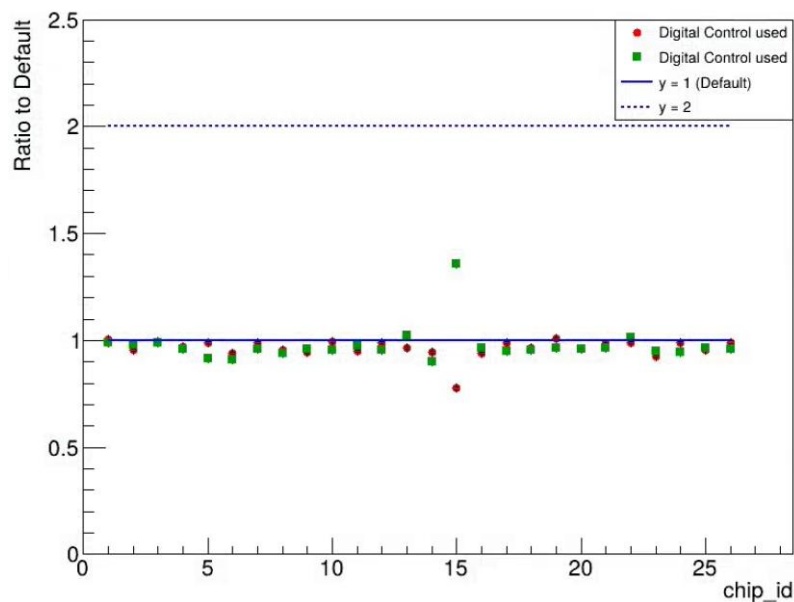


Digital-Control-analysis

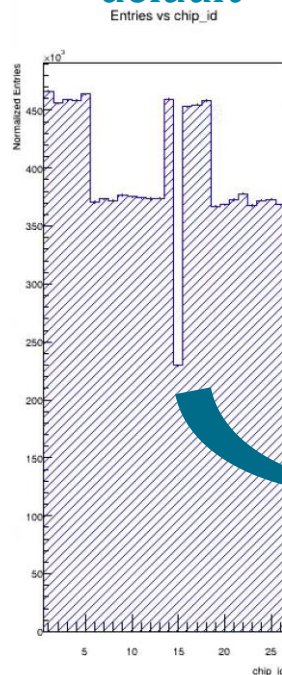
Rikkyo university M1 TOMOKI HARADA

Cloning data with digital control on a **ladder-by-ladder** basis didn't show 100% recovery like figure below.

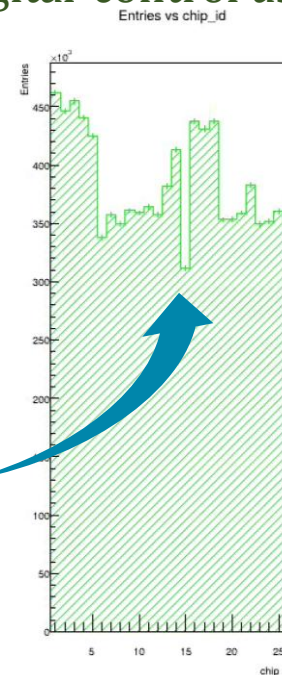
Ratio Graph for PID 3001, Module 7



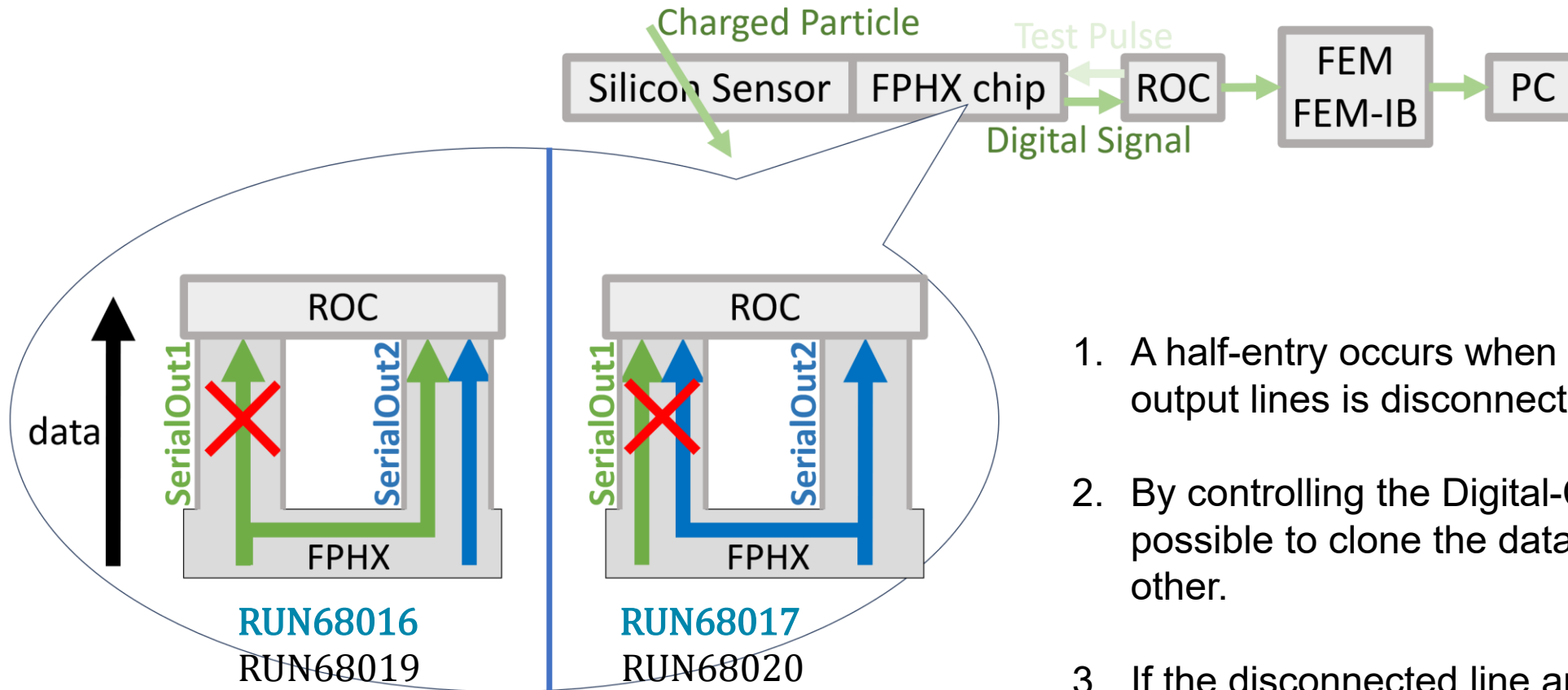
default



Digital-control used



→ We attempted to replicate **chip-by-chip**.



1. A half-entry occurs when one of the two serial output lines is disconnected from FPHX to ROC.
2. By controlling the Digital-Control parameters, it is possible to clone the data and send it through the other.
3. If the disconnected line and the cloned direction match, the number of entries is expected to recover to normal. If they do not match, the half-entry condition is expected to remain.

2025/06/20 20:42	68016	beam	On	plot	2min	15kHz(MBC All Felix	35	108	100	60	DigControl Test Map file (digcon_map_20250618.txt) Global Run Number 68011
2025/06/20 20:48	68017	beam	On	plot	2min	15kHz(MBC All Felix	35	108	100	60	DigControl Test Map file (digcon_map_20250618_another.txt) Global Run Number 68011
2025/06/20 20:54	68019	beam	On	plot	2min	15kHz(MBC All Felix	35	108	100	60	DigControl Test Map file (digcon_map_20250618.txt) Global Run Number 68018
2025/06/20 20:58	68020	beam	On	plot	2min	15kHz(MBC All Felix	35	108	100	60	DigControl Test Map file (digcon_map_20250618_another.txt) Global Run Number 68018

Data were taken twice for each of the two patterns of cloning, but I checked and they each behaved the same.

