

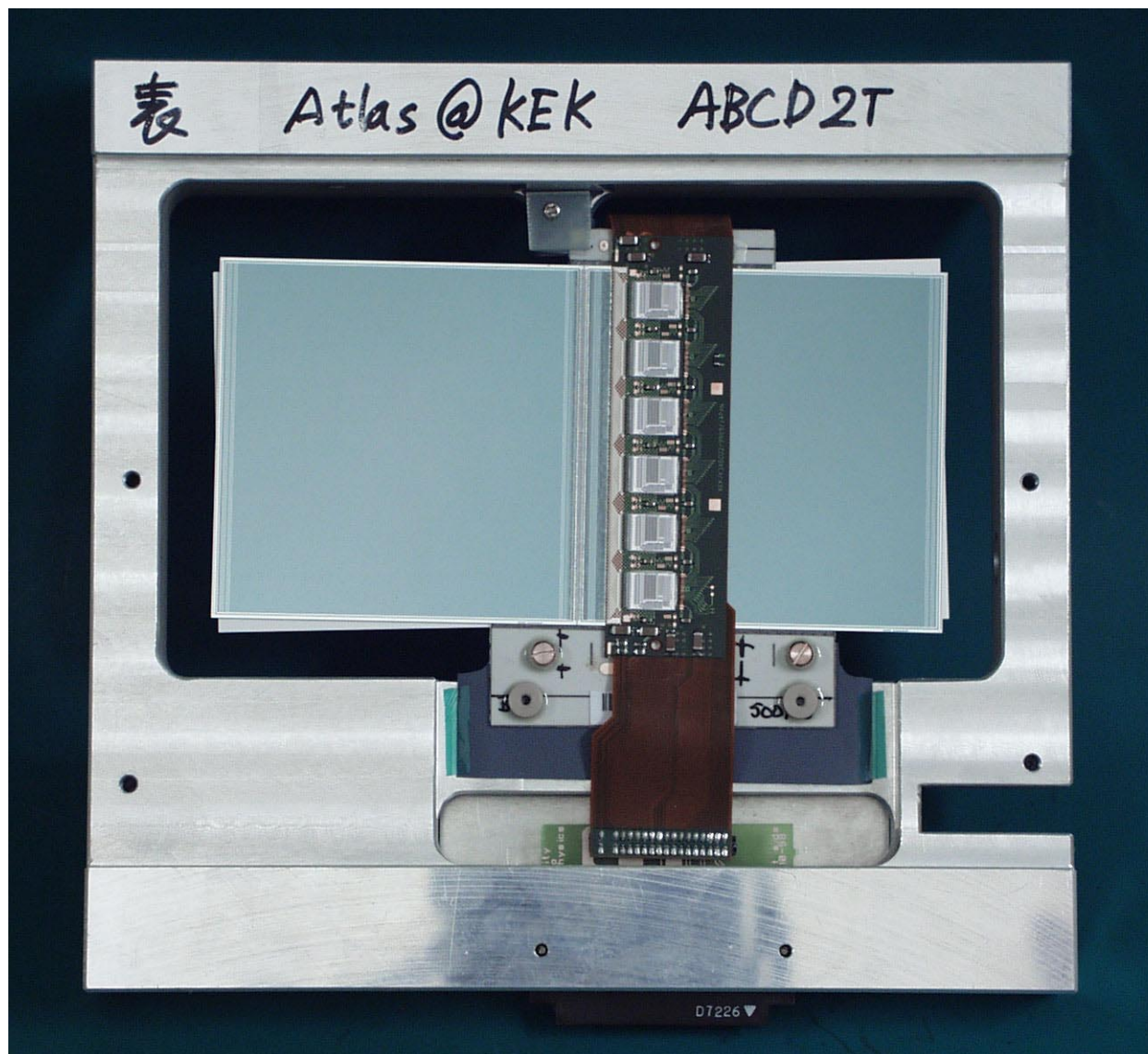
k3111

- **First of the 3 “investigation” modules at KEK**
- **After correspondences regarding the “investigation” modules,**
 - **Same latest hybrid version, i.e., version 3**
 - **No “meshed ground” variant was available for the version**
 - **“Split ground” version was recommended, leaving options how tightly connect the AGND and DGND**
 - **Leaving only a choice on the bridge material**
 - **Polymer-coated Carbon-carbon bridge, Insulated surface in increasing the resistivity of bridge**
 - **Electrical contact to the carbon-carbon through openings on the insulator at the chip pads**

表

Atlas @ KEK

ABCD 2T



k3111 cont'd

- **ABCD2T chips**

- Wafer 29476
- Greater variation in the trim stage

- **Trim characteristics**

- Trim at 2 fC=200 mV, leaving 75 untrimmable channels
- Threshold uniformity: 2.94 (Front 6) and 2.91 (Back 6) mV, i.e., <3 mV

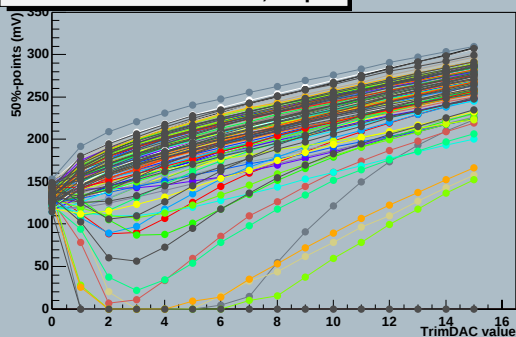
- **Stability**

- Noise scan with Edge=on, Comp=01X
- Stable, no global instability
- Noise scan with Edge=off, Comp=X1X
- Clean, no difference in upward or downward noise scans
- Individual s-curves: clean, but
- Chip5 (E5) of front 6 had “discontinuity” in the curves, similarly Chip4 (S12) of back 6 had “discontinuity”

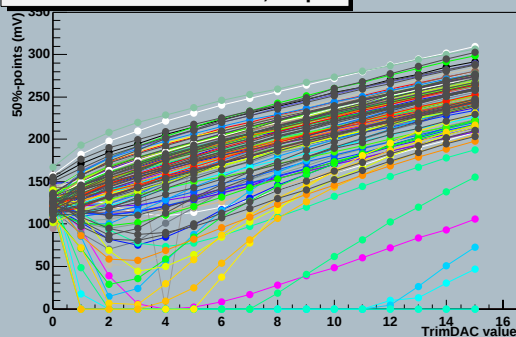
ATLAS SCT Module Test
ATLAS SCT Module Test
Run 1434 Trim Scans Module 0 Link 0

