# BCM1F Scalers and NIM electronics

Richard John Hall-Wilton

## BCM1F Workshop, 14 September 2010

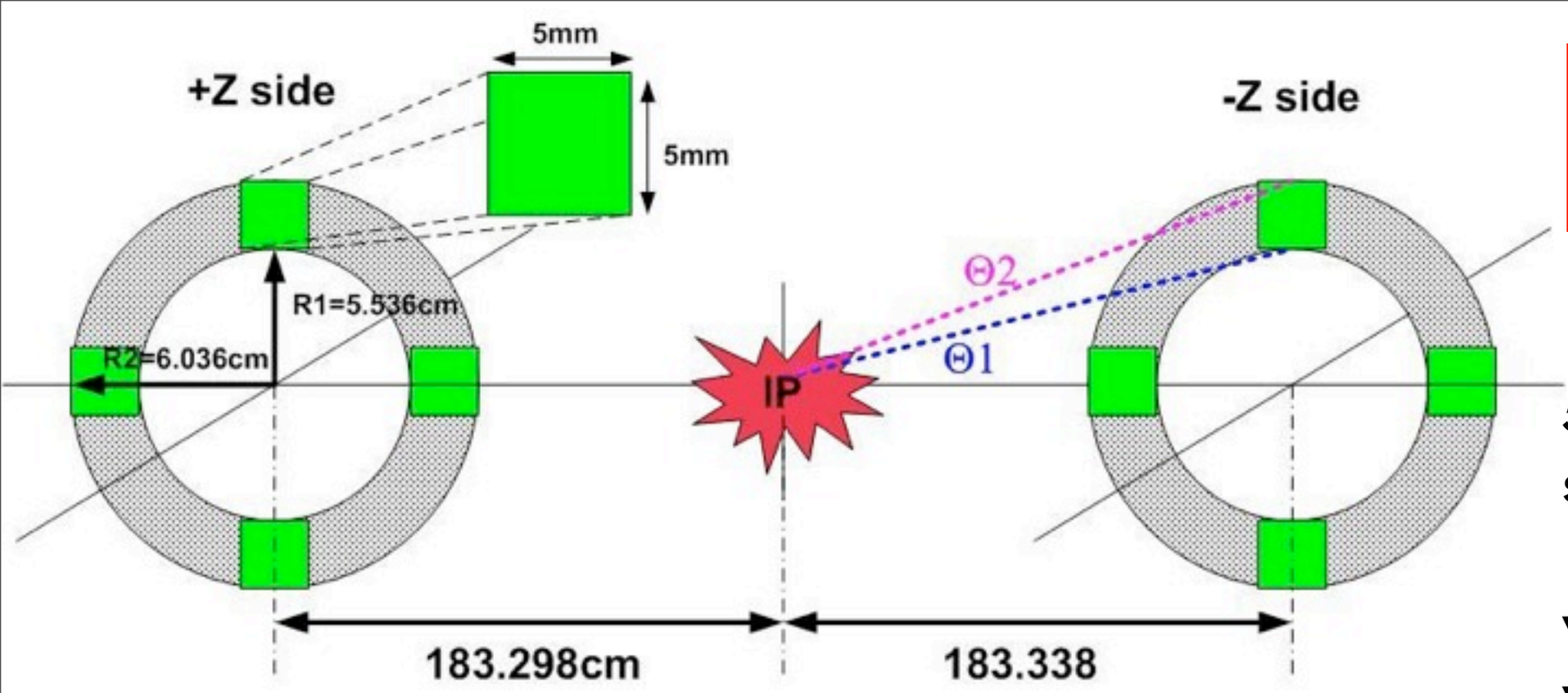
Scalers code is mostly the work of Elena and Alan
NIM is the work of Wolfgang, Vladimir, Ringo, Elena ...

Useful links for documentation:

https://znwiki3.ifh.de/CMS/Bcm1F

https://twiki.cern.ch/twiki/bin/viewauth/CMS/BrmWikiHome

# Layout



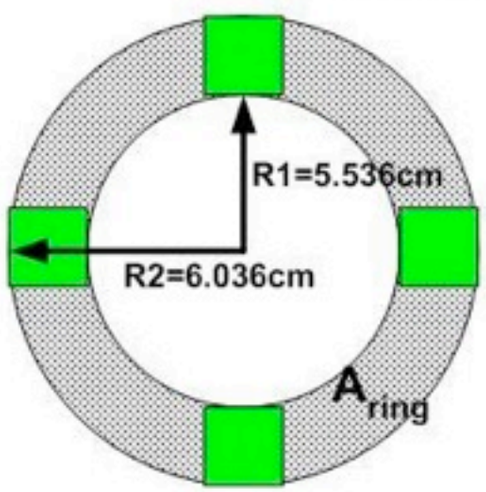

$$\eta = -\ln\left[tag\left(\frac{\Theta}{2}\right)\right]$$

$$\Theta_1 = arctag\left(\frac{5.536}{183.338}\right) = 1.73^\circ \Rightarrow \eta_1 = 4.19$$

$$\Theta_2 = arctag\left(\frac{6.036}{183.338}\right) = 1.88^\circ \Rightarrow \eta_2 = 4.11$$

- NB most diamonds 5x5mm, some 4.7x4.7, some 4.5x4.5.
- Do we remember/did we write down which ones we installed where?
- 25/22/20 mm^2
- Effective area is close to full area of diamond

