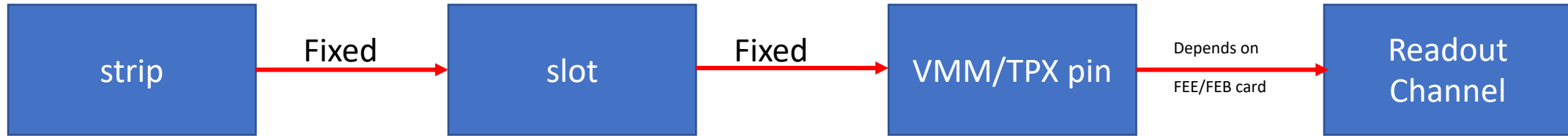

sTGC Map and QA plots

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Outline

- Maps
 - 60*60 prototype
 - Pentagon
- QA plots

Maps (TPX electronics)



- The fixed relationship will not be changed when the module produced
- Read local file to get the map information
- Map information added into StFttQAMaker, and have a local class
- Local map class worked from 60*60 prototype TPX electronic test. The result looks good.

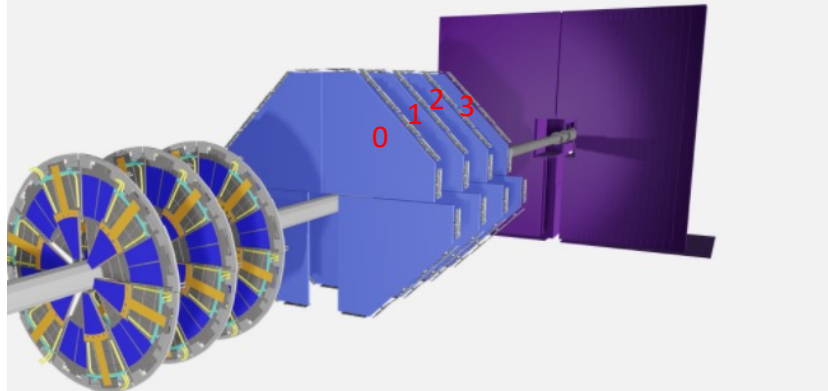
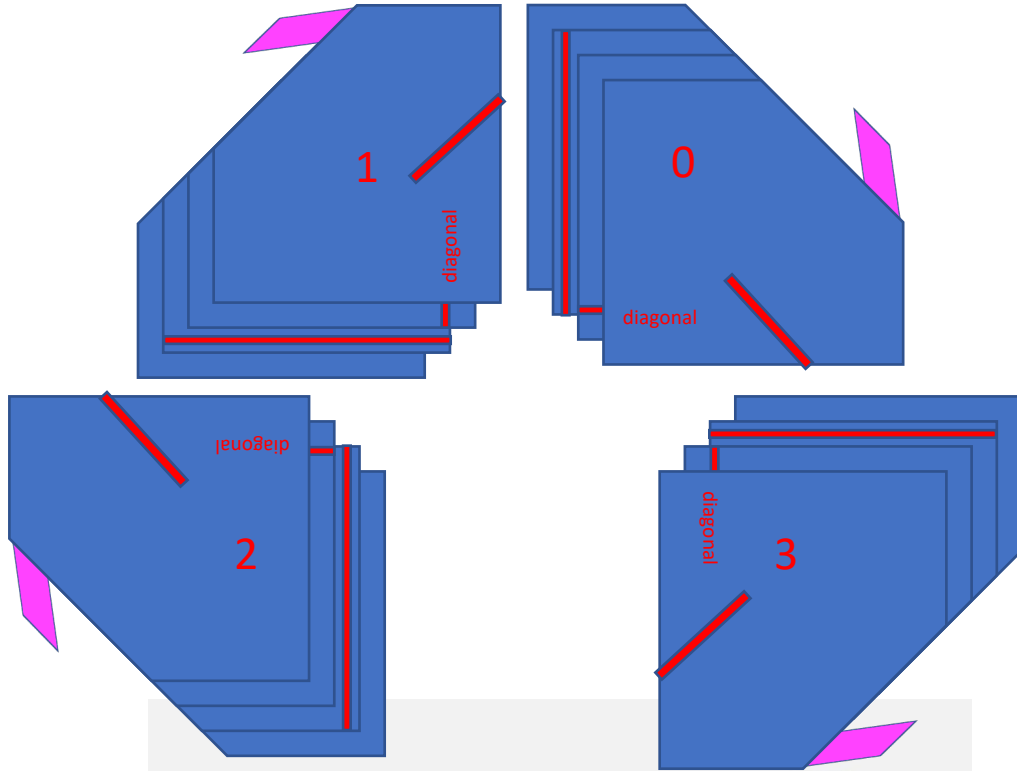
Maps (VMM electronics)



- The fixed relationship will not be changed when the module produced
- Read local file to get the map information
- Map information added into StFttQAMaker, and have a local class
- Local map class worked from 60*60 prototype TPX electronic test. The result looks good.

- 60*60 prototype data only
- An adapter between the 60*60 prototype slot and VMM readout.
- Now base on TPX electronic map
- Working on finish the map of Pentagon with VMM readout

sTGC pentagon mapping



Disk	module	layer	Row	strip
0	0	0	0	0
From east to west 0-4	Similar to the number of the quadrant	From west to east is 0 - 4	The strip row closest to beam pipe is 0	The strip closest to beam pipe is 0

We have 4 disks of sTGC in the FTS.

Each disk have 4 modules.

Each module have 2 chambers and 4 strip layers

There are 2 diagonal layers, one horizontal layer and one vertical layers in one module

H&V layer:

