JADE Computer Note No. 92

REDUC1 and REDUC2 for 1986 Data

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Introduction The production of REDUC1 and REDUC2 tapes had to follow slightly different paths in 1986 compared to the standard way, where REDUC1 tapes were produced at Rutherford Lab and REDUC2 was run at DESY. The reasons for redoing the reduction, or for recalibrating tapes, are laid out in JADE Computer Note 89. This note summarizes the status for the different runs and where the tape information can be found. All REDUCONE and REDUCTWO tapes are now available at DESY.

REDUC1 The REDUC1 output tapes for 1986 are broken up into several groups, which have to be distinguished according to the calibration used. In this respect the **preliminary** JETC calibration refers to a JETC calibration with estimated parameters (gain and pedestals), whereas **final** JETC calibration denotes the constants that are currently installed on the calibration file. The **preliminary** calibration has been used for some REFORM tapes to perform the selection of events. In these cases PATREC has been called again afterwards to use the final calibration for the selected events. The selection of events would have been slightly different though, if it had been performed with the final calibration from the beginning. Similarly, new lead glass gain constants were installed at DESY while REDUC1 was progressing. Here the different calibrations are denoted as **extrapolated** (from 1985) and **final.** Different to the JETC calibration most REDUCONE tapes have the results of the extrapolated calibration stored. The concerned user should, therefore, do the lead glass calibration again, himself.

Run	REDUCONE Tape	JETC Cal.	LG Cal.
24214 - 26371	JADEOL.RED1HH.G1244V00 - JADEOL.RED1HH.G1347V00	final	extr.
26372 - 28738	JADEPR.REDUCONE.G1365V00 - JADEPR.REDUCONE.G1519V00	prel.	extr.
28739 - 28746	JADEPR.REDUCONE.G1520V00	final	final
28747 - 29187	JADEPR.REDUCONE.G1521V00 - JADEPR.REDUCONE.G1548V00	prel.	extr.
29188 - 29339	JADEPR.REDUCONE.G1549V00 - JADEPR.REDUCONE.G1559V00	final	extr.
29340 - 29899	JADEPR.REDUCONE.G1567V00 - JADEPR.REDUCONE.G1599V00	final	final
29900 - 30397	JADEPR.REDUCONE.G1608V00 - JADEPR.REDUCONE.G1642V00	final	extr.

Tapes 1549 - 1559 and 1608 - 1642 were directly produced at Heidelberg. No effort was made to eliminate non-physics runs from these tapes. However, routines RUNFIX and EBEAM have been updated to inform the user of such runs. The summary information on REDUC1 output tapes is kept in member REDUCONE on 'JADEPR.TEXT'.

REDUC2 REDUC2 for 1986 had been started on the REDUC1 output tapes with the wrong calibration and had to be redone completely. The tapes that were produced from the calibrated files above are stored as F11OLS.REDUC22.G0xxxV00. They are subject to the same mix of calibrations as the REDUCONE output tapes.

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The V° finding package KOMAKS: JADE Computer note 93

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Introduction.

This note describes how to use the V° finding program package KOMAKS. As far as the authors of the note are aware, it has up to now only been used for K° searches however it could in principle be used for other V°s, e.g. Λs. In this respect it should be noted that all tracks are treated as pions. KOMAKS is based on the routine KST1 written by S. Komamiya (hence the name) somewhere back in the grey dawn of time and gently massaged into its present form by the other authors.

KOMAKS essentially consists of three steps.

(a) With the aid of several of the Dittmann vertex routines[1] (VTXPRE, VTXEE) each pair of tracks is examined as regards its feasibility of being a V°. For example pairs of tracks each with the same sign, or γ conversions are rejected. Also pairs containing tracks which do not pass the quality cuts in VTXPRE (see code for details) or which have less than the required minimum number of hits are rejected.

(b) Secondary vertices are then searched for by first looking for tracks which intersect in the $r\phi$ plane. It is possible to select only those pairs whose tracks do not come from the event vertex (see below), taken in this case as the run vertex from the common `/CALIBR/` .

(c) The z coordinate of the V° vertex is determined by performing a common fit in z.

How to use KOMAKS.

The KOMAKS package is for historical reasons written in FORTRAN IV (*ugh!*) and resides on
F11LHO.JADEGS/L
It is also necessary that

(a) the JADE block data (JADEBD) must be properly filled,

(b) one call is made to VTXINI at the start of the program,

(c) member WERTEX is INCLUDEd from JADEGL in order to pick up the appropriate version of the Dittmann vertex routines.

[1]See JADE computer note 32 and Appendix 1.

Failure to meet these requirements will probably result in junk results, 0C4's and all sorts of nasty retributions. The call to KOMAKS has the form
`CALL KOMAKS(IPRINT,IKOMA,ITRY,IERRK,IEEFG)`
where the arguments are of essentially an administrative nature and will be described later.

There are several parameters available to the user to enable her to steer the V° selection by KOMAKS, and although suggested values will be provided in this note, it is recommended that the user experiments a little in order to tune these parameters to her particular case. The values given here would be appropriate in a high multiplicity scenario, e.g. multihadronic events.

