Story of “Mod2”

- **Mod2 was built at the same time of Mod0, however,**

- **It was built with temporary sensor-baseboard**

  - Due to the lack of the same TPG baseboard as of Mod0, used early prototype TPG baseboard (with AlN facings)

  - Replacing the sensor-baseboard unit in future, in mind, used ATLAS97 design sensors

  - Hybrid was “screwed” on to the baseboard, instead of gluing, to be able to dismounted

- **The module performed inferior to the Mod0**

  - Larger leakage current of a few μA at around 100 V, not too large but significantly larger than that of Mod0 of <1 μA

  - One chips was sick in trimming, an order larger trim step

  - And, showed global instability on one of the 6 chip hybrid, when Edge=on, depending on the location of the backplane bias connection

Story of Mod2 cont'd

- **In the struggling in trying to identify the source of instability,**

  - One chip died, due to insufficient cooling when the hybrid was probed

  - Sensor leakage current increased, time by time, to about 40 μA around 100 V at the end

  - The trim-sick chip was replaced, did not cure the problem

- **After these poor conditions, Mod2 was sent to major surgery, dismounting the hybrid and building into a new modue with a latest sensor-baseboard assembly**

  - Gambled to use one of the 3 latest TPG baseboards

  - ATLAS98 sensors

  - Replacing the dead chip; in total 3 chips were replaced, one sick chip, one dead chip, and one normal chip because of mistake (located the wrong "sick chip")

Return of “Mod2mod”

- **After the surgery, named as “Mod2 modified”, or “Mod2mod”, returned on Friday last week, and the module was**

REVIVED!!

- **No sign of instability, as stable as Mod0**

  - Noise scans with Edge=on, off

  - S-curves, no hint of instability nor “discontinuity”

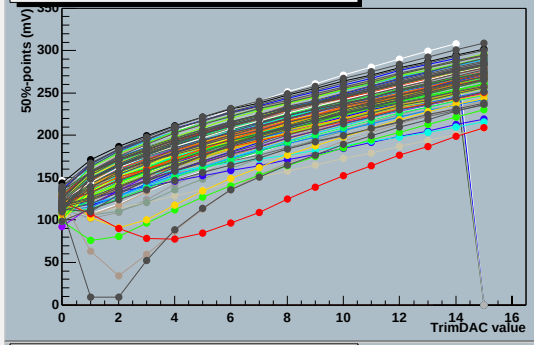
  - Trim characteristics was as good as Mod0 (of course, the same wafer, 32423

  - Due to repeating the trim scan for the module, the measurements were done with the trim file of hybrid, trim at 2 fC= 200 mV

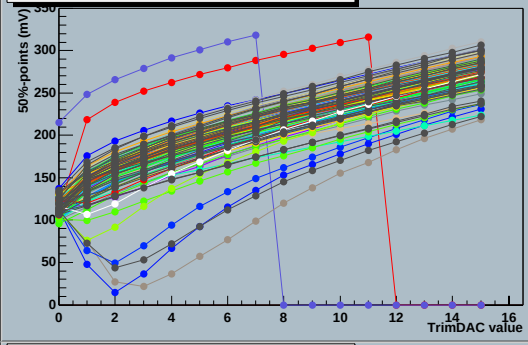
ATLAS SCT Module Test
ATLAS SCT Module Test
Run 1407 Trim Scans Module 0 Link 0