→I'll show the data of RUN68016 and 68017

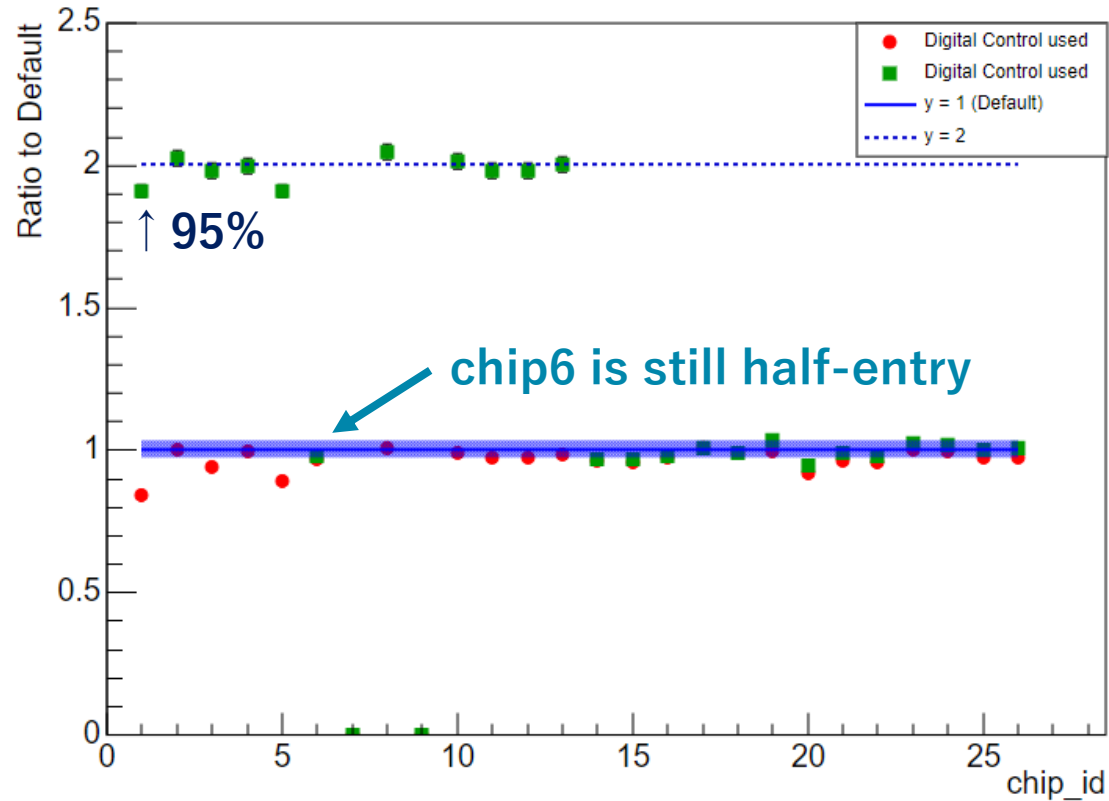
2025/06/20 20:11	68007	beam	On	plot	2min	15kHz(MBC All Felix	35	108	100	60	Trigger rate for MBD is quite high enough. Do 2mins data taking instead.(Clock trigger rate is low enough) Global Run Number 68006
------------------	-------	------	----	----------------------	------	---------------------	----	-----	-----	----	--

Run68007→ Default

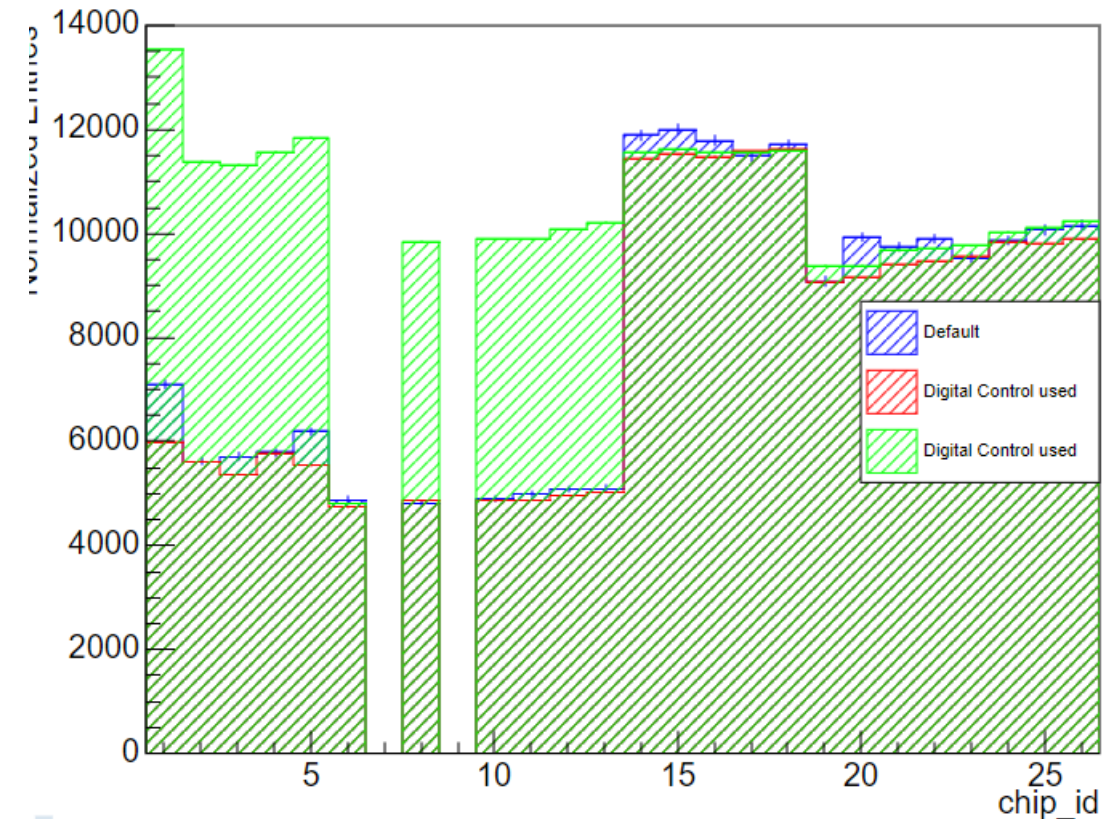
Viewing Run68016, 68017 data

Felix Server	0
pid	3001
module	6
chip id	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13

Ratio Graph for PID 3001, Module 6



Entries vs chip_id



Viewing Run68016, 68017 data

digicon_map

```
#DAQ_server Felix_ch Chip_id DigCon
```

```
#Half entry chip (Former: disable signal input/Latter: enable signal input)
```

```
0 6 1 12
```

```
0 6 2 12
```

```
0 6 3 12
```

```
0 6 4 12
```

```
0 6 5 12
```

```
0 6 7 12
```

```
0 6 8 12
```

```
0 6 9 12
```

```
0 6 10 12
```

```
0 6 11 12
```

```
0 6 12 12
```