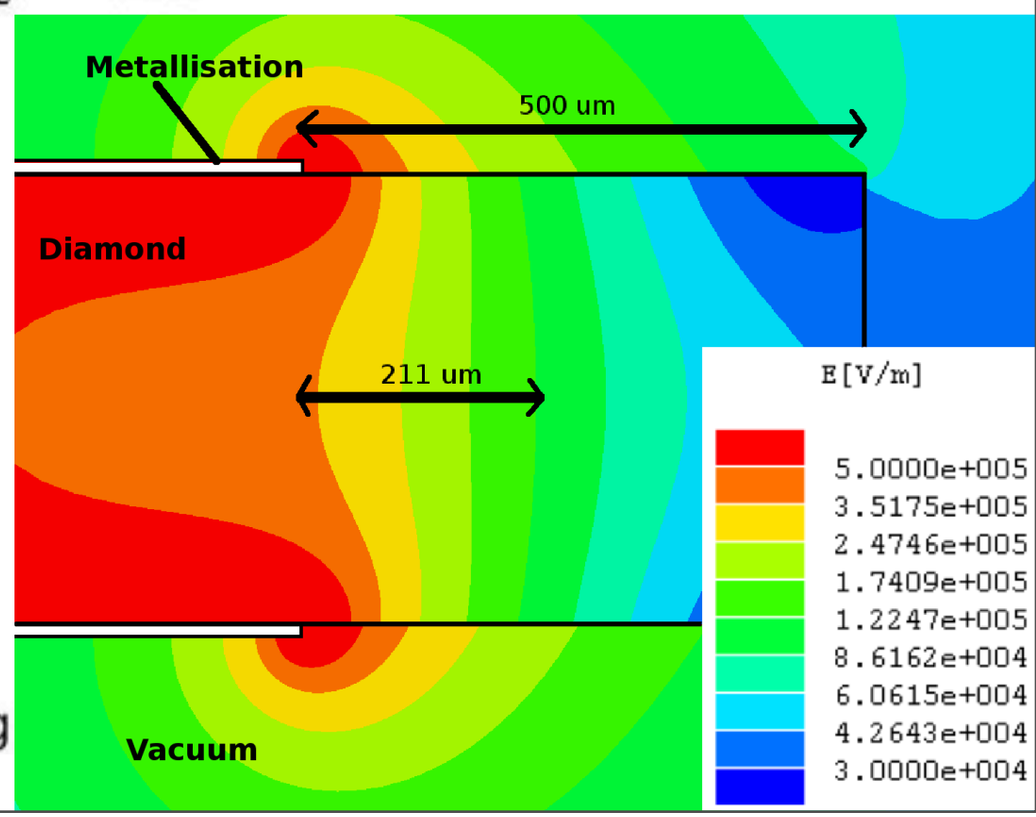
## Effective area of BCM1F?

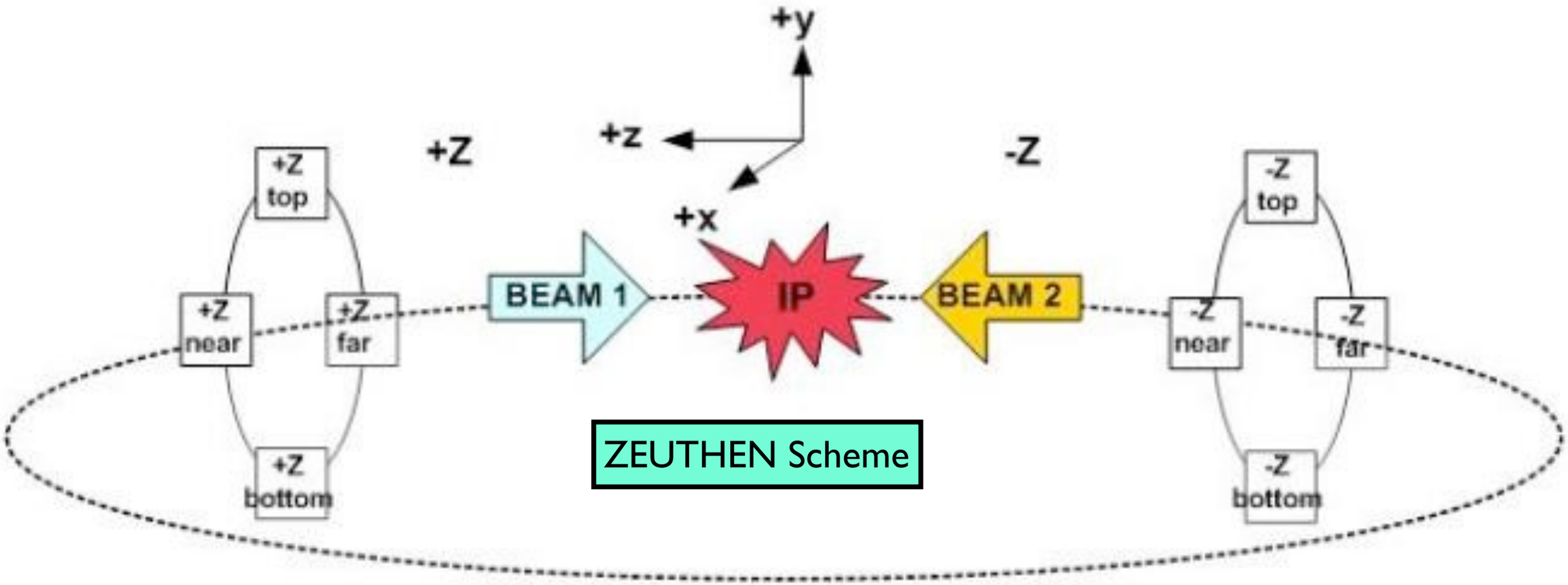



$A_1 = \pi R_1^2 = 9628\ mm^2$
$A_2 = \pi R_2^2 = 11445\ mm^2$
$A_{ring} = A_2 - A_1 = 1817\ mm^2$

