Software Documentation for the TOSCA Test-Beam

FESTA

(**F**uture **E**mulsion **S**ilicon **T**racker **A**nalysis)

Version 1 Release 0

P. Migliozzi*

September 23, 1997

*Pasquale.Migliozzi@cern.ch

Contents

1 Introduction **2**

2 Processing steps **2**

3 Key banks and trigger bit **2**

4 How to create the executable **3**

5 Data cards **3**
5.1 Description of the data cards 4

6 INPUT-OUTPUT **5**

7 The geometry of the experimental setup **7**

8 Bank documentation **7**
8.1 Description of JBECH bank 7
8.1.1 Description of the data words 7
8.2 Description of JSILI bank 8
8.2.1 Description of the data words 8
8.2.2 Description of the links 9
8.3 Description of JMWPC bank 9
8.3.1 Description of the data words 9
8.3.2 Description of the links 10

1 Introduction

The program consists of a control structure providing initialisation, input of data cards, and looping over runs and events. The main program reads and unpacks the raw data of the sub-detector choosen by the user (via data cards), and at the end it gives the control to the routine MODUSR, where the user can add his own code.

2 Processing steps

The program can be in different modes, according to the variable IMODE. Its meaning are:
IMODE = 0
This mode corresponds to the START OF JOB. All the overall user initialisations have to be performed here.
IMODE = 1
This mode corresponds to the START OF RUN RECORD.
IMODE = 2
This mode corresponds to the END OF RUN RECORD.
IMODE = 3
This mode corresponds to the END OF EVENT. At this point of the program all the banks produced by the different sub-detectors are available. The analysis of the event has to be done here.
IMODE = 4
This mode corresponds to the ZEBRA END OF FILE.
IMODE = 5
This mode corresponds to the SYSTEM OF FILE.
IMODE = 6
This mode corresponds to the reading of the EVENT.
IMODE = 7
This mode corresponds to the JOB TERMINATION. All the packages (ZEBRA, HBOOK, HIGZ) are closed. For istance if a user book histograms in IMODE=0, he has not to give the command HROUT in IMODE=7, since it is automatically done by the program.

The user routine MODUSR is automatically called by the main program for each IMODE.

3 Key banks and trigger bit

The raw data contain the following banks, each bank is identified by its own key. These keys are deeply used in the program to drive the processing of the different sub detectors:
Bank name = EVBI key = 1901 Event builder information
Bank name = VTDC key = 1505 NOMAD beam chamber (not used)
Bank name = VADC key = 1510 xxxxxxx
Bank name = RHDR key = 1515 Honeycomb bank
Bank name = SILI key = 1525 Silicon bank
Bank name = MICM key = 1530 Micromegas bank

Bank name = MWPC key = 1520 MWPC's bank
Bank name = BEAM key = 1535 Beam chambers bank

The word 10 of each bank (except the EVBI bank) contains the trigger bit information):

IQ(bank+10) = 1 $\rightarrow$ calibration for silicon, honey, mwpc, beam chamber (OUT of BURST events)
IQ(bank+10) = 2 $\rightarrow$ physics event
IQ(bank+10) = 4 $\rightarrow$ calibration for beam chambers
IQ(bank+10) = 8 $\rightarrow$ end of burst event

4 How to create the executable

The program **festa.cmz** can be found in the directory

/afs/cern.ch/chorus/toscatest/festa/src

To produce the executable **festa** the user has to execute in CMZ the kumac **MAKE**. The linking to the silicon library and to the CERN library is automatically done through the file */afs/cern.ch/chorus/toscatest/festa/src/linklib* called by the kumac **MAKE**.

5 Data cards

A standard file with data cards to drive the execution of the program is the following:

```
LIST
LABE 135 1 121 0
DISP OFF
NRUN 1 5460
NEVT 1000
REVT 3010 1000000
PRIN 'IPBE' 'IPSI' 'IPHO' 'IPMI' 'IPMW' 'IPGE'
TRIG 'BEAMCHAM' 'MULTIWPC' 'HONEYCOM' 'SILICON ' 'MICROMEG'
IMWC 300
ISCA 100
END
```

The file **run.cards** can be found in the directory

/afs/cern.ch/chorus/toscatest/festa/cards

By default the program reads the file **run.cards**. To change the name of the input file the user has to give the command

festa -r myrun.cards

5.1 Description of the data cards

LABE 135 1 121 0
With this setting the physical events (LABEL=135) are processed, while the Montecarlo ones (LABEL=121) are not.

