

Summary on Unmaskable Channels

Magali Gruwe
Harris Kagan
Terry Pritchard
Rainer Wallny

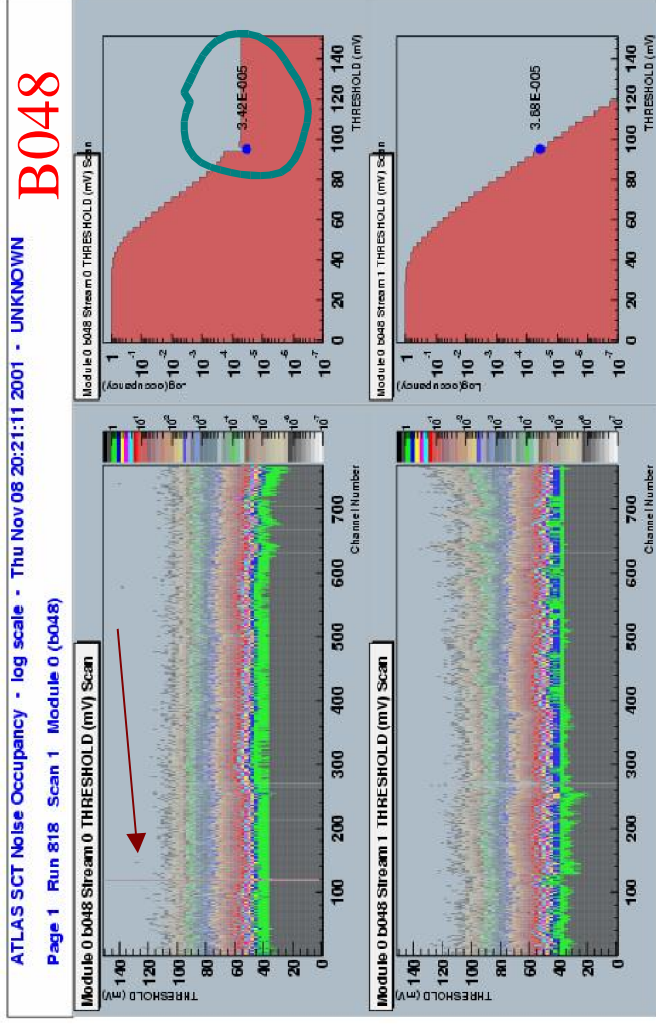
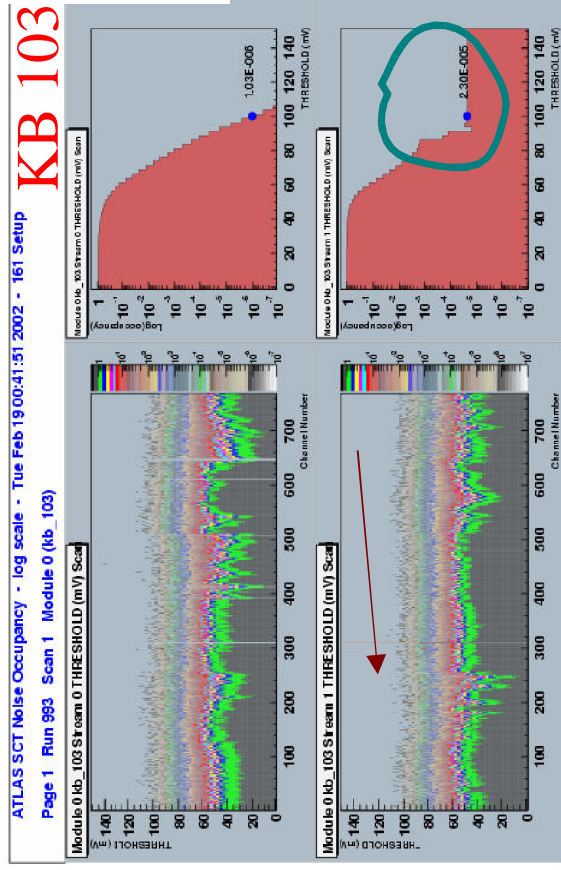
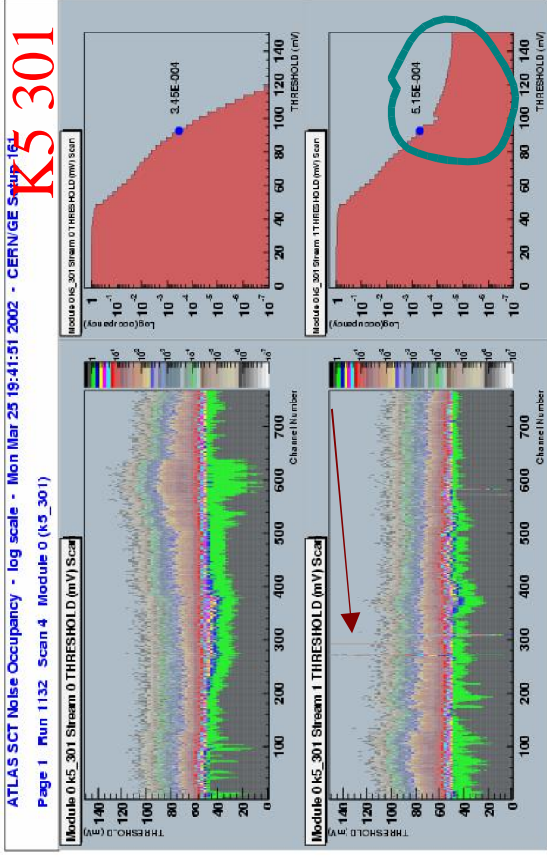
Mauro Donega
Monica D'Onofrio
Mariane Mangin–Brinet



