CRIB Anapaw Inductory Manual

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Introduction

I assume that you have no experience or knowledge of ANAPAW.

This manual explains about the ways of conducting ANAPAW in CLI, defining histograms and how to look up valuables in order to calculate in the environment of CRIB.

Pictures in this manual were took in the environment of my PC, but the environment was not so different from the PC of CRIB. Then ANAPAW in PC of CRIB can be conducted with the procedures explained in this manual.

I assume that the structure of directories, the names of files and source codes for this manual were the PC in CRIB in 2015.

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- How to conduct in CLI to obtain histograms
  - analogin, anapaw, a/l, book, start, hst
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- Defining histograms
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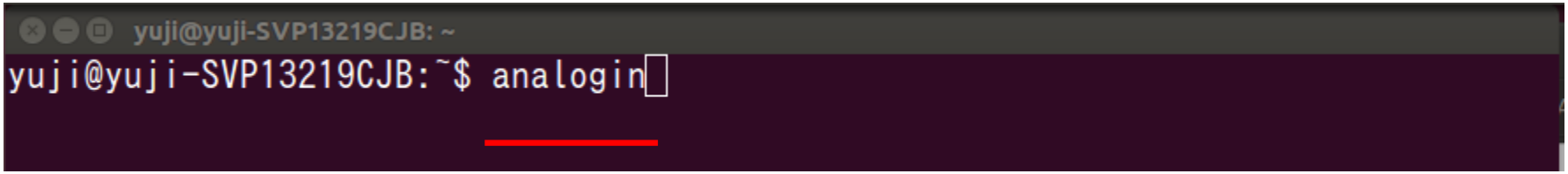
  - Definition of gate
  - How to define histograms
- Valuables in source codes
  - How to look up valuables among source codes

How to conduct in CLI to obtain histograms

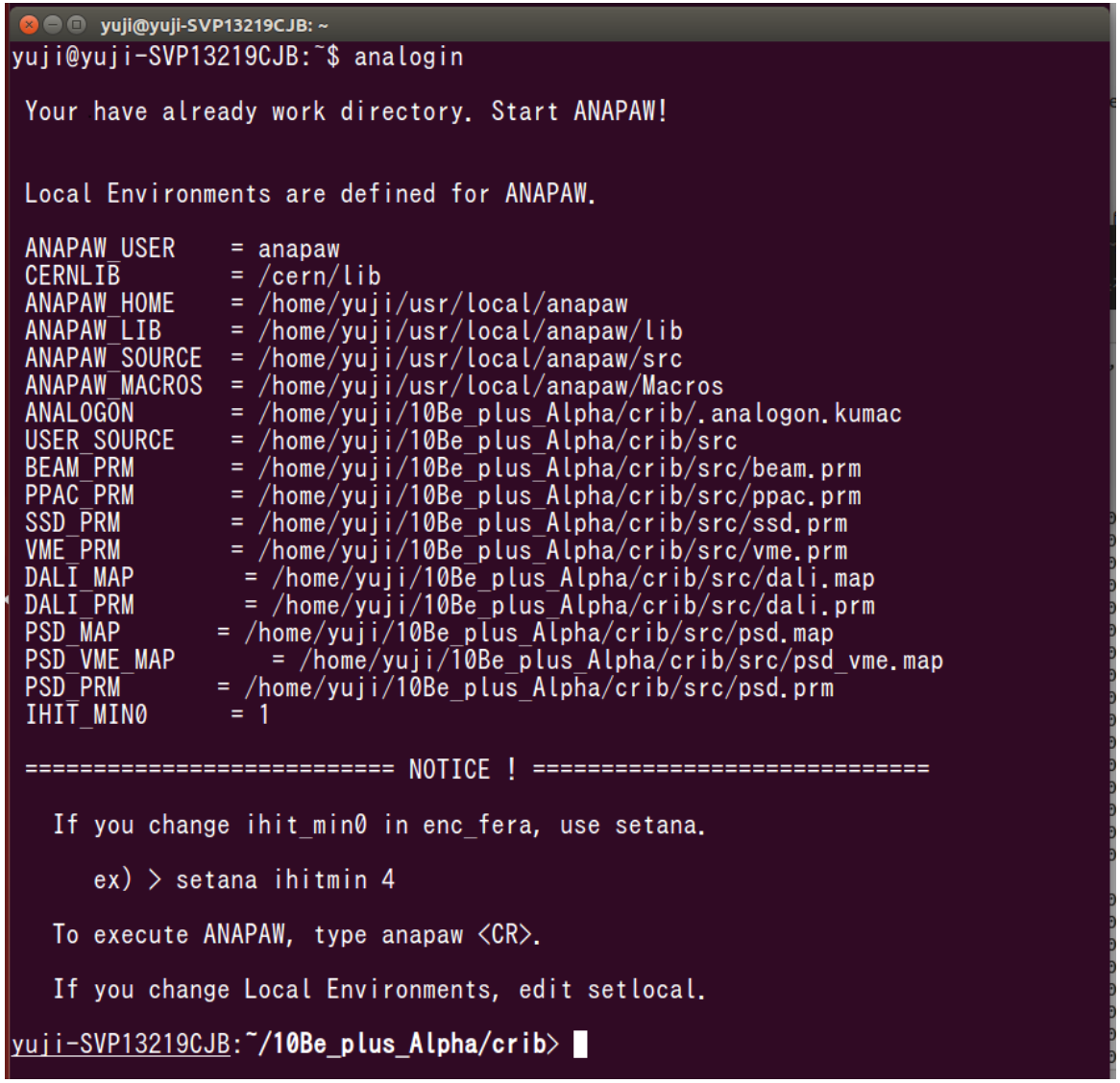
First of all, I explain how to enter the system of ANAPAW.