row0 : 166 ch

row1 : 152 ch

row2 : 93 ch

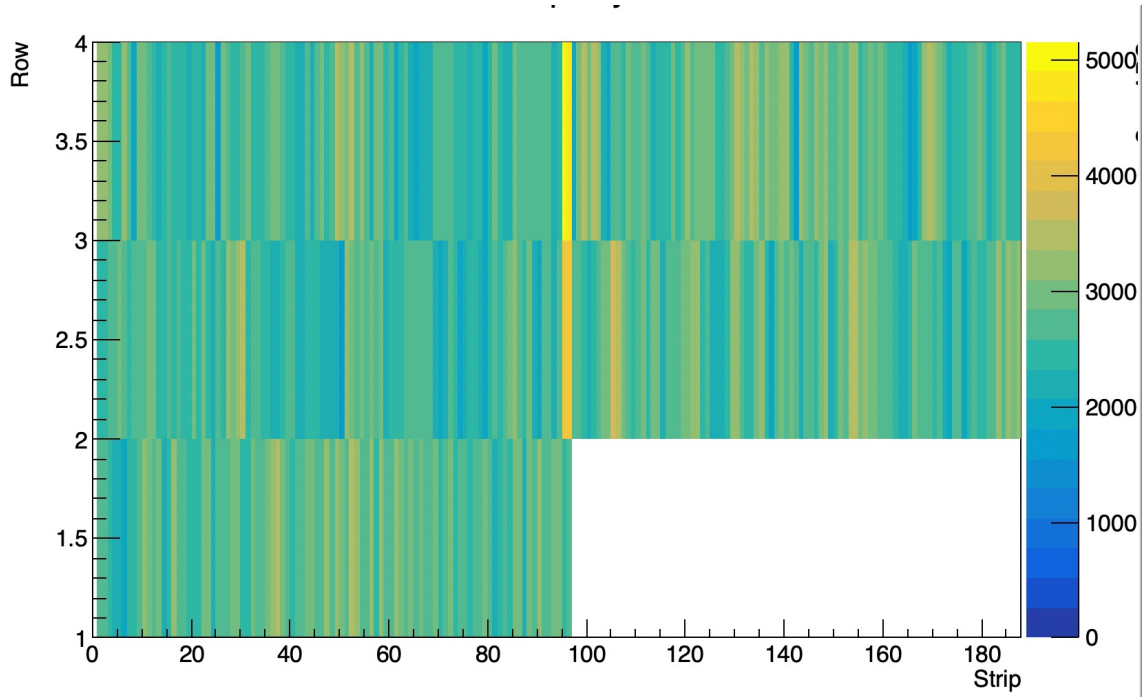
Diagonal layer :

row0 : 151 ch

row1 : 58 ch

The number and name rules base on these information

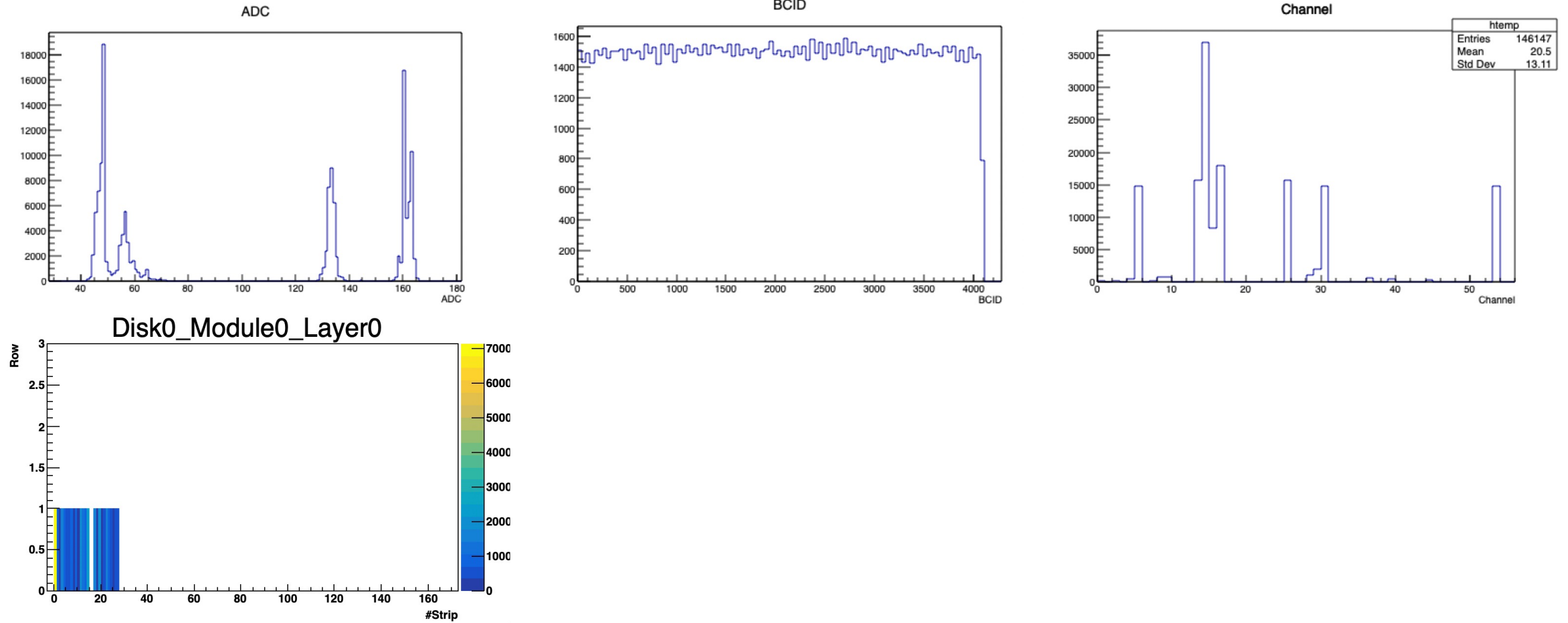
QA plots (60*60 prototype)



sTGC fire map

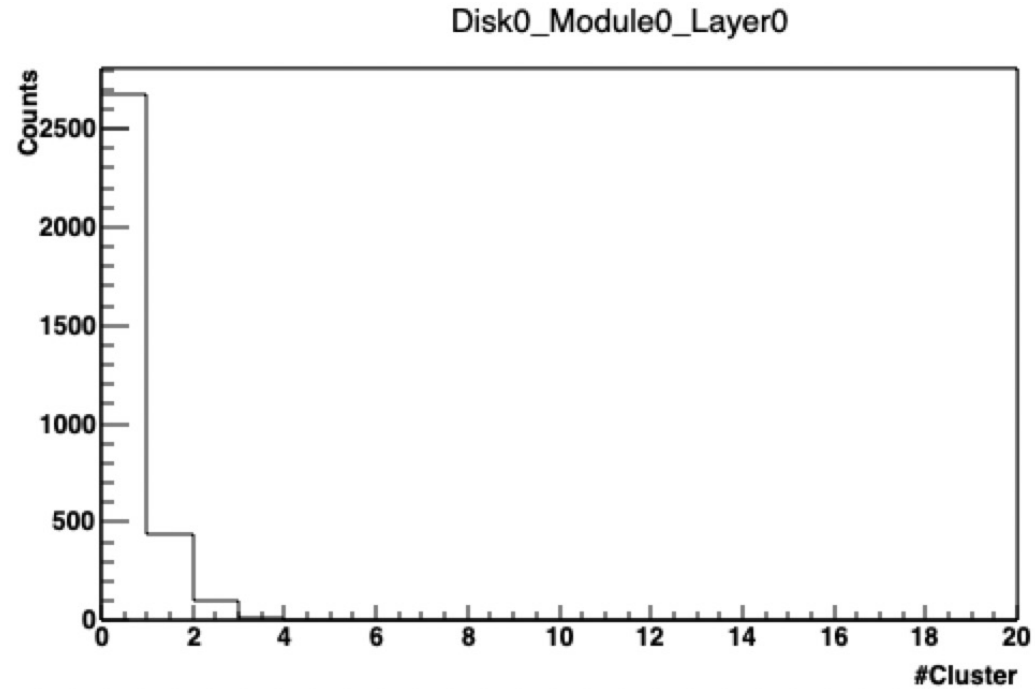
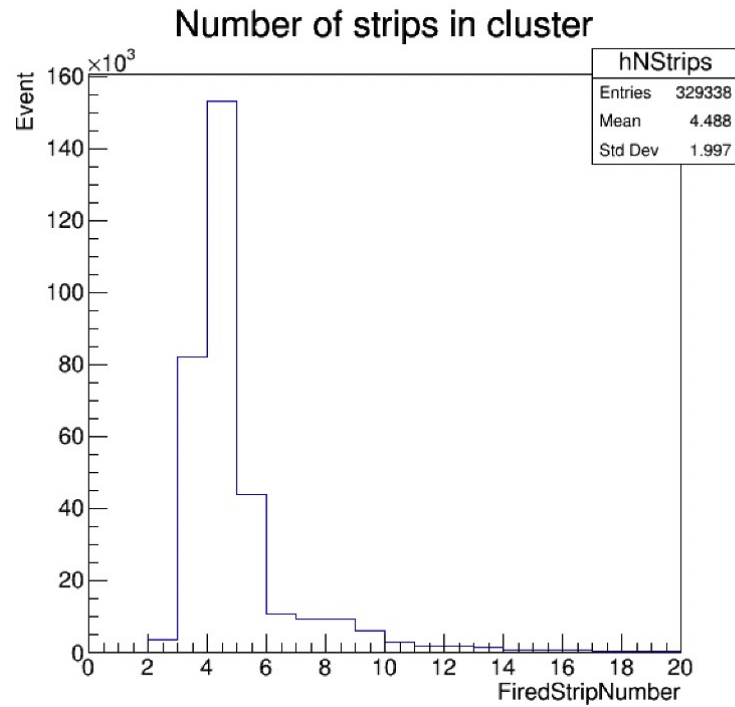
Check the hot/cold channel