CERN/Geneva Team

Unmaskable Channels:

Channels have non-zero occupancy even if masked by mask register



KB: **B048**, 100, 102, **103**

K5: 300, **301**, 302, 303, 400, 401, 402

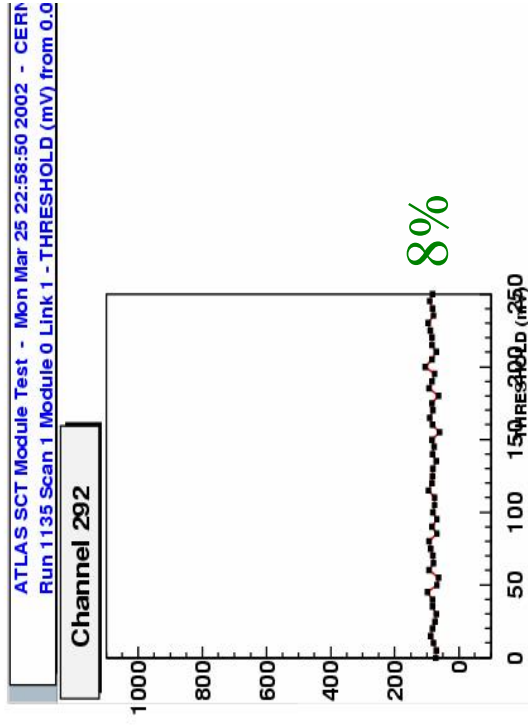
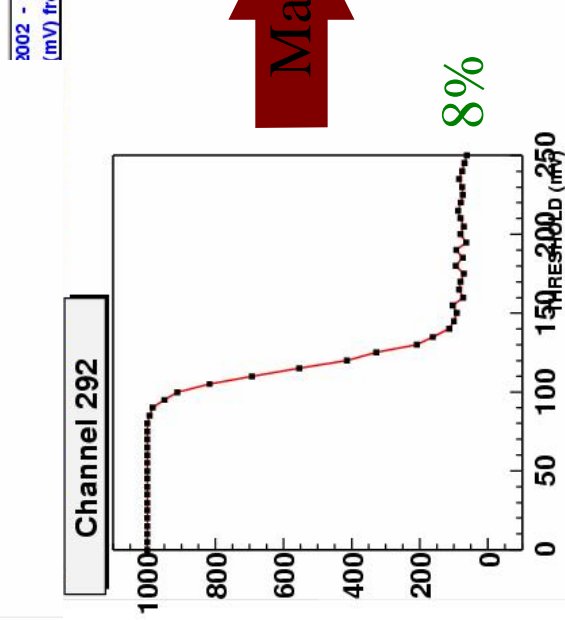
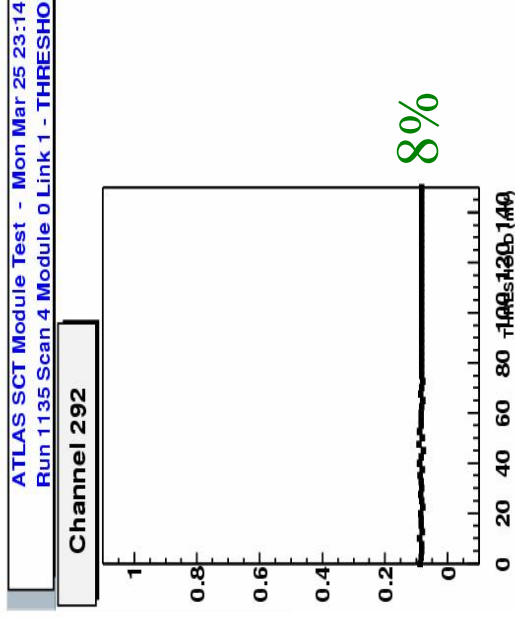
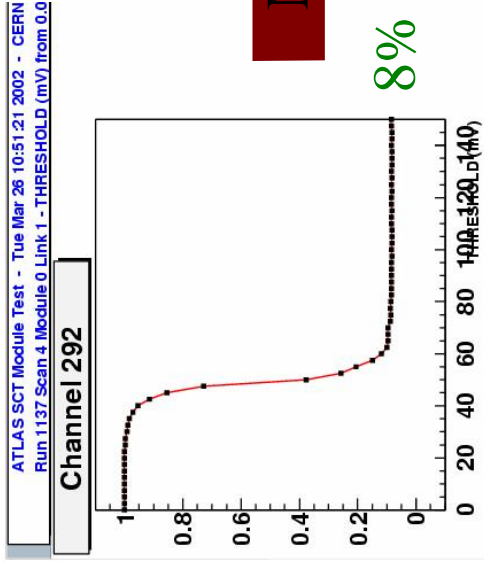
- 3 out of 11 modules 30%
- 3 out of 132 chips 2%
- 3 out of ~17000 channels 0.01%