DISP OFF
The event display is switched OFF (DISP ON activate it).

NRUN 1 5460
Runs with run number in the range 1 5460 are processed.

NEVT 1000
This card determines the total number of events to be processed.

REVT 3010 1000000
Allowed range for the number of events to be processed.

PRIN 'IPBE' 'IPSI' 'IPHO' 'IPMI' 'IPMW' 'IPGE'
For all the modules specified in the command the debug printing is switched ON.

TRIG 'BEAMCHAM' 'MULTIWPC' 'HONEYCOM' 'SILICON ' 'MICROMEG'
It allows to modify the default list of modules to be called for each physics event.

- **BEAMCHAM** call the unpacking and the reconstruction for the beam chambers.
- **MULTIWPC** call the unpacking and the reconstruction for the MWPC's.
- **HONEYCOM** call the unpacking and the reconstruction for the honeycomb.
- **SILICON** call the unpacking and the reconstruction for the silicon.
- **MICROMEG** call the unpacking and the reconstruction for the micromegas.

IMWC 300
Determines the number of calibration events to be used for the MWPC. By default this number should be put to 0, since the calibration constants are automatically read by the program from reference files previously produced.

ISCA 100
Determines the number of events to be used for the silicon calibration (pedestals, common noise). If this number is put to 0 the calibration constants are automatically read by the program from reference files. The user is recommended to put this card to 0.

6 INPUT-OUTPUT

So far part of the runs we took have been copied on tape. In the following are shown the runs copied on tape SR0143

file 1	rsch01.trig.02539.12091997-085856.saved
file 2	rsch01.trig.02540.12091997-091233.saved
file 3	rsch01.trig.02541.12091997-092619.saved
file 4	rsch01.trig.02542.12091997-111626.saved
file 5	rsch01.trig.02546.12091997-144628.saved
file 6	rsch01.trig.02547.12091997-162654.saved
file 7	rsch01.trig.02548.12091997-190241.saved
file 8	rsch01.trig.02549.12091997-204018.saved
file 9	rsch01.trig.02550.12091997-215102.saved
file 10	rsch01.trig.02552.12091997-230126.saved
file 11	rsch01.trig.02553.12091997-233941.saved
file 12	rsch01.trig.02554.13091997-001104.saved
file 13	rsch01.trig.02555.13091997-010432
file 14	rsch01.trig.02556.13091997-012641.saved
file 15	rsch01.trig.02530.11091997-155852.saved
file 16	rsch01.trig.02531.11091997-161323.saved
file 17	rsch01.trig.02532.11091997-162237.saved
file 18	rsch01.trig.02533.11091997-175842.saved
file 19	rsch01.trig.02534.11091997-180654.saved
file 20	rsch01.trig.02535.11091997-181644.saved
file 21	rsch01.trig.02537.11091997-201739.saved
file 22	rsch01.trig.02538.11091997-214951.saved
file 23	rsch01.trig.02571.17091997-145504.saved
file 24	rsch01.trig.02572.17091997-155341.saved
file 25	rsch01.trig.02573.17091997-165159.saved
file 26	rsch01.trig.02574.17091997-183423.saved
file 27	rsch01.trig.02575.17091997-194905.saved
file 28	rsch01.trig.02576.17091997-203036.saved
file 29	rsch01.trig.02566.17091997-093205.saved
file 30	rsch01.trig.02567.17091997-100823.saved
file 31	rsch01.trig.02568.17091997-102527.saved
file 32	rsch01.trig.02560.16091997-192608.saved
file 33	rsch01.trig.02561.16091997-195335.saved
file 34	rsch01.trig.02562.16091997-201506.saved
file 35	rsch01.trig.02563.16091997-204027.saved
file 36	rsch01.trig.02564.16091997-211353.saved
file 37	rsch01.trig.02558.16091997-184121.saved
file 38	rsch01.trig.02559.16091997-190716.saved