Target value to be 200 mV
This gives 1518 trimmable channels

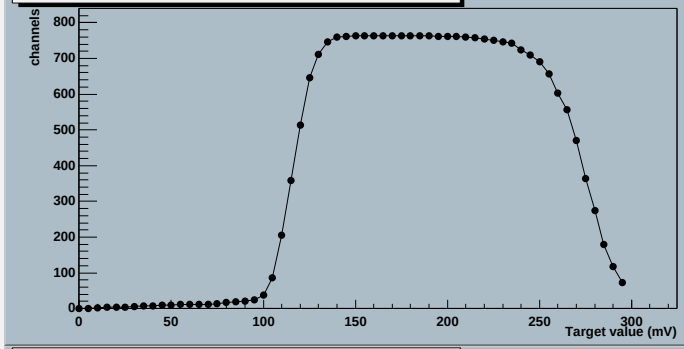
TrimDAC characteristics, chip 0



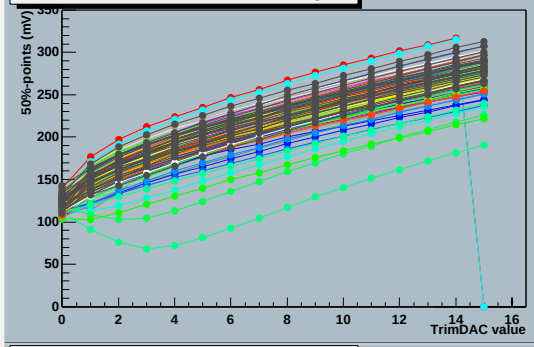
TrimDAC characteristics, chip 1



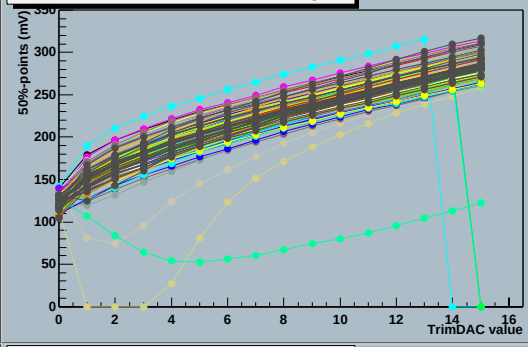
Trimmable channels, chip 0 to 5



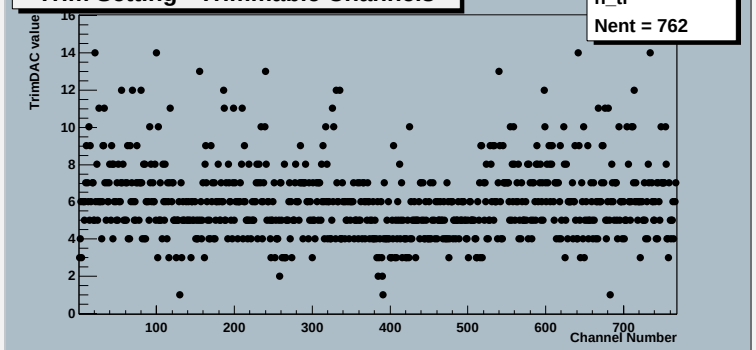
TrimDAC characteristics, chip 2



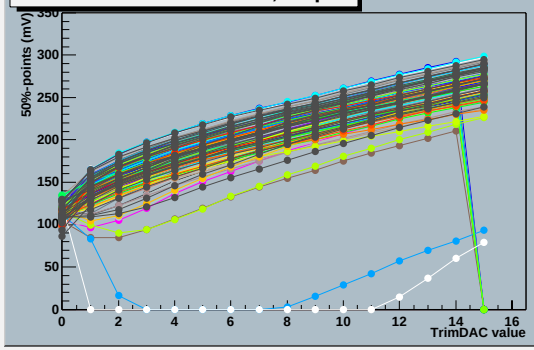
TrimDAC characteristics, chip 3



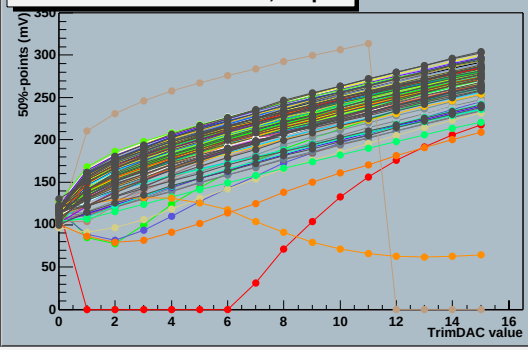
Trim Setting - Trimmable Channels



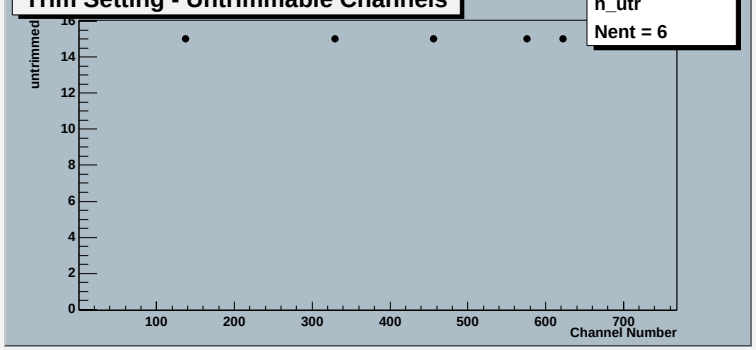
TrimDAC characteristics, chip 4



TrimDAC characteristics, chip 5

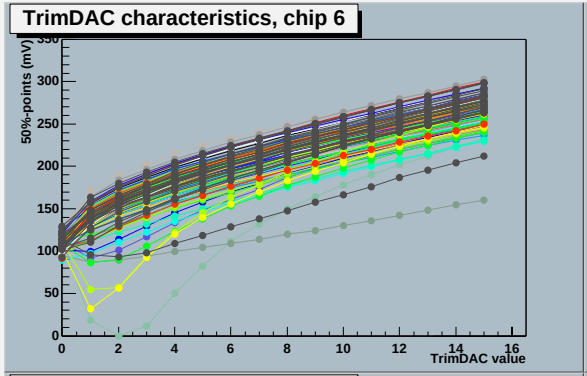


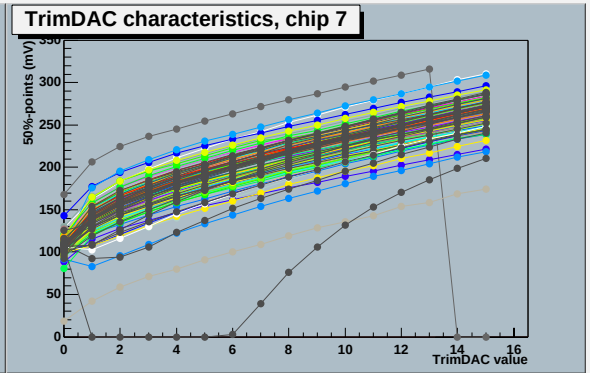
Trim Setting - Untrimmable Channels

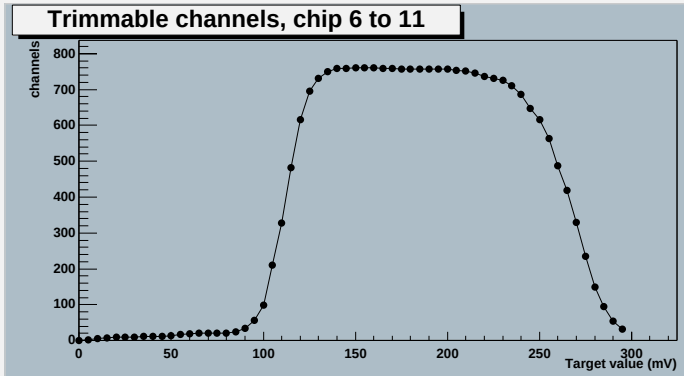


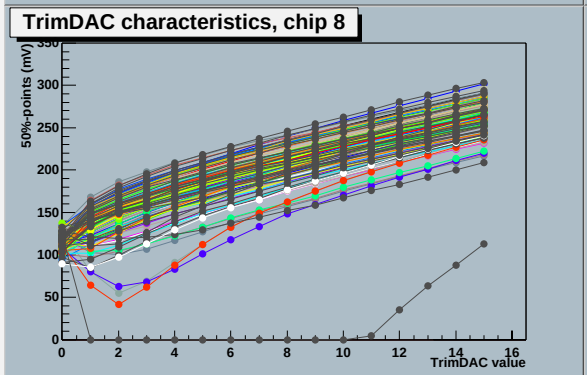
ATLAS SCT Module Test
ATLAS SCT Module Test
Run 1407 Trim Scans Module 0 Link 1

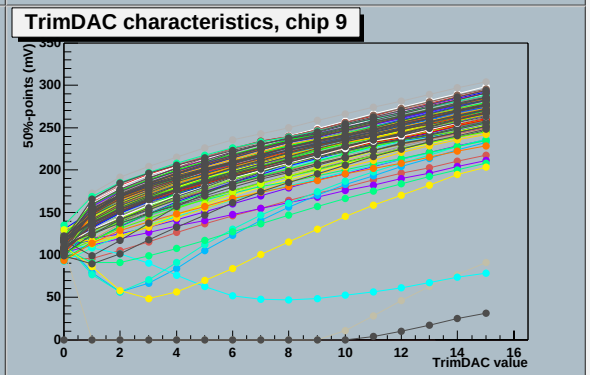
Target value to be 200 mV
This gives 1518 trimmable channels