S-Curves

K5-301:

VtriggerBurst
(100 kHz)

NoiseOccupancy



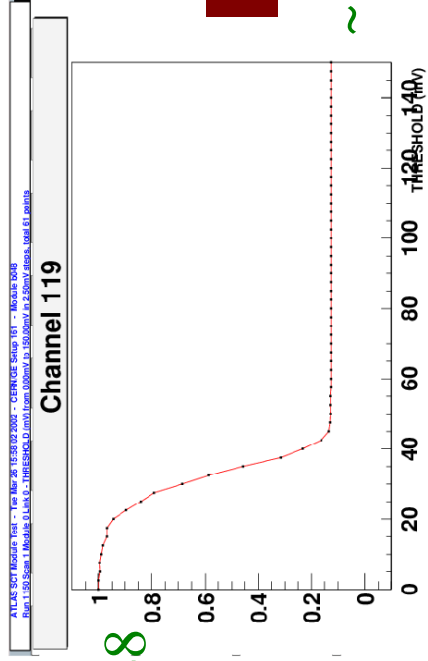
TriggerBurst

ResponseCurve

... independent from TriggerBurst Type

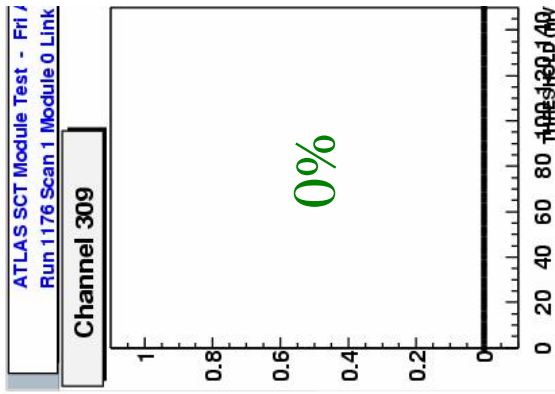
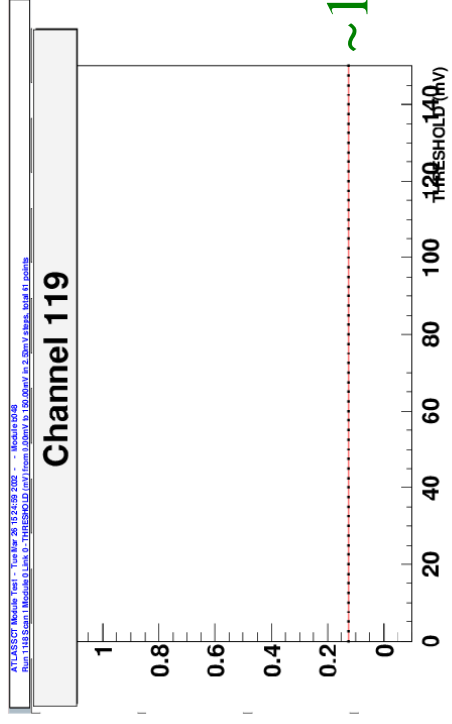
S-Curves: (cont'd)