(i.e. rsch01.trig.02559.16091997-190716.saved refers to the run 2559)

To stage the file #23 on tape SR0143 has to be used the command

stagein -v SR0143 -q 23 -F F -L 32400 -E keep -s 1024 -p chorusdata -P -s 1024 -h sp007

TOSCA Test-Beam (Aug-Sep 1997) – Selected runs

Date	Run	Trigger	Magnet	Energy	Intensity	Target	Absorber
12/9	2539	$T_1T_2T_3$	On (-)	15	High	None	None
12/9	2540	$T_1T_2T_3T_4$	On (-)	15	High	None	None
12/9	2541	$T_1T_2T_3$	Off	15	High	None	None
12/9	2542	$T_1T_2T_3T_4$	On (-)	15	Low	None	None
12/9	2546	$T_1T_2T_3T_4$	On (-)	15	Low	ETAR1+CET1+DET1	None
12/9	2547	$T_1T_2T_3T_4$	On (-)	15	Low	ETAR1+CET1+DET1	None
12/9	2548	$T_1T_2T_3T_4$	On (-)	15	Low	ETAR1+CET1+DET1	None
12/9	2549	$T_1T_2T_3$	Off	15	Low	DET1	None
12/9	2550	$T_1T_2T_3$	On (+)	10	Low	None	None
12/9	2553	$T_1T_2T_3$	On (-)	5	Low	CET2+DET2	None
13/9	2554	$T_1T_2T_3$	On (+)	10	Low	CET2+DET2	None
13/9	2555	$T_1T_2T_3$	Off	3	Low	None	None
13/9	2556	$T_1T_2T_3$	Off	3	High	None	None
16/9	2558	$T_1T_2T_3$	Off	15	High	None	None
16/9	2559	$T_1T_2T_3$	On (+)	5	High	None	None
16/9	2560	$T_1T_2T_3$	On (+)	5	High	None	1.5 X_0
16/9	2561	$T_1T_2T_3$	On (-)	3	High	None	None
16/9	2562	$T_1T_2T_3$	On (-)	3	High	None	1.5 X_0
16/9	2563	$T_1T_2T_3$	On (-)	3	High	None	(1.5 +4) X_0
16/9	2564	$T_1T_2T_3$	On (-)	3	High	None	Stop per
17/9	2566	$T_1T_2T_3$	On (-)	3	High	None	None
17/9	2567	$T_1T_2T_3$	On (-)	3	High	None	4 X_0
17/9	2568	$T_1T_2T_3$	On (-)	3	High	None	1.5 X_0
17/9	2571	$T_1T_2T_3$	On (-)	3	High	ETAR2+CET3	4 X_0
17/9	2572	$T_1T_2T_3$	On (-)	3	High	ETAR2+CET3	4 X_0
17/9	2573	$T_1T_2T_3$	On (-)	3	High	ETAR2+CET3	4 X_0
17/9	2574	$T_1T_2T_3$	On (+)	5	High	ETAR2+CET4	4 X_0
17/9	2575	$T_1T_2T_3$	Off	15	High	None	None
17/9	2576	$T_1T_2T_3$	Off	3	High	None	None

As soon as possible the remaining runs will be copied on tape. To give an input to FESTA, the user has to write a file (with default name run.list) containing all the files he wants to use. If the user wants to use a different name (i.e. myrun.list) he has to run the program using the command

festa -f myrun.list

By default (but this is a temporary solution) the program produces two output files:

- a HBOOK output file (histograms and ntuples) in the current directory with default name *ntuple.rz*. To change the name of the file the user has to give the command
  festa -p myhbook.rz
- a ZEBRA output file containing a copy of the rawdata and the results of the reconstruction (still to be tuned) with default name fzout.fz. To change the name of the file the user has to give the command
  festa -p myfzout.fz

7 The geometry of the experimental setup

In preparation

8 Bank documentation

In the following the banks containing the reconstruction of the sub-detectors and available in **IMODE=3** are described. These banks are hung to the bank **JOUT(3)**. The pointer to **JOUT(3)** is stored in the common block XQSTOR.

