CRT related Data and Software availability

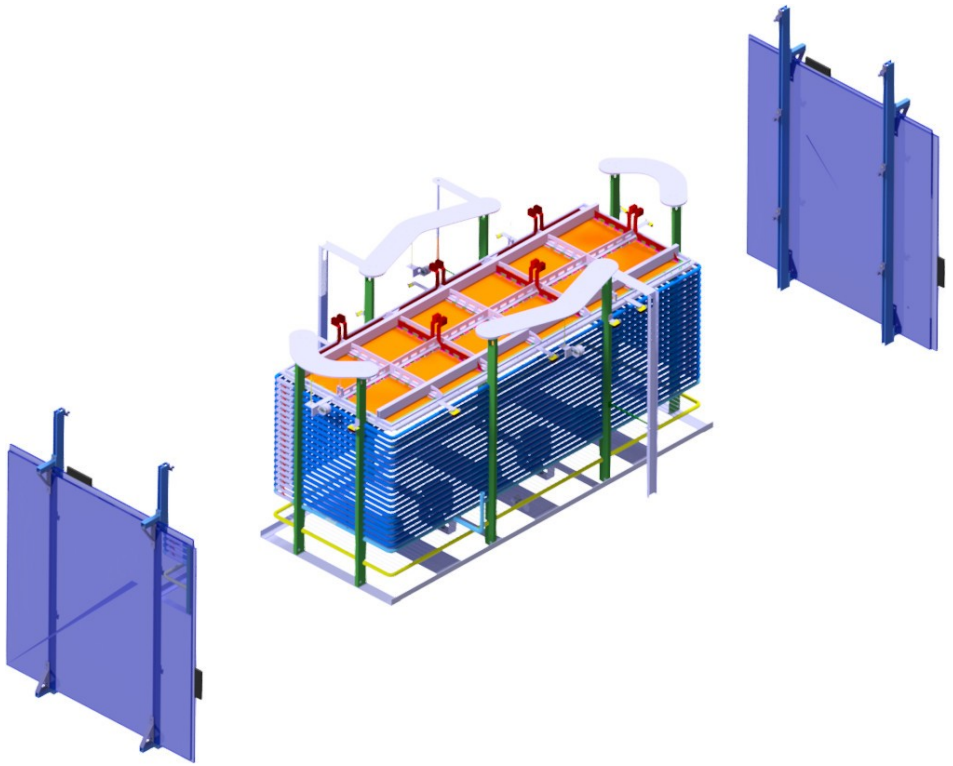
Thomas Mettler, Igor Kreslo

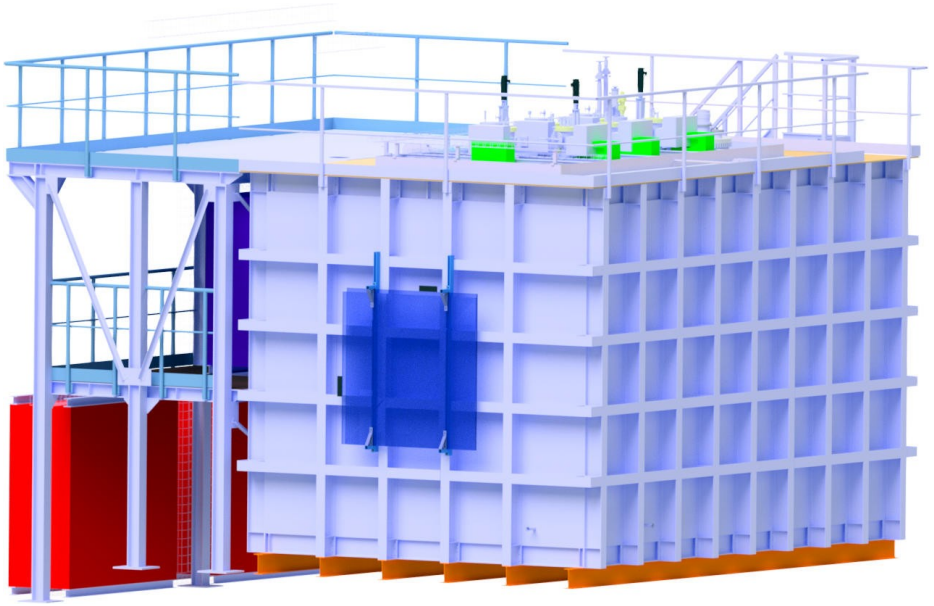
LBNODEMO/WA105 bi-weekly science board meeting
12.07.2017