KB-B048

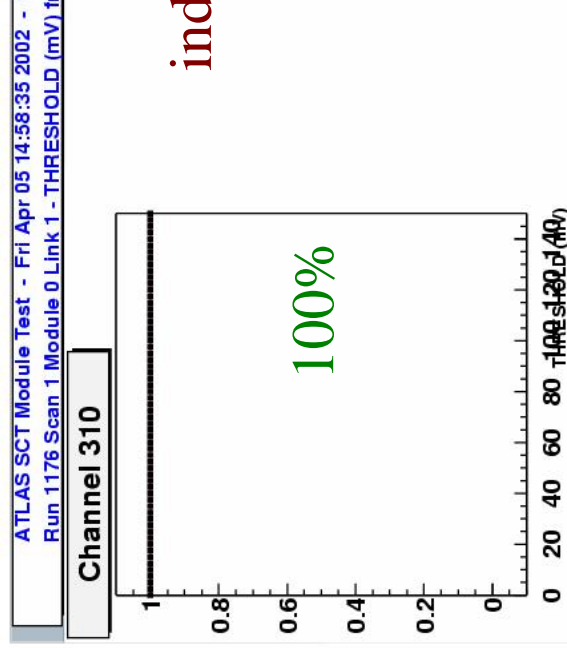


~12%

~12%



kb-103



independent of masking!

ABCD

Digital Pipeline w/ 132 cells
one stuck cell 1/12 ~ 8%
(12 x 12 multiplexed FIFO)
=> K5-301

Derandomisation Buffer w/ 8x3 cells
one stuck cell 1/8 ~ 12%
=> KB-B048?
(X1X compression -> middle bit)