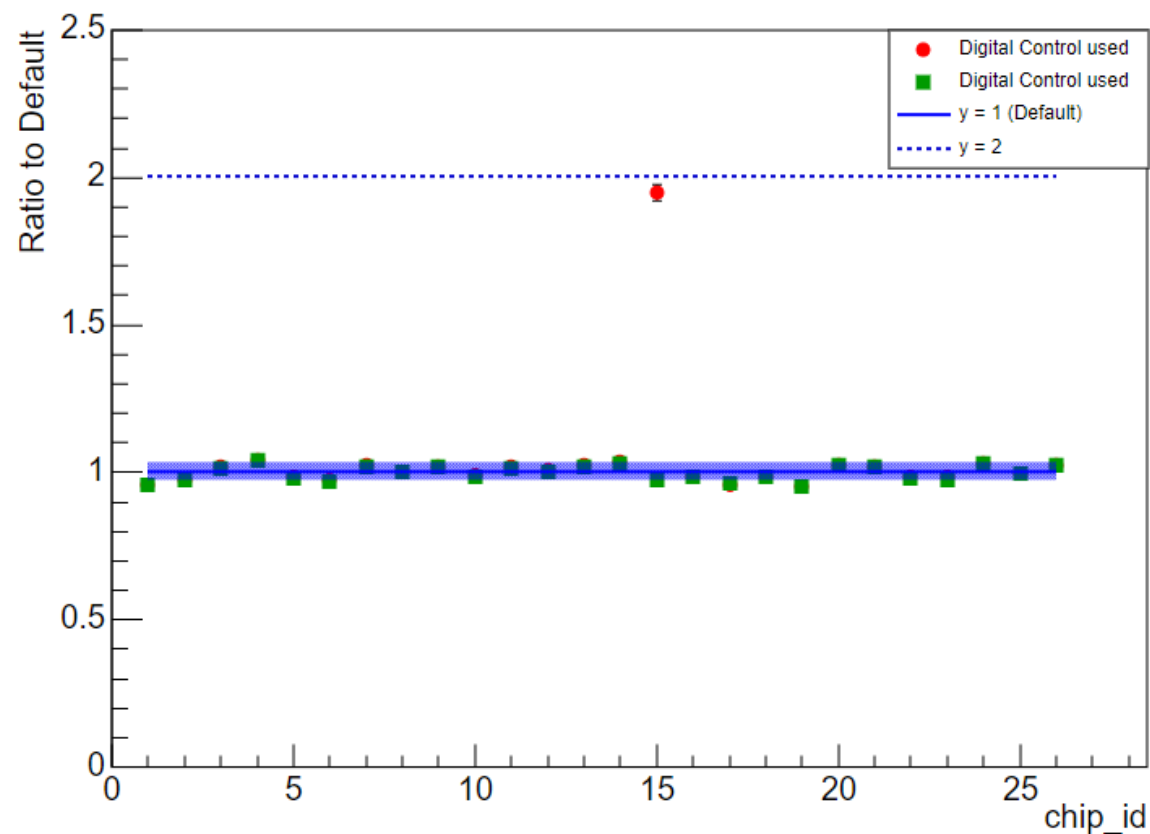
```
0 6 13 12
```

←Chip6 missing

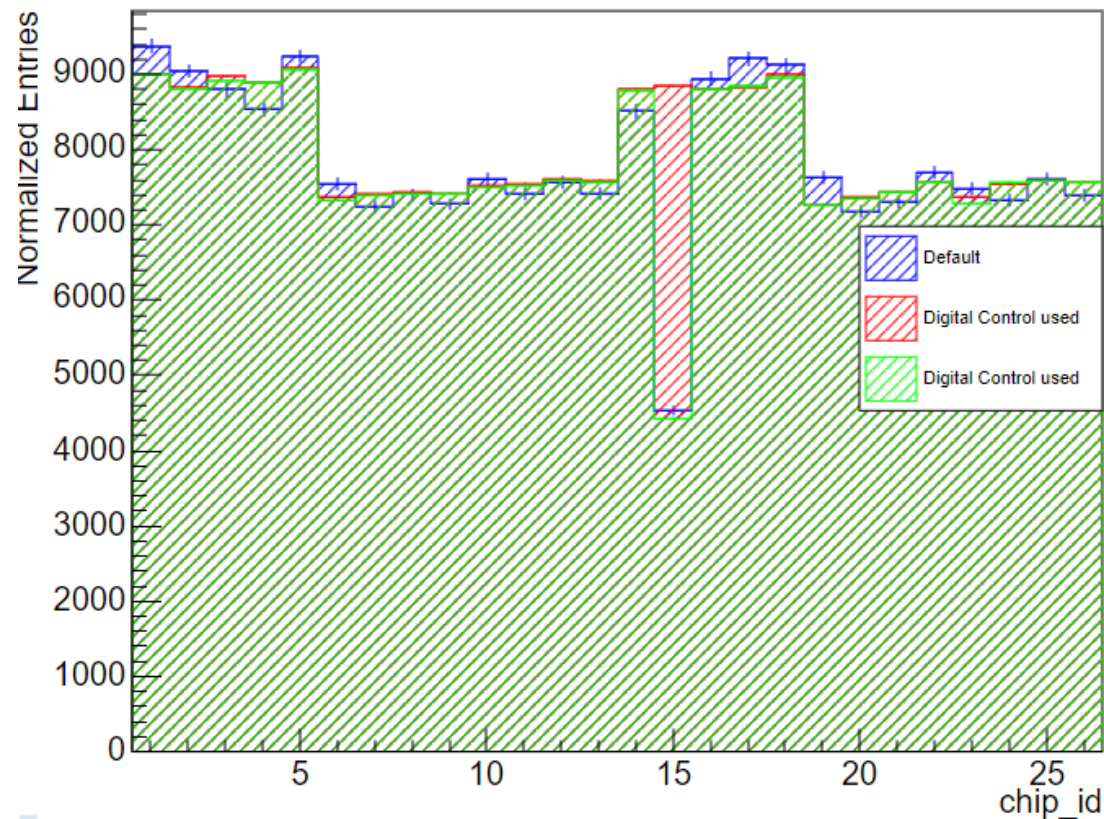
Viewing Run68016, 68017 data

Felix Server	0
pid	3001
module	7
chip id	15

Ratio Graph for PID 3001, Module 7



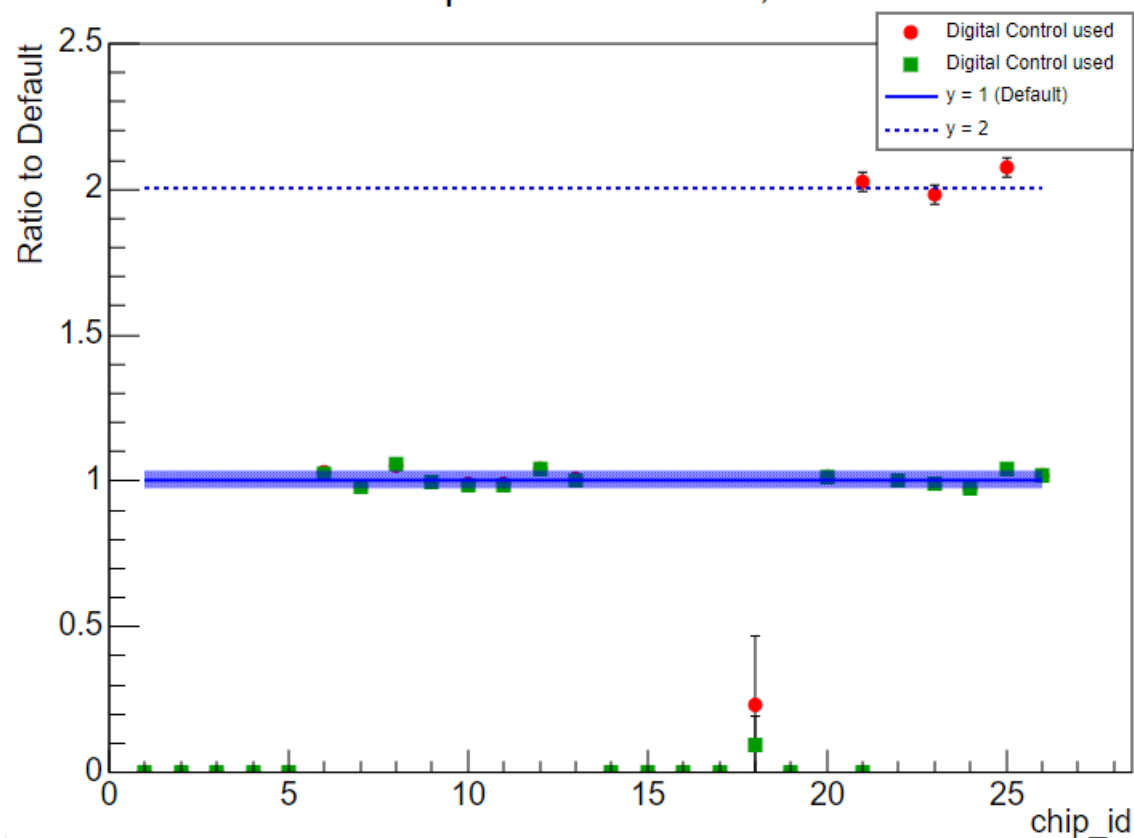
Entries vs chip_id



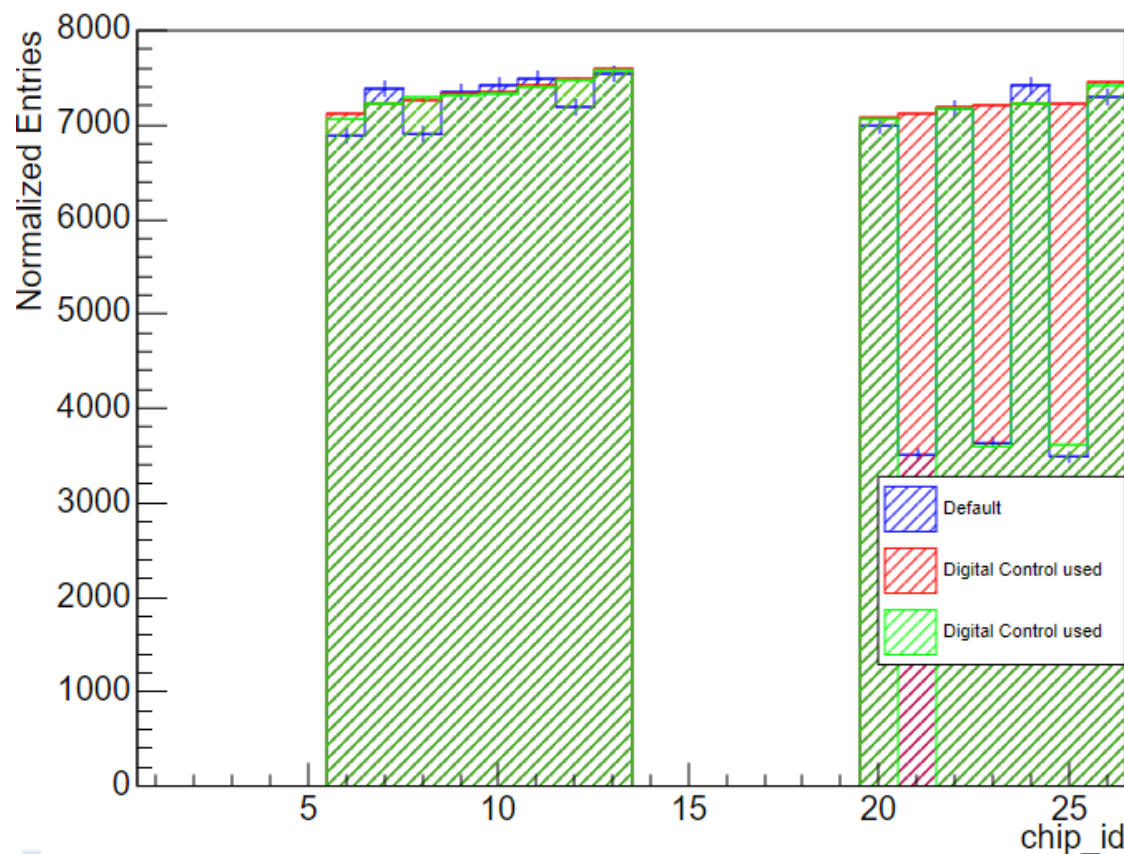
Viewing Run68016, 68017 data

Felix Server	3
pid	3004
module	13
chip id	21, 23, 25