Target value to be 200 mV
This gives 1461 trimmable channels

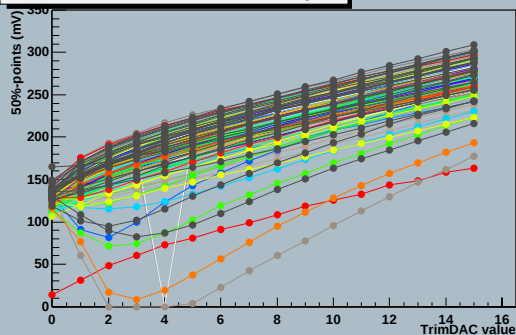
TrimDAC characteristics, chip 0



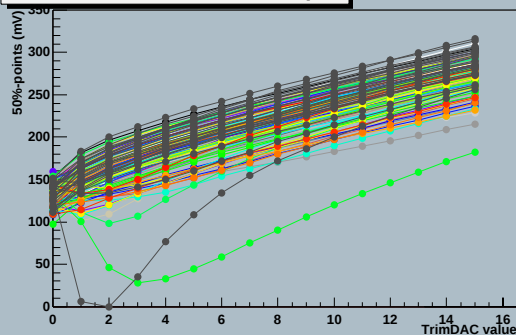
TrimDAC characteristics, chip 1



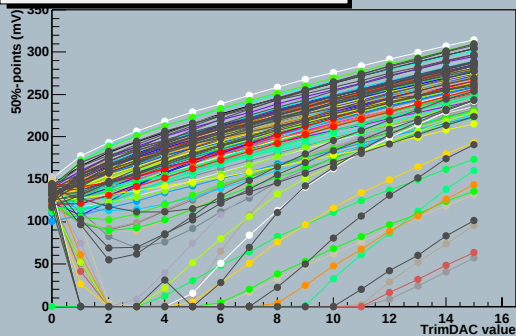
TrimDAC characteristics, chip 2



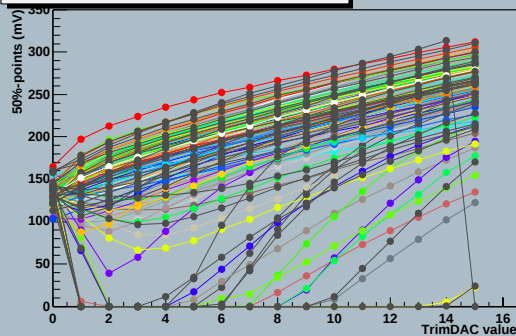
TrimDAC characteristics, chip 3



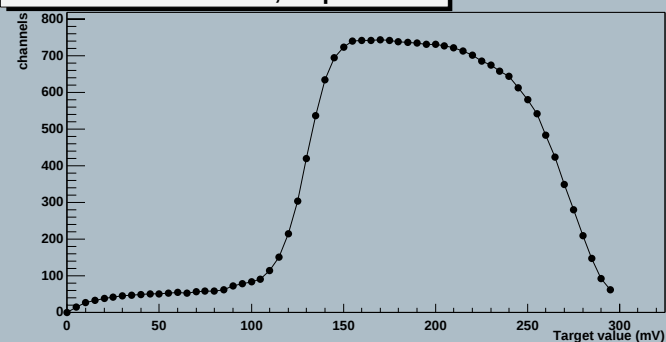
TrimDAC characteristics, chip 4



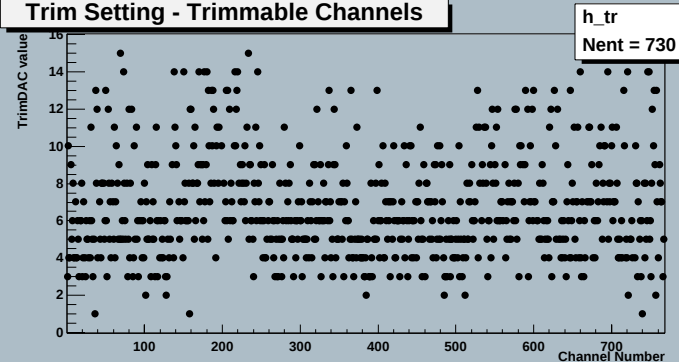
TrimDAC characteristics, chip 5



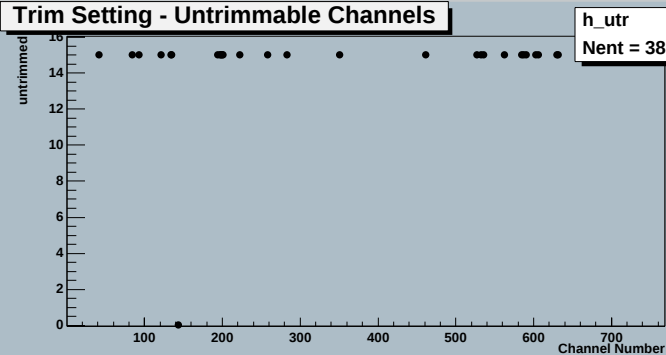
Trimmable channels, chip 0 to 5



Trim Setting - Trimmable Channels



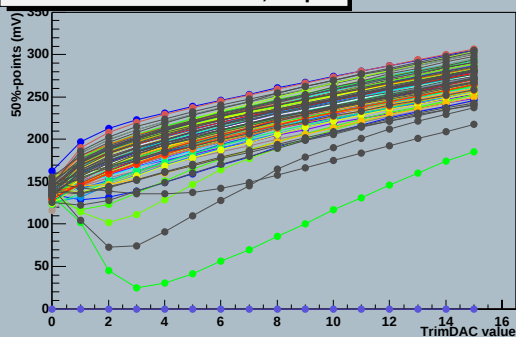
Trim Setting - Untrimmable Channels



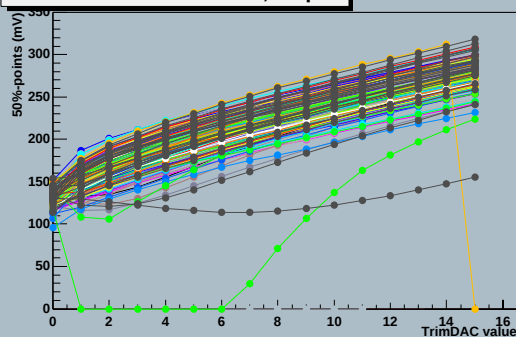
ATLAS SCT Module Test
ATLAS SCT Module Test
Run 1434 Trim Scans Module 0 Link 1