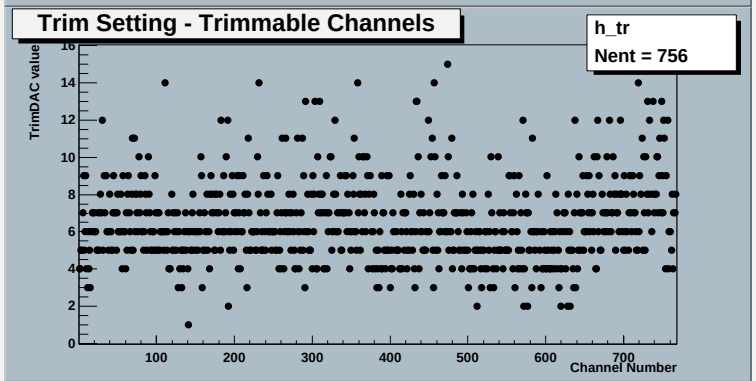


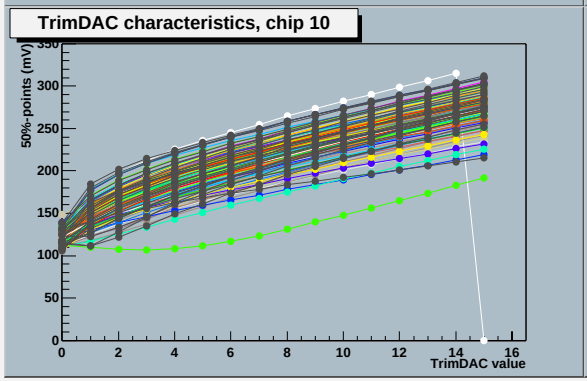


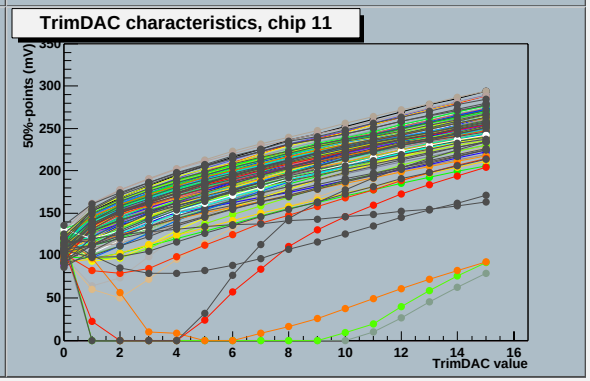


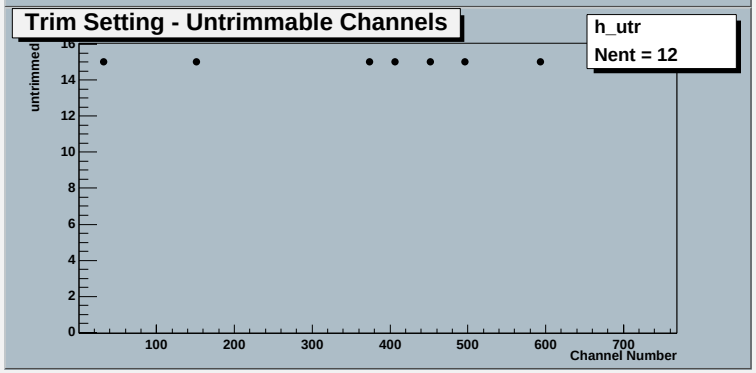






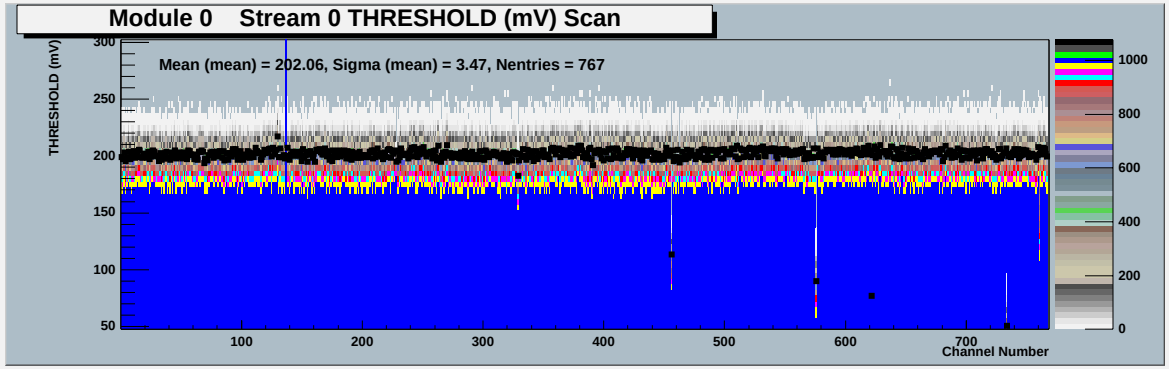


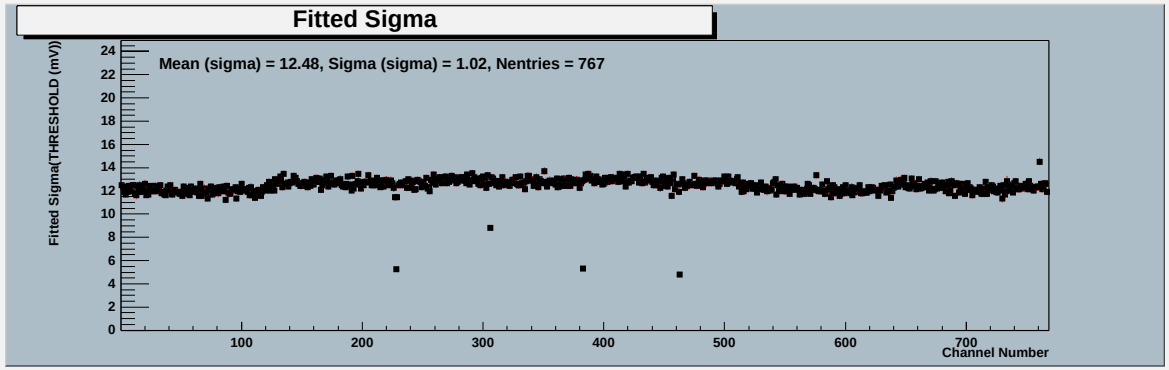


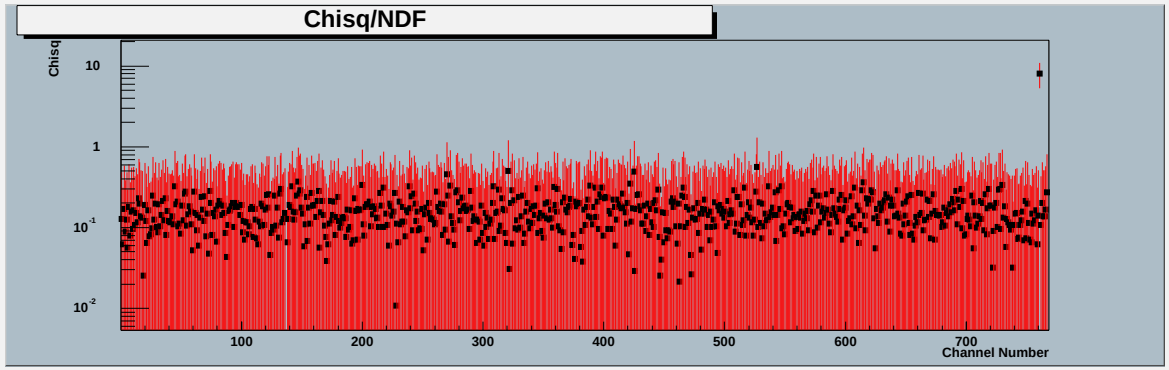


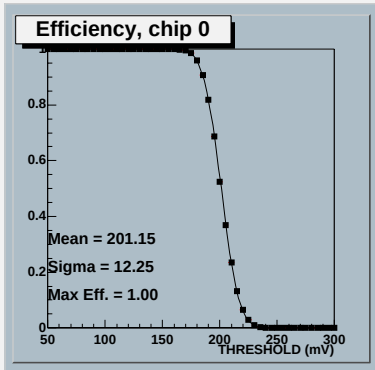
ATLAS SCT Module Test - Fri May 26 16:21:02 2000

