1,    2,    3,    4,....
 HDATA      :   'NAME',  NO.,NEXTP,LNGTH, 1, 2, 3, 4, 5, 6, 7, 8,....




;
                'TPEV'/1 Bank    (Event Summary)
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;


IDATA( 1)  The version number - currently 8 .
  "  ( 2)  The production date and time. (This is fixed  at the
           beginning of the TP job.)
HDATA( 5)  # of recorded particles
  "  ( 6)  # of positive recorded particles
  "  ( 7)  # of negative recorded particles
  "  ( 8)  # of ambiguous charged tracks (i.e. sigma(rho) > rho)
  "  ( 9)  # of neutral particles (includes gammas)
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  "  (10)  # of clusters in the - z tagging detector
  "  (11)  # of clusters in the + z tagging detector

@
  "  (12)  # of vertices in the event including the primary vertex
              = no. of 'TPVX' banks.
  "  (13)  # of neutral vertices (not including the primary vertex).
  "  (14)  # of charged vertices.

  "  (15)  # of  gammas in the 'TPTR' banks
  "  (16)  # of  e+                 "
  "  (17)  # of  e-                 "
  "  (18)  # of  mu+                "
  "  (19)  # of  mu-                "
  "  (20)  # of  pi+                "
  "  (21)  # of  pi-                "
  "  (22)  # of  pi0                "
  "  (23)  # of  K+                 "
  "  (24)  # of  K-                 "
  "  (25)  # of  K0/s               "
  "  (26)  # of  eta-0              "
  "  (27)  # of  protons            "
  "  (28)  # of  anti-protons       "
  "  (29)  # of  lambda-0           "
  "  (30)  # of  unknown particles"

  "  (31)  A flag of seen particle types (additive)
           ( 1 = gamma, 10 = e+-, 100 = mu+-, 1000 = hadrons )
  "  (32)  Not used
  "  (33)   "   "
  "  (34)   "   "
@
           N.B. The following energies and momenta are measured in GeV.

ADATA(18)  Visible charged particle energy (E_visM-Ach)
  "  (19)  Sigma(E_visM-Ach)
  "  (20)  Visible neutral particle energy (E_visM-Aneu)
  "  (21)  Sigma(E_visM-Aneu)

  "  (22)  Missing momentum (p_miss) x
  "  (23)      "       "             y
  "  (24)      "       "             z
  "  (25)  Sigma(p_miss) x
  "  (26)    "           y
  "  (27)    "           z

HDATA(55)  Charge sphericity flag
             = 0, if all tracks are included.
             = 1, if only charged tracks are used.
  "  (56)  # of tracks used for the sphericity calculation


ADATA(29)  Smallest momentum tensor ellipse eigenvalue, alpha1 = S
  "  (30)  Middle      "        "      "        "     , alpha2
  "  (31)  Largest     "        "      "        "     , alpha3

           Q1 = 1 - 2/3 * alpha3           alpha1 + alpha2 + alpha3 = 3
           Q2 = 1 - 2/3 * alpha2             Q1  +   Q2   +   Q3   = 1
           Q3 = 1 - 2/3 * alpha1

           Sphericity   (S) = 1/2 * ( Q1 + Q2 ) = alpha1     ( 0..1 )
           Acoplanarity (A) = 1/2 * Q1                       ( 0..1 )
@
ADATA(32)  Direction cosine x  of the eigenvector corresponding to Q3
  "  (33)      "         "    y              "
  "  (34)      "         "    z              "

             This is the alpha1 or sphericity axis (for p(long.) ).

  "  (35)  Direction cosine x  of the eigenvector corresponding to Q2
  "  (36)      "         "    y              "
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  "  (37)     "        "    z             "

            This is the alpha2 or major axis (for p(t)_in ).

  "  (38)  Direction cosine x  of the eigenvector corresponding to Q1
  "  (39)     "        "    y             "
  "  (40)     "        "    z             "

            This is the alpha3 or minor axis (for p(t)_out ).