Target value to be 200 mV
This gives 1461 trimmable channels

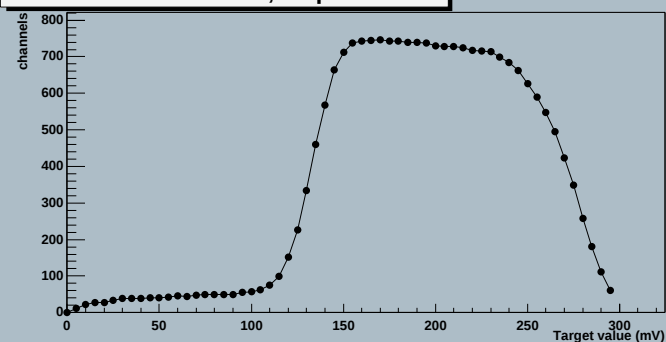
TrimDAC characteristics, chip 6



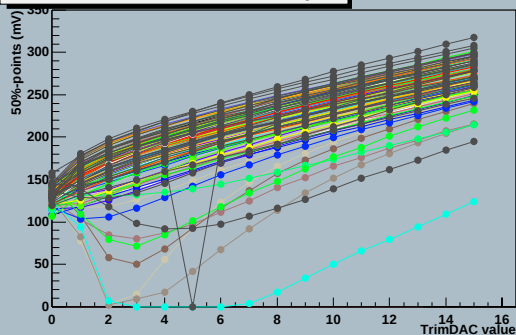
TrimDAC characteristics, chip 7



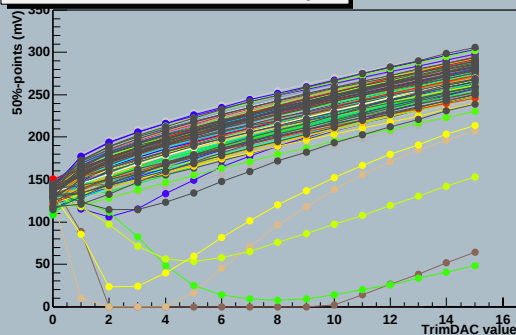
Trimmable channels, chip 6 to 11



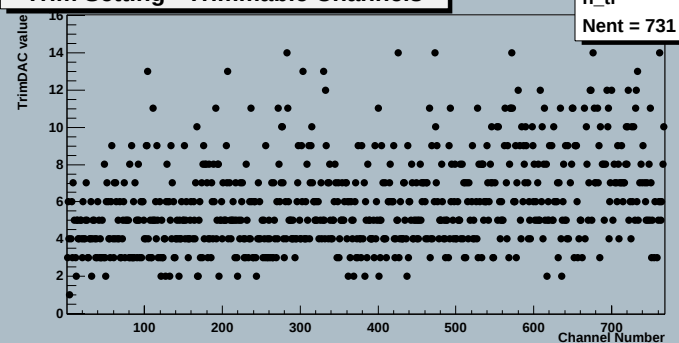
TrimDAC characteristics, chip 8



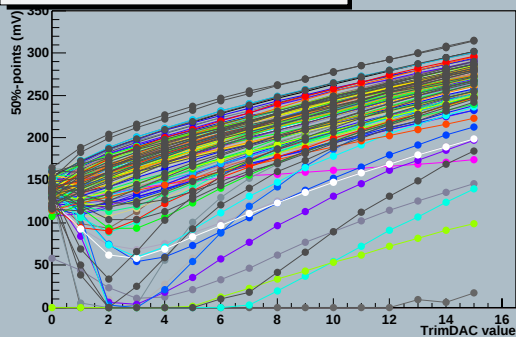
TrimDAC characteristics, chip 9



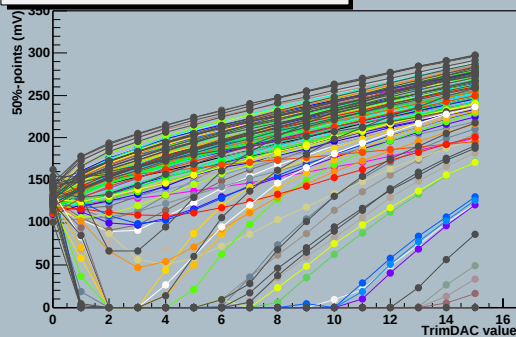
Trim Setting - Trimmable Channels



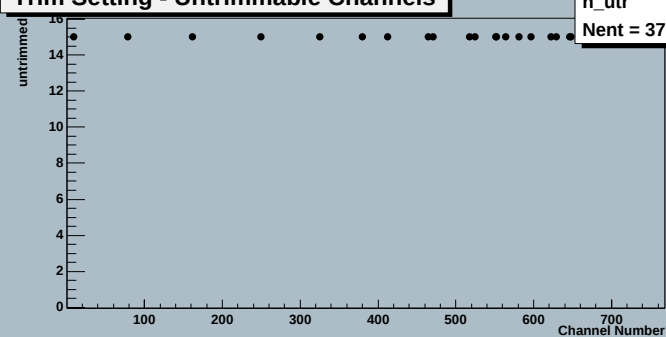
TrimDAC characteristics, chip 10



TrimDAC characteristics, chip 11

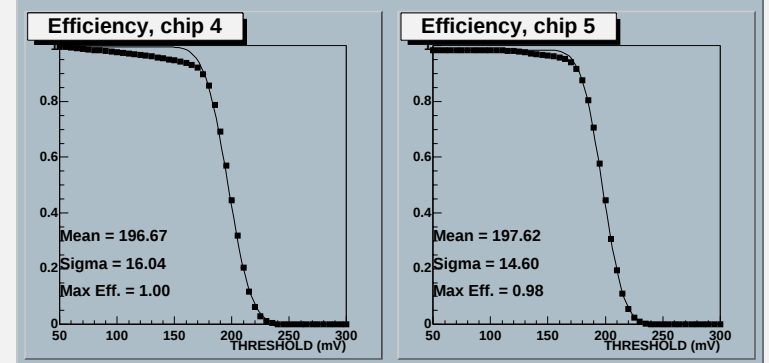
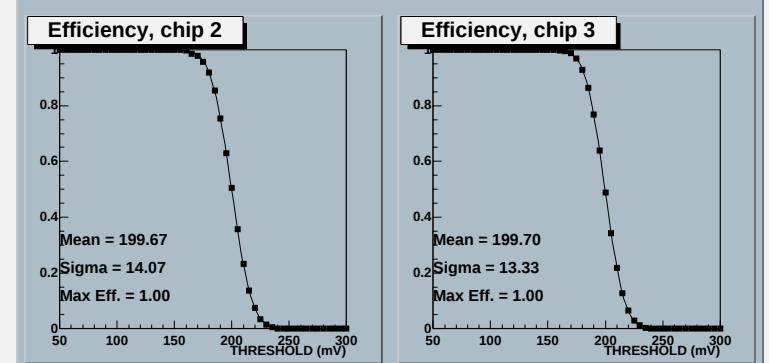
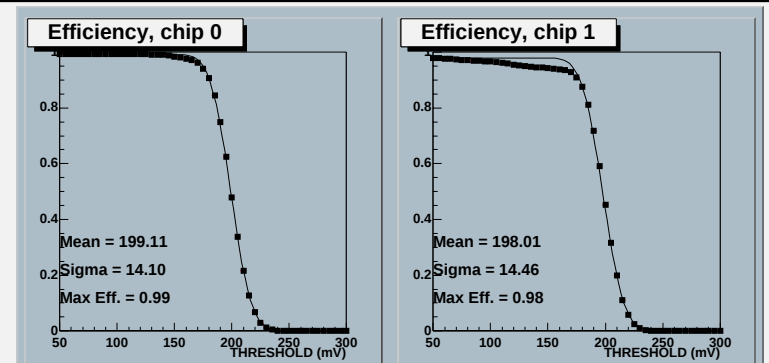
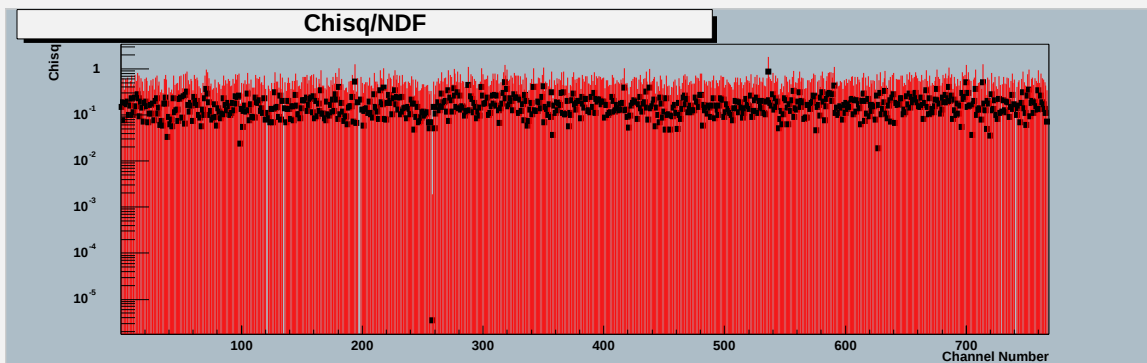
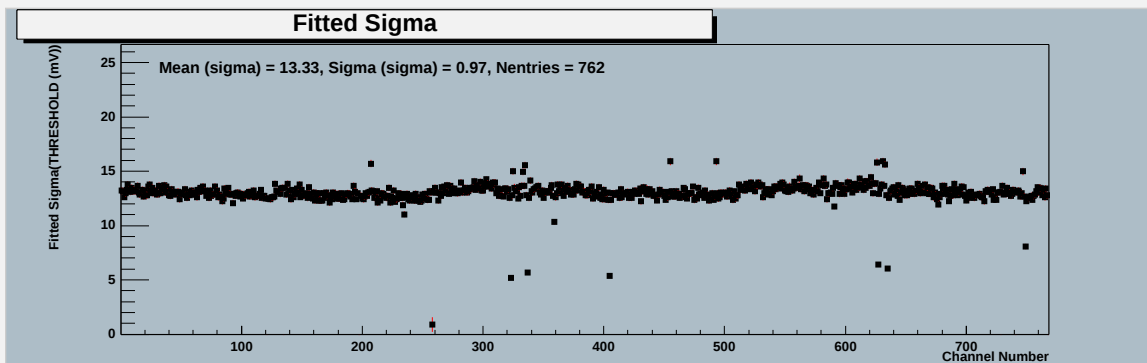
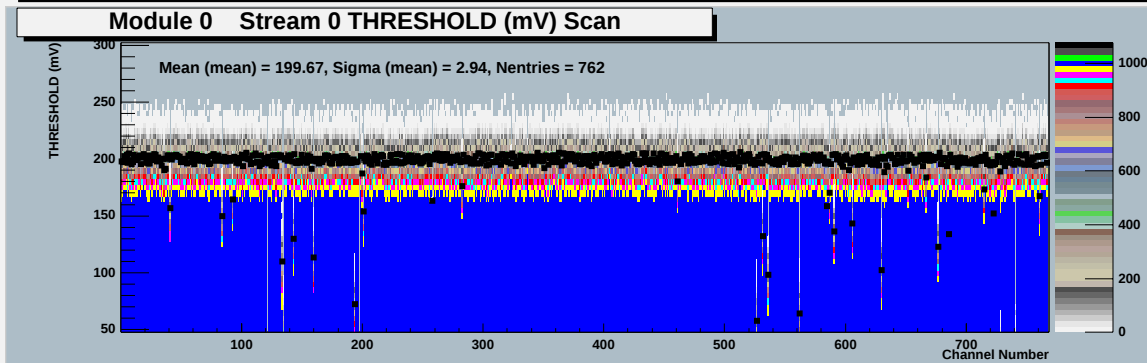