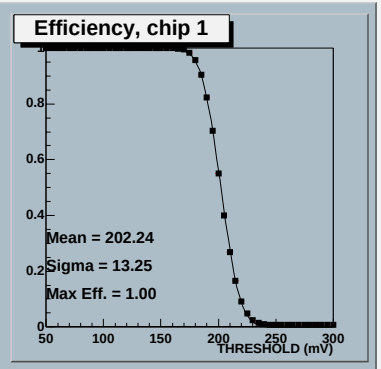
Run 1493 Scan 12 Module 0 Stream 0 Scan type: THRESHOLD (mV)

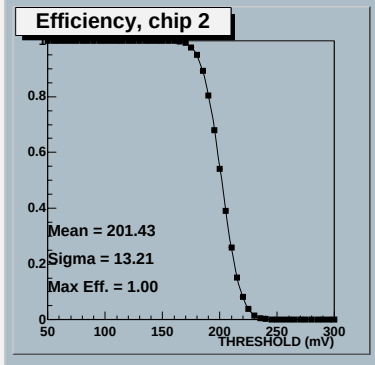


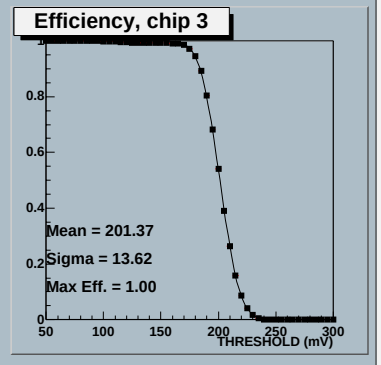


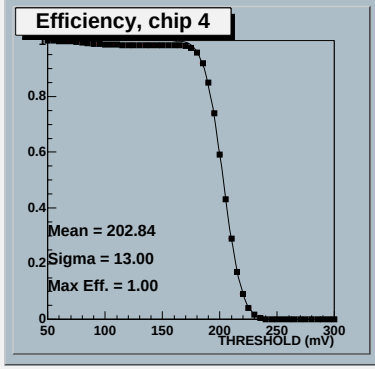


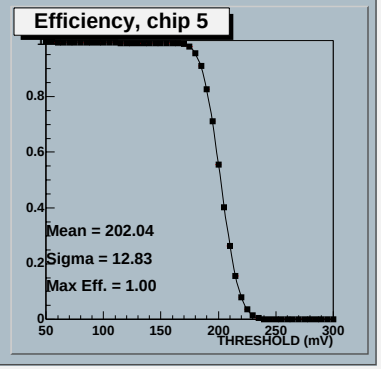