Ratio Graph for PID 3004, Module 13



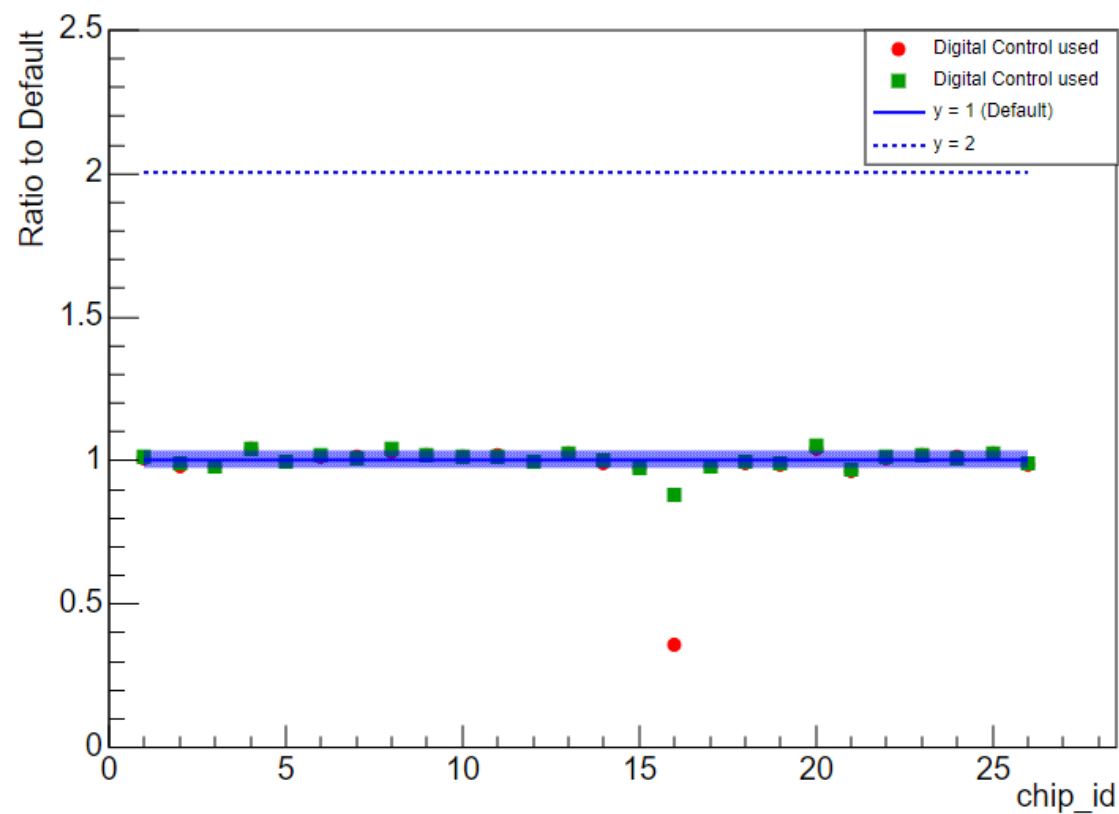
Entries vs chip_id



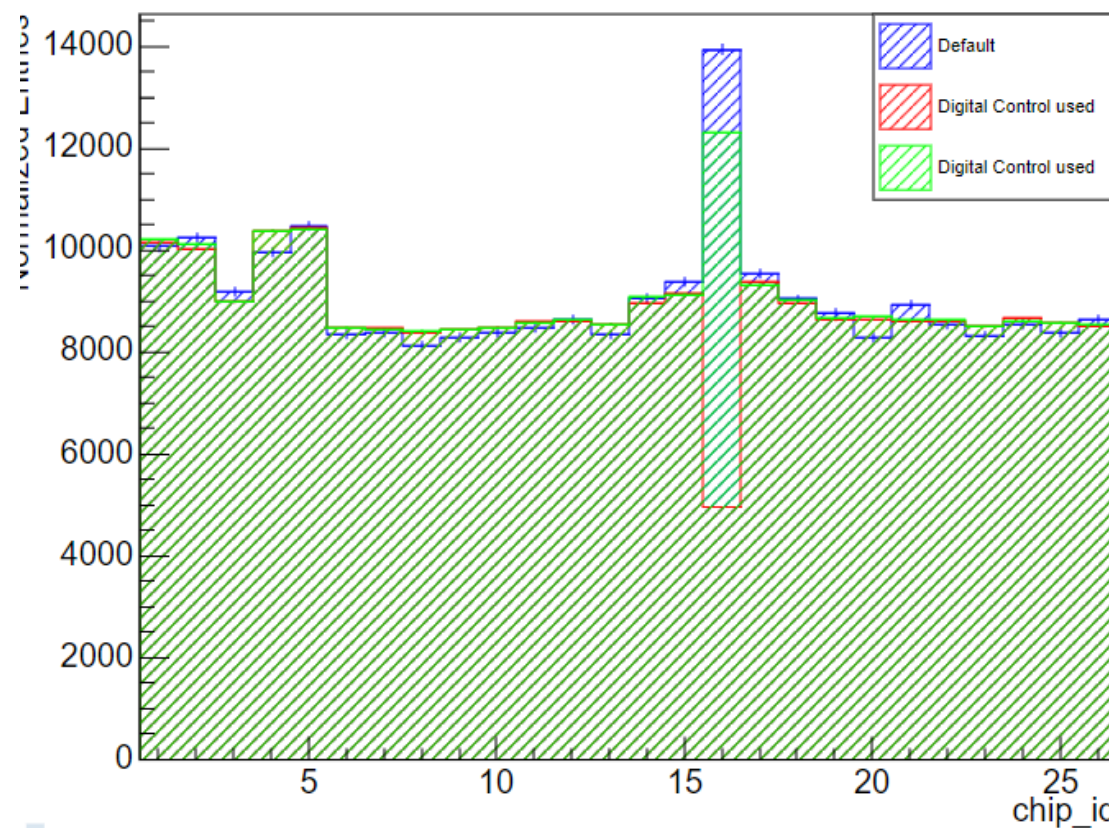
Viewing Run68016, 68017 data

Felix Server	5
pid	3006
module	3
chip id	16

Ratio Graph for PID 3006, Module 3

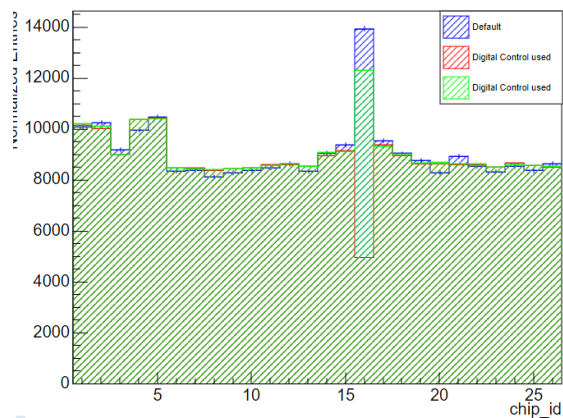


Entries vs chip_id



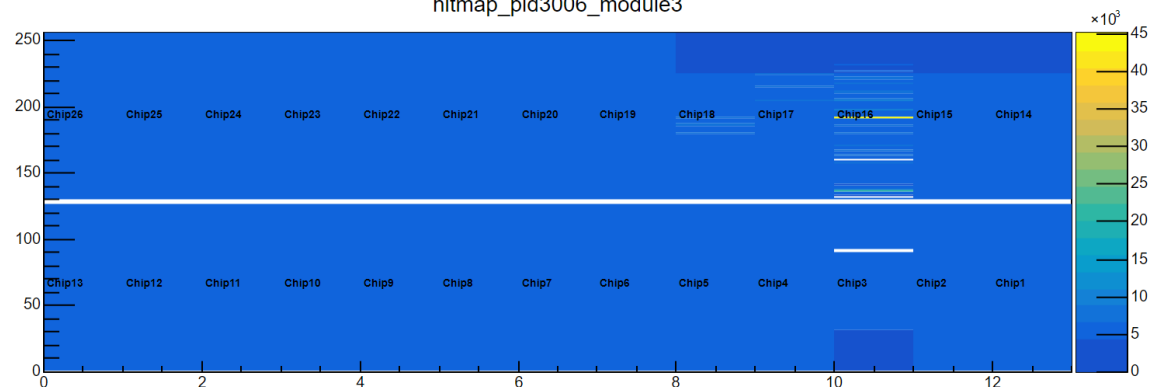
Viewing Run68016, 68017 data

Entries vs chip_id

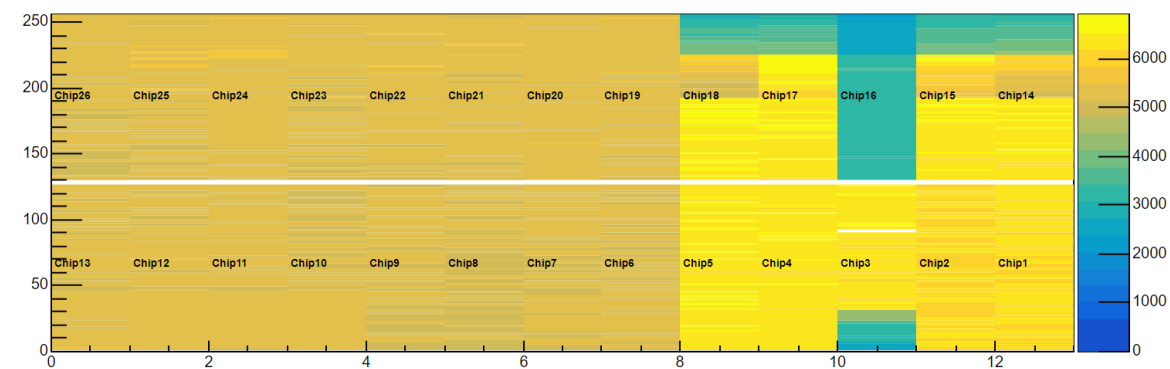