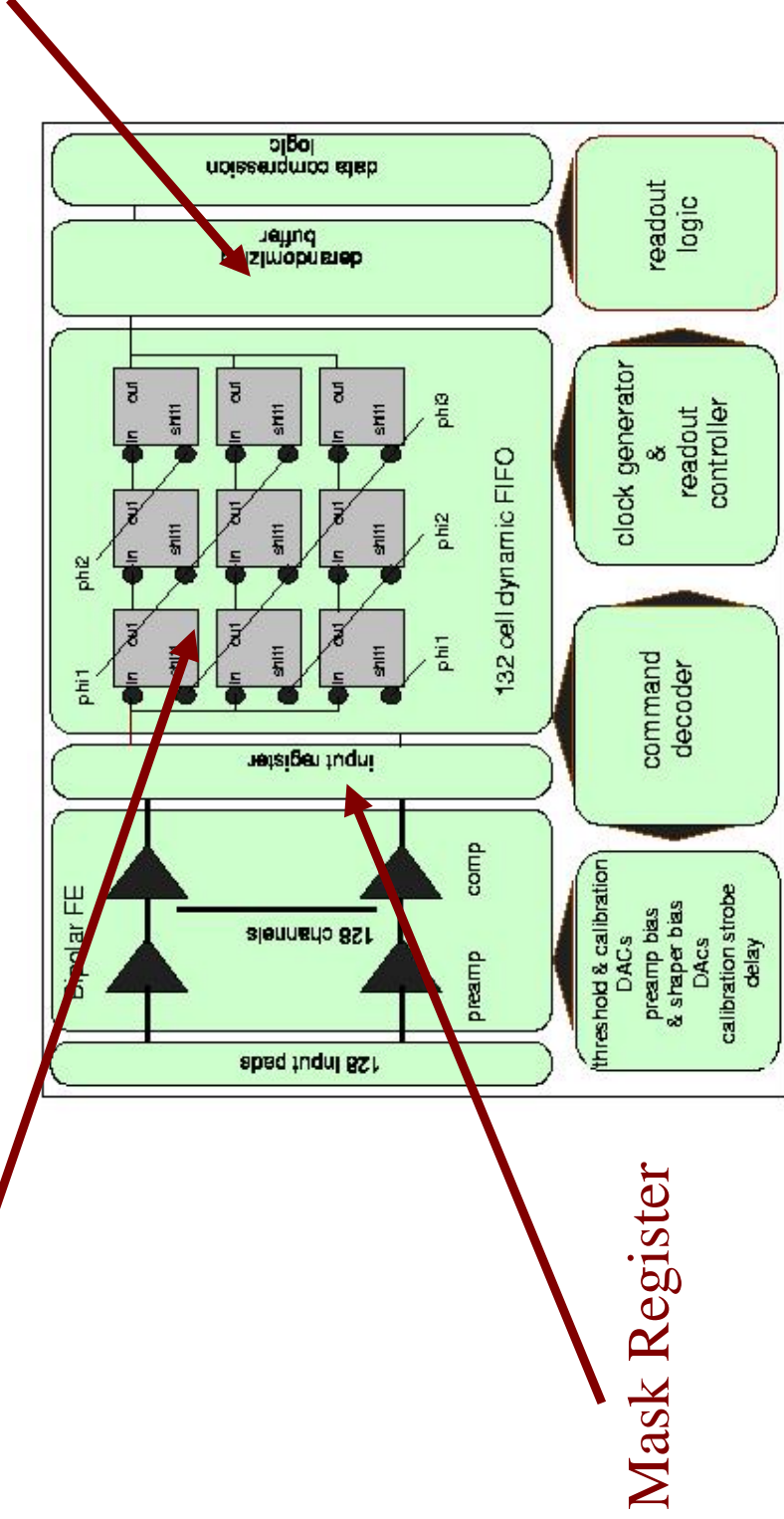


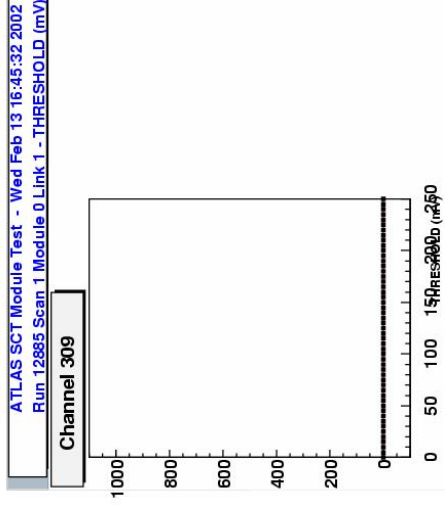
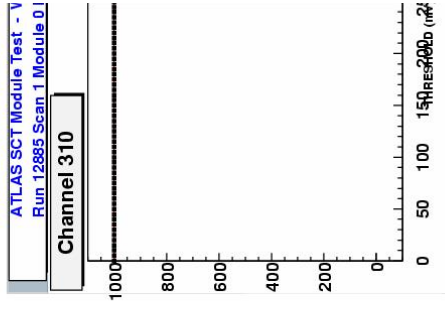
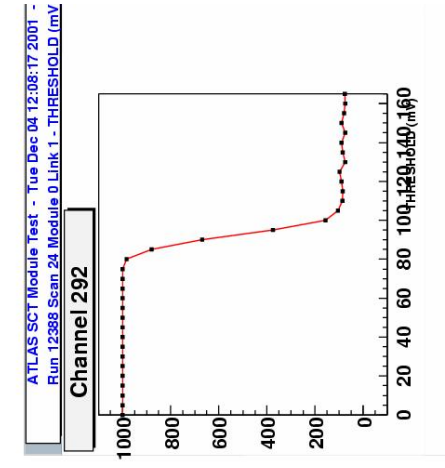
Figure 3.1. Block diagram of the ABCD chip.

kb-103: 0%/100% twin cells ????

Time Dependence

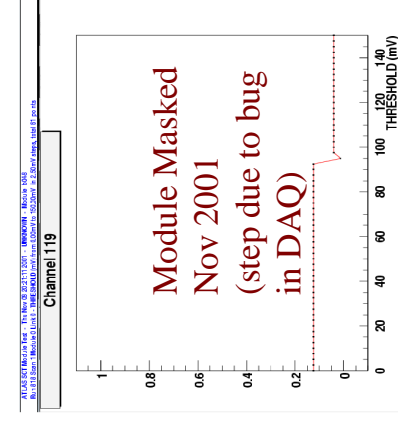
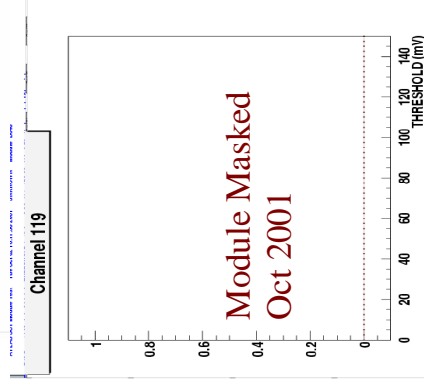
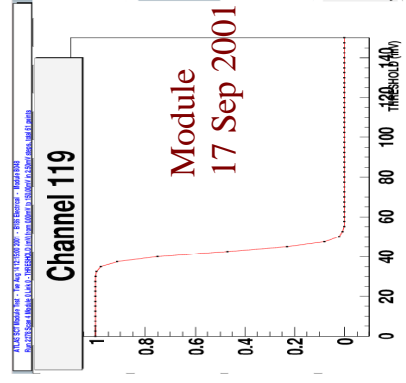
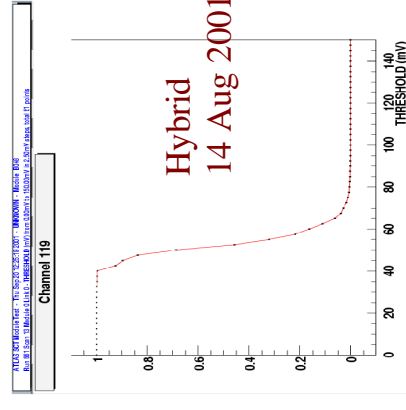
kb-103:

K5-301:



K5-301 and kb-103 defects already seen on hybrid

KB-B048:



KB-B048 defect established to be time dependent!