Trim Setting - Untrimmable Channels



ATLAS SCT Module Test - Thu May 18 14:17:31 2000

Run 1442 Scan 12 Module 0 Stream 0 Scan type: THRESHOLD (mV)

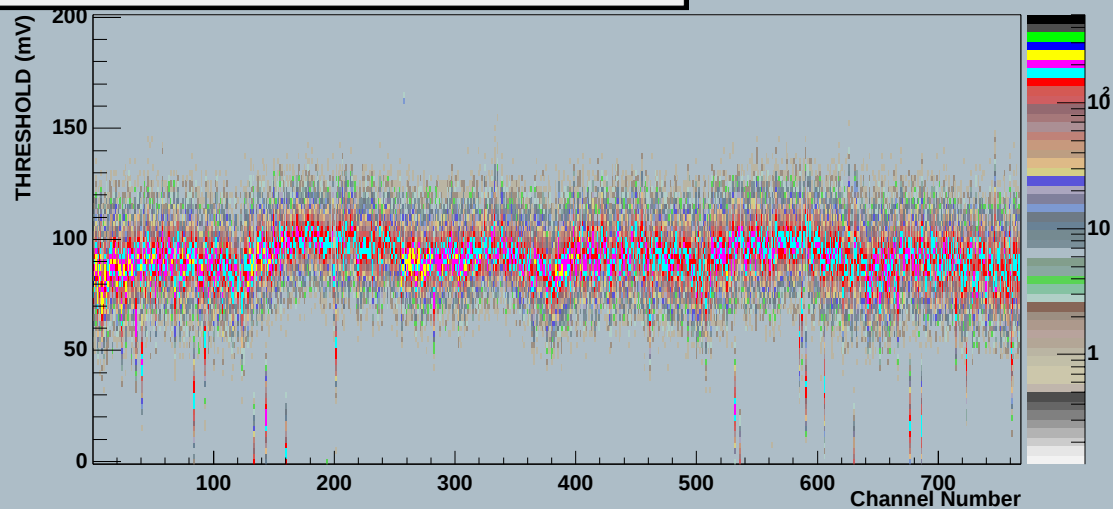


ATLAS SCT Scan Comparison - log scale

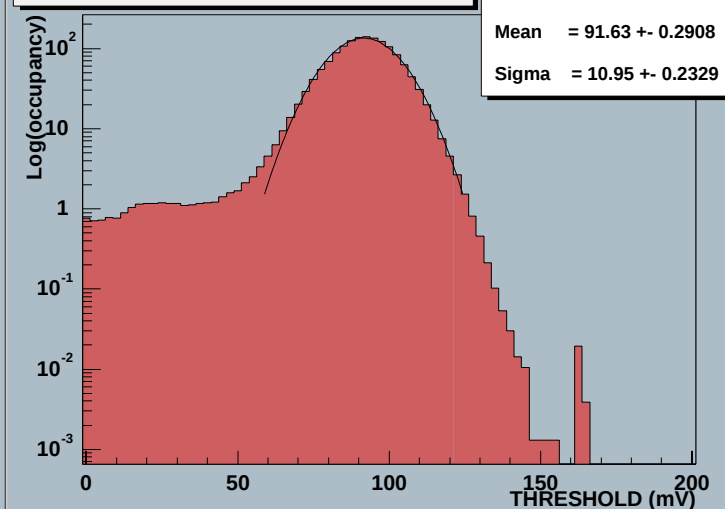
Run 1477 Scan 1 Module 0 Stream 0 (Projection of ch 0 to ch 767) vs

Run 1477 Scan 1 Module 0 Stream 1 (Projection of ch 0 to ch 767)