A part of my terminal

Input “analogin” from the terminal of analys2 (PC in CRIB).

How to conduct in CLI to obtain histograms



You can enter into a directory which includes the system of ANAPAW.

A part of my terminal

How to conduct in CLI to obtain histograms

Directories you should focus on

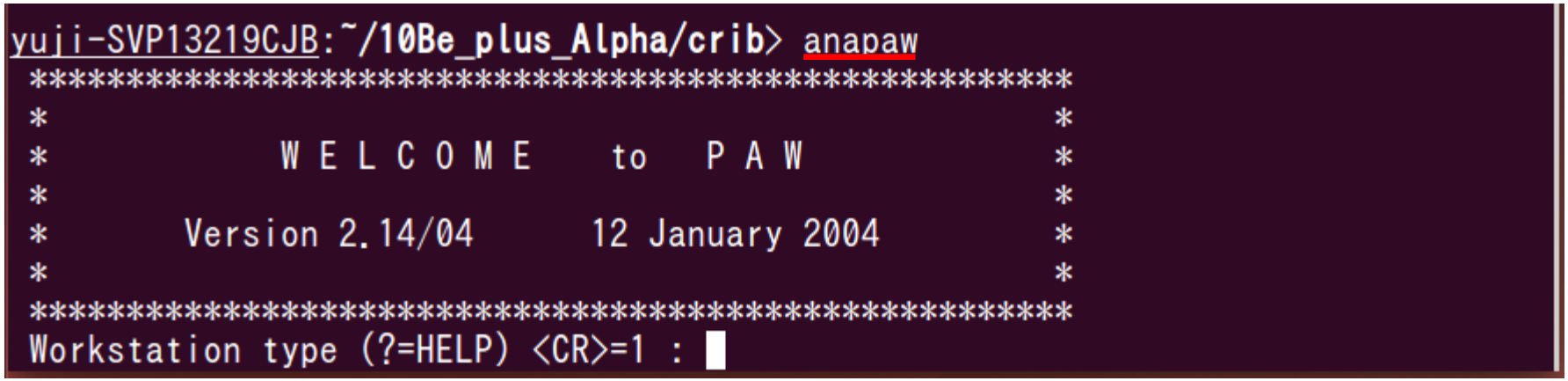
Input “ls”. Then files and directories in ANAPAW show up.

Beginners should focus on the directories as bellow.

- **rdf**…Raw data of an experiment are included.
- **ana**…”anafile” is icluded. Definition of histograms is performed by anafile.
- **src**…source codes are included. Calculation of physical quantities such as channel, energy and time is performed with the source code.