QA plots



1D QA plot for the different layer of sTGC to check the uniformity. Same plots can be used at final QA plots
2D QA plots to check the hot/dead channel

QA plots in future



The QA plots of clusters will be added when the have data with VMM electronics

Summary & next step

Summary:

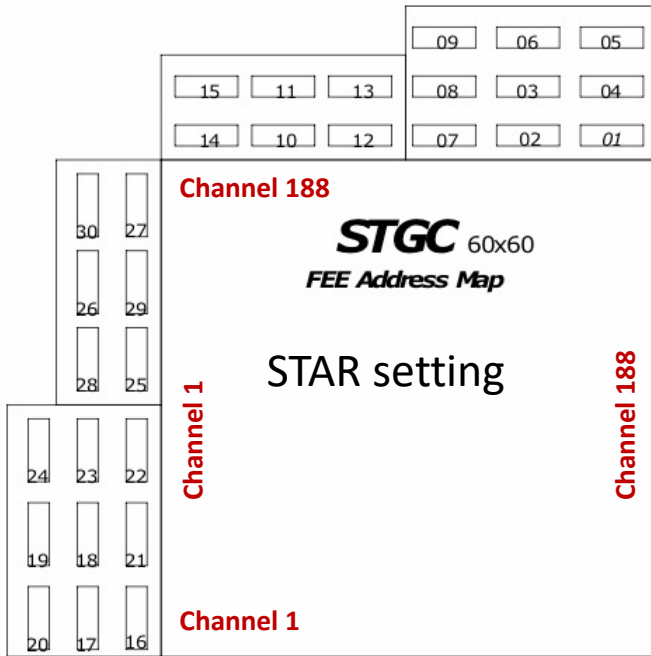
- 60 * 60 sTGC prototype tested in the cleanroom.
- Code work of map, save data to root format is finished. Basic function of analysis code is built and add in StFttQAMaker
- HV can be controlled remotely
- Demo of sTGC online QA plots are generated

Next step :

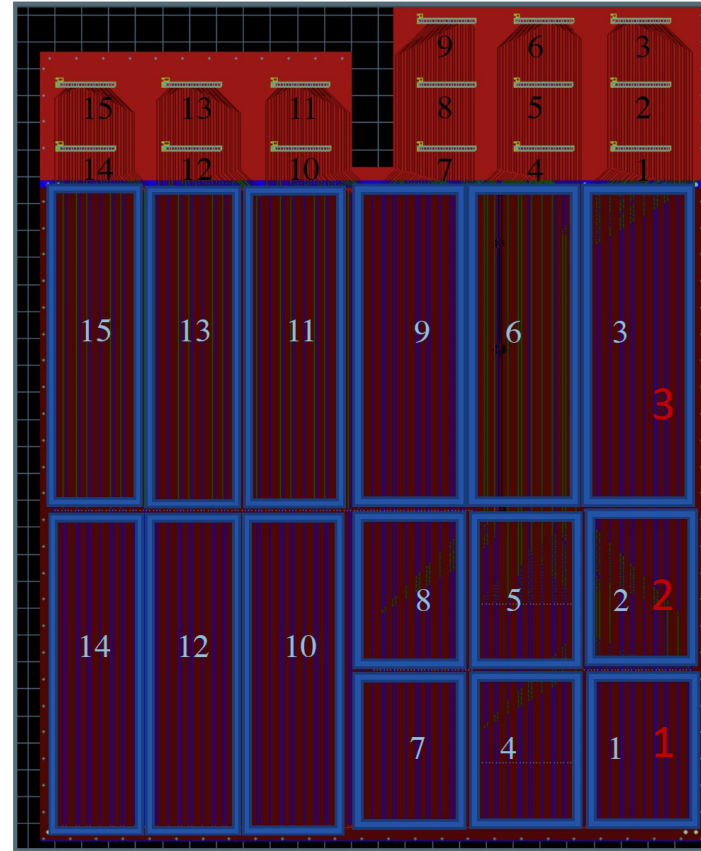
- 60 * 60 sTGC prototype tested in the beam.
- 60 * 60 sTGC prototype test with new electronics