default

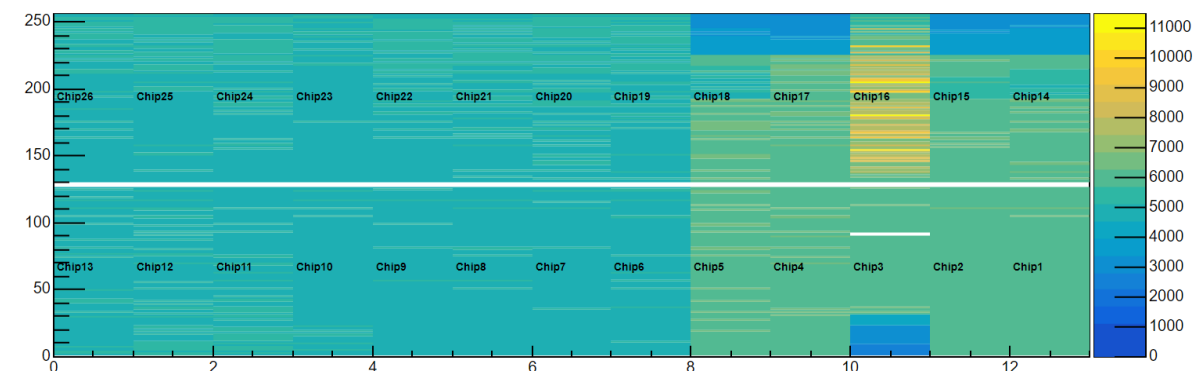
hitmap_pid3006_module3



run68016



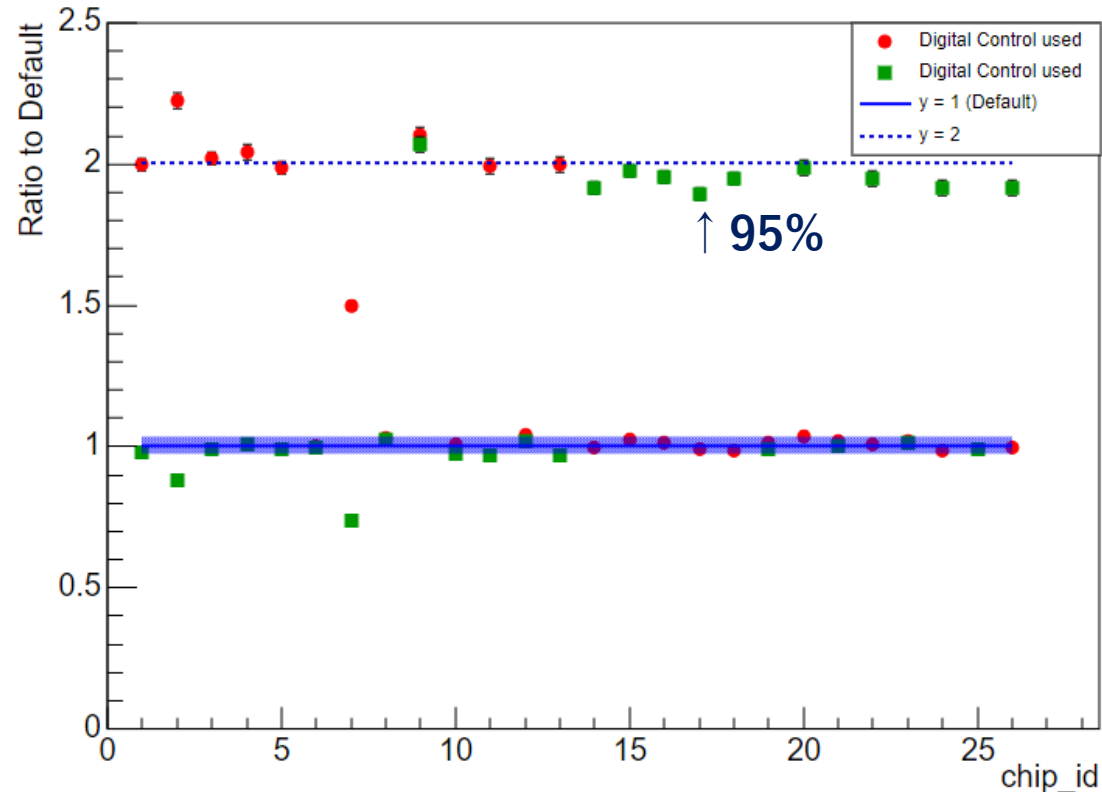
run68017



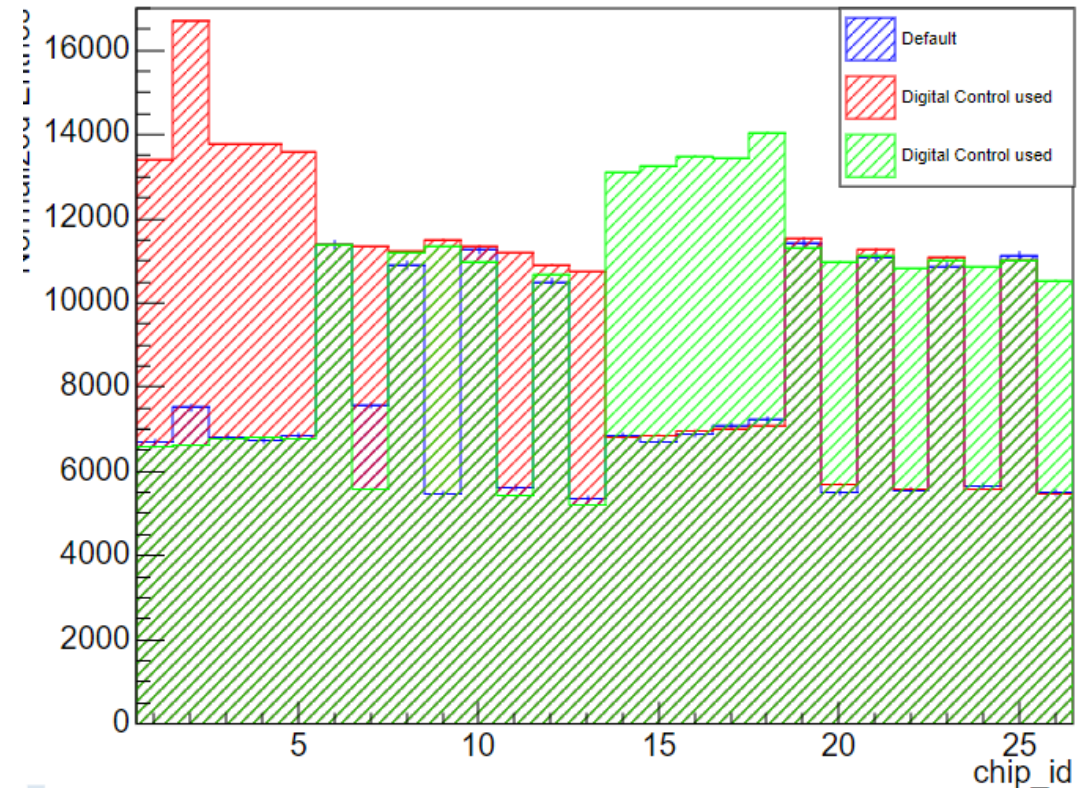
Viewing Run68016, 68017 data

Felix Server	7
pid	3008
module	0
chip id	1, 2, 3, 4, 5, 7, 9, 11, 13, 14, 15, 16, 17, 18, 20, 22, 24, 26

Ratio Graph for PID 3008, Module 0



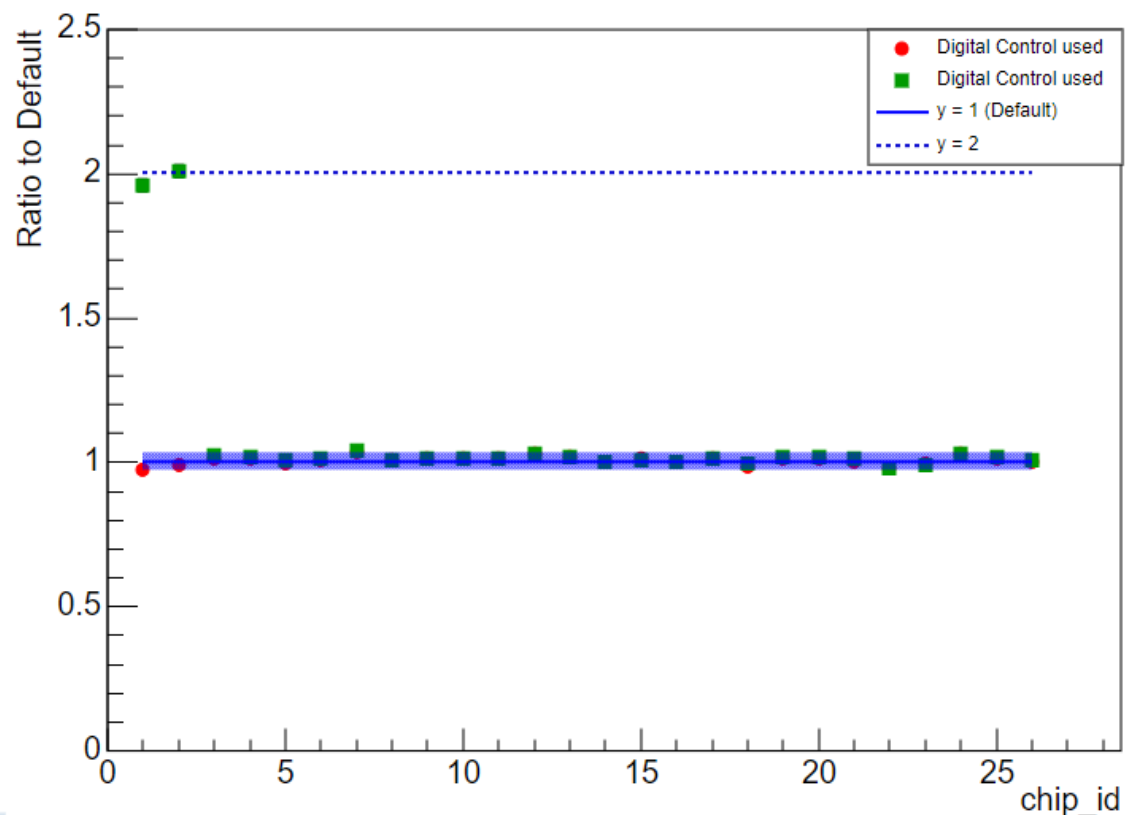
Entries vs chip_id