LABORATORIUM FÜR HOCHENERGIEPHYSIK
LHEP
UNIVERSITÄT BERN

b
UNIVERSITÄT
BERN

The set-up WA105 @ CERN

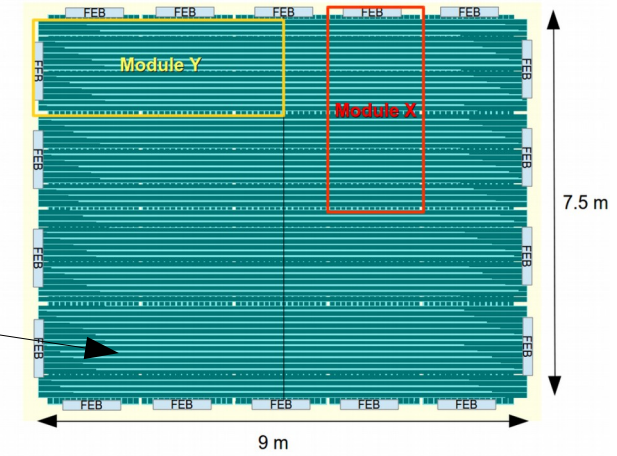


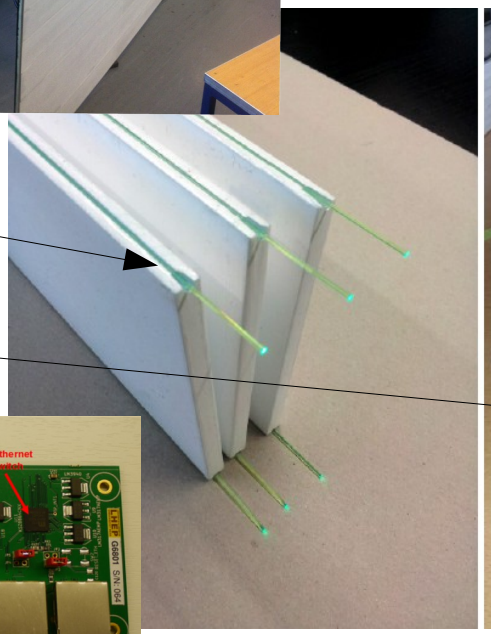


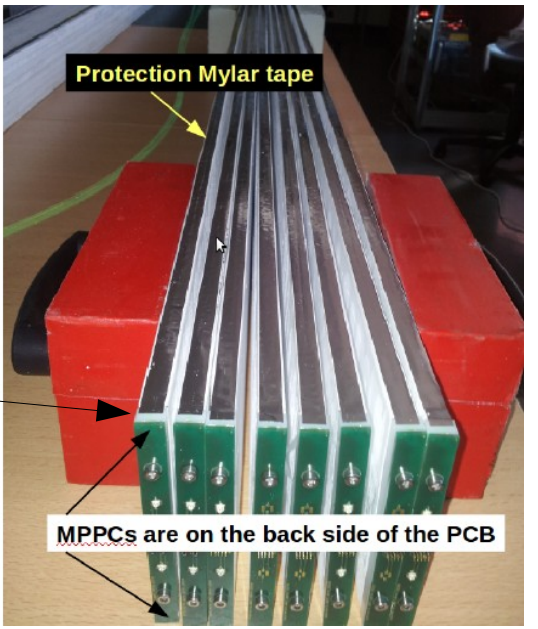
- 4 scintillating modules
- 2 orthogonal modules at each short side of the cryostat
- Muon tracking
- Providing trigger for crossing muons