HDATA(81)  # of tracks used for the thrust calculation
  "  (82)  Max. # of tracks accepted by the thrust program
ADATA(42)  Thrust    ( T : 0.5 ... 1.0 )          (if calculation done)
  "  (43)  Direction cosine x of the thrust axis ( "       "        " )
  "  (44)     "        "    y            "       ( "       "        " )
  "  (45)     "        "    z            "       ( "       "        " )
  "  (46)  Not used
  "  (47)   "
  "  (48)   "
  "  (49)   "
  "  (50)   "
@
ADATA(51)  TOF of the beam counter
  "  (52)  Hit time difference for 2-prong events
  "  (53)  Collinearity of 2-prong events
  "  (54)  Acoplanarity of 2-prong events
  "  (55)  Not used


           The following 10 I*2 words are error flags for each step.
           General error codes (additive):
                    10000  the necessary raw data is missing.
                     4000  corresponding TP-subroutine was not called
                     2000  /BCS/ space was not enough for a new bank.
                     1000  the necessary result bank is missing or
                           it has an error.
                       -1  analysis or TP program is not ready yet.

HDATA(111)    Error flag for Jet Chamber pattern recognition
  "  (112)        "          vertex fit
  "  (113)        "          TOF
  "  (114)        "          dE/dx
  "  (115)        "          Lead Glass
                          100  LGCDIR was not called or ended prematurely
                           10  ID track-LG connection was not done.
                            1  LG-cluster energy correction was not done.
  "  (116)        "          Muon detector
  "  (117)        "          Tagging detector
  "  (118)        "          pairs and vees
  "  (119)        "          jet analysis
  "  (120) Not used

@
;
                'TPTR'  Bank    (One Particle Summary)
                 ------------------------------------
;


      A 'TPTR' bank is made for each particle.  The length
      of the bank is different for each type, e.g. for gammas
      the TOF and dE/dx information is omitted.
      PATR tracks: 80 words,  LG Photons: 50 words,   Others: 40 words

HDATA( 1)  The index( = the TPVX bank #) of the vertex for the track
  "  ( 2)  The index( = the TPVX bank #) of the secondary vertex if any
  "  ( 3)  Flag of the detectors where the track is seen
           1000  Jet Chamber
            100  Lead Glass shower counters
             10  Muon Filter
              1  Tagging Detector
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  "  ( 4)  The index of the track in the 'PATR' bank, if seen there,
             (otherwise 0)
  "  ( 5)  Number of LG clusters connected to the track
             0  not detected by the LG and it is not expected to be
            -1   "       "    "   "   "  although it is expected.
                   (The extrapolated hit position is near the edge)
            -2  not detected by the LG although LG hit is expected
                within the fiducial detection region.
  "  ( 6)  The index of the 1-st connected LG cluster
  "  ( 7)   "    "     "   "  2-nd     "        "    "
  "  ( 8)  Not used       <<
  "  ( 9)   "    "        <<       This was not filled even
  "  (10)   "    "        <<       by the old program.
  "  (11)   "    "        <<
  "  (12)   "    "        <<
@
HDATA(13)  The index of the Tagging Detector cluster
  "  (14)  Not used
  "  (15)   "    "
  "  (16)   "    "
  "  (17)  Type of the stored track origin
             1  first observed point in the Jet Chamber
             2  the fixed point (x,y,z) = (0,0,0)
             3  the closest point from the beam axis on the track
                extrapolation
            20  on the beam beam axis,at z = z_vertex of the event
                (used for gammas)
            30  closest point on the track from the fitted event vertex
  "  (18)  Original track flag.
             1  if the track is used to fit the event vertex.
             0  otherwise.
ADATA(10)  x coordinate of the track origin  = x(origin)
  "  (11)  y       "                       = y(origin)
  "  (12)  z       "                       = z(origin)
  "  (13)  Sigma( x(origin) )
  "  (14)  Sigma( y(origin) )
  "  (15)  Sigma( z(origin) )
  "  (16)  The shortest distance from the vertex to the track=abs(delta)
  "  (17)  d(r)/sigma(r)    ( not filled )
  "  (18)  d(z)/sigma(z)    ( not filled )