How to conduct in CLI to obtain histograms

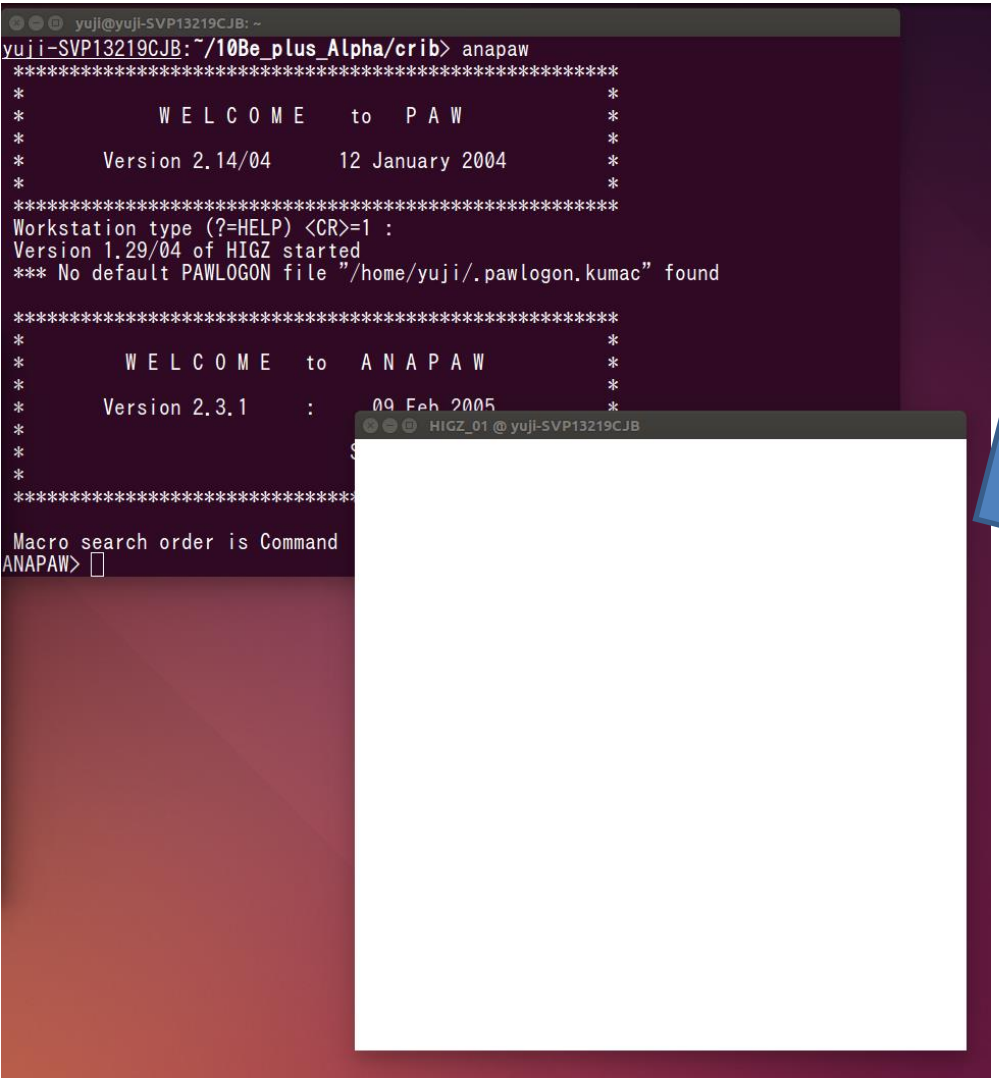
After that, input “anapaw”. Your terminal becomes a state like the pictute bellow.



A part of my terminal

Push your enter key.

How to conduct in CLI to obtain histograms



Then a window shows up like this.
Histograms show up in this window if you perform commands in your terminal.

You finish entering the system of ANAPAW.