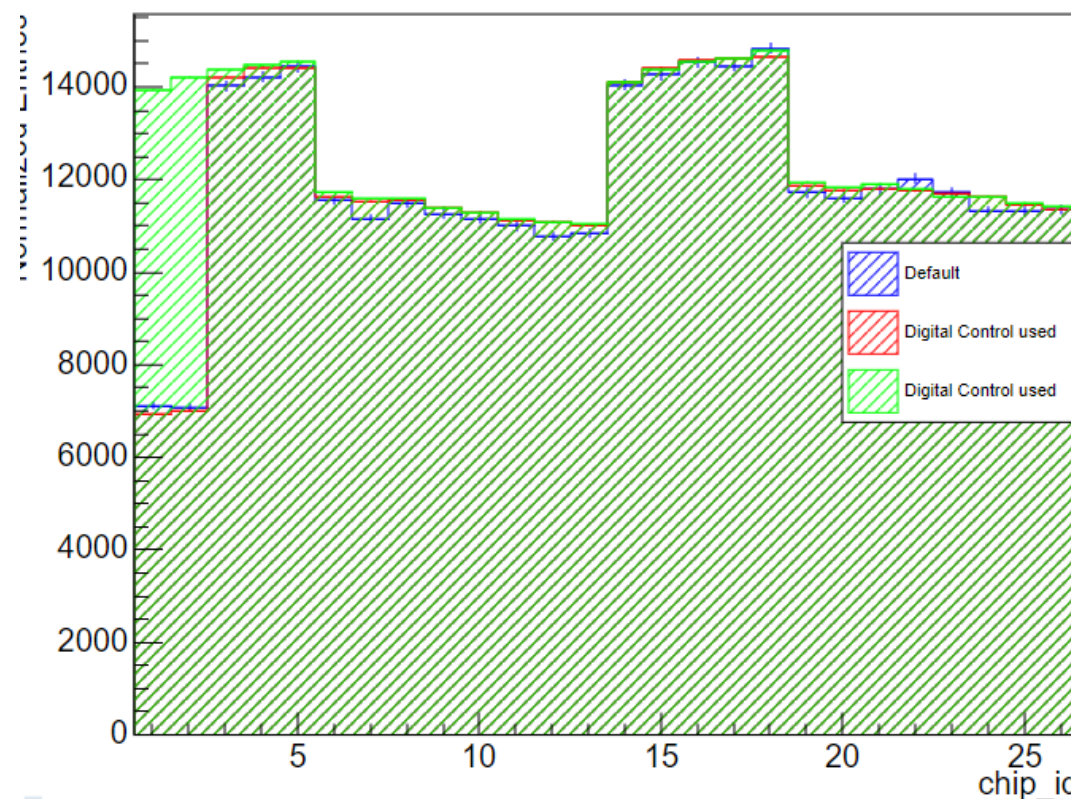
Viewing Run68016, 68017 data

Felix Server	7
pid	3008
module	1
chip id	1, 2

Ratio Graph for PID 3008, Module 1



Entries vs chip_id



Half-entry-chips chart(36 half-entry-chips)

Felix Server	0	0	3	5	7	7
pid	3001	3001	3004	3006	3008	3008
module	6	7	13	3	0	1
chip id	1, 2, 3, 4, 5, 6 , 8, 10, 11, 12, 13	15	21, 23, 25	16	1, 2, 3, 4, 5, 7, 9, 11, 13, 14, 15, 16, 17, 18, 20, 22, 24, 26	1, 2