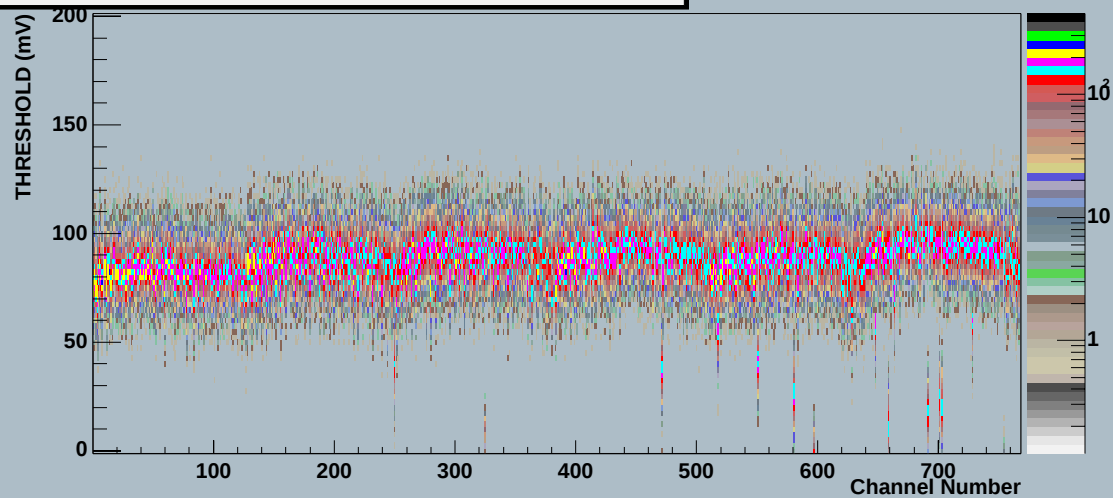
Module 0 Stream 0 THRESHOLD (mV) Scan



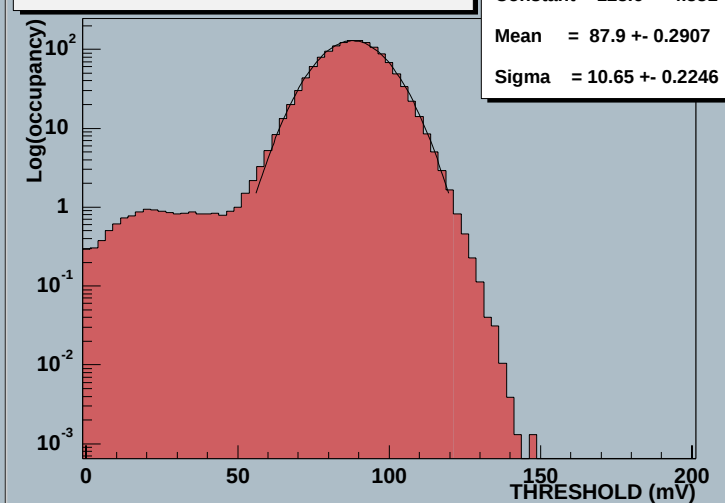
Module 0 Stream 0 THRESHOLD (mV) Scan



Module 0 Stream 1 THRESHOLD (mV) Scan



Module 0 Stream 1 THRESHOLD (mV) Scan

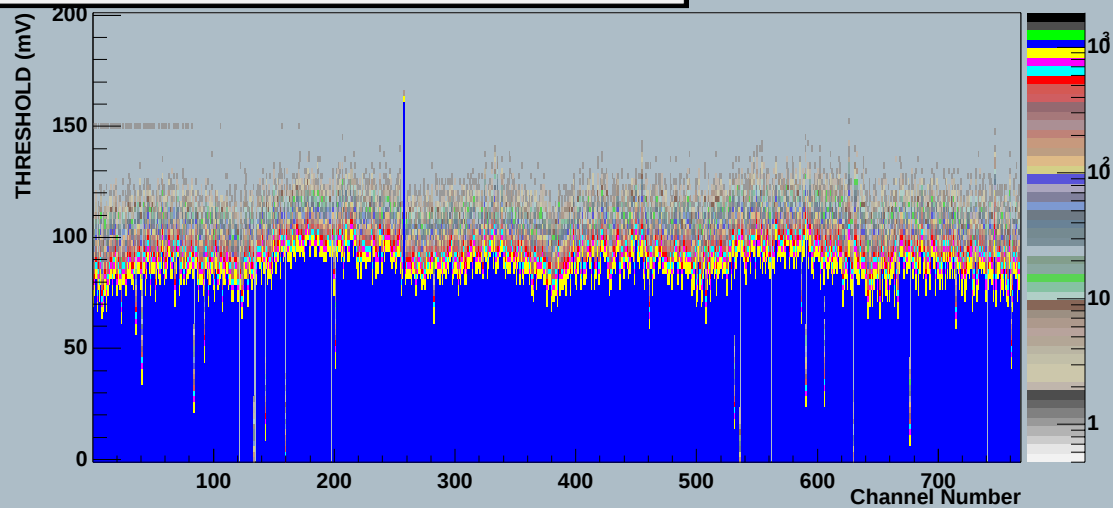


ATLAS SCT Scan Comparison - log scale

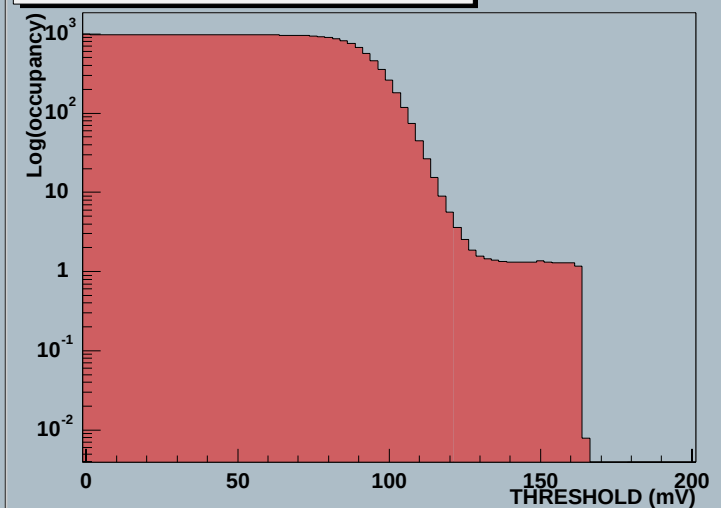
Run 1438 Scan 2 Module 0 Stream 0 (Projection of ch 0 to ch 767) vs

Run 1438 Scan 2 Module 0 Stream 1 (Projection of ch 0 to ch 767)