Backup

Maps



FEE number to slot number



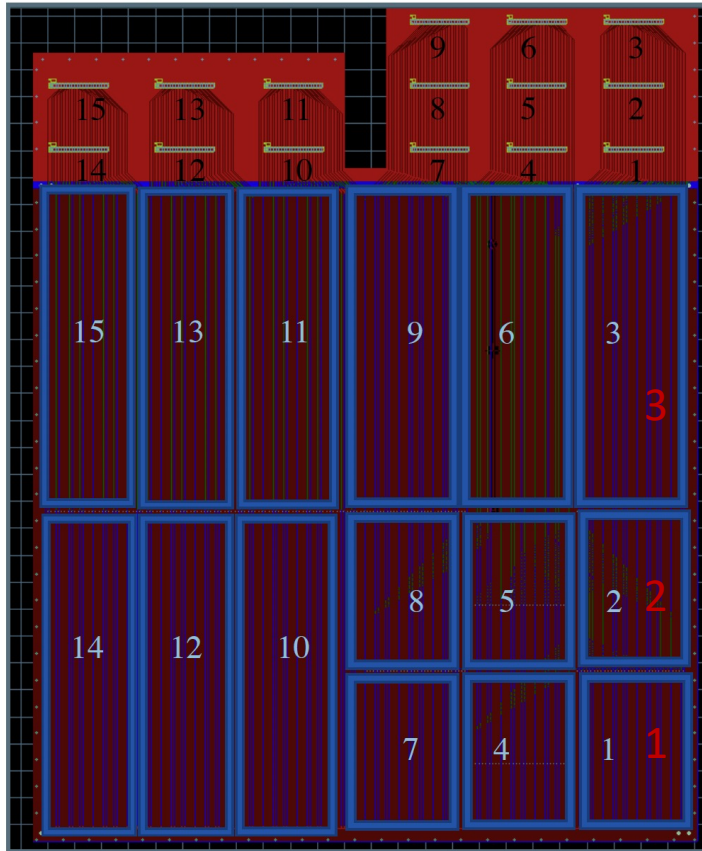
4Digis of strip number:
1st digi is which row: see plot
2-4th digi is number of strip

FEE CH			Strip CH	
grounding			grounding	
address			address	
8	9	ALTRO 1	2	1
10	11		4	3
12	13		6	5
14	15		8	7
7	6		10	9
5	4		12	11
3	2	ALTRO 2	14	13
1	0		16	15
9	8		18	17
11	10		20	19
13	12		22	21
15	14		24	23
6	7	26	25	
4	5	28	27	
2	3	30	29	
0	1	32	31	
address			address	
grounding			grounding	

FEE channel to strip channel

ALTRO number = #FEE*2 and #FEE*2+1

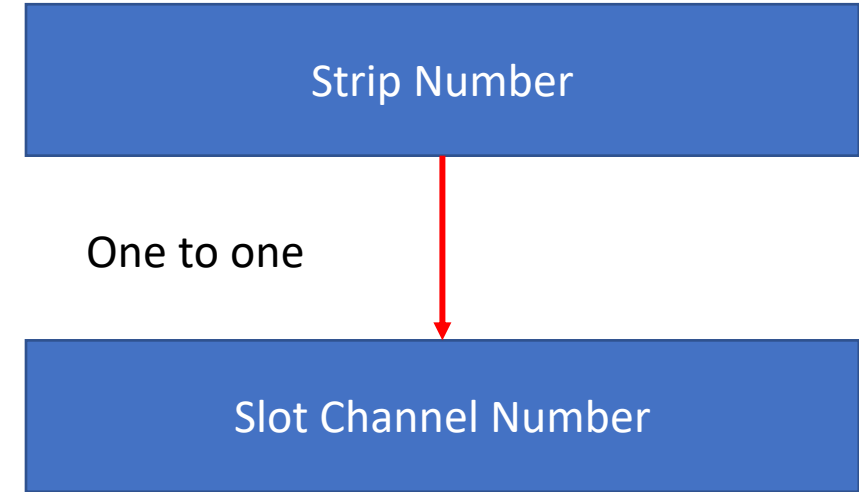
Maps



4Digis of strip number:
 1st digi is which row: see plot
 2-4th digi is number of strip

FEE CH				Strip CH	
grounding					
address					
8	9	ALTRO 1		2	1
10	11			4	3
12	13			6	5
14	15			8	7
7	6			10	9
5	4			12	11
3	2	ALTRO 2		14	13
1	0			16	15
9	8			18	17
11	10			20	19
13	12			22	21
15	14			24	23
6	7		26	25	
4	5		28	27	
2	3		30	29	
0	1		32	31	
address					
grounding					

slot channel to strip channel



Maps (code)

Uploaded to github

https://github.com/wztbxl/sTGC_6060_prototype_map

Class : Strip2CH

Initialization :

Edit the FEE2Slot_Layer*.dat file, i^{th} line is the FEE number of i^{th} Slot

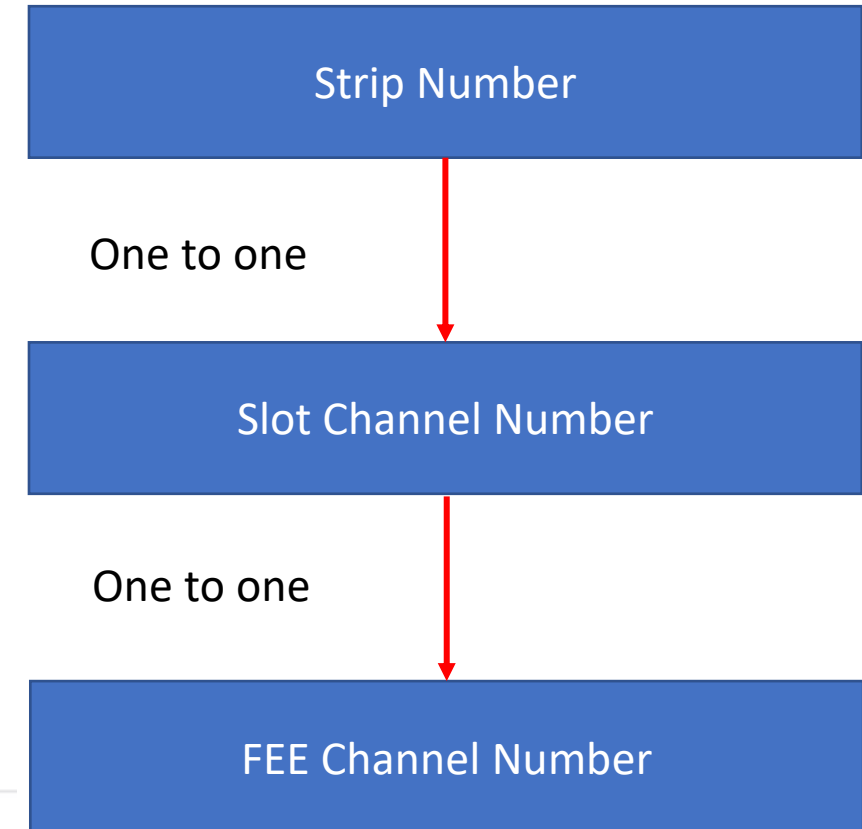
```
void init( std::string filename, int n_FEEs );
```

Get Strip number :

Input : FEE number, ALTRO number, Channel number

```
int GetStripNumber( int FEE, int ALTRO, int Channel );
```

1	1
2	4
3	5
4	2
5	3
6	6
7	7
8	8
9	9
10	12
11	13
12	10
13	11
14	14
15	15



If the relationship between the Slot and Strip group and the relationship between the FEE and ALTRO number do not change, what you need to change is the

FEE2Slot_Layer1.dat

FEE2Slot_Layer2.dat

Data of sTGC

Code upload to the github and will add a clear ReadMe file :

https://github.com/wztxbl/sTGC_6060_prototype_map/tree/master/ReadRawData

Reading long text file needs 10 mins or more

To reduce the time of reading data, save the data from text file to the ROOT file :

Timebin and ADC :

1D array

A long 1D array is need.