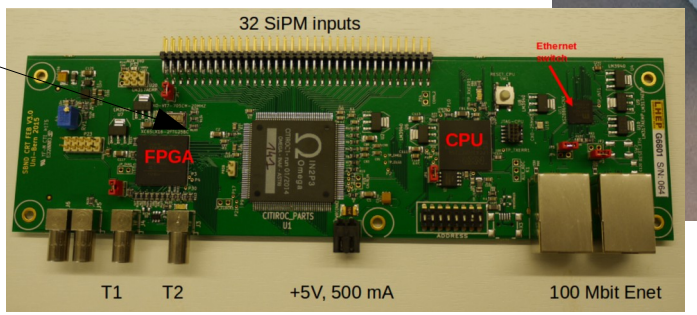
The Comic Ray Tagger system

- X- and Y-layer each plane
- 16 scintillating strips each module
- 32 WLS fibers
- 32 SiPM's
- 1 FEB



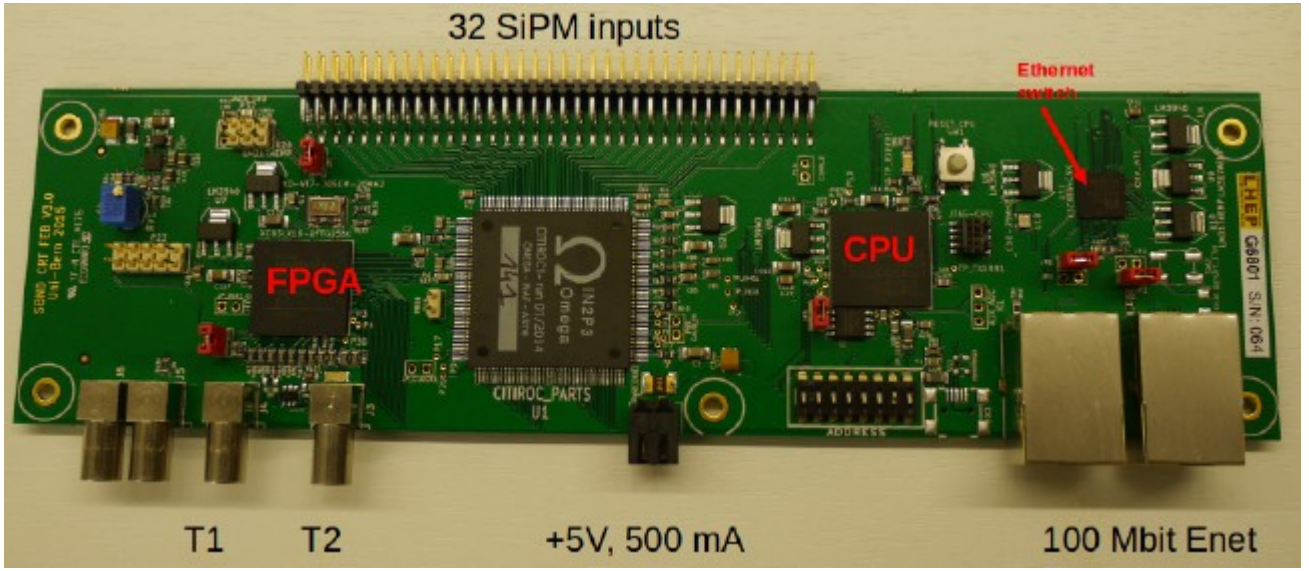






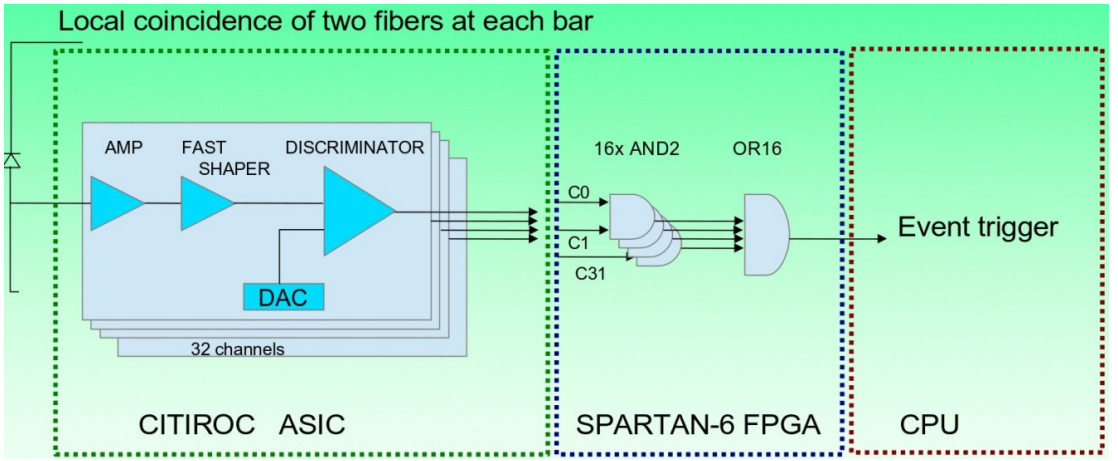
The front end board (FEB)

- Adjustable bias voltage for each SiPM
- Signal amplifing and shapping
- Discriminating and trigger logic
- Time resolution of nano seconds
- Data buffering and communication with host computer