A part of my monitor of PC

How to conduct in CLI to obtain histograms

From here I explain how to obtain histograms.

```
ANAPAW> a/l rdf/0100.rdf

rdf/0100.rdf  Size : 336.9 MB   Block : 21564
ANAPAW/EVTLOOP> book ana/run.ana
  > book ana/run.ana
ANAPAW/EVTLOOP> start
```

A part of my terminal

Select a file to Loop with “a/l (the name of a file to analyze)”
(If you analyze in online, you do not need the name of the file.).

Select an anafile with “book (the name of an anafile)”.

Start Loop with “start”.

Loop…calculating valuables of physical quantity which correspond to detectors, and filling to create histograms

How to conduct in CLI to obtain histograms

As Loop is performed, this number is increased. Loop is automatically stopped if the calculation reaches the end. You can stop Loop with enter key though Loop is not finished.

A part of my terminal

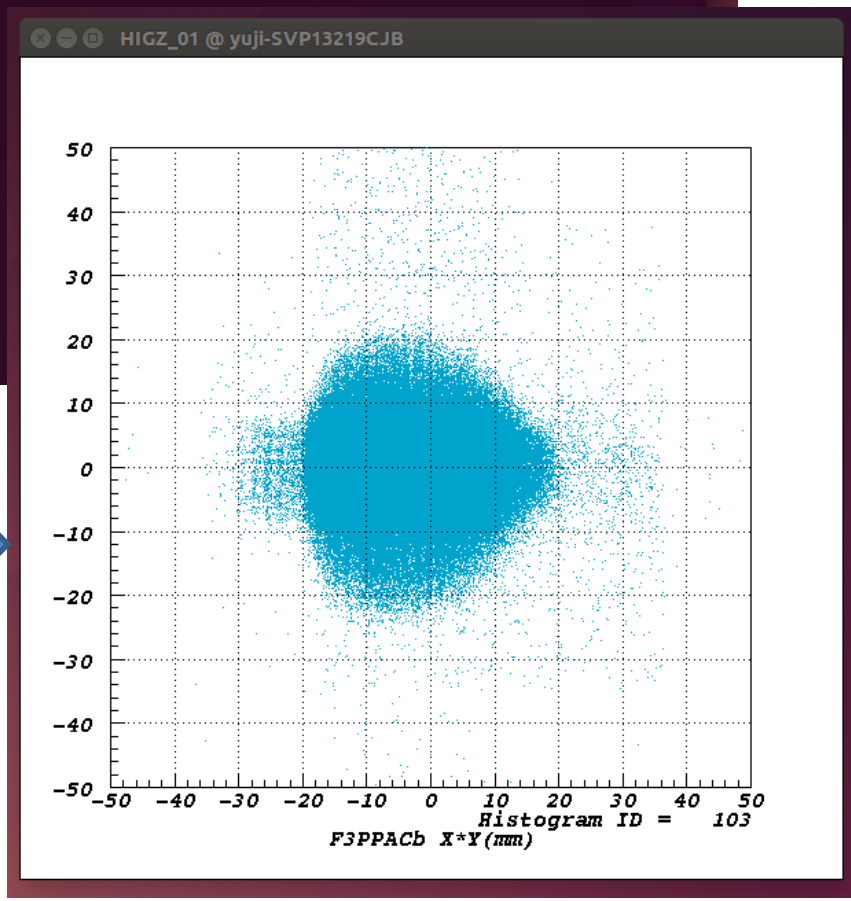
Input “i”. Then ID of histograms (HID) show up.

How to conduct in CLI to obtain histograms

Part of my terminal

```
ANAPAW/EVTLOOP> i
  > i

 ===> Histogram List

              #    HID  Kind       Title

       ->     1    101   (1)      PPACa cal
              2    102   (2)      F3PPACa X*Y(mm)
              3    103   (2)      F3PPACb X*Y(mm)

ANAPAW/EVTLOOP> ht 103
  > ht 103
```

Select a histogram you need.
Input “ht (HID)”.
Then the histogram show up in the window.



How to conduct in CLI to obtain histograms

Reference to commands

For the purpose of looking up commands of ANAPAW, a tutorial from Rilken RIBF is very helpful.
https://ribf.riken.jp/RIBFDAQ/index.php?plugin=attach&refer=Tools%2FAnalysis%2FANAPAW%2FTutorial&openfile=riken_guide.pdf

These commands as bellow are useful for you.
xf, opt logz, opt linz, xsta, hcut, prx…

Defining histograms

In order to define histograms, you need abilities as bellows.