Working on using vector/map or 2D array to save the data.

Channel number:

$FEE * 10000 + ALTRO * 1000 + Channel$

Strip number :

$Row * 1000 + Strip\ number$

Code of save data:

[ReadRawData.cxx](#)

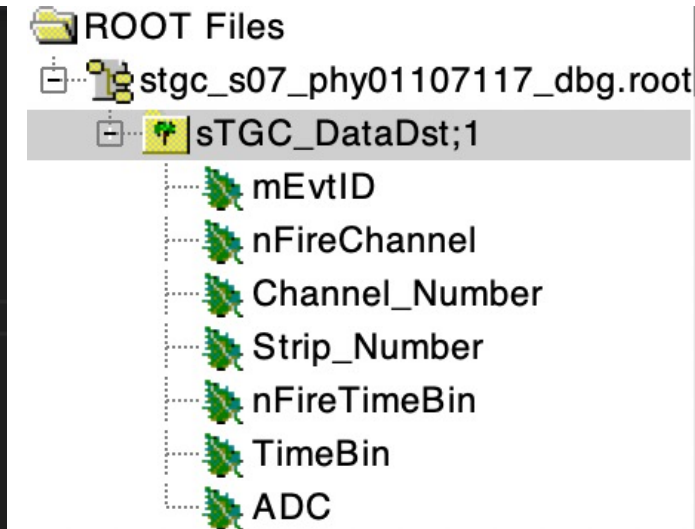
Code of analysis :

[Analysis.cpp](#)

```
[34mINFO: rts_example.C [line 253]: evt 1: sequence 8: token 1, trgcmd 4, daqcmd
[34mINFO: rts_example.C [line 2831]: STGC found[0m
[34mINFO: rts_example.C [line 253]: evt 2: sequence 9: token 2, trgcmd 4, daqcmd
STGC ALTRO: evt 1: sec 7, ALTRO 51(FEE25):00
15 9
14 8
13 9
STGC ALTRO: evt 1: sec 7, ALTRO 28(FEE14):12
48 9
47 9
46 8
STGC ALTRO: evt 1: sec 7, ALTRO 24(FEE12):05
27 10
26 12
25 9
STGC ALTRO: evt 1: sec 7, ALTRO 54(FEE27):00
21 8
20 14
19 9
```

```
const Int_t mMax = 1000;
struct StsTGCDData
// event information
Int_t mEventId;
Int_t nFireChannel;
// track information
Int_t Channel_Number[mMax];
Int_t Strip_Number[mMax];
Int_t nFireTimeBin[mMax];
Int_t TimeBin[mMax];
Int_t ADC[mMax];
```

Data Format



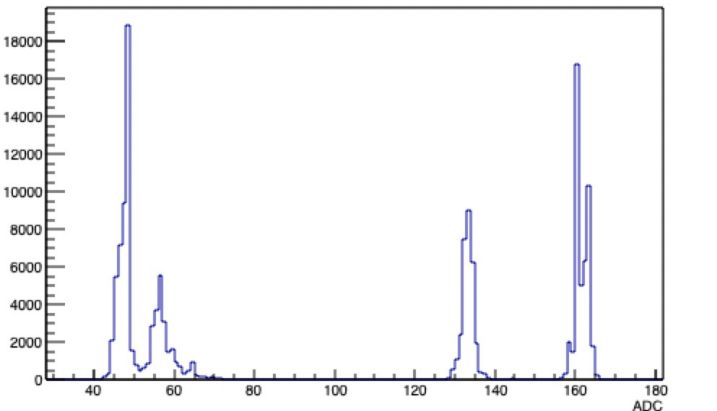
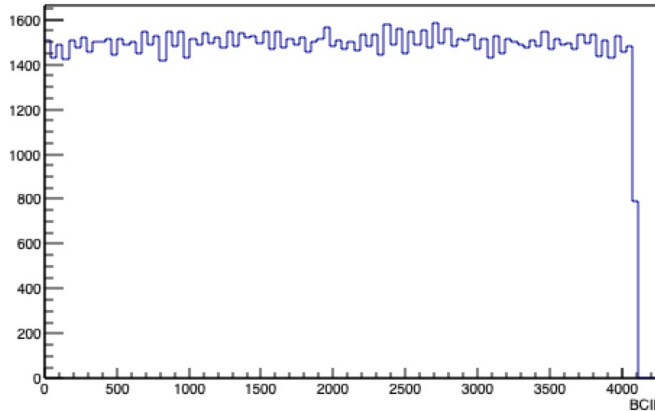
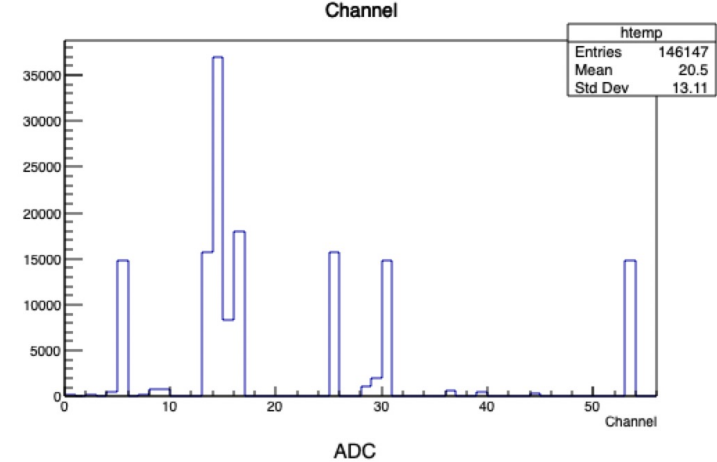
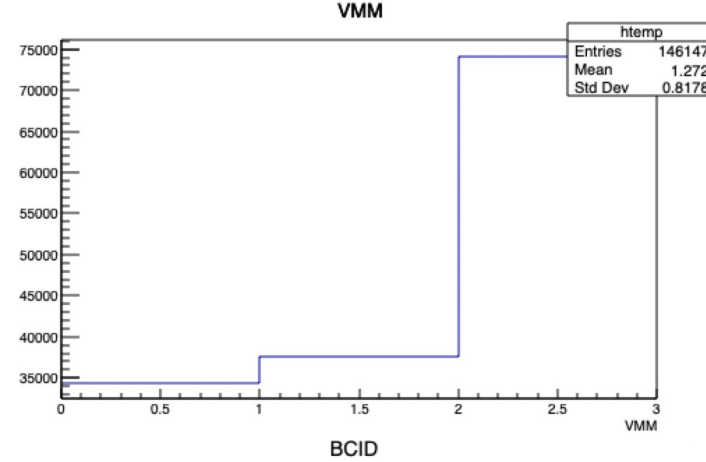
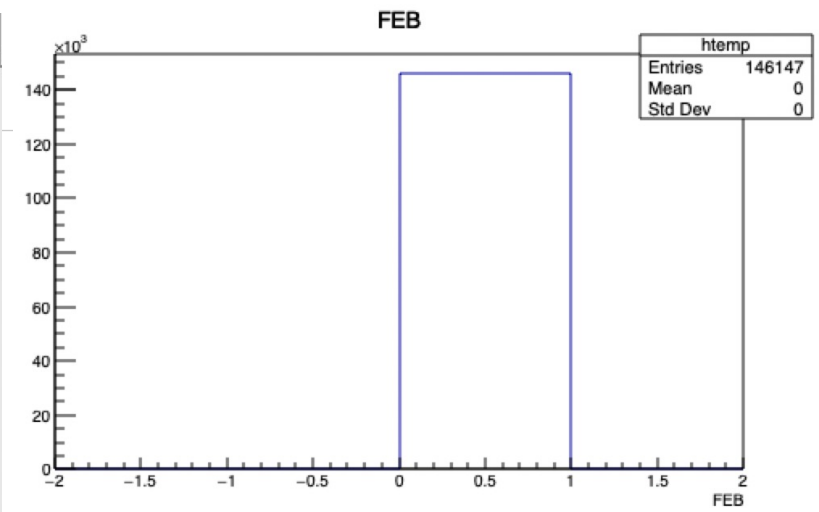
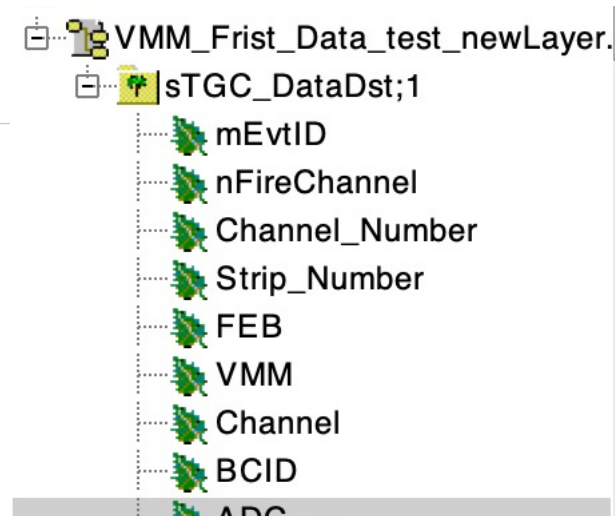
VMM data