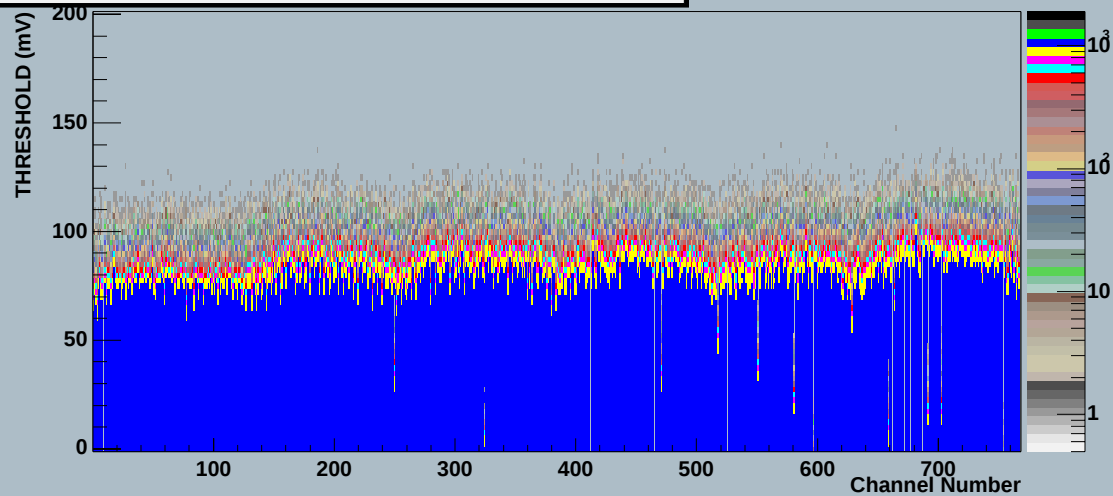
Module 0 Stream 0 THRESHOLD (mV) Scan



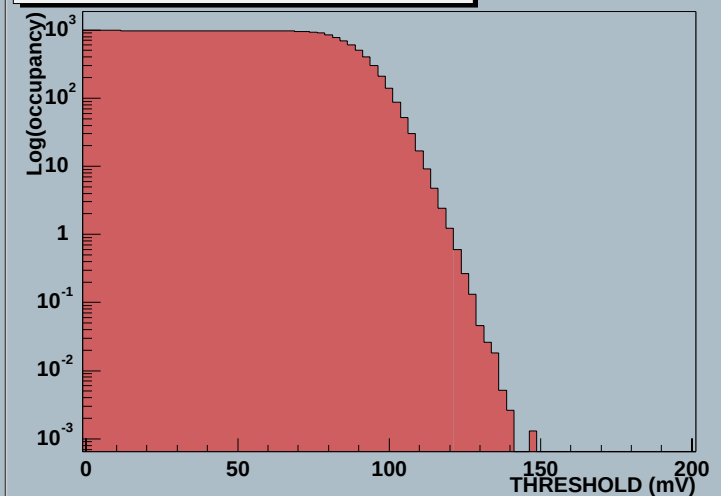
Module 0 Stream 0 THRESHOLD (mV) Scan



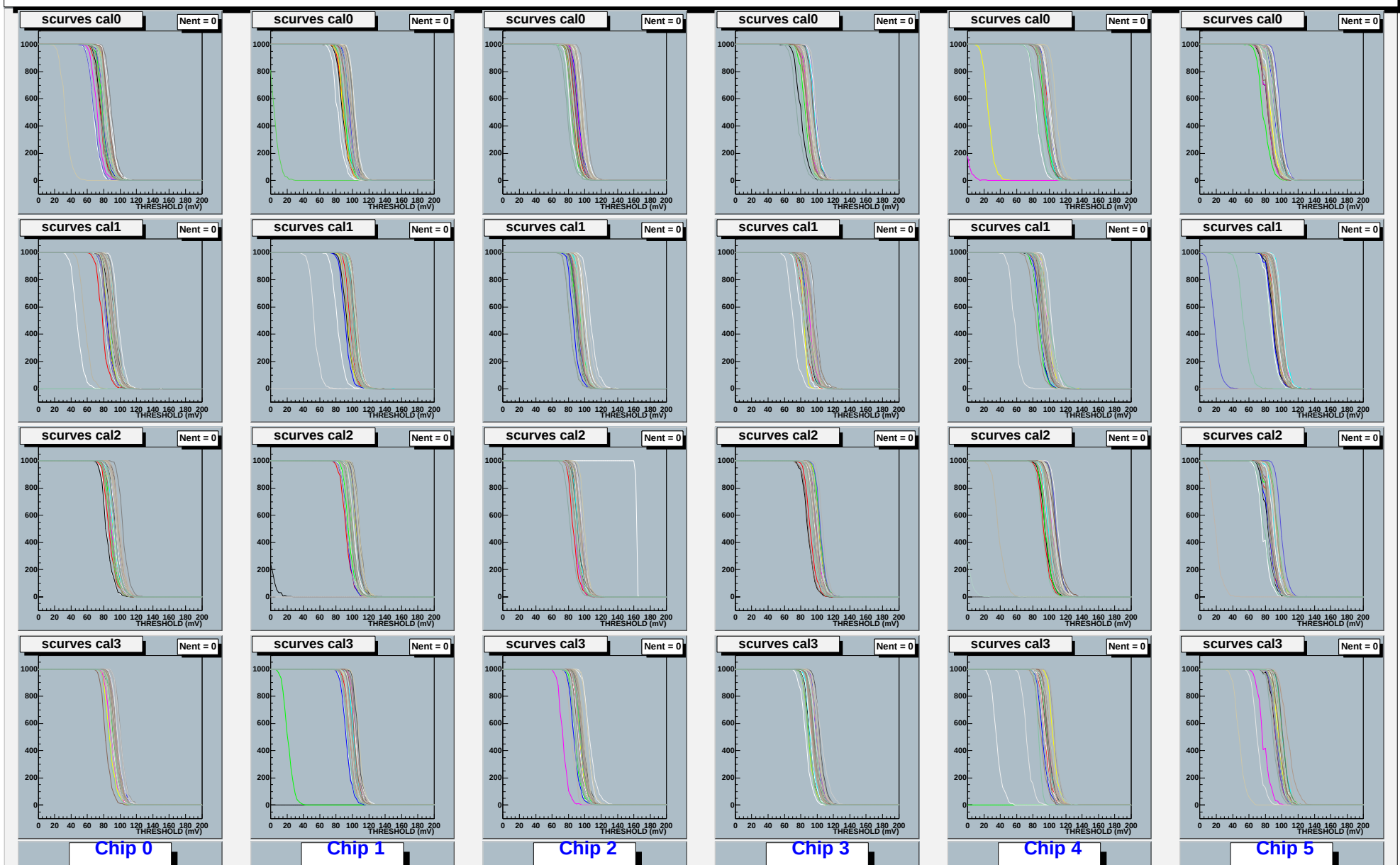
Module 0 Stream 1 THRESHOLD (mV) Scan



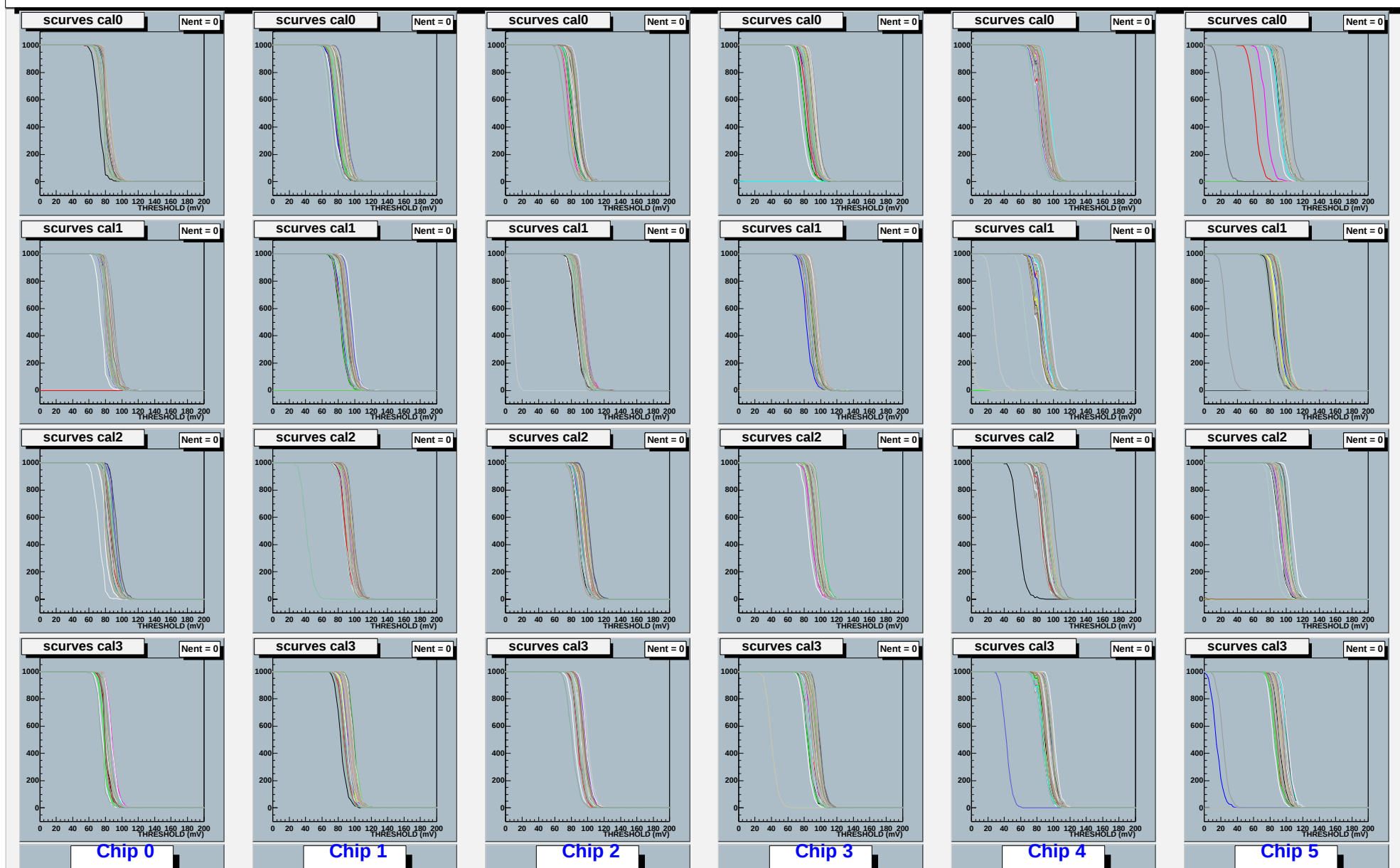