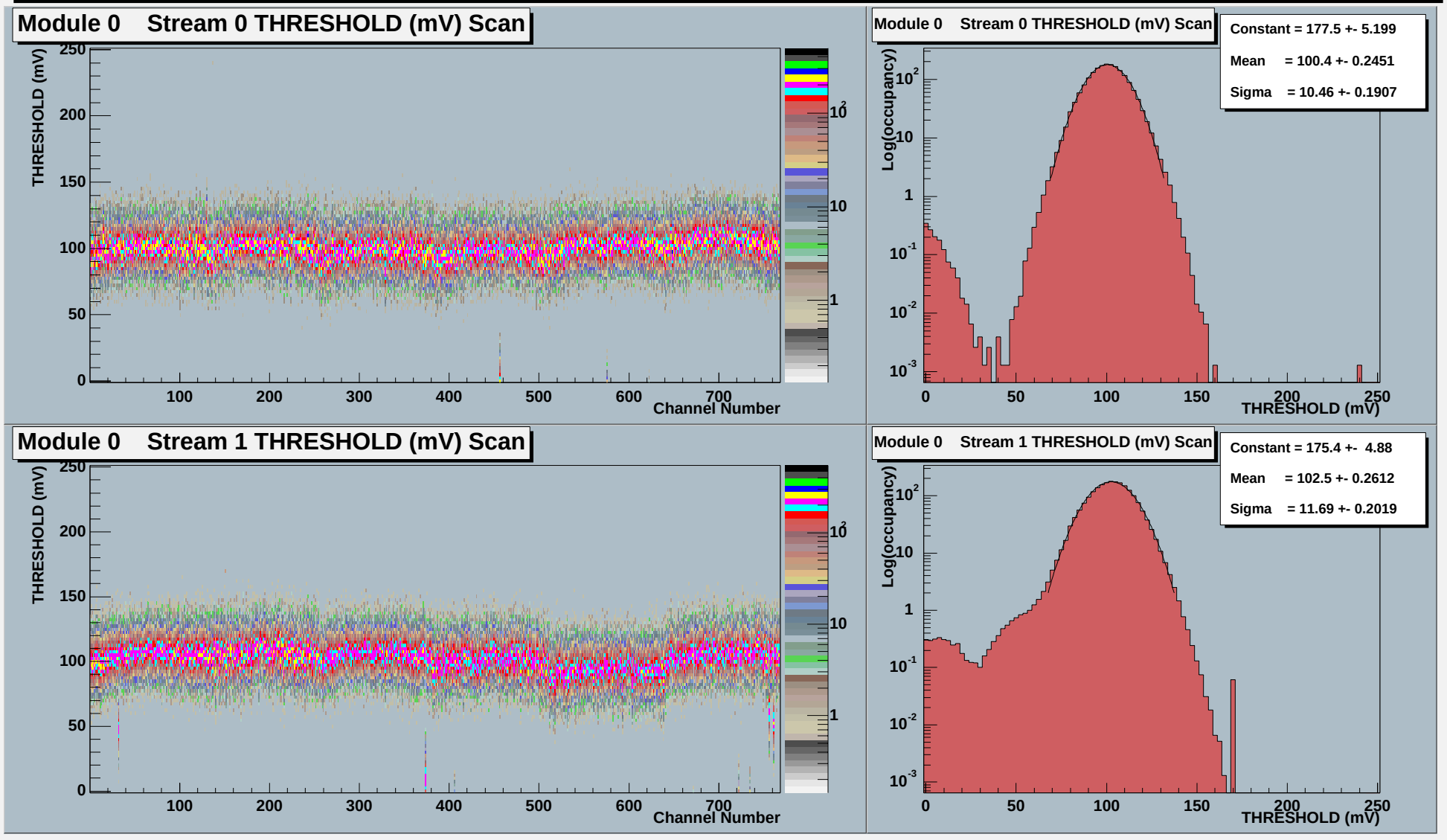




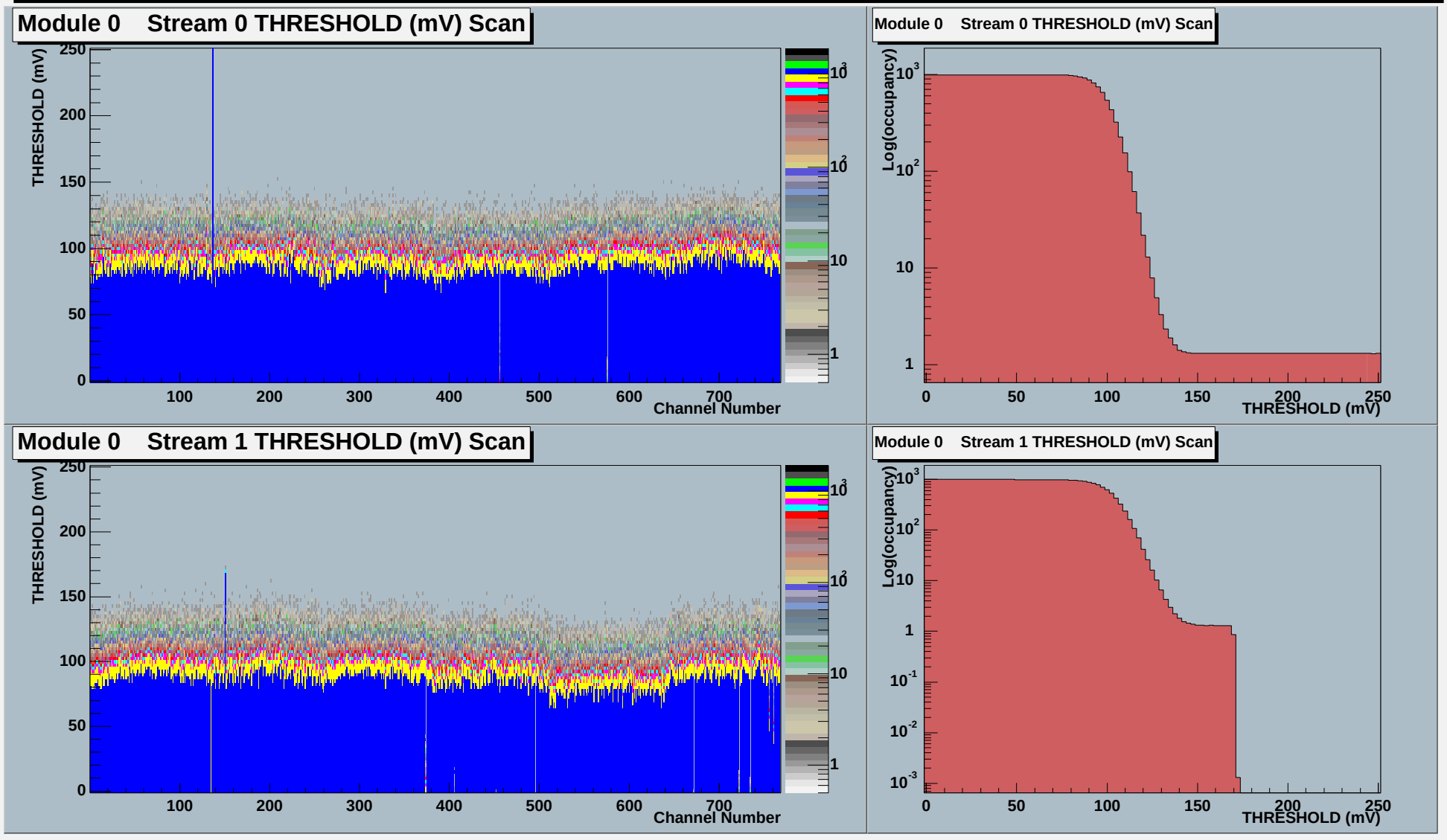
ATLAS SCT Scan Comparison - log scale

Run 1490 Scan 1 Module 0 Stream 0 (Projection of ch 0 to ch 767) vs

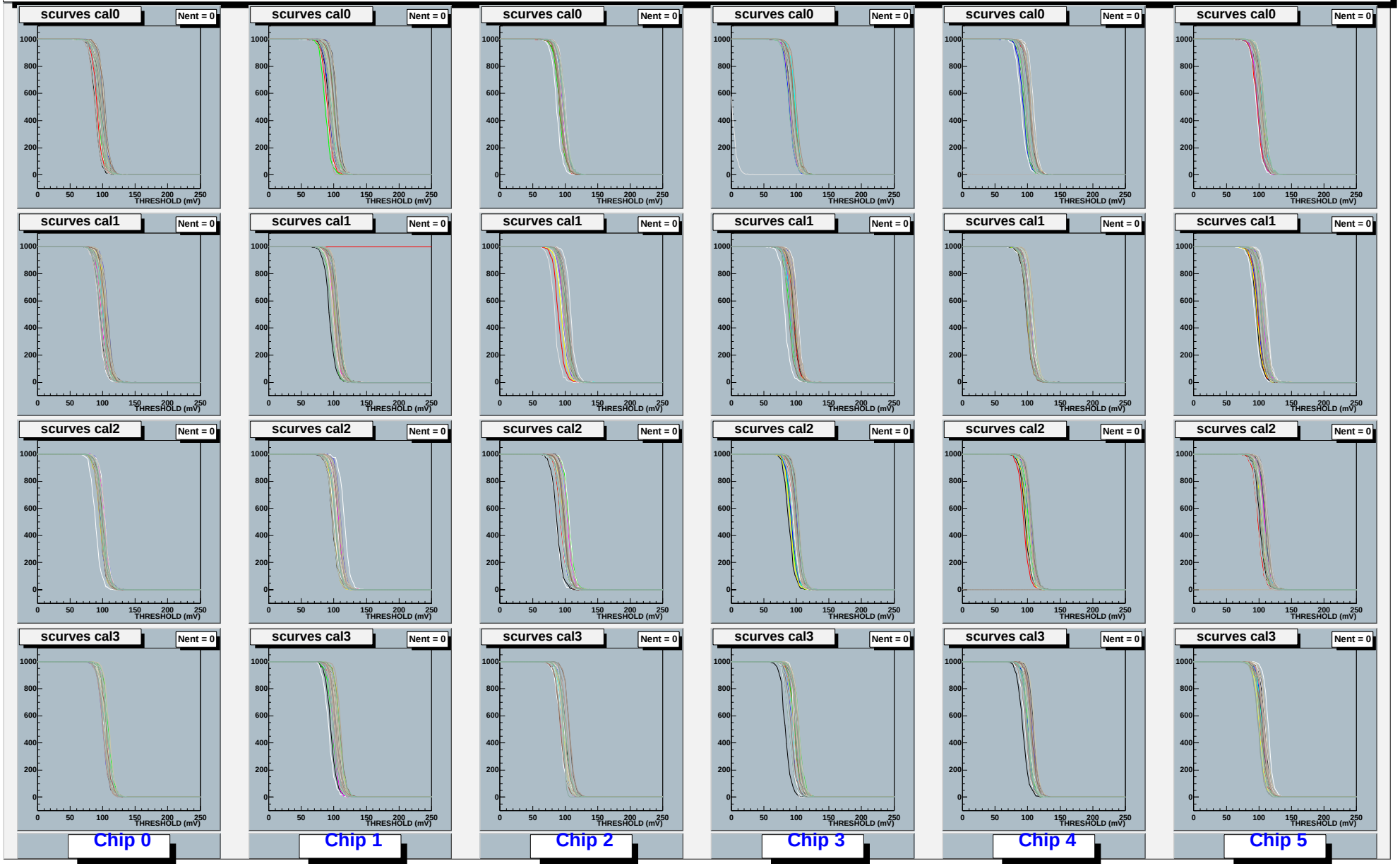
Run 1490 Scan 1 Module 0 Stream 1 (Projection of ch 0 to ch 767)