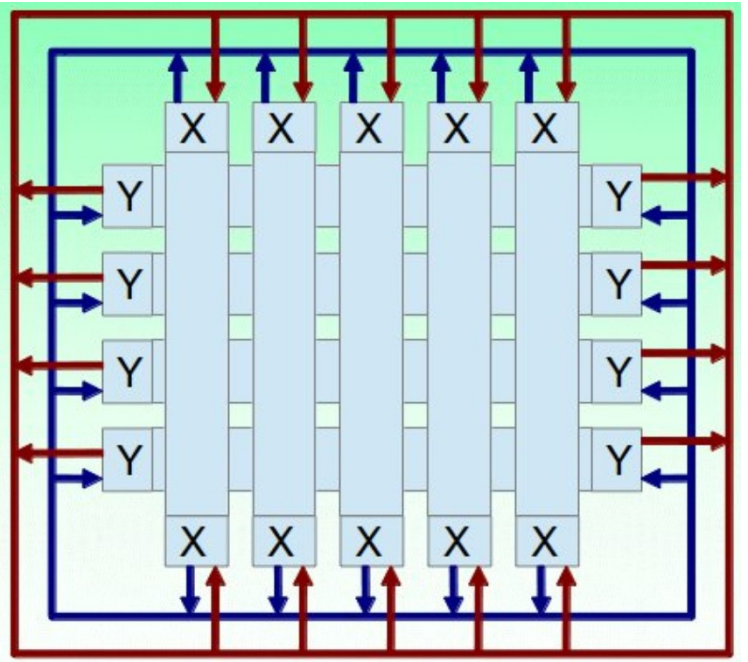


The trigger logic

- Both SIPMs in each strip have to reach treshold
- X-Y coincidence in both layers



- Additional trigger for crossing all four modules



Raw data format

- Run start automatically every 7 hours (cronscript)
- Data stored in:

  crt@wa105crt.cern.ch

  /home/crt/CRT_DAQ_local/DAQdriver
- Normal event structure:

```
typedef struct {
    uint16_t mac5;
    uint16_t flags;
    uint32_t ts0;
    uint32_t ts1;
    uint16_t adc[32];
} EVENT_t;
```