  "  (19)  Chi-squared of the (r-phi) fit
IDATA(20)  Number of degrees of freedom of the (r-phi) fit
ADATA(21)  Chi-squared of the (r-z) fit
IDATA(22)  Number of degrees of freedom of the (r-z) fit
@
ADATA(23)  Electric charge  ( = 100 if not known )
  "  (24)  Momentum (GeV/c)   = p
  "  (25)  Sigma(p)

IDATA(26)  Type of the stored track direction
             1 the line direction from the vertex to the first hit point
             2 the tangent direction on the track at the closest point
               from the vertex
ADATA(27)  x-component of the direction cosine  alpha-x
  "  (28)  y-component  "  "      "         "    alpha-y
  "  (29)  z-component  "  "      "         "    alpha-z
  "  (30)  Sigma( alpha-x )
  "  (31)  Sigma( alpha-y )
  "  (32)  Sigma( alpha-z )

  "  (33)  Not used

HDATA(67)  Input mass type (available only for MC test data)
           The mass code is given below.
  "  (68)  Most likely particle type
             0 = unknown,          1 = gamma,
             2 = electron,         3 = muon,
             4 = pion,             5 = kaon,
             6 = proton/neutron,   7 = lamda
ADATA(35)  Most likely mass of the particle in GeV/c**2 = AMASS
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  "  (36)  Total energy       = ETOT = SQRT( p**2 + AMASS**2 )

  "  (37)  Shower energy      = ESH
  "  (38)  Sigma(ESH)
@
HDATA(77)  Quality of the shower energy measurement
             -2  not detected by the LG although LG hit is expected
                 within the fiducial detection region.
             -1  not detected by the LG although hit is expected
                 near the detector edge.
              0  not detected and a hit is not expected due to
                 the gap in the LG detector or absorption in the coil.
              1  the connected LG cluster is near the detector edge.
                 (ESH may not be correct)
              2  the connected LG cluster is in the fiducial region.

  "  (78)  Uniqueness of the cluster assignment
           = number of other tracks which share the same connected
             clusters. =0 , if the connection is unique.
ADATA(40)  Chi-squared deviation of the ESH and p for a shower
           =( (ESH-p)/sigma(ESH) )**2
ADATA(41)  Chi-squared deviation of ESH and expected ESH for a
           non-showering track
           =(( ESH-(Expected_ESH) / sigma(Expected_ESH) )**2
           Temporarily  Expected_ESH = 0.25, sigma(Expected_ESH) = 0.125
  "  (42)  Not used

HDATA(85)  Number of associated muon hits with the Jet Chamber track
  "  (86)  The Muon Filter acceptance flag        <<
             0  track is safely inside the Muon Filter acceptance
             1  track is at edge of Muon Filter acceptance
             2  track is definitely outside the Muon Filter acceptance

  "  (87)  Muon track quality flag (see JCN 22).
              <  1  track did not satisfy basic muon criteria
            1..99  track satisfied basic muon criteria(1 & 2 = good)
             > 99  probably a penetrating hadron
@
HDATA(88)  Not used.      <<
  "  (89)   "    "        <<
  "  (90)   "    "        <<      These were not filled even
  "  (91)   "    "        <<      with earlier versions of
  "  (92)   "    "        <<      the TP program.
  "  (93)   "    "        <<
  "  (94)   "    "        <<
  "  (95)   "    "        <<
  "  (96)  Muon selection flag  ("MUCUTS")    (see JCN 22).
             0  not a good muon candidate
             1  good muon candidate
             5  better muon candidate
             9  best muon candidate