- Understanding Analyzer ID, Detector ID and Valuable ID
- Understanding a structure of an anafile
- Understanding how to define a gate
- Understanding the way of defining histograms

Defining histograms

Analyzer ID

Physical quantities from measurements with detectors are treated as valuables in source code such as enc_psd.f and enc_ppac.f.

Each source code has Analyzer ID.

When you want to look up what Analyzer ID of a source code is in order to define histograms in an anafile, refer to usersrc.f in **src**.

Defining histograms

Analyzer ID and a source code

View usersrc.f. There is a part like this picture.

Analyzer ID is 2.

Corresponding to enc_ppac.f.

```
c
c Analyzer 2: PPAC
c

      If(AnalyzerFlag(2))Then
         call FND_EID(EvtData(1),2,iadr_sub,nw_sub)
         If(nw_sub.le.0)Then
            EVTERR = .TRUE.
            Return
         EndIf
         Call Enc_PPAC( EvtData(iadr_sub),nw_sub,
     &                  val(1,1,2),nx,ny,naok(2) )
      EndIf
```

A part of usersrc.f

Defining histograms

Detector ID and Valuable ID

In source codes, correspondence between each detector and ID is written. Correspondence between each physical quantity from a detector and ID is also written.

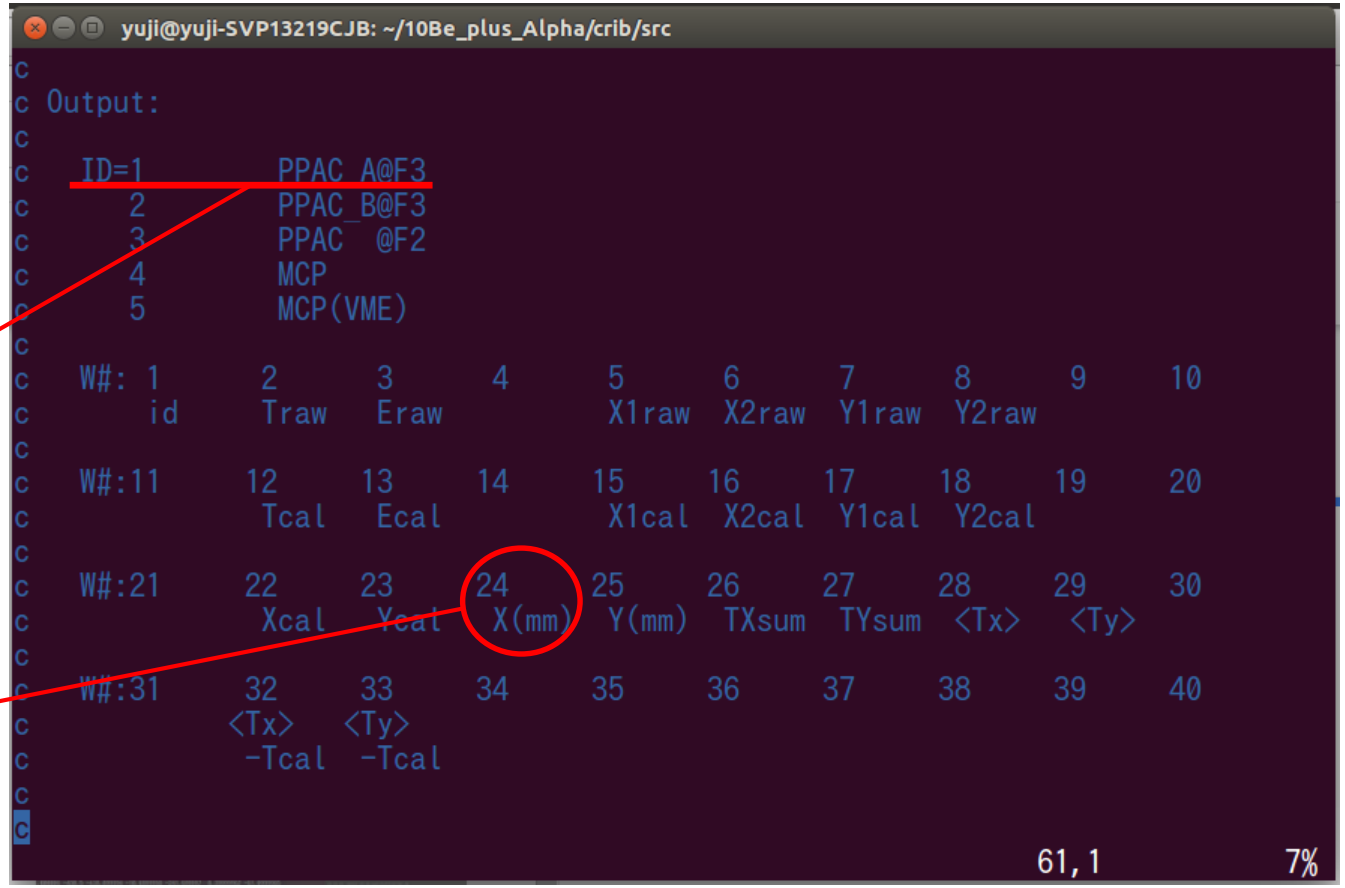
Defining histograms

Detector ID and Valuable ID in a source code

Detector ID and Valuable ID are written basically in the top part. View enc_ppac.f. You should find a part like this picture.

Detector ID of PPACa in F3 chamber is 1.

Valuable ID of X (mm) is 24.



A part of enc_ppac.f