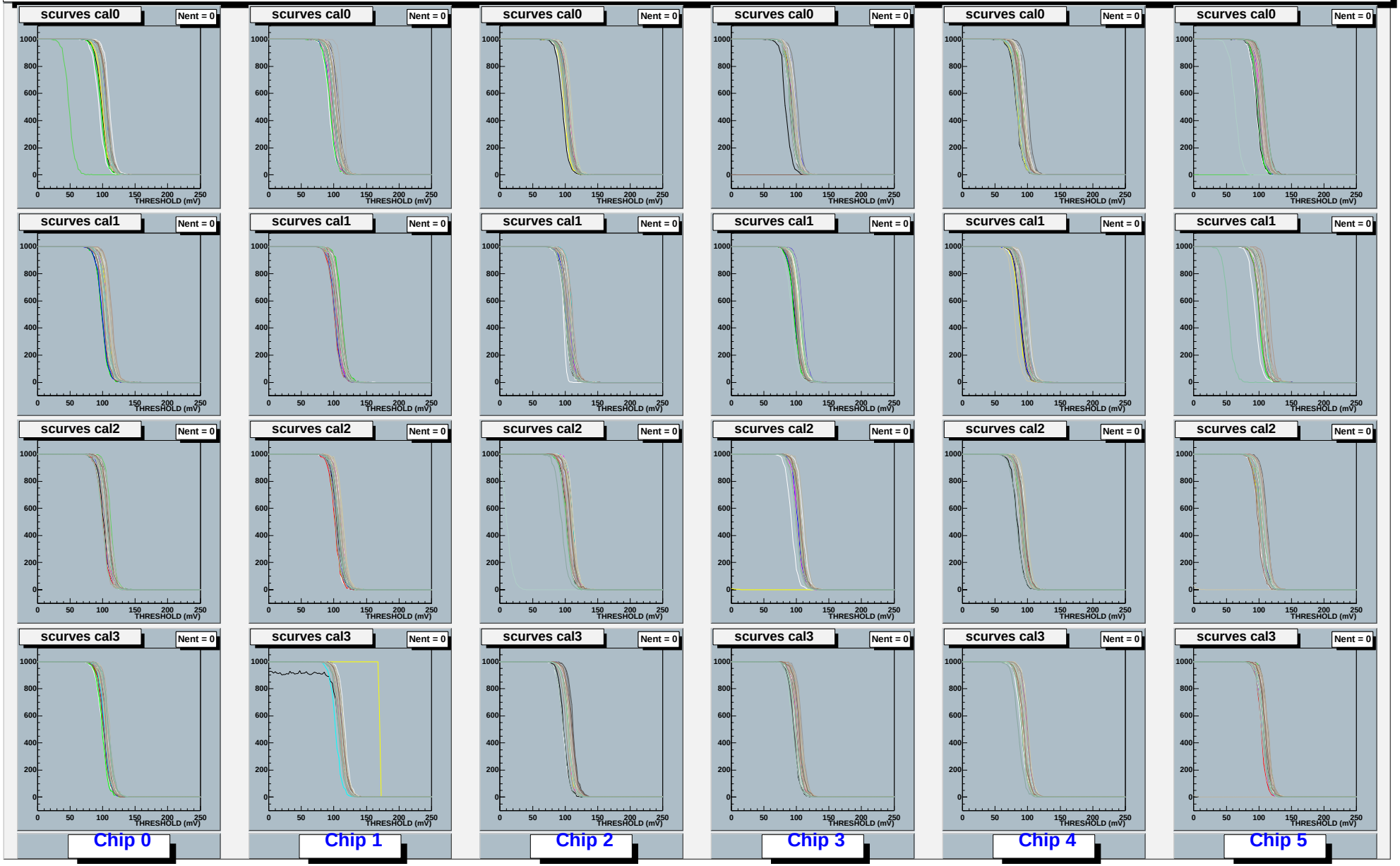
ATLAS SCT Scan Comparison - log scale
Run 1490 Scan 3 Module 0 Stream 0 (Projection of ch 0 to ch 767) vs
Run 1490 Scan 3 Module 0 Stream 1 (Projection of ch 0 to ch 767)



Module 0 Link 0 Run 1490 Scan 3 - THRESHOLD (mV) from 0.00mV to 250.00mV in 2.50mV steps, total 101 points

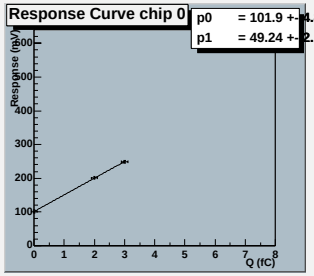


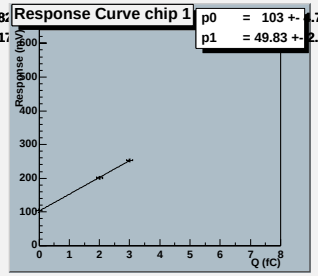
Module 0 Link 1 Run 1490 Scan 3 - THRESHOLD (mV) from 0.00mV to 250.00mV in 2.50mV steps, total 101 points

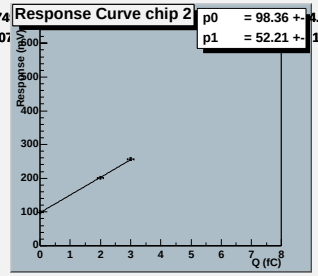


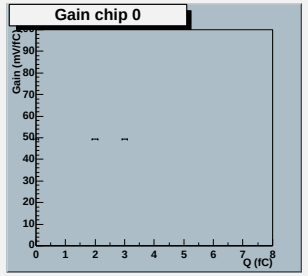
ATLAS SCT Module Response Curve - ABCD2T - Linear fit