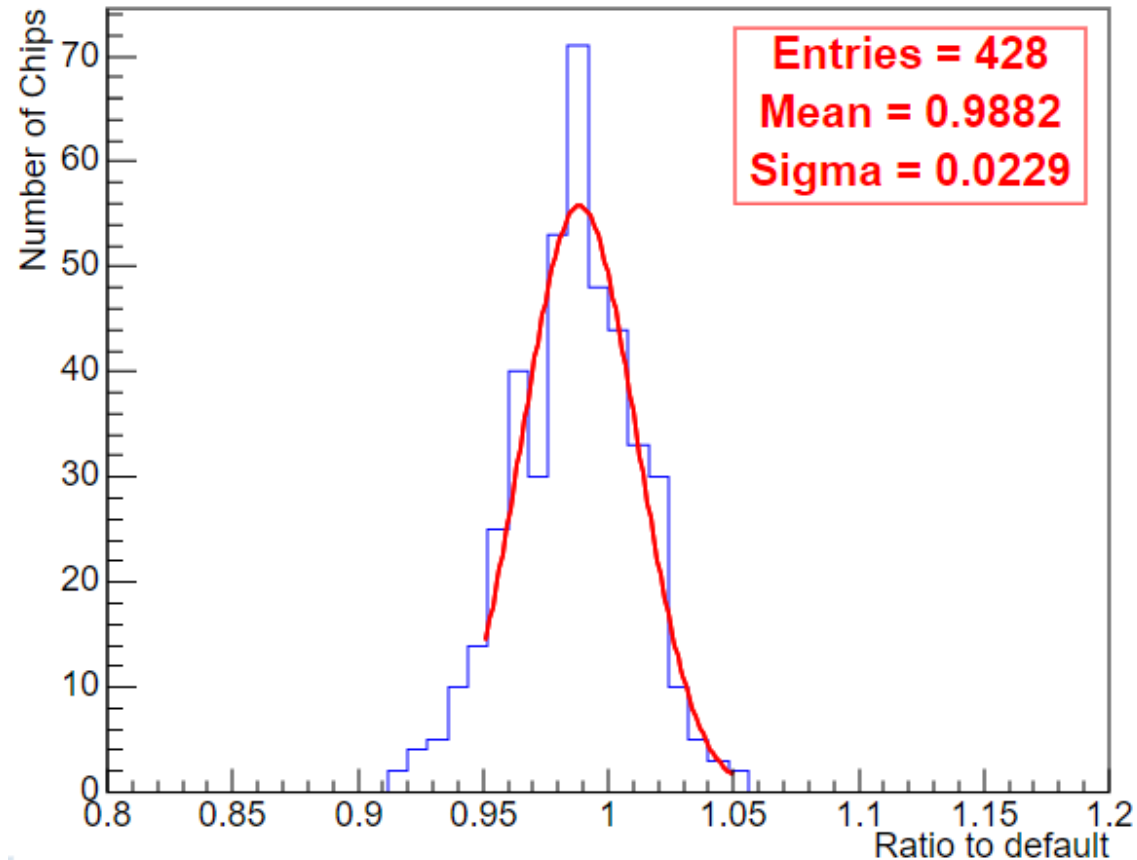
- 34 chips/36 half-entry-chips are perfectly recovered.
- The 2 chips (which are not recovered) need to check **the hot channel** and **half entry map text files**.

Effect to healthy chips

$$\text{ratio} = \frac{\text{entries}}{\text{entries_of_default}}$$

Target chips

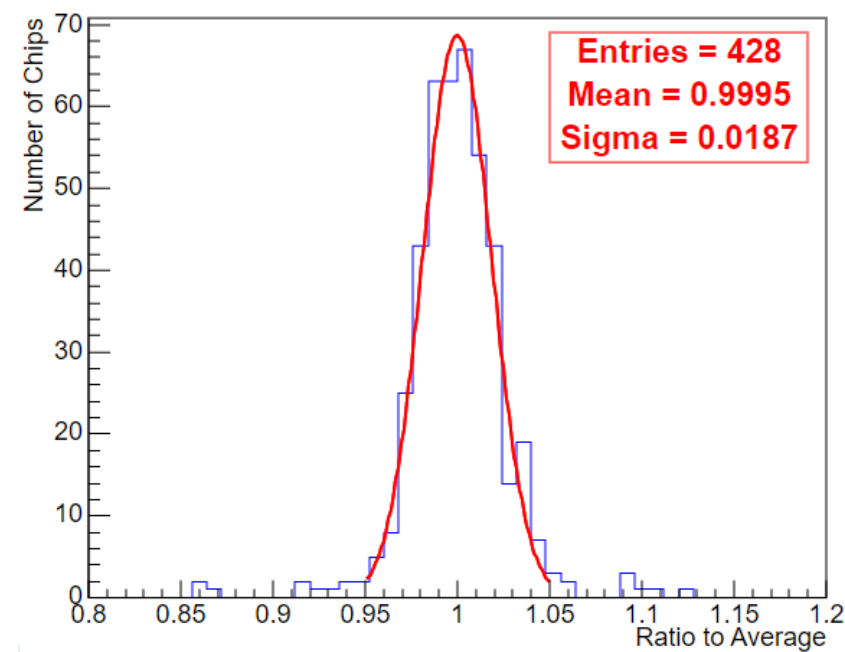
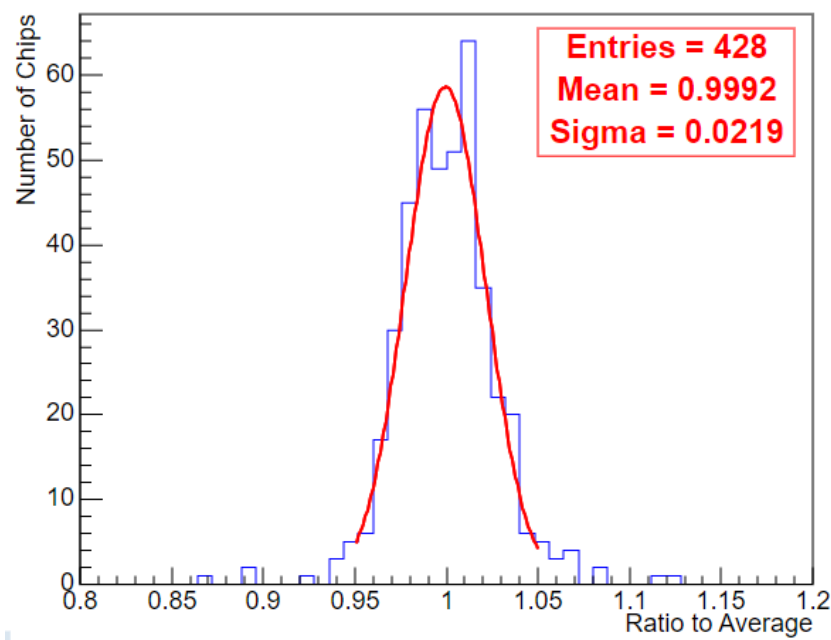
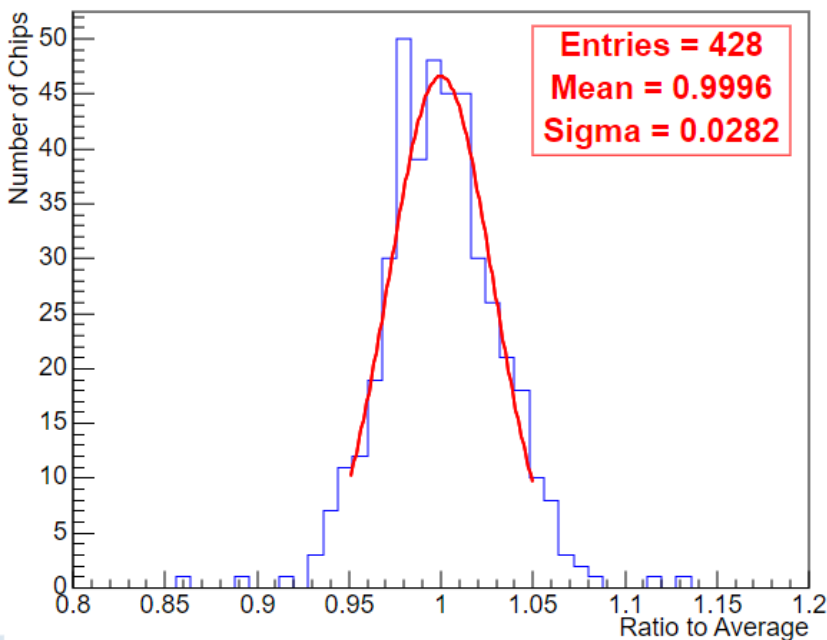
- 6 *half ladders* $\times$ 26 *chips* = 156 *chips*
- 156 *chips* – 36 *half entry chips* – 13 *masked chips* = **107 chips**