Vmm.sfs

```
STGC VMM: evt 1: sec 1, RDO 1
STGC VMM: evt 2: sec 1, RDO 1
STGC VMM: evt 3: sec 1, RDO 1
STGC VMM: evt 4: sec 1, RDO 1
STGC VMM: evt 5: sec 1, RDO 1
STGC VMM: evt 6: sec 1, RDO 1
STGC VMM: evt 7: sec 1, RDO 1
STGC VMM: evt 8: sec 1, RDO 1
STGC VMM: evt 9: sec 1, RDO 1
STGC VMM: evt 10: sec 1, RDO 1
STGC VMM: evt 11: sec 1, RDO 1
STGC VMM: evt 12: sec 1, RDO 1
STGC VMM: evt 13: sec 1, RDO 1
STGC VMM: evt 14: sec 1, RDO 1
STGC VMM: evt 15: sec 1, RDO 1
STGC VMM: evt 16: sec 1, RDO 1
STGC VMM: evt 17: sec 1, RDO 1
FEB 0:0, ch 16: ADC 53, BCID 3908
FEB 0:2, ch 25: ADC 160, BCID 345
FEB 0:1, ch 14: ADC 47, BCID 1324
FEB 0:2, ch 30: ADC 163, BCID 357
FEB 0:1, ch 39: ADC 49, BCID 1326
FEB 0:2, ch 53: ADC 132, BCID 365
```