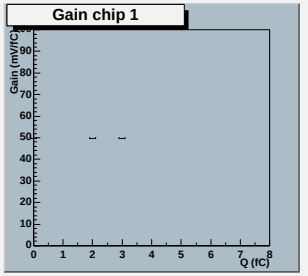
Run 1493 Scans 3 - 18 Charges 0.00 - 3.00 fC Module 0 Stream 0

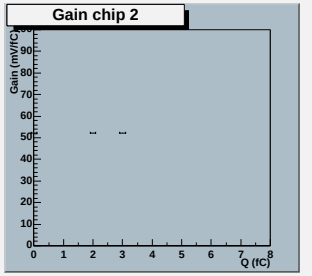


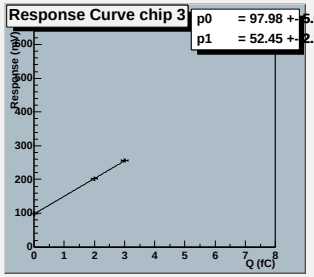


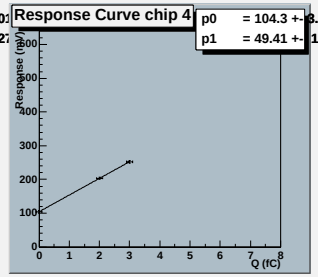


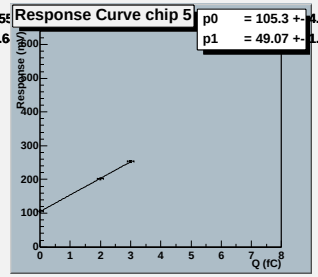


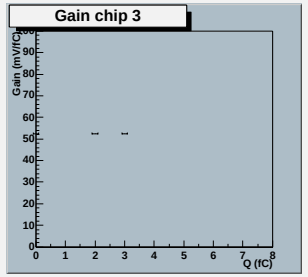


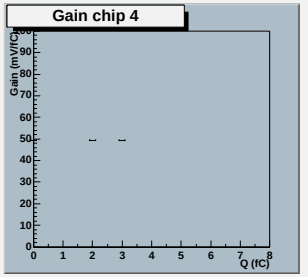


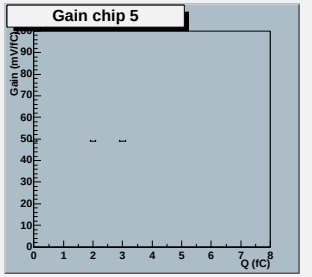


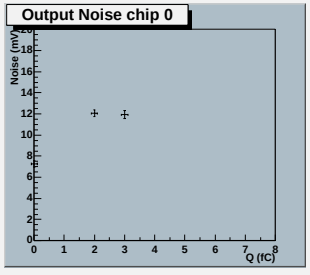


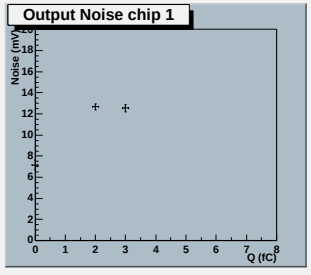


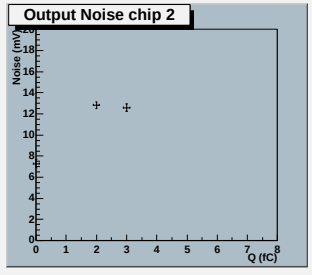


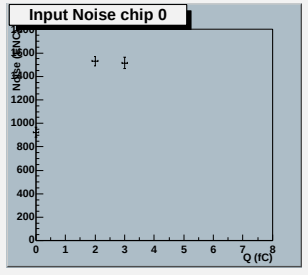


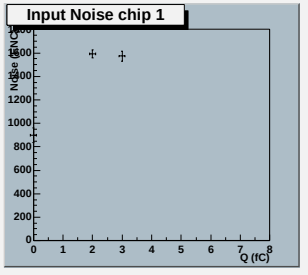


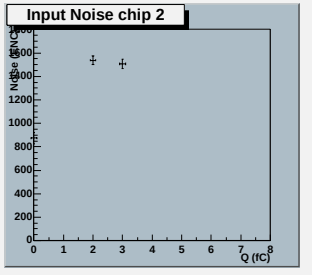


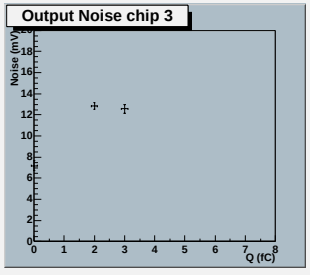


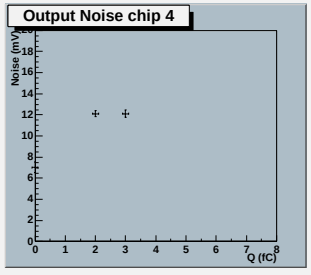


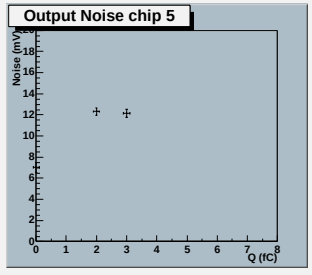


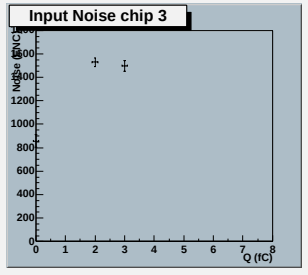


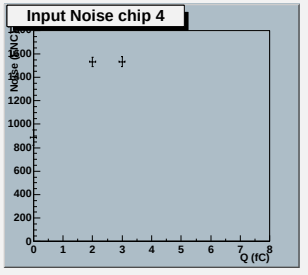


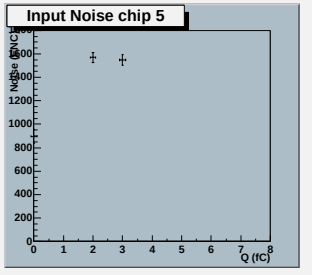






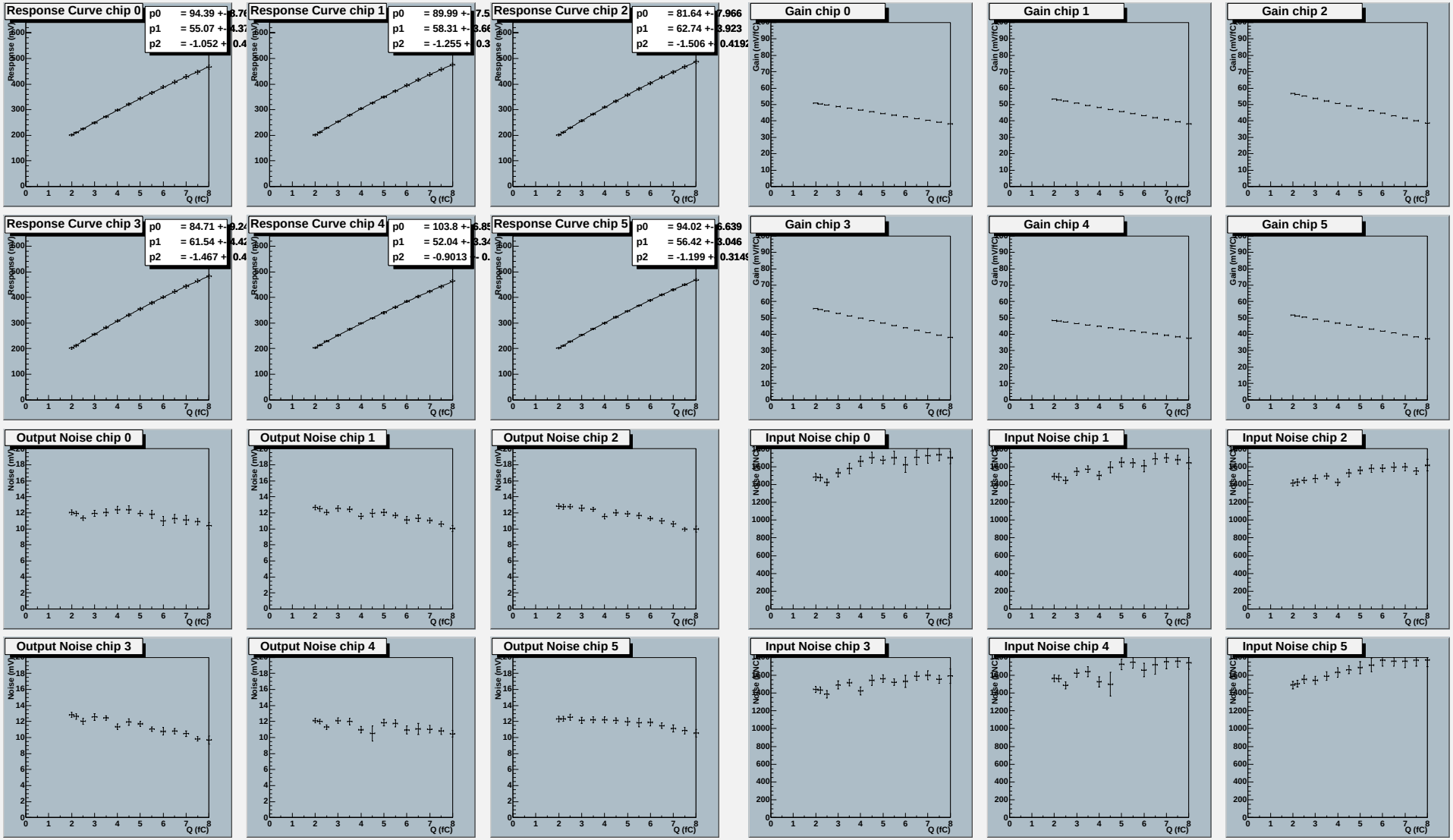






ATLAS SCT Module Response Curve - ABCD2T - Polynomial fit

Run 1493 Scans 12 - 37 Charges 2.00 - 8.00 fC Module 0 Stream 0



Mod2mod

- **Offset (Noise pedestal)**

  (1) 50% point with Edge=off 102, 104 mV
  (2) Peak with Edge=on 100, 103 mV
  (3) Intercept of 2nd-order poly with Edge=off 91, 98 mV
  (4) Intercept of 2nd-order poly with Edge=on 76, 79 mV

- **Gain and noise (at 2 fC)**

  (1) Linear fit at 0, 2, 3 fC with Edge=off
  (2) 2nd-order poly (2~8 fC) with Edge=off
  (3) 2nd-order poly (2~8 fC) with Edge=on

  - Gains ~54, ~51, ~60 mV/fC
  - Input noises ~1420, ~1520, ~1360 e

  - These were consistent with Mod0, but differed from k3111

Module name	k3104mod	k3104mod		
Strip sensors:	Type	Thickness [um]	Vendor	
Top	ATLAS98 narrow-m	285 um	Hamamatsu	
Bottom	ATLAS98 wide-poly	285 um	Hamamatsu	
Baseboard id.	???			
ASICs:	Type	Batch	Wafer	
M0-E13	ABCD2T	30423	3 + 9	
Hybrid:	Substrate	Substrate Surface finish		