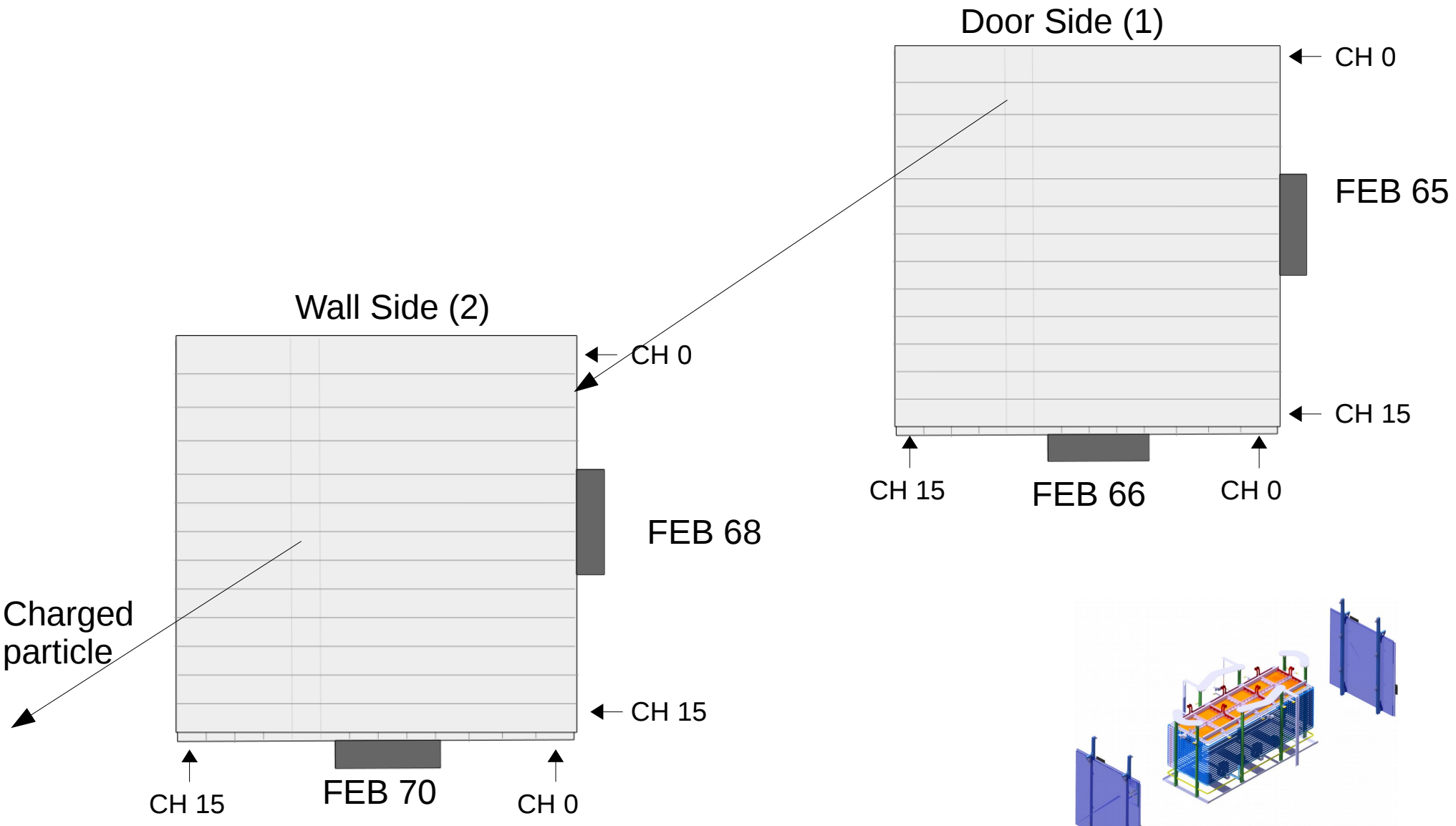
Special Event

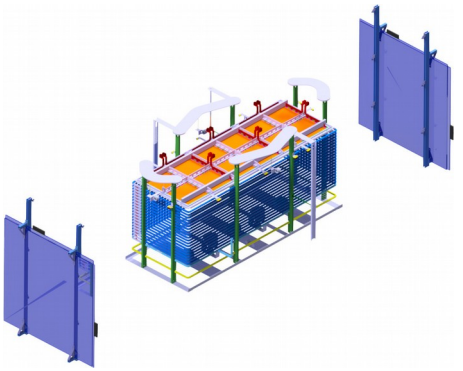
- In the end of every poll
- mac5=0xFFFF
- Poll start and end time in bits from adc[2]

```
typedef struct {
    timeb start_t;
    timeb end_t;
} REF EVENT t:
```

```
typedef struct
  {
    time_t time;    /* Seconds since epoch, as from `time'.  */
    unsigned short int millitm; /* Additional milliseconds.  */
    short int timezone;   /* Minutes west of GMT.  */
    short int dstflag;    /* Nonzero if Daylight Savings Time used.  */
  } timeb;