Defining histograms

Structure of anafile

anafile is composed of

①.Analyzer ID area
②.definition of xygate file area
③.gate area
④.definition of histograms area

・gate…selection effect of events
If you perform gates, only events which have valuables in a certain region are filled to histograms..

・xygate…two dimensional gate
Refer to “hcut”, a command for a two dimensional gate.

I explain a concrete structure and grammar of an anafile by using a certain anafile.

Defining histograms

Structure of anafile

```
yuji@yuji-SVP13219CJB: ~/
analys
1
2
4
5
8
6
c
c
c coin, single, pileup

xygate
@,anapaw.cut

gate
11,  4,1,1,3,  0.5,1.5
12,  4,2,2,3,  1.5,2.5
13,  4,3,3,3,  2.5,3.5
```

A part of a certain anafile

①.Analyzer ID area

②. definition of xygate file area

③. gate area

④. definition of histograms area

```
hst1
0, 2,1,1,24, 1000,-50.,50., 'PPACa X(mm)'

hst2
0,2,1,1,24, 2,1,1,25,  1000,-50.,50., 1000,-50.,50., 'F3PPACa X*Y(mm)'
0,2,2,2,24, 2,2,2,25,  1000,-50.,50., 1000,-50.,50., 'F3PPACb X*Y(mm)'
exit
```

If you understand
③. **gate area**

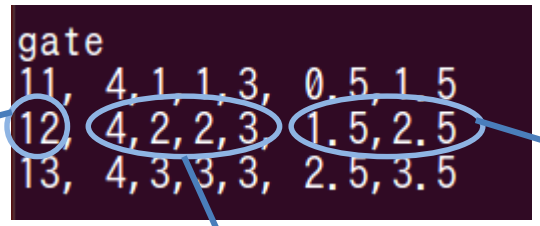
④. **definition of histograms area,**
you do most of ANAPAW.
Then I explain those two.

Defining histograms

Definition of gate

In ③. **gate area**, some numbers are arranged. Each number has meaning, and there is a rule of the order of the numbers.
I explain those by using this picture.

A part of an anafile



You define ID of a new gate here.

A region of the valuable as a gate. Here the region of the gate is 1.5-2.5.