Details see <http://dpnc.unige.ch/atlas/atlaspage/module/forward/b048/b048.htm>
 k5_301/k5_301.htm
 kb_103/kb_103.htm

Site180

file Screens Coordinates

v-7.5 SCIPP-Z38850-W06-D20010724 784

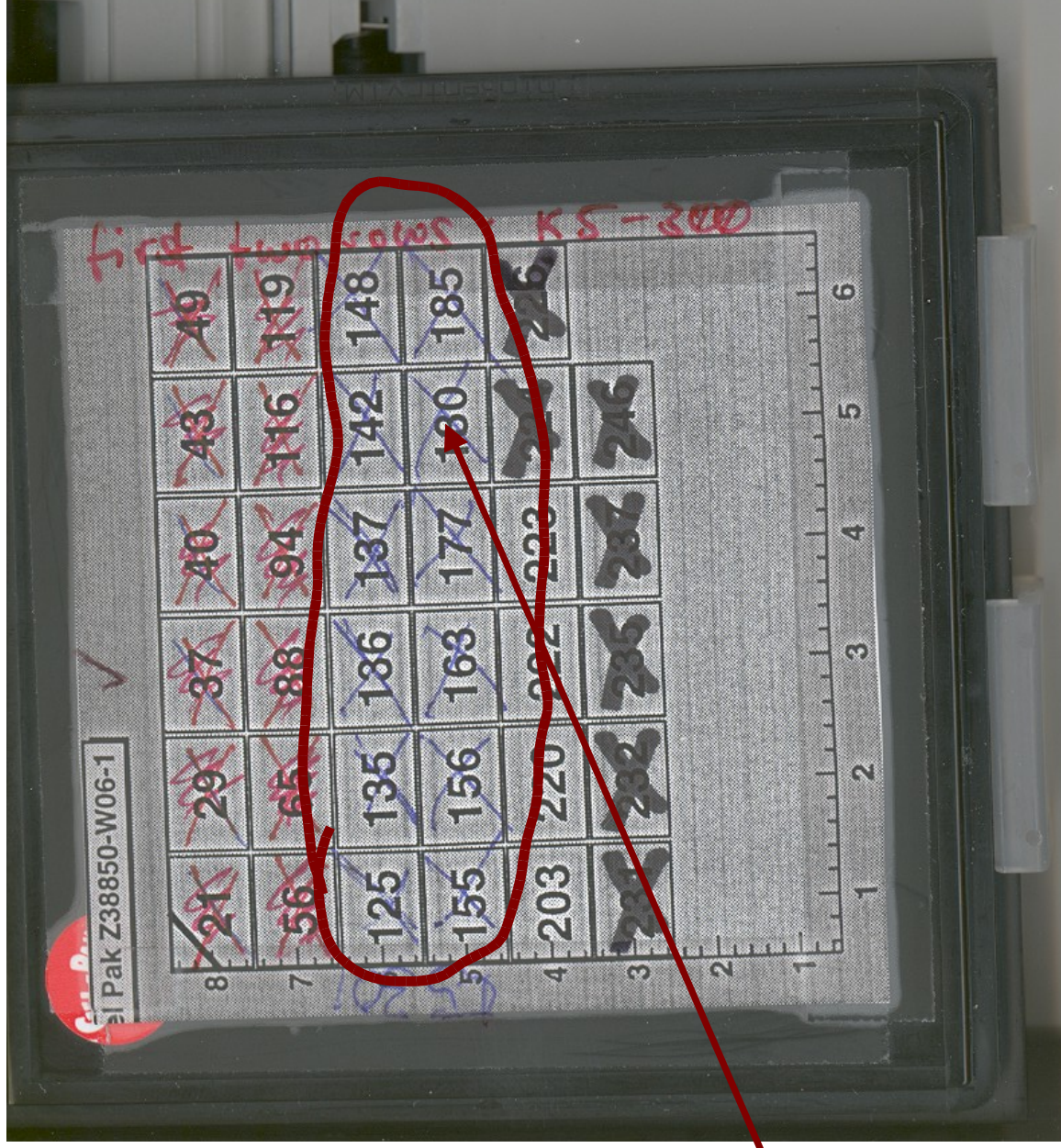
Chips	Perfect	1 Bad	2 Bad	Total	Dig. OK
256	35(13.6%)	51(19.9%)	31(12.1%)	117(45.7%)	143(55.8%)