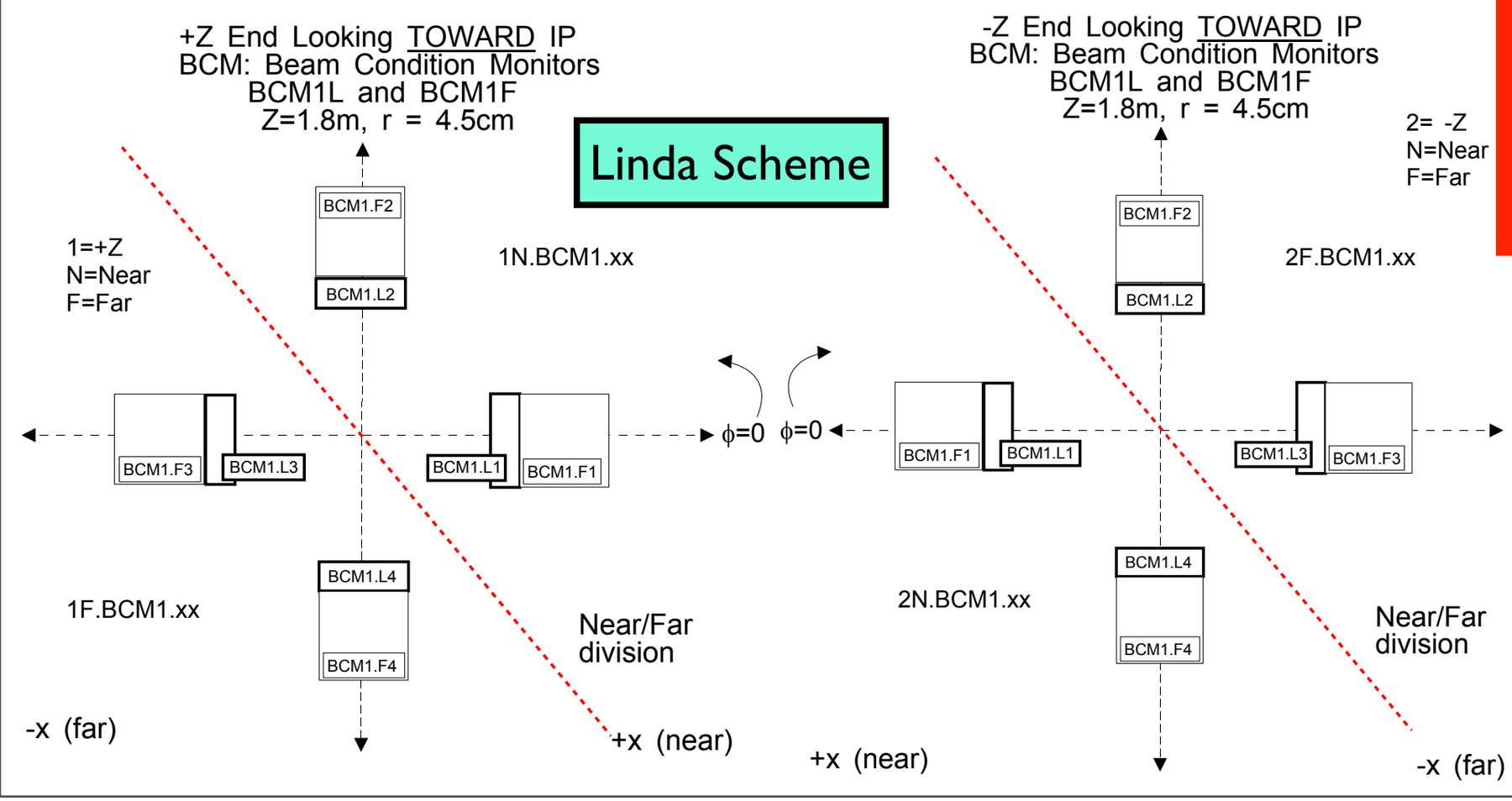
$A_{diamonds} = 4*25mm^2 = 100mm^2$

The diamonds occupy the 5.5% of the total area of the ring

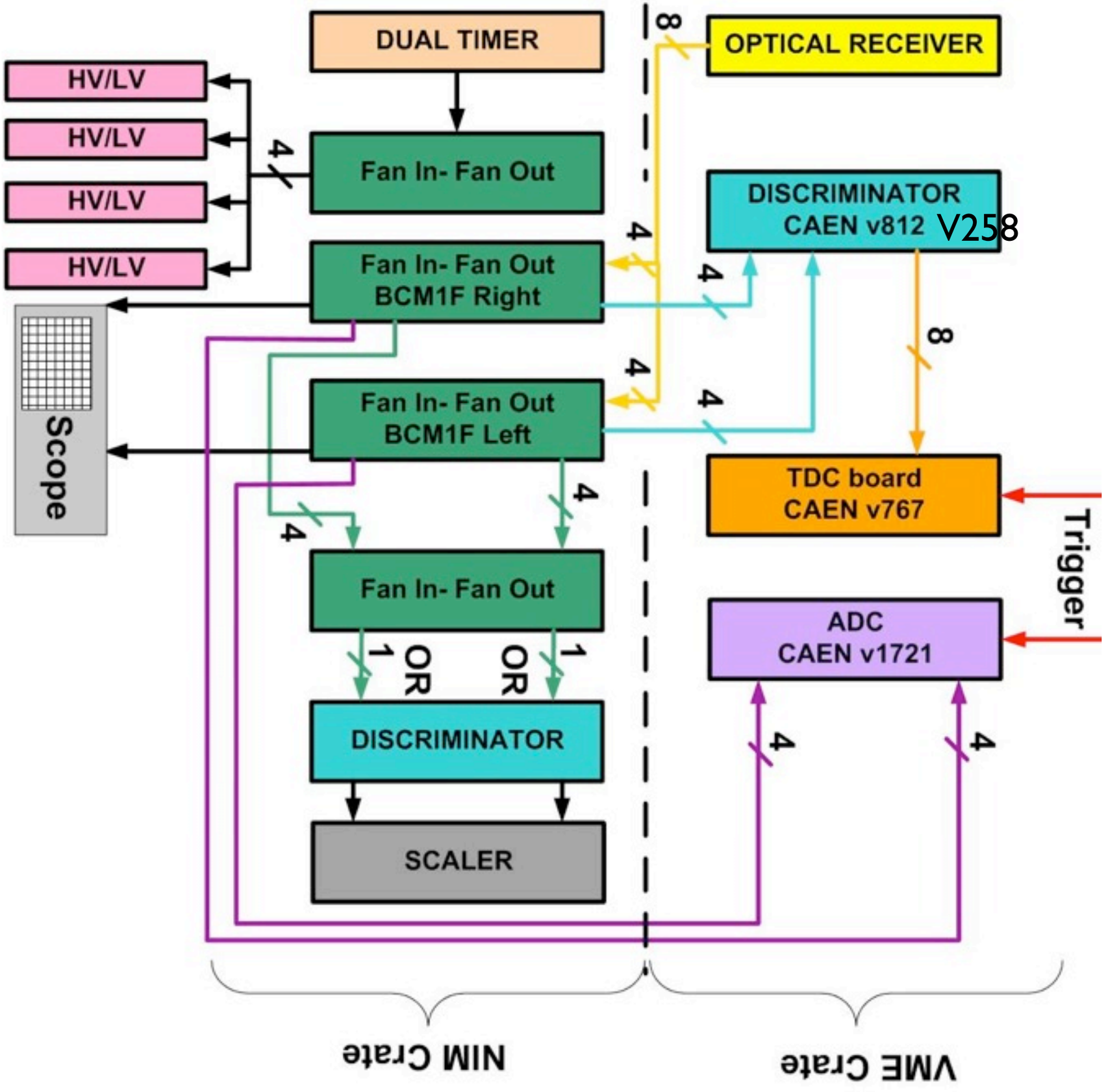