JOUT(3) has 7 links:

1. **JBECH** contains Beam chambers reconstruction;
2. **JEMUL** will contain the emulsion scanning results;
3. **JSILI** contains Silicon reconstruction;
4. **JMWPC** contains MWPC reconstruction;
5. **JHONE** contains Honeycomb reconstruction;
6. **JMICR** contains Micromegas reconstruction;
7. **JGLRE** will contain the results of the global reconstruction;

8.1 Description of JBECH bank

This bank has 21 data words.

8.1.1 Description of the data words

word 1 empty;

word 2 longitudinal position of chamber# 1 (at the present is zero, since we have to implement the measurements of the geometers);

word 3 transverse position (in mm) reconstructed inside the chamber# 1;

word 4 pulse height measured in the chamber# 1;

word 5 longitudinal position of chamber# 2 (at the present is zero, since we have to implement the measurements of the geometers);

word 6 transverse position (in mm) reconstructed inside the chamber# 2;

word 7 pulse height measured in the chamber# 2;

word 8 longitudinal position of chamber# 3 (at the present is zero, since we have to implement the measurements of the geometers);

word 9 transverse position (in mm) reconstructed inside the chamber# 3;

word 10 pulse height measured in the chamber# 3;

word 11 longitudinal position of chamber# 4 (at the present is zero, since we have to implement the measurements of the geometers);

word 12 transverse position (in mm) reconstructed inside the chamber# 4;

word 13 pulse height measured in the chamber# 4;

word 14 longitudinal position of chamber# 5 (at the present is zero, since we have to implement the measurements of the geometers);

word 15 transverse position (in mm) reconstructed inside the chamber# 5;

word 16 pulse height measured in the chamber# 5;

word 17 pulse height (in TDC units) measured in the scintillator T4 UP;

word 18 pulse height (in TDC units) measured in the scintillator T4 DOWN;

word 19 pulse height (in TDC units) measured in the scintillator T4 RIGHT;

word 20 pulse height (in TDC units) measured in the scintillator T4 LEFT;

word 21 pulse height measured in the Cerenkov counter;

8.2 Description of JSILI bank

This bank has 4 links and 4 data words.

8.2.1 Description of the data words

word 1 number of hits in plane #1 (nhit1);

word 2 number of hits in plane #2 (nhit2);

word 3 number of hits in plane #3 (nhit3);

word 4 number of hits in plane #4 (nhit4);

8.2.2 Description of the links

In total there are 4 links, one for each plane. Each link has a number of data words equal to 7*nhit.

word 1 pulse height of the hit;

word 2 x-coordinate of the hit;

word 3 error on x;

word 4 y-coordinate of the hit;

word 5 error on y;

word 6 z-coordinate of the hit;

word 7 error on z;

Notice that

- the origin of the reference system of the testbeam coincides with the one of the silicon;
- the planes 1 and 4 measure the bending coordinate (y) and the planes 2 and 3 measure the non bending coordinate;
- when we measure the coordinate x the given y coordinate refers to the center of the ladder and viceversa.

8.3 Description of JMWPC bank

This bank has 6 links and 6 data words.

8.3.1 Description of the data words

word 1 number of hits in plane #1 (nhit1);

word 2 number of hits in plane #2 (nhit2);

word 3 number of hits in plane #3 (nhit3);

word 4 number of hits in plane #4 (nhit4);

word 5 number of hits in plane #5 (nhit5);

word 6 number of hits in plane #6 (nhit6);

8.3.2 Description of the links

In total there are 6 links, one for each plane. Each link has a number of data words equal to 3*nhit.

word 1 pulse height of the hit pedestal subtracted;

word 2 longitudinal position (at present 0);

word 3 transverse position in mm;

Notice that I used the agreement that the first 4 planes correspond to the ones measuring the bending coordinate (y), while plane 5 and 6 measure the non bending coordinate.