Module 0 Stream 1 THRESHOLD (mV) Scan



Module 0 Link 0 Run 1438 Scan 2 - THRESHOLD (mV) from 0.00mV to 200.00mV in 2.50mV steps, total 81 points

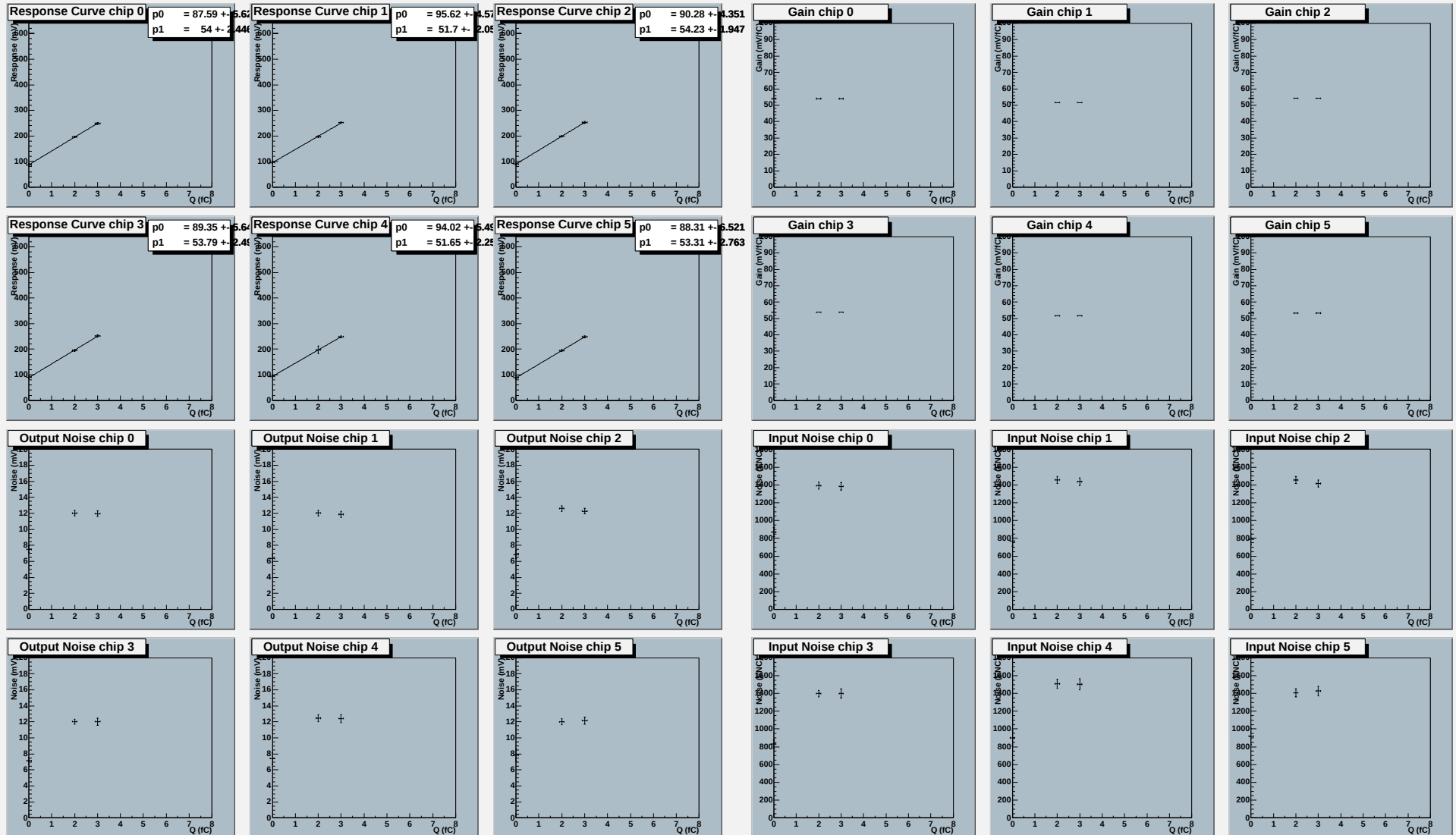


Module 0 Link 1 Run 1438 Scan 2 - THRESHOLD (mV) from 0.00mV to 200.00mV in 2.50mV steps, total 81 points