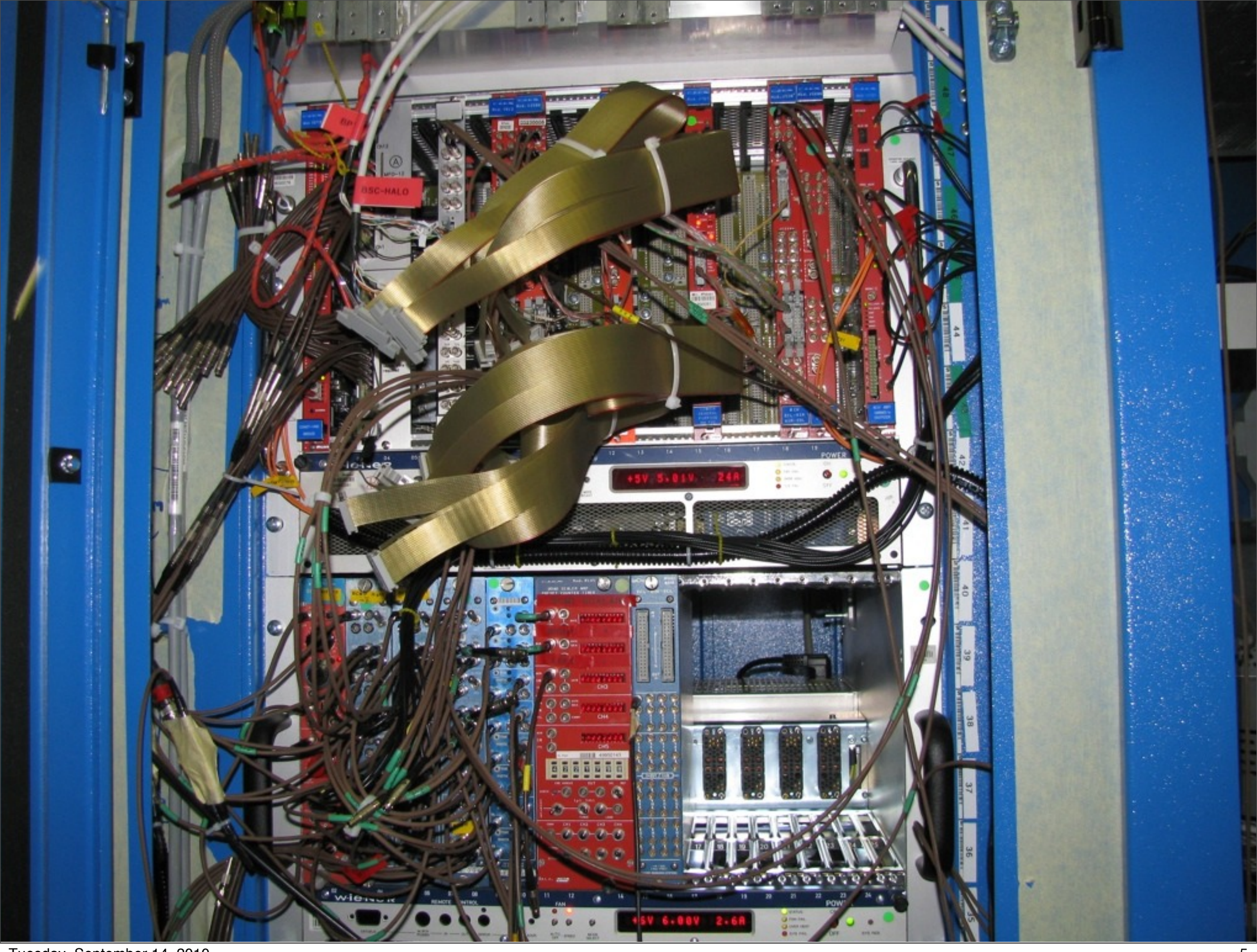

# Channel Mapping



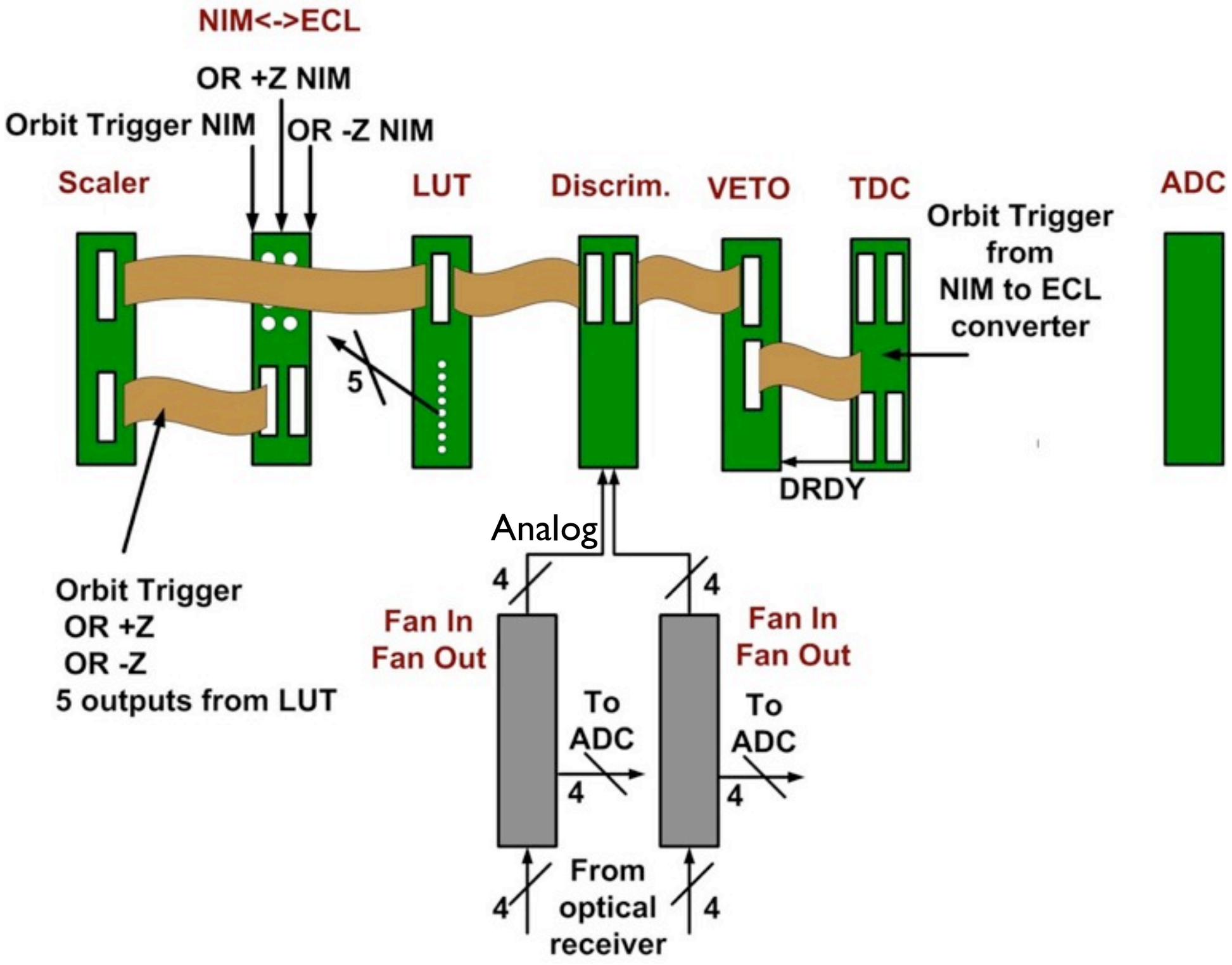
# NIM Electronics




- Main use is analogue FAN OUT of signals
- There is a set of discriminators and these give an 'OR' of each side into VME scalers
- Setup is finished - no changes anticipated