```

CRT @ WA105 3x1x1





pmtsender

- Sends out information of going-through tracks if requested:

```
typedef struct {
    EVENT_t V1; //module 65
    EVENT_t H1; //module 66
    EVENT_t H2; //module 68
    EVENT_t V2; //module 70
    EVENT_t TS; //hit from logic box with time stamp for the trigger
    EVENT_t SE; //special event
} CRT_EVENT_t;
```

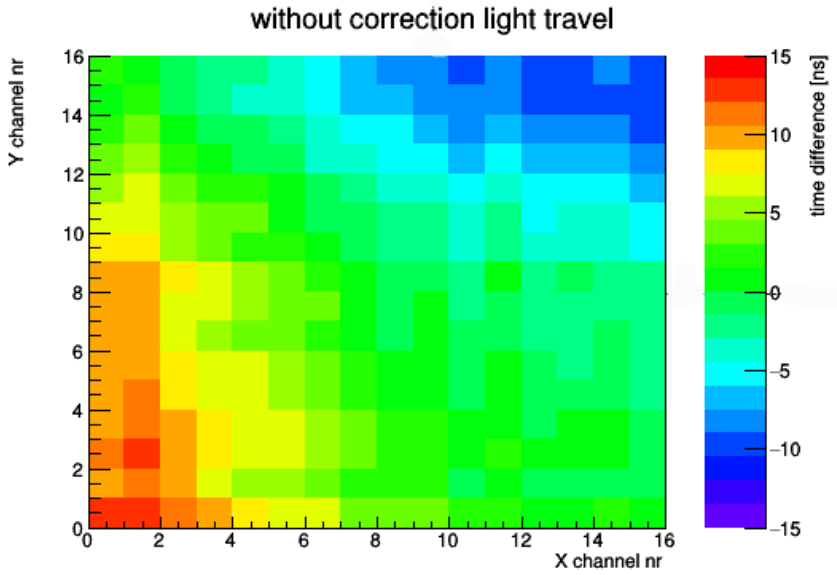
Time corrections

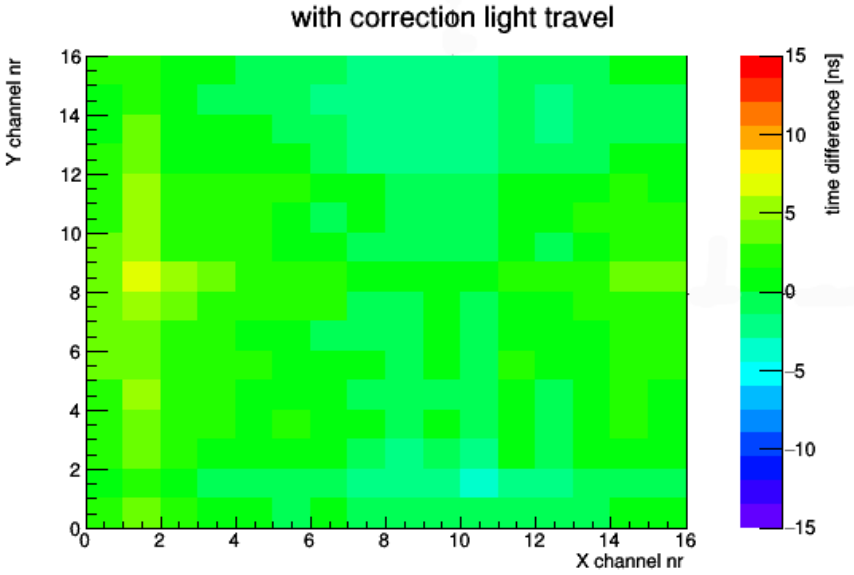
- Cable delays:
  - FEB 65: +94ns
  - FEB 66: +81ns
  - FEB 68: +10 ns
  - FEB 70: 0 ns