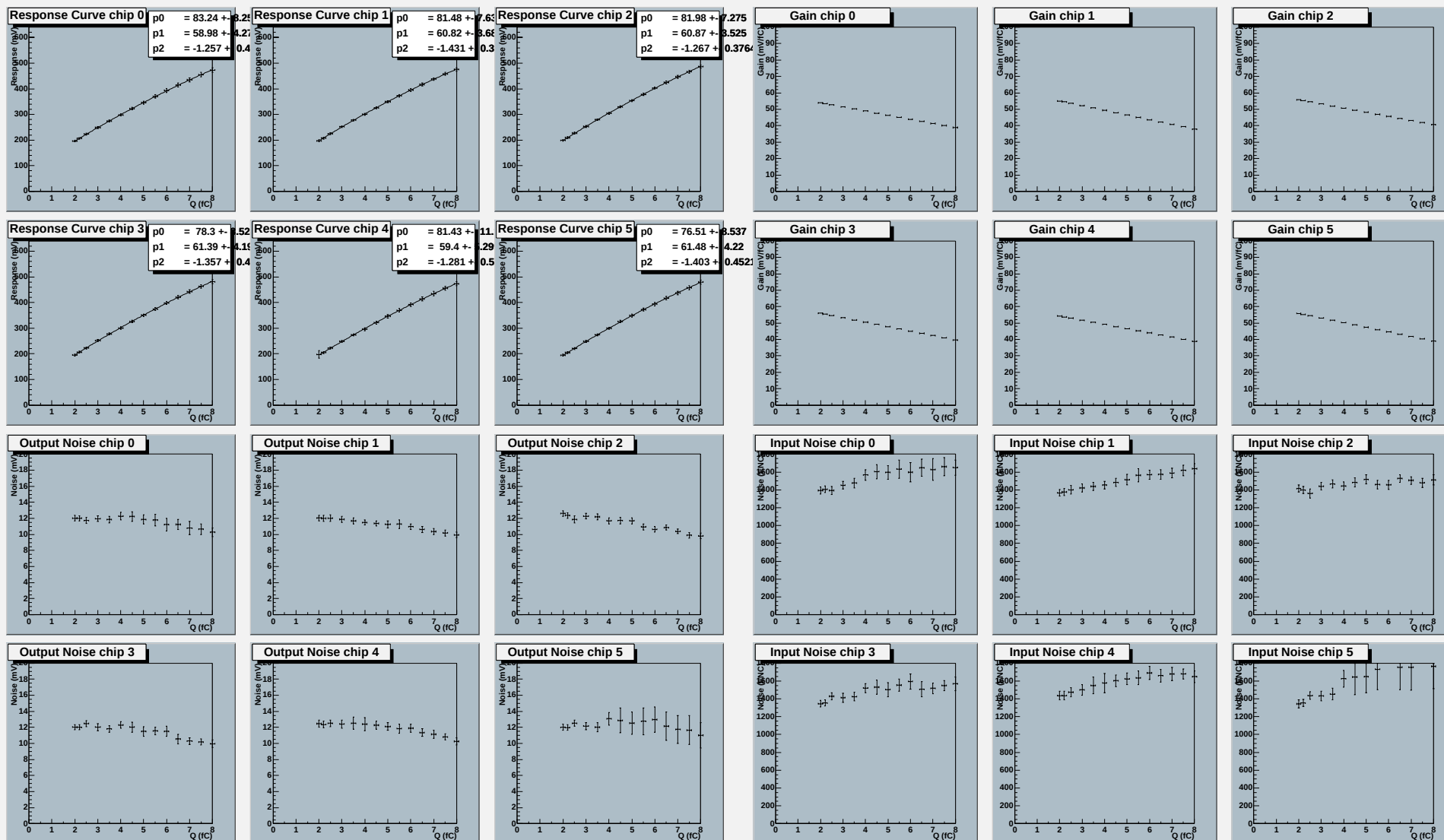
ATLAS SCT Module Response Curve - ABCD2T - Linear fit

Run 1476 Scans 1 - 16 Charges 0.00 - 3.00 fC Module 0 Stream 0



ATLAS SCT Module Response Curve - ABCD2T - Polynomial fit

Run 1476 Scans 12 - 37 Charges 2.00 - 8.00 fC Module 0 Stream 0



k3111 cont'd

- “Offset” (or I call “Noise pedestal”)

- (1) 50% point of s-curves with Edge=off**
- (2) Peak with Edge=on**
- (3) Intercept from the high threshold scans, 2 ~ 8 fC, with 2-nd order polynomial fit, with Edge=off**

- (1) 91 mV, 87 mV, link average, i.e., front 6 and back 6
(2) 92 mV, 88 mV
(3) 81 mV, 80 mV

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

- (1) Linear fit of 0, 2, 3 fC threshold scans, Edge=off**
- (2) 2nd-order polynomial fit to high thresholds, 2~8 fC, Edge=off**
- (3) ditto, but Edge=on**

- Gain per (1), (2), (3) ~54, ~55, ~65 mV/fC

- Input noise ~1430, ~1384, ~1240 e

- Why the gains differed in (2) and (3)?

- The responses were different in higher threshold with Edge=off and on. Why?

Summary sheet

- **One sheet summary of critical items**

Module name	k3111	k3111		
Strip sensors:	Type	Thickness [um]	Vendor	
Top	ATLAS98 narrow-m	285 um	Hamamatsu	
Bottom	ATLAS98 narrow-m	285 um	Hamamatsu	
Baseboard id.	???			
ASICs:	Type	Batch	Wafer	
M0-E13	ABCD2T	29476	15	
Hybrid:	Substrate	Substrate Surface finish		
Kapton ABCD v3	Carbon-carbon	polymer-coated		
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]	Leakage 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	0.89		
Vdd	4	0.47	0.73	
Trimming:	Chage [fC]	Threshold [mV]	Trimnable ch	Untrimmable ch
	2	200	1461	75
Threshold uniformity [mV]	Edge=off		Edge=on	
at trim threshold	link0	link1	link0	link1
	2.94	2.91	3.34	3.57
Offset threshold [mV]:	Edge=off	(2~8fC, 2nd-poly)	Edge=on	(2~8fC, 2nd-poly)
Chips	Vt50	Intercept	Peak	Intercept
link0 average	91.3	80.5	91.6	62.3
link1 average	87.1	80.1	87.9	58.8
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	55.2	xxx	64
link1 average	54	54.9	xxx	65.7
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	1383	xxx	1256
link1 average	1409	1385	xxx	1224
Instability thresholds:	Edge=off		Edge=on	
Chips	Lower [mV]	Upper [mV]	Lower [mV]	Upper [mV]
link0 E5	77.5	80	77.5	80
link1 S12	77.5	80	77.5	80

Timewalk

- **Measured at**
 - Threshold = 1fC
 - Strobe delay scan for the calibration charges of 1.5, 2.0, 4.0, 6.0, 8.0, 16.0 fC
 - Extract the strobe time of 50% efficiency
 - (No fundamental reason to take the 50% point, just a technical easiness to extract a timing)
- **Reasonable fit with “inverse square root” function**
 - $f(q) = p_0 + p_1/\sqrt{q - p_2}$
 - In average,
 - $p_1 \sim 10 \text{ ns}$
 - $p_2 \sim 1 \text{ fC}$
 - What does this mean?

ATLAS SCT Module Timewalk Curve - ABCD2T - Inverse sqrt+ fit

Run 1443 Scans 1 - 9 Charges 1.50 - 16.00 fC Module 0 Stream 2