Next :
Map information
Noise in different channel

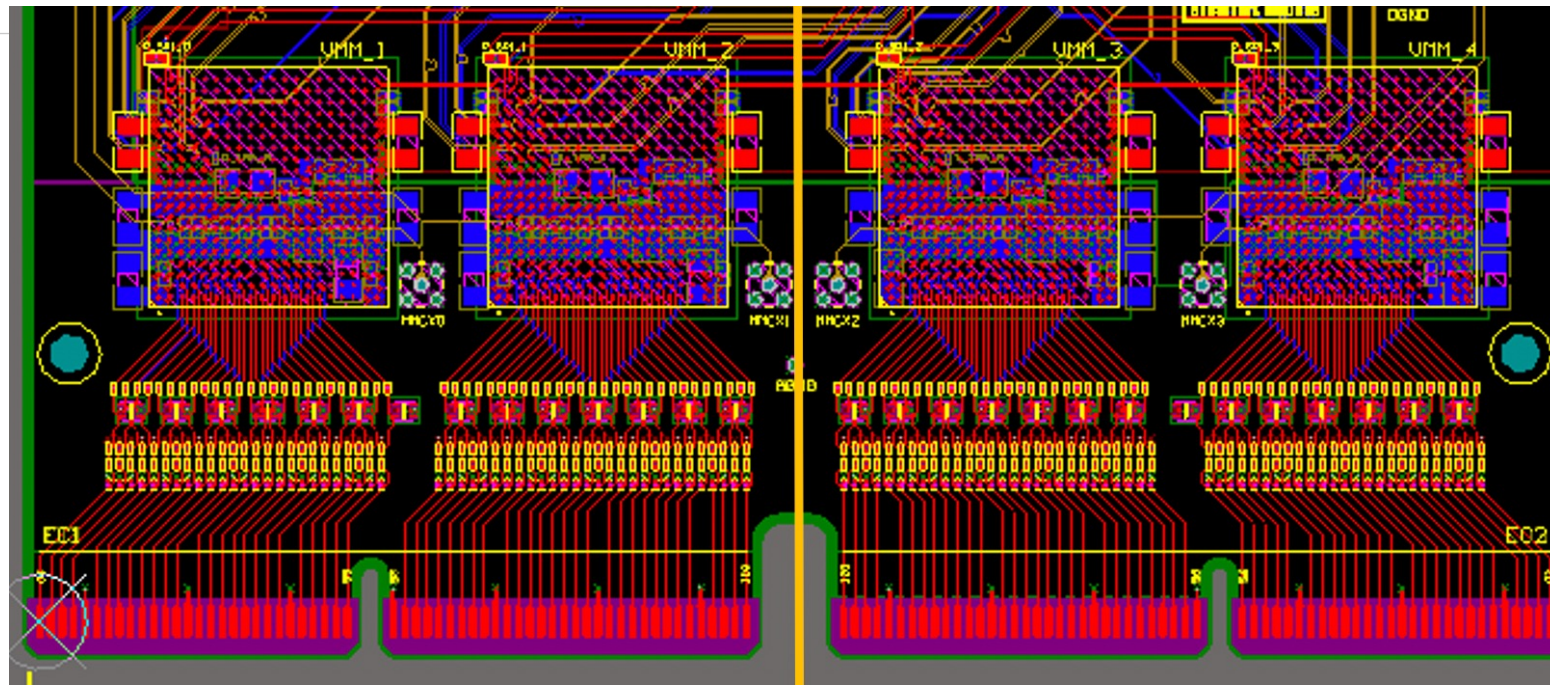
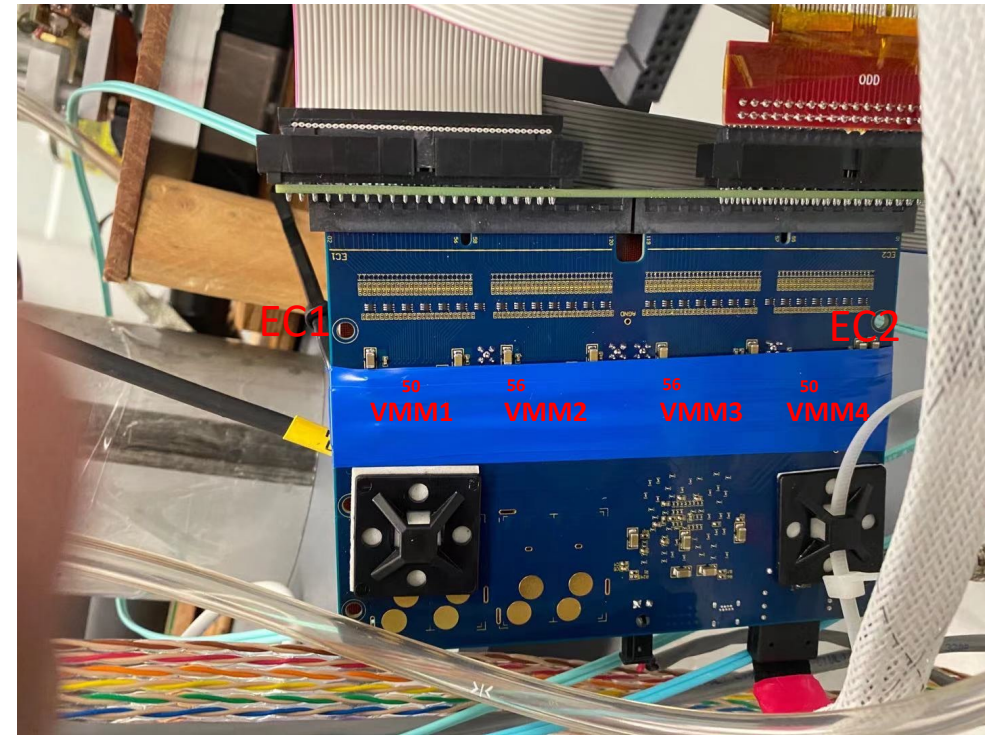
4/27/21