OSC-HALO
+5V 5.01V 24A
+5V 6.00V 2.6A

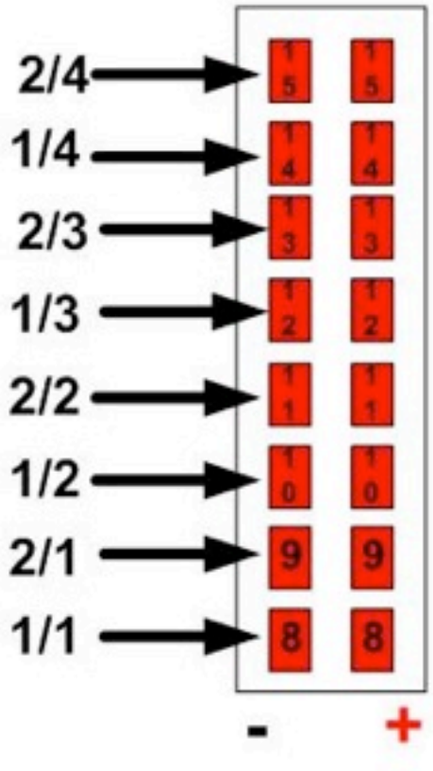
# Scalers

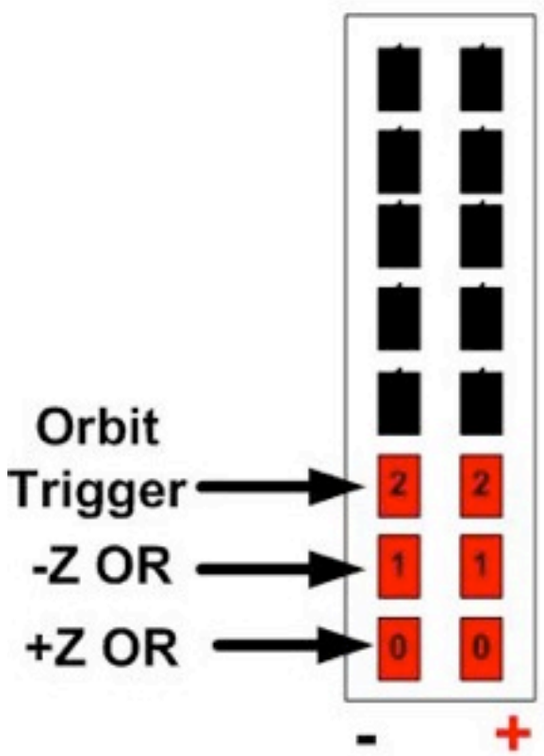



- In data path: discriminators (CAEN V258B) and Scalers (CAEN V560)

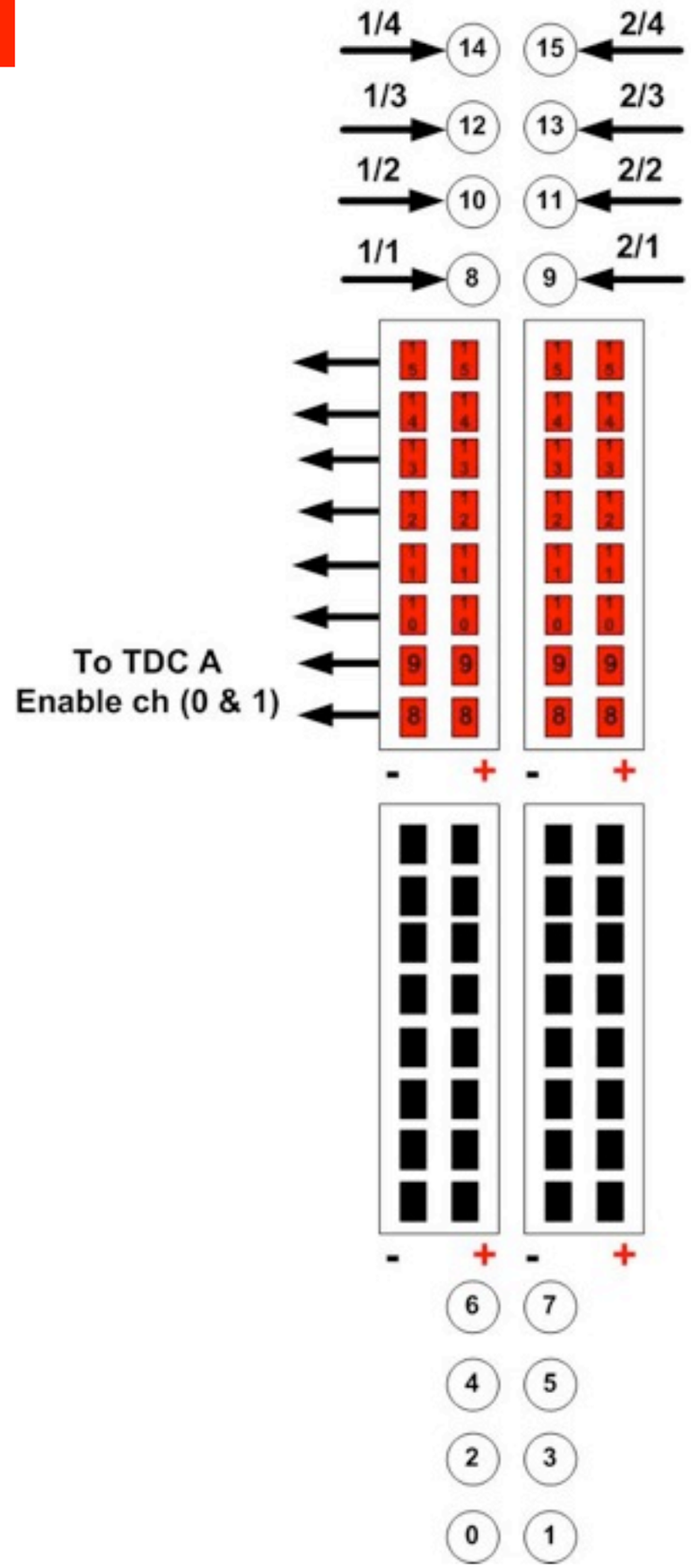
# Which Channel?

## SCALER v560




## DISCRIMINATOR v258B



# Specs for Discriminators and Scalers

- Discriminator:
  - Not a constant fraction discriminator
  - Double pulse resolution is 10 ns
  - Presently 7 channels at 24 mV, 1 at 50 mV
  - 2 channels have been changed as high as 75/100mV
  - 50mV still our best estimate of a MIP?
- Scalers:
  - 100 MHz
  - 5ns FWHM double pulse resolution
  - The 100 MHz limitation might limit performance above L=10^33 cm-2 s-1?