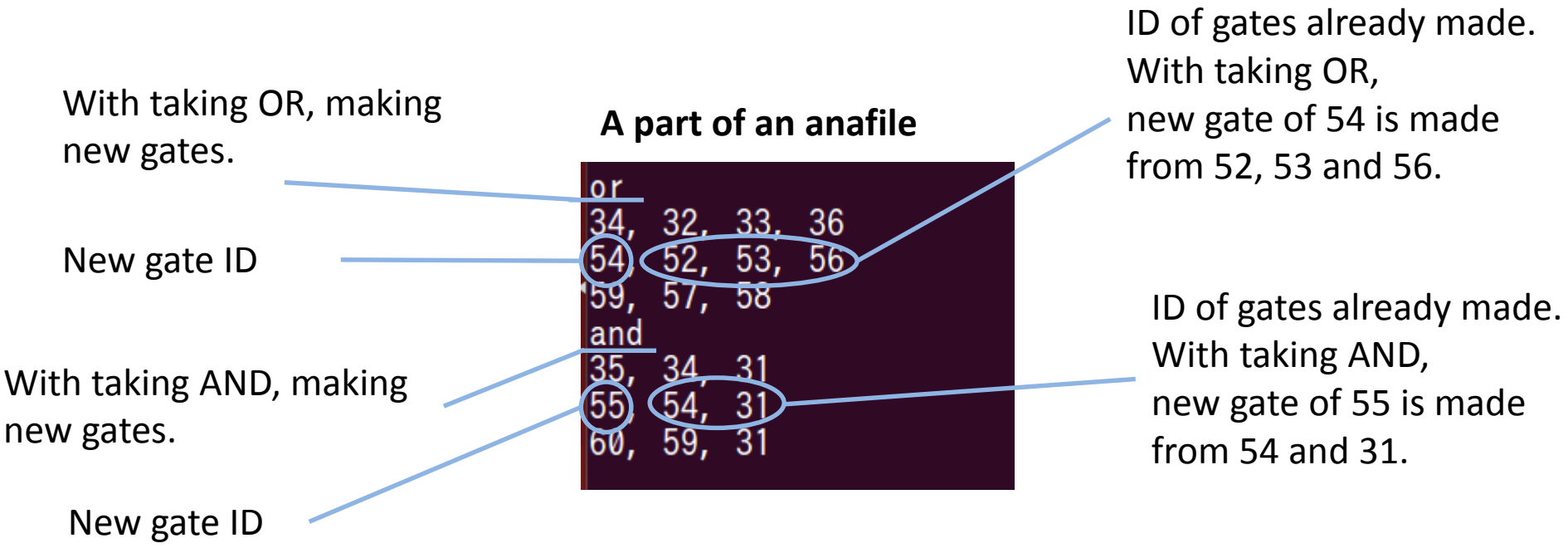
The order is
Analyzer ID, Detector ID, Detector ID, Valuable ID

a valuable which is used for a gate is designated.

Defining histograms

Definition of gate

New gates can be made from the gates already made above with taking OR or AND.



gate ID is written in ④. **definition of histograms**, and it performs while Loop is processed.

Defining histograms

Definition of gate

Like this picture, ④. **definition of histograms** is composed of “hst1”, definition area for one dimensional histograms and “hst2”, definition area for two dimensional area.

```
hst1
0, 2,1,1,24, 1000,-50.,50., 'PPACa X(mm)'

hst2
0,2,1,1,24, 2,1,1,25,  1000,-50.,50., 1000,-50.,50., 'F3PPACa X*Y(mm)'
0,2,2,2,24, 2,2,2,25,  1000,-50.,50., 1000,-50.,50., 'F3PPACb X*Y(mm)'
exit
```

A part of a certain anafile

You can define histograms by arranging meaningful numbers in a rule of the order.
I explain the meaning of numbers and the order.

Defining histograms

Definition of gate

One dimensional histogram

Definition of a shape of histograms
The order is
the number of bin, minimum value, maximum value

Name of a histogram

gate ID
You can designate which gate you use.

```
hst1
0  2,1,1,24,  1000,-50.,50.,  'PPACa X(mm)'
```

A part of a certain anafile

Designation of a valuable filled to a histogram.
The order is
Analyzer ID, Detector ID, Detector ID, Valuable ID

Defining histograms

Definition of gate

Two dimensional histogram

Definition for a horizontal axis.
The meaning and the order are same with those of one dimensional histograms.

```
hst2
0,2,1,1,24,  2,1,1,25,  1000,-50.,50., 1000,-50.,50., 'F3PPACa X*Y(mm)'
0,2,2,2,24,  2,2,2,25,  1000,-50.,50., 1000,-50.,50., 'F3PPACb X*Y(mm)'
exit
```

A part of a certain anafile

Definition for a vertical axis.
The meaning and the order are same with those of one dimensional histograms.