ADATA(49)  Probability of chi-squared for the muon candidate.(0.0..1.0)
           = 0 if muon quality flag is not greater than zero
  "  (50)  Integral material thickness in mm
  "  (51)  Integral material thickness in g/cm**2
  "  (52)  Total energy loss in the material (GeV)
  "  (53)  Integral absorption length for a pion
  "  (54)  Energy at outermost hit assuming particle is a muon (GeV).
  "  (55)  Probability of being a muon ( = 1.0  if  ADATA(49) > 0 )
  "  (56)  Probability of being a punchthrough pion
  "  (57)  Not used

IDATA(58)  Quality of TOF
             1  one hit and unique solution
             2  two tracks hit the same counter but resolved
            -1  only one hit but left/right TOF does not agree
            10  >=2 hits and can not be resolved
@
ADATA(59)  TOF in nsec (after all corrections)
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  "  (60)  Path length to the TOF counter hit point
  "  (61)  Beta
  "  (62)  Sigma( beta )
  "  (63)  Calculated mass  (GeV/c**2)
  "  (64)  Sigma( mass )
  "  (65)  Chi-squared to be a proton   from TOF data
  "  (66)        "       "      kaon      "    "   "
  "  (67)        "       "      pion/muon "    "   "
  "  (68)        "       "      electron  "    "   "
  "  (69)  dE/dx in the TOF counter
  "  (70)  Not used
  "  (71)   "    "

IDATA(72)  Quality of the Jet Chamber dE/dx measurement
ADATA(73)  dE/dx
  "  (74)  Sigma( dE/dx )
  "  (75)  Chi-squared to be a proton   from the dE/dx data
  "  (76)        "       "      kaon      "    "    "    "
  "  (77)        "       "      pion/muon "    "    "    "
  "  (78)        "       "      electron  "    "    "    "
IDATA(79)  Particle type with lowest chi**2 ( numbered as above )
  "  (80)  Not used

@

;

              'TPVX'  Bank    (One Vertex Summary)
              ------------------------------------

;


      A 'TPVX' bank is made for each vertex. The first bank 'TPVX'/1 is
      used for the event vertex.  The length of the bank is different
      for each bank.


HDATA( 1)  The bank no. of the primary particle which makes this vertex.
           For 'TPVX'/1 it is 0.
  "  ( 2)  Flag of the vertex calculation
           = 10 * ( number_of_used_tracks) + fitting_mode
           Fitting mode = 0,1     the vertex is not calculated.
                        = 2       closest point from the beam axis
                        = 3       fitted in the (x,y) projection
                        = 4       fitted in the 3-dim. space
ADATA( 2)  x coordinate of the vertex      = xvtx
  "  ( 3)  y      "                        = yvtx
  "  ( 4)  z      "                        = zvtx
  "  ( 5)  Sigma( xvtx )
  "  ( 6)  Sigma( yvtx )
  "  ( 7)  Sigma( zvtx )
  "  ( 8)  Chi-squared of the vertex fit

IDATA( 9)  Number of degrees of freedom in the fit

           ****** Important caution ******                              <<
           If fitting mode is 2 or 3, this word is REAL; ADATA(9).      <<
           = dev**2 / (sigma**2 * number_of_d.o.f.)                     <<
@
ADATA(10)  COST =  < cos( angle_between_tracks ) >

HDATA(21)  Charge of the vertex ( = charge of the original track)
  "  (22)  # of the secondary tracks emitted from the vertex = mulsec
  "  (23)  # of the positive secondary tracks
  "  (24)  # of the negative secondary tracks
  "  (25)  # of the neutral secondary tracks including gammas
  "  (26)  # of ambiguous secondary tracks
  "  (27)  # of gammas
  "  (28)  # of electron/positrons
  "  (29)  # of muons
  "  (30)  # of hadrons (including ambiguous tracks)
```

```
*  (31)  The bank no. of the 1-st secondary track
*  (32)        "             2-nd   "
*  (33)        "             3-rd   "
*
******
*
*  (30+mulsec) "             last   "
```