Light propagation time:

6.1 ± 0.7 ns/m

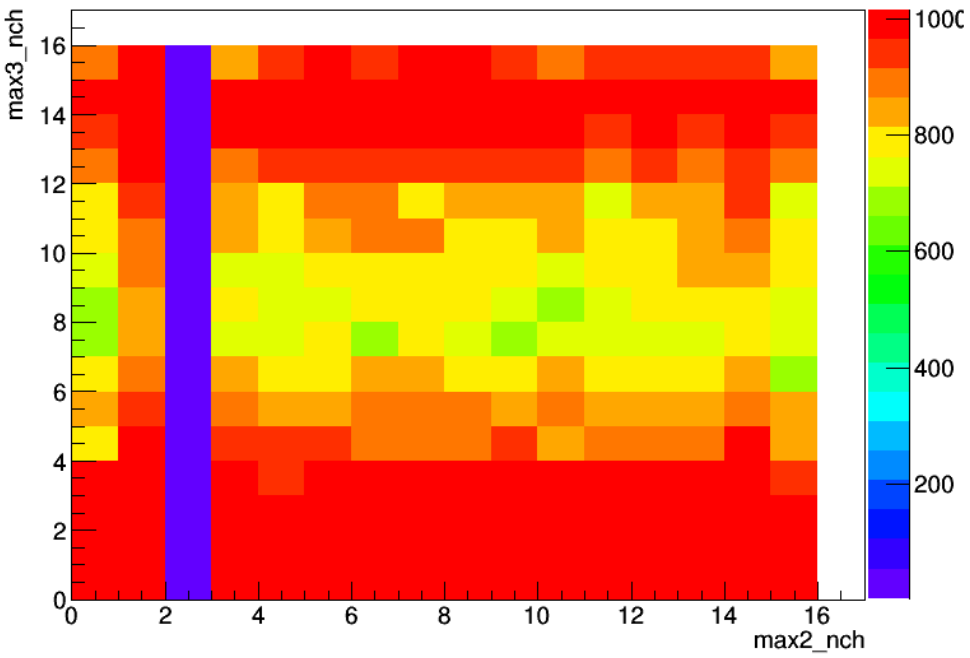
Channel width: 112mm



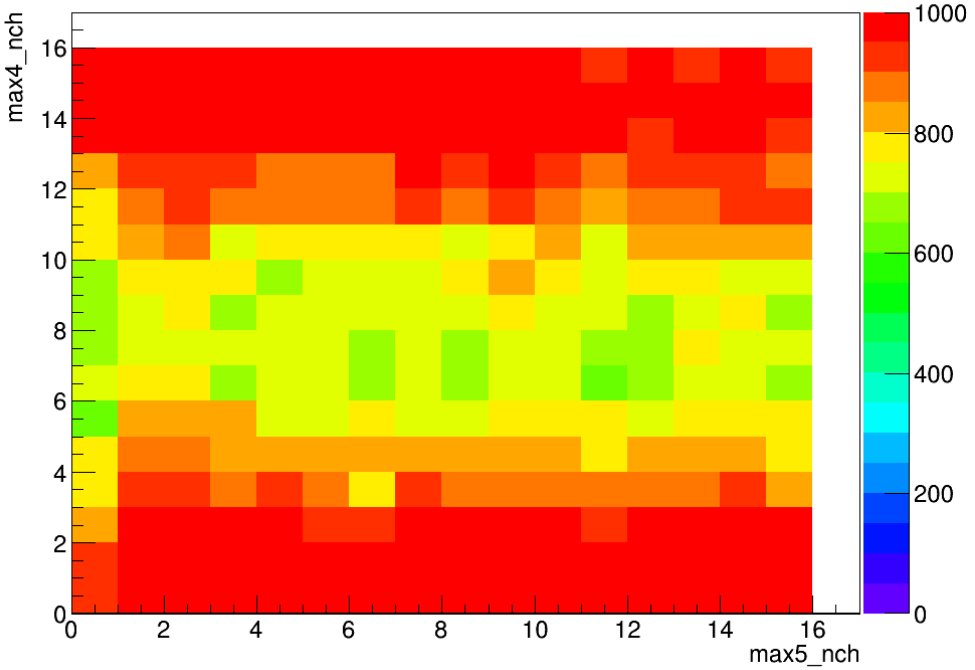


Occupancy

- Occupancy for single particles crossing all 4 modules:

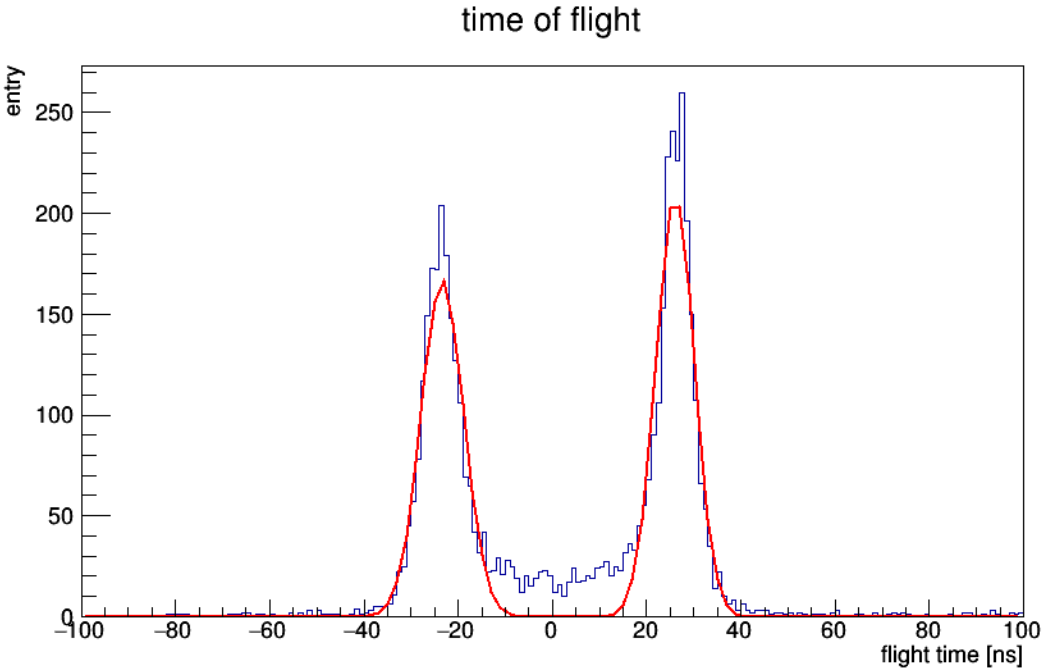


Door side



Wall side

Time of flight



Certain channels, only single hits

- TOF Measurement: 7.33 m ± 0.022m
- Measured with tape: 7.3 m ± 0.05m

Direction determination

- Delta ray identification
- dE/dx analysis
- Multiple scattering

Conclusion

- CRT @WA105 running since 6 .Sep. 2016
- Providing trigger for going-through tracks for the PMT group
- Already taken 1.6 TB of data
- Calibration and reconstruction algorithms tested and available