# Data Definition

- All data transport done with DIP (reliable)
- Tony's auto-restart scheme works - transparent
- Data written every Hz to disk
- Transferred daily to CASTOR
- 1 in 60 measurements stored in WBM database
- Data definition:
  - Unix_time Mod_Id Data_1 ... Data_16
- Both raw values of scalers and rates written
- Location on ctrl3:
  - /data/bcm1f/scaler/scaler_rate.dat

```
1284352558   3   0   0   11268   0   0   0   0   1   0   0   0   0   0   0   0   0
1284352559   3   0   0   11268   0   0   0   0   0   0   0   0   0   0   0   0   0
1284352560   3   0   0   11269   0   0   0   0   1   0   0   0   0   0   0   0   0
1284352561   3   0   0   11268   0   0   0   0   1   0   0   0   0   0   0   0   0
1284352562   3   0   0   11268   0   0   0   0   1   0   0   0   0   0   0   0   0
1284352563   3   0   0   11268   0   0   0   0   0   0   0   0   0   0   0   0   0
```

time orbit data

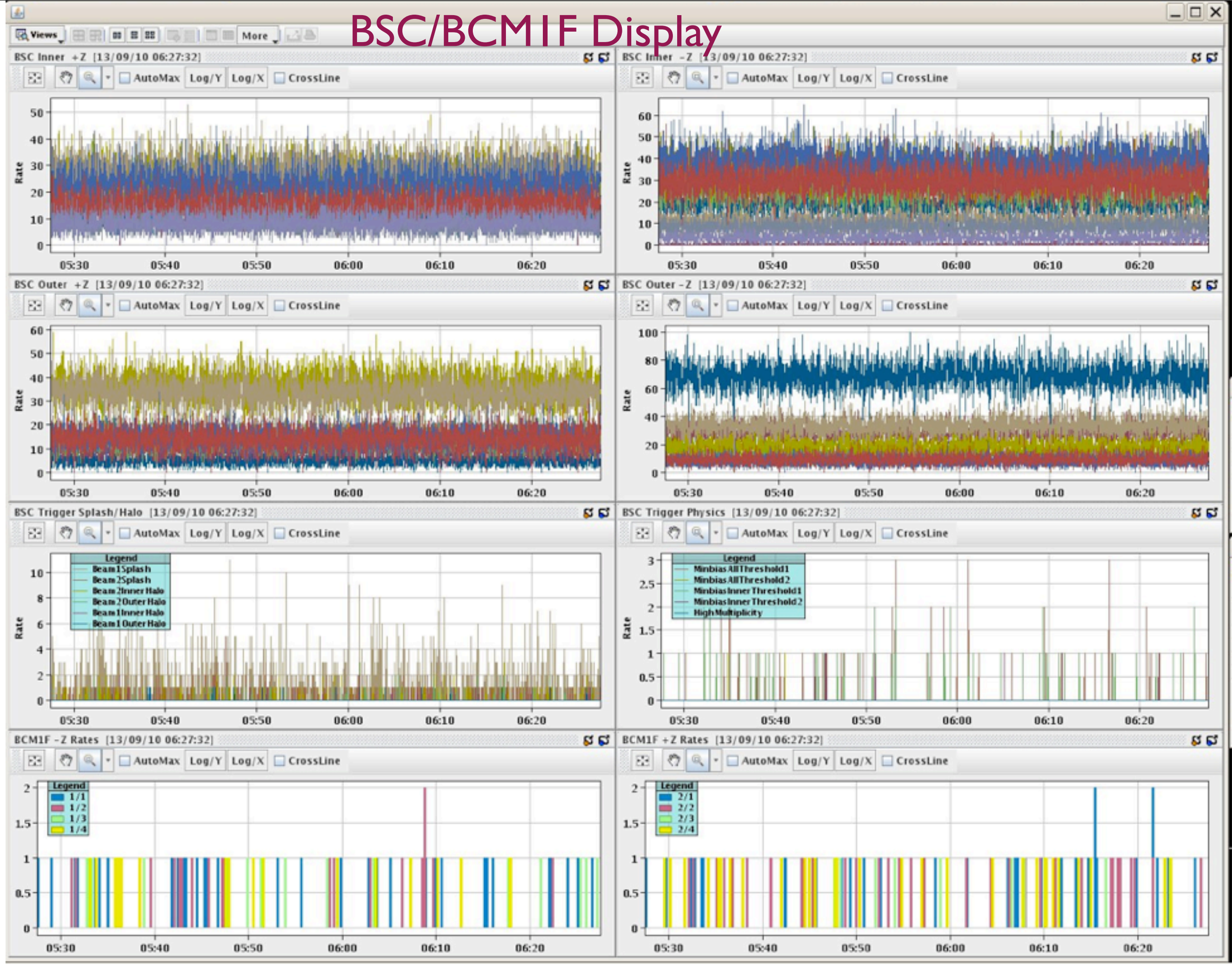
- Data on CASTOR is very well documented by Tony's excellent wiki page:

https://twiki.cern.ch/twiki/bin/view/CMS/BrmData

# Data Display

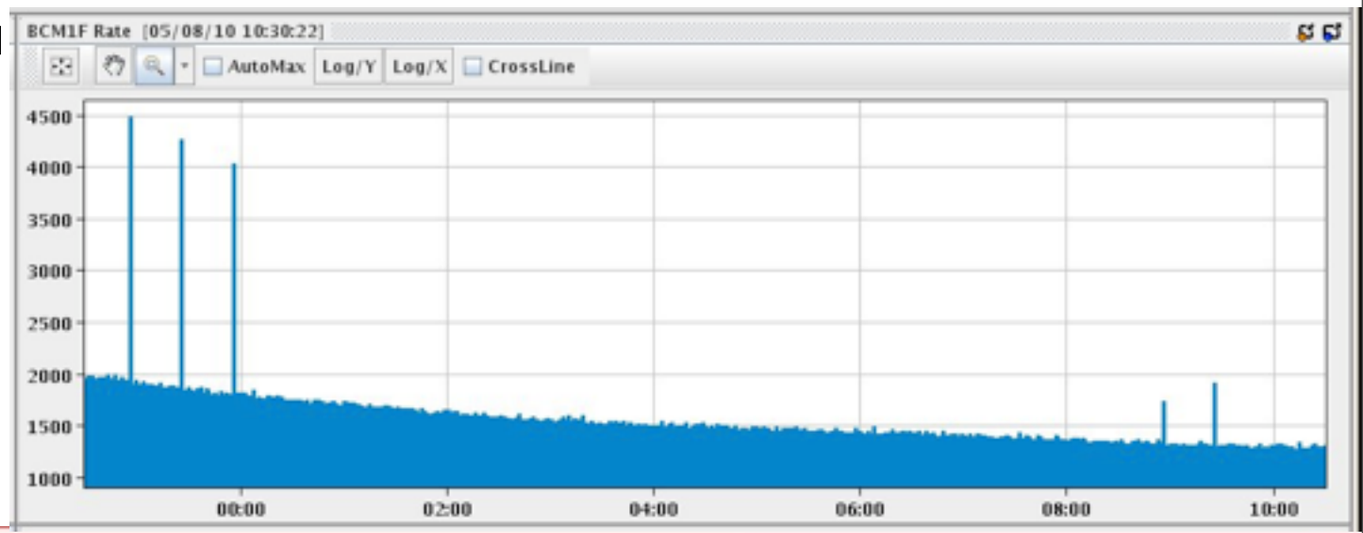
- Rates are displayed in OP VISTARS, Shift leader display and BSC/BCM1F display

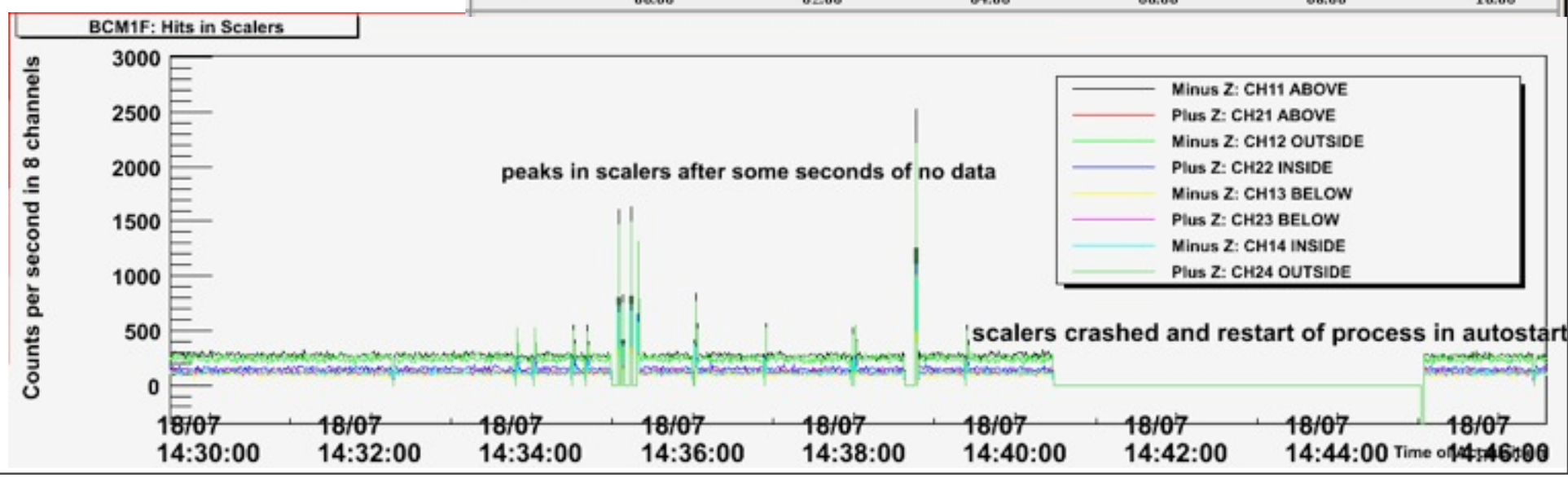
# BSC/BCM1F Display



# Work to still be done …

- Basically done actually
- Code needs to be uploaded into cmsbrm svn repository
  - In (backed up) brmdev nfs home directory at the moment
  - Have to make the svn repository also so that it be simply checked out onto online machines (i.e. quick recovery from PC/disk loss)
- Small code tidiness needed (type conversions, offset displays 2s from data file)
- Need to record the discriminator levels used
- The disk-access bottleneck with TDC data
  - Other disks are in the machine, and waiting on action on savannah ticket submitted in July
  - Should disappear when we move the TDC data to a different disk
- Who? Me?



# Options

- Actually, basically all possibilities are already covered by measuring singles rate of every channel
- Only possible change would be to increase the rate of reporting
  - Presently run at ca. 1 Hz
  - Gabor showed that these could be run at up to 1 kHz
  - Not sure if this is compatible with also running TDC and LUT over the same VME bridge (without latency features)
  - Would need to use orbit clock counter to check each readout period, and renormalise rates
  - Not clear of gain from this?
  - Certainly this would introduce more features into the data

# To Conclude ...

- Scalers are basically final
- All running and working. Data format final
- Code needs some final tweaking and needs to be in svn