21	29	37	40	43	49
56	65	88	94	116	119
125	135	136	137	142	148
155	156	163	177	185	203
220	222	223	224	226	227
231	232	235	237	246	

Gel Pak 1 of 1

Gain
Noise
Number Dead

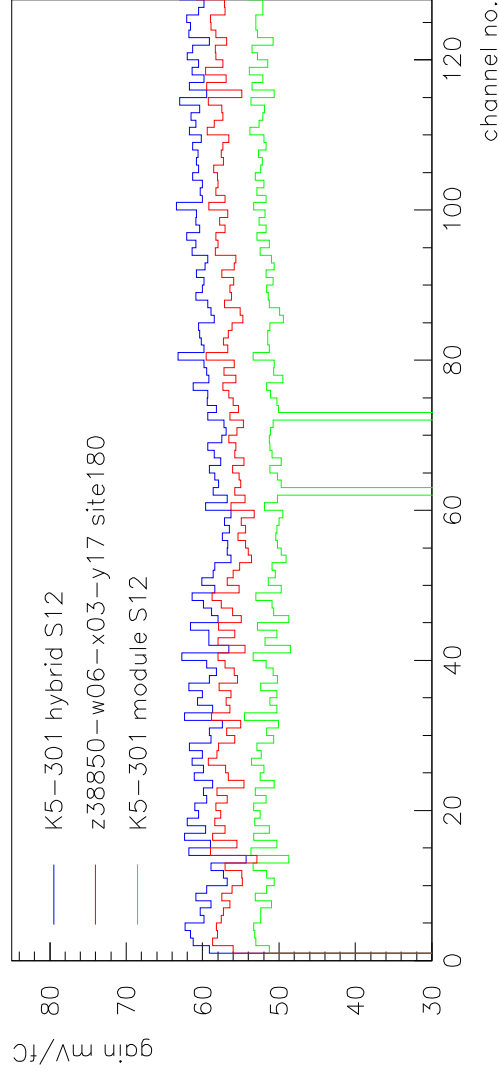
Unsigned Java Applet Window



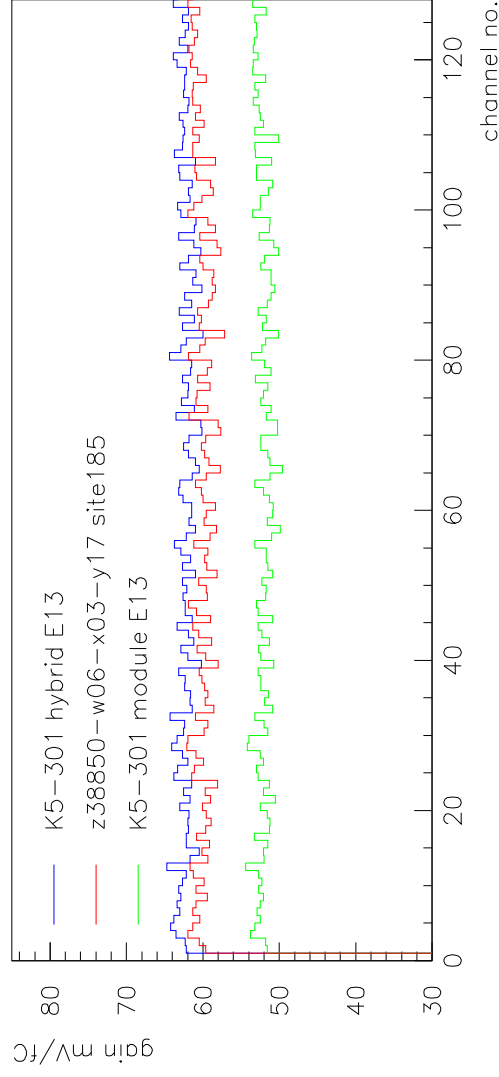
● Site 180 not in database
but on Gel Pack (S10)

● 227 missing instead on
Gel Pack

Site180 (cont'd)