"exit" means the end of an anafile. Sentences after "exit" are ignored. Therefore you can use "exit" in order to debag.

When you input "book" in your terminal, designate the anafile you rewite and Loop. Then you can obtain histograms you designed.

Valuables in source codes

You are required to calculate valuables derived from measured values such as energies and positions for your analysis.

For the calculation, you are required to understand how valuables are written in source codes.

I explain an introductory way of looking up valuables.

Valuables in source codes

valuables derived from measured values are treated as arrays which are named as “val1” or “val2”, and the arrays are shared among source codes.

View enc_recoil.f. There are sentences like this picture.

```
c Input:
c     Analyzer #5 ENC_PSD     --> val1
c     Analyzer #8 ENC_PSD_VME--> val2
```

A part of enc_recoil.f

Valuables calculated in enc_psd.f are stored to arrays named as val1.
Valuables calculated in enc_psd_vme.f are stored to arrays named as val2.

Valuables in source codes

val1 and val2 are arrays. Therefore you are required to understand correspondence between each element and each measured value. View enc_recoil.f.

```
c First layer... PSD 3,2,1

      AdE1 = val1(5,151) ! dE1X MeV
      AdE2 = val1(5,153)
      AdE3 = val2(8,24)

      ID = val1(2,151) + 30
      T1a= val2(7,ID)

      ID = val1(2,153) + 30
      T2a= val2(7,ID)
```

A part of enc_recoil.f

Like this picture, there are sentences such as “val1(5,151)”.
I explain the way of looking up what physical quantity val1(5,151) means.

Valuables in source codes

I explained above that the pair “5,151” from the val1(5,151) corresponds to the valuable ID, and valuable IDs are written in the upper side of source codes. The val1 is an array coming from enc_recoil.f. View the upper side of enc_recoil.f.

```
ID: 151  Strip with highest pulse height (PSD1-x)
    152                                  (PSD1-y)
    153  Strip with highest pulse height (PSD2-x)
    154  Strip with highest pulse height (PSD2-y)
    155  Strip with highest pulse height (PSD3-x)
    156  Strip with highest pulse height (PSD3-y)
Word#:  1     2       3         4     5
        ID    ID_max  Acal_max  Tmax  Ecal_max
        6     7
        T-RF1 T-RF2

        Tmax: valid for PSD-1x & PSD-2x
        Acal_max: Maximum Acal of the plane
        Ecal_max[MeV] = Acal_max * CommonGain
```

A part of enc_psd.f

The number “5” of the val1(5,151) corresponds to “Word#”, and “5” corresponds to “Ecal_max”. The left number of the two numbers which point out one array corresponds to Word#. “151” corresponds to the valuable ID of 151 which is linked to “Strip with highest pulse height (PSD1-x)”. We can guess that val1(5,151) is a valuable which is used for an calculation for the highest energy of the strips in PSD1-x.

Valuables in source codes

I explained how to look up the correspondence between valuables and physical quantities by using sentences written in the upper side of the source codes.
Some people change the sentences during experiments.
Therefore the correspondence can be broken easily.
You should read source codes referring to the sentences, and confirm the correspondence.

If you change some sentences in the source codes, you need to complie in order to reflect the change.
“make” of Anapaw is “makeana”.

If you learn to calculate physical quantities with the source codes, define histograms with the anafiles and conduct Anapaw with CLI, you finish obtaining the skills to analyze with Anapaw.

You can get better at using Anapaw by analyzing actual data with considering by yourself, looking up ambiguous points and remembering those.

Reference for Anapaw installation

Daid Kahl, who belonged to CRIB group made a Web site for Anapaw installation.

http://www.cns.s.u-tokyo.ac.jp/~daid/physix/anapaw.html

I put an installation manual which was made by Dahee, who performed an experiment by CRIB in the directory including this manual.

I almost succeed in installing Anapaw in Dahee's way, but there are still some bags in a font and hcut.

If you succeed in modyfing bags, please write the way in this manual.