The communication of steering parameters and results between the user and KOMAKS is made via the common `/CKOMAK/`. For historical reasons the maximum number of vertices which can be stored in the common is limited to 50.

```
COMMON/CKOMAK/NMAS,PCOMB1(4,50),PCOMB2(4,50),HTR1(50),
      HTR2(50),VMAS(50),DMAS(50),DVLKO(50),DKO(50),XYZKO(3,50),
      STDEV,ARLIM,IZRFIT,MNHIT,PCUTT,DVLMIN,DKOMAX,IEEFG3
```

The steering parameters are the following (recommended values in parentheses).

STDEV (3.0): This has a somewhat complicated meaning. As stated previously it is possible to exclude those V° candidates which have one or both tracks being consistent, within scattering errors, with coming from the event vertex. STDEV is a factor which can be used to increase (STDEV > 1.0), or decrease (STDEV < 1.0) the size of the errors on each track. Thus the larger the value of STDEV the 'clearer' the separation between event vertex and secondary vertex.

ARLIM (4.0): Minimum closest approach in $r\phi$ of a track to the run vertex (mm).

IZRFIT (1): Flag to choose whether or not to perform the common z fit (1= perform, 0= do not perform).

MNHIT (24): Minimum number of hits required to be associated with a track in the $r\phi$ plane.

PCUTT (0.1): Minimum track momentum (GeV).

DVLMIN (10.0): Minimum $r\phi$ decay length of a V° candidate (mm).

DKOMAX (10.0): Maximum of the minimum distance between the event vertex and the V° flight path in the $r\phi$ plane (mm).

IEEFG3 (1): Flag to select only those vertices whose tracks are inconsistent with coming from the run vertex (1= select, 0= no selection). If IEEFG3 = 0 then the value of STDEV is irrelevant.

The results of the V° search are given by:

NMAS : The number of secondary vertices.

Run	REDUCTWO Tape
24214 - 26356	F11OLS.REDUC22.G0420V00 - F11OLS.REDUC22.G0470V00
26357 - 26371	F11OLS.REDUC22.G0470W00
26372 - 26387	F11OLS.REDUC22.G0470W00
26388 - 29187	F11OLS.REDUC22.G0471V00 - F11OLS.REDUC22.G0539V00
29188 - 29339	F11OLS.REDUC22.G0539V00 - F11OLS.REDUC22.G0544V00
29340 - 29899	F11OLS.REDUC22.G0554V00 - F11OLS.REDUC22.G0569V00
30900 - 30397	F11OLS.REDUC22.G0570V00 - F11OLS.REDUC22.G0582V00

The summary information on REDUC2 output tapes is kept in member REDUCTWO on 'JADEPR.TEXT'.

PCOMB1/2(4,n) : The four-vector of the $1^{st}/2^{nd}$ track making up the n^{th} vertex (GeV).

HTR1/2(n) : The number in the PATR bank of the $1^{st}/2^{nd}$ track making up the n^{th} vertex (note that these arrays are INTEGER $*$ 2).

VMAS(n) : The $\pi\pi$ mass of the n^{th} vertex (GeV).

DMAS(n) : The error on the $\pi\pi$ mass of the n^{th} vertex (GeV).

DVLKO(n) : The $r\phi$ decay length of the n^{th} vertex.

DKO(n) : The minimum distance between the event vertex and the $r\phi$ flight path the n^{th} vertex.

XYZKO(3,n) : The coordinates of the n^{th} vertex. If IZRFIT=0 then the third dimension of this array is meaningless.

The arguments in the call to KOMAKS have the following meaning.

IPRINT : is an input flag to switch on the WRITE statements.(0= no print and the amount of print increases with the non-zero value).

IKOMA : is an error return flag.
0 = normal return
1 = no PATR bank
2 = < 3 PATR tracks (then the whole exercise is a little pointless!).

ITRY : is the number of two particle combinations tried.

IERRK(50) : contains a code for the first 50 combinations tried.
0= V° candidate passes all selection criteria.
1= array IEEFG(50,2) has a non-zero element. For the first 50 combinations each track is flagged in this array. The meaning of the non-zero values are
1= track is part of γ conversion (given by VTXEE),
2= not used,
3= track comes from event vertex (only causes rejection if IEEFG3 = 1and hence the name of this flag),
4= r_{min} > ARLIM,
5= Z_{min} > 350.0, mm
6= track judged bad by VTXPRE.
2= one of the tracks has < MNHIT hits.
3= tracks do not originate from the same side of the event vertex.
4= error return from subroutine XYVRTX.
5= error return from subroutine XYVOPT.
6= error return from subroutine ZRVOPT.
7= track momentum > PCUTT.
8= error return from subroutine ELOSS.
9= γ conversion.
10= DVL > DVLMIN.
11= DKO > DKOMAX.
12= two tracks have the same charge.