Kapton ABCD v3	Carbon-carbon	metalized		
Capacitors:	C [nF]	Type	Reso freq [MHz]	Vendor
Vcc, Vdd	100	GRM39-X7R-104-K-25	~26	Murata
Common Vcc, Vdd	330	GRM42-6-X7R-334-K-25	~15	Murata
HV decoupling	10	GHM1530-B-103-K-630	~70	Murata
HV connections:	No. locations	No. bonds/location		
Strip	4	2		
Backplane	2	2		
AGnd-DGND connections:	14	5		
Bias [V]	Leak current [uA]	Env. temp [deg.C]	Condition	
100	~0.8	18	fan circulation	
ASIC currents [A]:	V(sense) [V]	Vth>offset+200 mV	Vth=offset	
Vcc	3.5	0.93		
Vdd	4	0.5	0.79	
Trimming:	Chage [fC]	Threshold [mV]	Trimmable ch	Untrimmable ch
(using hybrid data)	2	200	1518	18
	Edge=off		Edge=on	
Threshold uniformity [mV]	link0	link1	link0	link1
at trim threshold	3.47	3.33		
Offset threshold [mV]:	Edge=off	(2~8fC, 2nd-poly)	Edge=on	(2~8fC, 2nd-poly)
Chips	Vt50	Intercept	Peak	Intercept
link0 average	102.2	91.4	100.4	76.1
link1 average	104	98.3	102.5	79
Gain (@2fC) [mV/fC]:	Edge=off		Edge=on	
Chips	Linear(0,2,3fC)	2nd poly(2~8fC)	Linear(0,2,3fC)	2nd poly(2~8fC)
link0 average	53.1	52.8	xxx	60.1
link1 average	54	49.6	xxx	59.3
Noise (@2fC) [e]	Edge=off		Edge=on	
Chips	Linear(0,2,3fC)	2nd poly(2~8fC)	Linear(0,2,3fC)	2nd poly(2~8fC)
link0 average	1437	1480	xxx	1352
link1 average	1409	1557	xxx	1374
Instability thresholds:	Edge=off		Edge=on	
Chips	Lower [mV]	Upper [mV]	Lower [mV]	Upper [mV]
link0	none	none	none	none
link1	none	none	none	none

Summary

- **All three modules built at KEK are now all stable**

  - Mod0, Mod2mod -- ABCD2T wafer 30423

  -k3111 -- ABCD2T wafer 27496

- **ABCD2T wafers, 30423 and 27496, showed different performance in module**

  - 27496 chips were more sensitive to instability, or ???

  - Although small and evident in 12 cm strips and 12 chips, the “discontinuity” looked similar behaviour in the ABCD1

- **We have more statistics, and looking forward to the discussion of differences in the summary sheets**