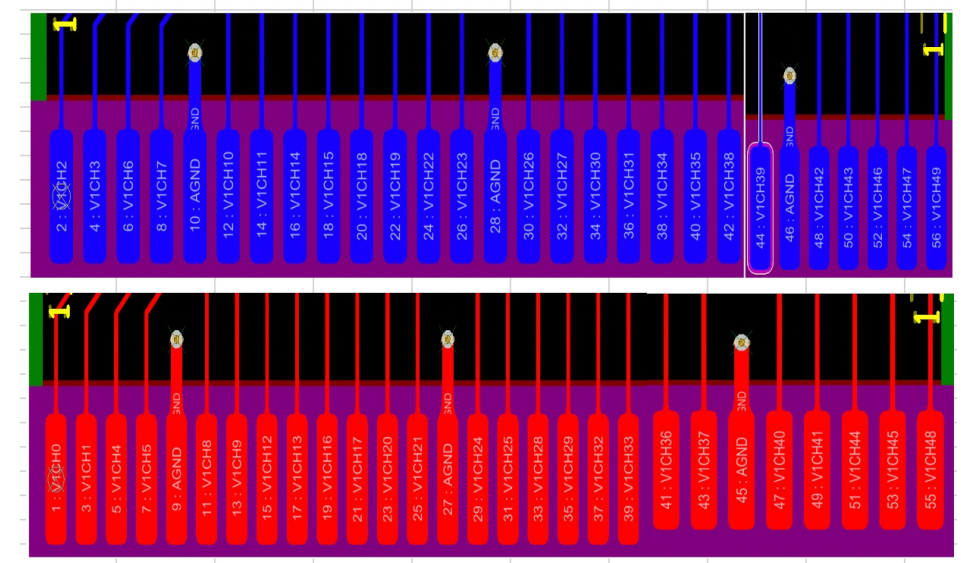
VMM data

stgc_2021_04_01_12_51.sfs with cosmic

Lack of the map information



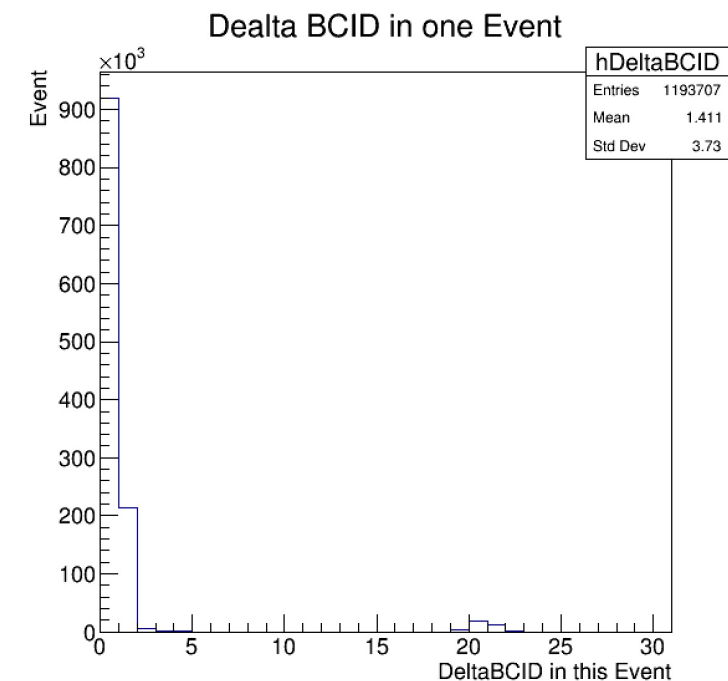
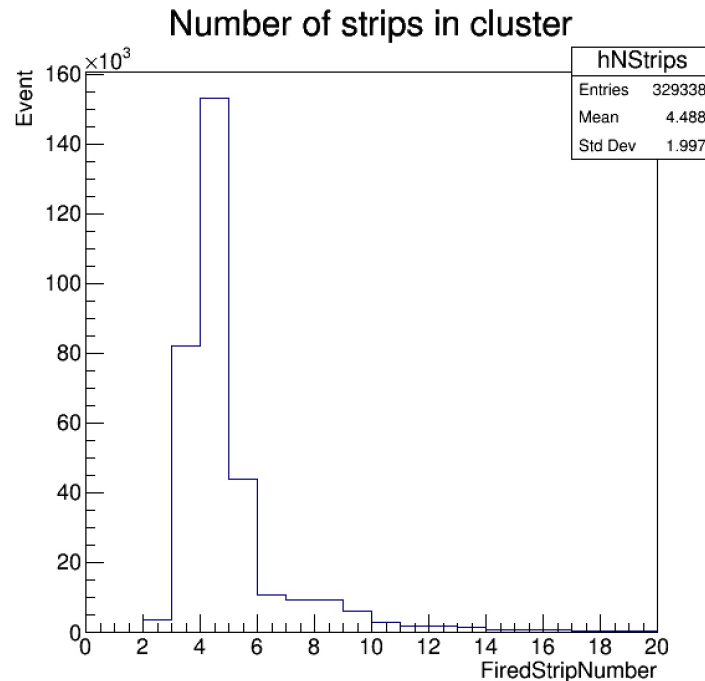
Need the adapter structure
Thanks for Tim's help



VMM1 (VMM2?) connect to detector
VMM3 & 4 did not connect to the detector


```

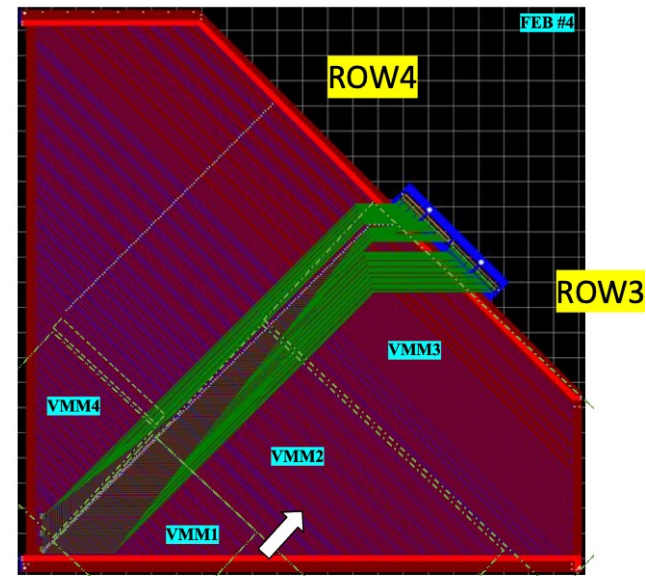
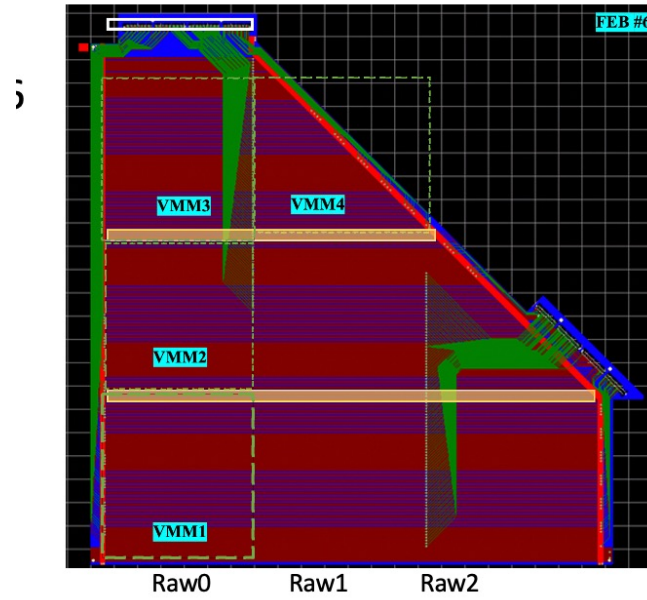
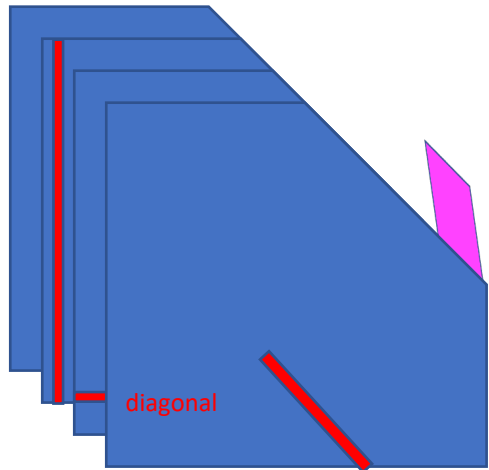
STGC VMM: evt 37: sec 1, RDO 1
FEB 0:0, ch 23: ADC 68, BCID 1494
FEB 0:3, ch 07: ADC 72, BCID 1033
FEB 0:0, ch 43: ADC 596, BCID 2967
FEB 0:0, ch 05: ADC 696, BCID 183
FEB 0:2, ch 17: ADC 124, BCID 4000
FEB 0:1, ch 28: ADC 325, BCID 1078
FEB 0:0, ch 14: ADC 174, BCID 3015
FEB 0:2, ch 37: ADC 237, BCID 970
FEB 0:3, ch 63: ADC 94, BCID 1846
FEB 0:2, ch 44: ADC 4, BCID 500
FEB 0:0, ch 23: ADC 72, BCID 3140
FEB 0:0, ch 26: ADC 73, BCID 3140
FEB 0:0, ch 28: ADC 955, BCID 3118
    
```



BCID have a strange distribution. In SDU's test, most Δ BCID is less than 4 for cosmic event. And most events have more than 3 strips respond.

To select the cosmic like event. the cut Δ BCID < 4 and number of strip which Δ BCID < 4 are used.

sTGC pentagon mapping



Support link

Prototype test:

<https://drupal.star.bnl.gov/STAR/event/2021/04/07/star-forward-stgc-meeting/stgc-6060-prototype-test-and-vmm-test>

Local code:

https://github.com/wztbxi/sTGC_6060_prototype_map

https://github.com/wztbxi/sTGC_6060_prototype_map/tree/master/ReadRawData