Effect to healthy chips

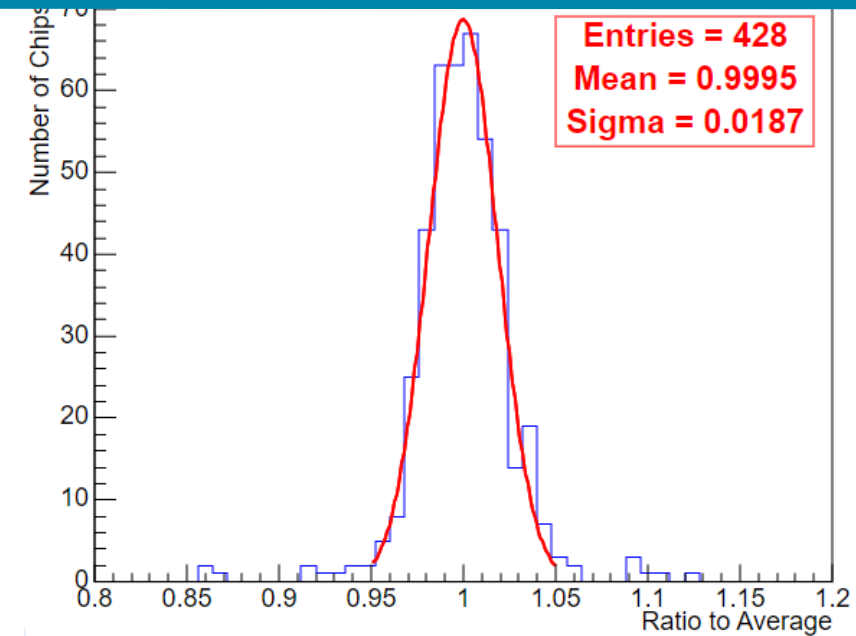
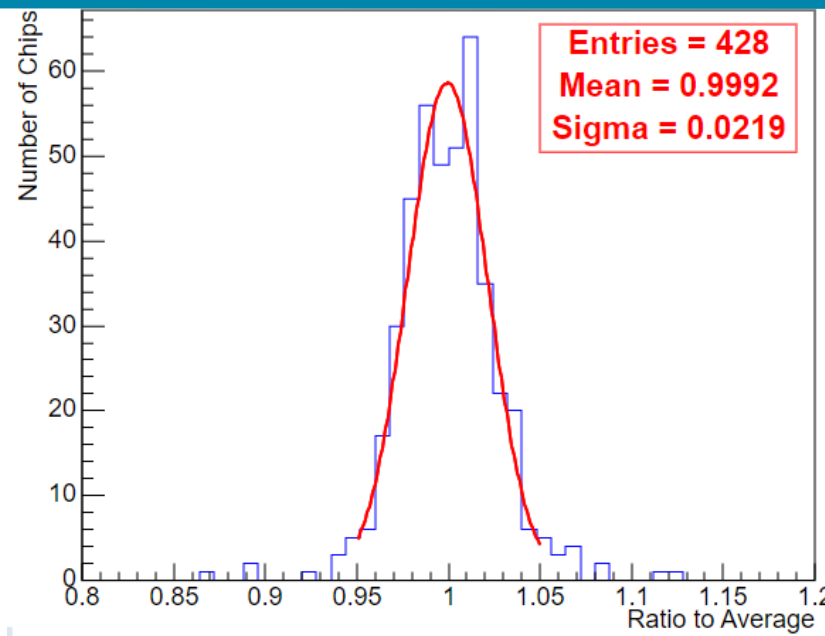
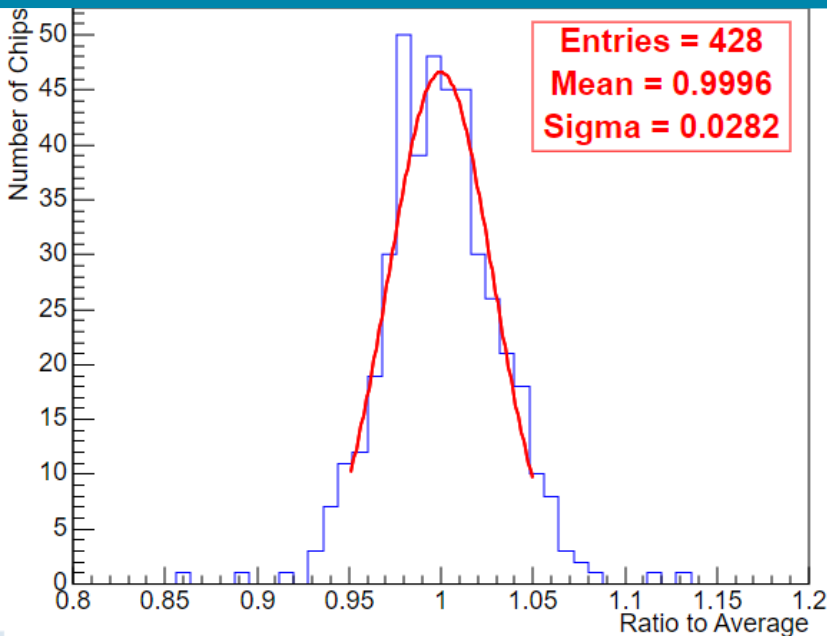
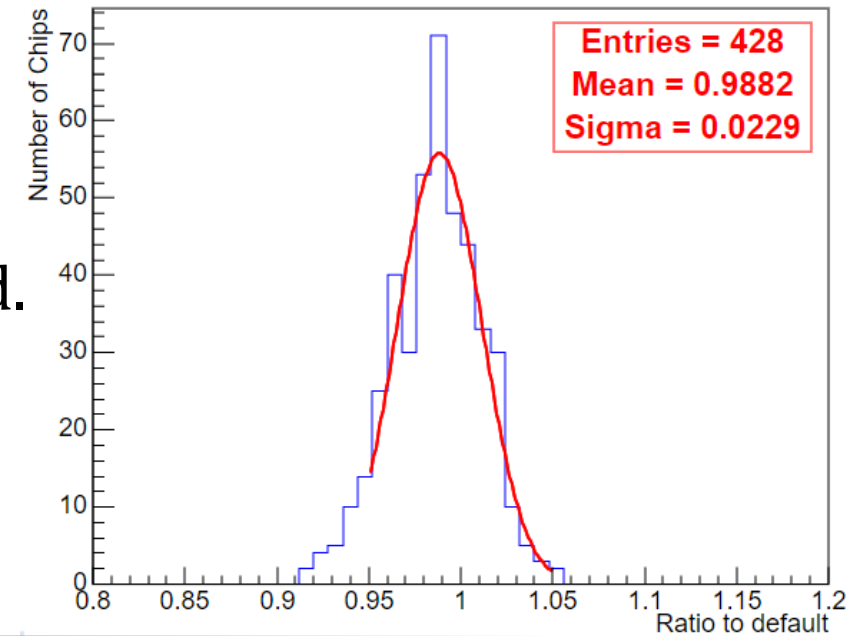
$$ratio = \frac{entries}{average_of_4files}$$

2025/6/9 18:34	66525	beam	On	plot	59sec	All Felix	35	90	100	60
2025/6/9 18:38	66526	beam	On	plot	60sec	All Felix	35	90	100	60
2025/6/9 18:58	66527	beam	On	plot	67sec	All Felix	35	108	100	60
2025/06/09 19:12	66532	beam	On	plot	61sec	All Felix	35	109	100	60
2025/06/09 19:30	66534	beam	On	plot	62sec	All Felix	35	110	100	60
2025/06/09 19:31	66535	beam	On	plot	64sec	All Felix	35	110	100	60
2025/06/09 19:47	66539	beam	On	plot	60sec	All Felix	35	111	100	60
2025/6/9 19:49	66540	beam	On	plot	63sec	All Felix	35	111	100	60
2025/6/9 20:00	66542	beam	On	plot	63sec	All Felix	35	112	100	60
2025/6/9 20:03	66543	beam	On	plot	60sec	All Felix	35	112	100	60
2025/6/9 20:15	66544	beam	On	plot	59sec	All Felix	35	113	100	60
2025/6/9 20:16	66545	beam	On	plot	60sec	All Felix	35	113	100	60



Comparison

- The spread is about same
- Healthy chips don't seem to be particularly affected.



We could observe that

- 34 chips/36 half-entry-chips are perfectly recovered.
- There is no effect of using digital control to healthy chips.

→ **Digital control should be used for half-entry chips during the data-taking process**

pid	module	chip	Digicon
3001	6	1	4
		2	4
		3	4
		4	4
		5	4
		6	4
		8	4
		10	4
		11	4
		12	4
		13	4
3006	3	16	4

pid	module	chip	Digicon
3008	0	1	4
		2	4
		3	4
		4	4
		5	4
		7	4
		9	4
		11	4
		13	4
3008	1	1	4
		2	4

pid	module	chip	Digicon
3001	7	15	12
3004	13	21	12
		23	12
		25	12
3008	0	14	12
		15	12
		16	12
		17	12
		18	12
		20	12
		22	12
		24	12

pid	module	chip	Digicon
3008	0	26	12
3008	1	2	12