Also available are routines for packing the common `/CKOMAK/` into a BOS bank KOKS (subroutine BKKOKS),and also unpacking the bank KOKS into the common `/CKOMAK/` (subroutine KOKSRE(IERROR)).

Disclaimer.

Most of the routines in this package were written a long time ago and to the remaining authors of this note who have not prudently emigrated to California, resemble something of a black box. While a certain amount of experience with the package has been gained, and willing as we may be to help the user with any problems that may be encountered, we do not consider ourselves to be legally liable for the results produced by KOMAKS. For any really interesting problems the only solution may be to have a look at the source code. However be warned, this is not a pretty sight and in some of the routines the rare comments are in Japanese!

Happy hunting.

Appendix 1.

To help those brave souls who do venture to look at the code of KOMAKS the details of the common /CWORK1/ are given here. This has been taken from F22KLE.VERTEX.S(VTXDEF). For further information regarding this common and the updated Dittmann WERTEX package contact Claus Kleinwort.

```
C X-Y-Z VERTEX FIT
C
COMMON /CWORK1/ NT,T(2000),NV,V(200)
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 T( 3) = PHI AZIMUTH AT POINT XT,YT,ZT
C T( 4) = THETA POLAR ANGLE TO XY-PLANE(0=VERTICAL TO BEAM)
C T( 5) = XT .
C T( 6) = YT . FIRST MEASURED POINT ON TRACK
C T( 7) = ZT .
C T( 8) = DPHI ERROR OF PHI
C T( 9) = DTHETA ERROR OF THETA
C T(10) = DXT .
C T(11) = DYT . ERROR OF XT,YT,ZT
C T(12) = DZT .
C IT(13) = NPT NUMBER OF POINTS ON TRACK (INTEGER)
C T(14) = 0 NOT USED ON INPUT
C T(15) = SO INITIAL ARCLENGTH ( = 0.  OR CLOSEST
C APPROACH TO RUNVERTEX )
C 16-40 FOR INTERNAL USE (SEE BELOW)
C (41-80) 2.  TRACK
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 T( 5) = XT .
C T( 6) = YT . POINT ON TRACK NEAREST TO VERTEX
C T( 7) = ZT .
C T(10) = DXT .
C T(11) = DYT . ERROR OF XT,YT,ZT
C T(12) = DZT .
C IT(14) = NV NUMBER OF VERTEX TO WHICH TRACK BELONGS (I)
C t(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 V( 2) = X .
C V( 3) = Y . VERTEX COORDINATES
C V( 4) = Z .
C V( 5) = DX .
C V( 6) = DY . ERROR OF X,Y,Z
C V( 7) = DZ .
C IV(8) = NTR NUMBER OF TRACKS USED IN VERTEX FIT
C V( 9) = CHI2 CHISQARE OF FIT (N.D.F. = 2NTR-3)
C IV(10)= NTRALL NUMBER OF TRACKS BELONGING TO THIS VERTEX
C
C NEW VERTEX RESULTS ( 11 - 13 ) BY KLE
C -------------------
C V(11) = COVXY FOR VERTEX
C V(12) = COVXZ FOR VERTEX
C V(13) = COVYZ FOR VERTEX
C
C (13-26) 2.  VERTEX
C ......  .........
C
C INTERNAL PARAMETERS
C ===================
C IT(1) IS SET NEGATIV TEMPORARILY IF TRACK BELONGS TO VERTEX
C T(16) = COULOMB SCATTERING ERROR ( TANKWALL )
C T(17) = COULOMB SCATTERING ERROR ( NEW BEAMPIPE ONLY )
C T(18) = S TO TANKWALL NEAR
C T(19) = S TO BEAMPIPE NEAR
C T(20) = PROJ. TRACKLENGTH IN RPHI
C T(21) = SIN(PHI0)
C T(22) = COS(PHI0)
C T(23) = TAN(THETA)
C T(24) = COS(THETA)
C T(25) UNUSED
C T(26) = S TO TANKWALL FAR
C T(27) = S TO TANKWALL NEAR
C T(28) = S.D. X
C T(29) = S.D. Y
C T(30) = S.D. Z
C
C NEW INTERNAL PARAMETERS ( 31 - 40 ) BY KLE
C -----------------------
```

```
C IT(31)= 1 FOR 'COMFIT'TED TRACKS, 0 ELSE
C ( COVAR. DEFAULTS : )
C T(32)=RPHI COVARIANCE :X**4(180SIG**2/N/L**4)
C T(33) = RPHI COVARIANCE : X**3 ( 0.0 )
C T(34) =RPHI COVARIANCE :X**2(-18SIG**2/N/L**2)
C T(35) = RPHI COVARIANCE : X**1 ( 0.0 )
C T(36) = RPHI COVARIANCE : X**0 ( 9/4 SIG**2/N )
C T(37) = SIG**2/NPT IN ZS
C T(38) = PROJ. TRACKLENGTH IN ZS
C T(39) = SO(ZS) - SO(RPHI)
C T(40) = COVARIANCE TERM FOR ANGULAR ERROR
C
```