• **S12 is Site 180**



• **E13 is Site 185**

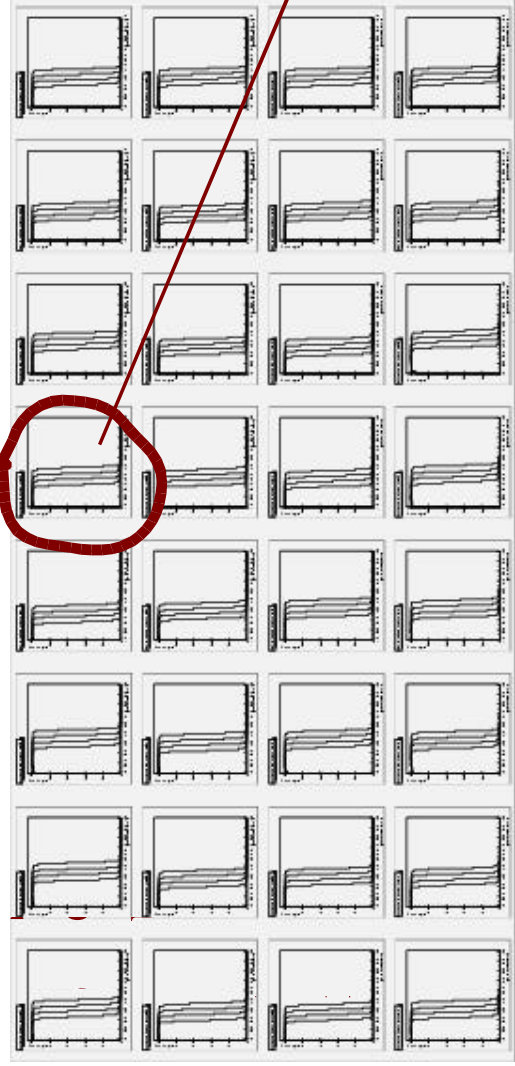
→ **SCIPP consistent**

(no labeling error)

→ **CERN and SCIPP software versions disagree**

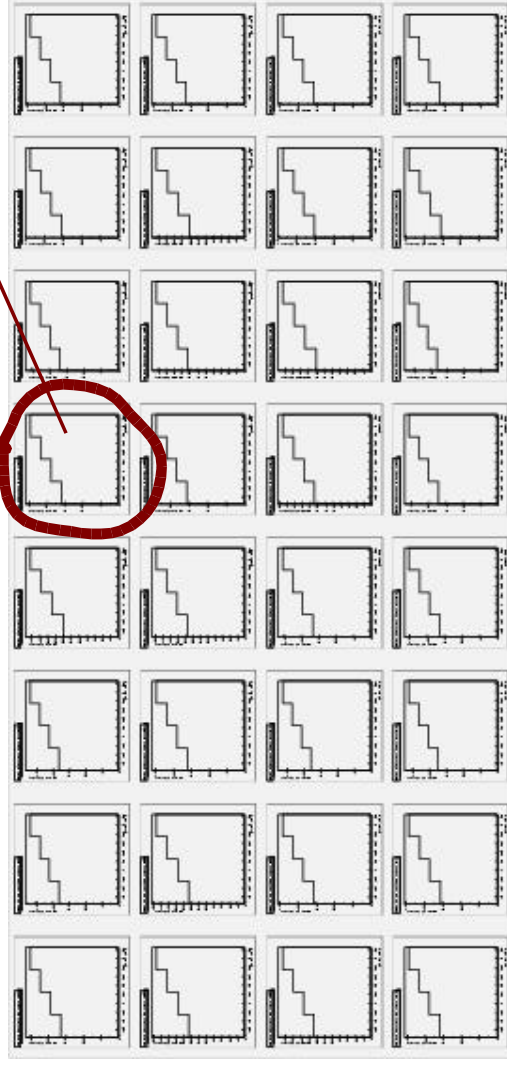
S-Curves from WaferTest Z38850-W06-D20010724 Site 163

Scurves @ 2.5, 3.0,3.5,4.0 fC



Ch36 looks OK

Vt50 @ 2.5, 3.0,3.5,4.0 fC



All other 11 chips
also checked and no
deviation observed

Z38850-W08-D20010730 Site 119
(kb_103) same result

Impact on DAQ:

Back of the envelope and possibly wrong

Assume 17 bits/hit. Neglect overhead (data headers etc.)

- **PHYSICS SIGNAL:**

TDR quotes 1% signal occupancy on a module @ full lumi

$$\sim 15 \text{ hits/L1/2 links} * 17 \text{ bits/hit} * 100 \text{ kHz} = 12.8 \text{ Mbits/sec/link}$$

- **NOISE:**

$$\text{NO of few} * 10^{-4}$$

$$\sim 0.15 \text{ hits/L1/2 links} * 17 \text{ bits/hit} * 100 \text{ kHz} = 128 \text{ kbits/sec/link}$$

- **A STUCK PIPELINE:**

$$0.08 \text{ hits/L1/1 link} * 17 \text{ bits/hit} * 100 \text{ kHz} = 136 \text{ kbits/sec/link}$$

- **A STUCK CHANNEL**

$$1.0 \text{ hits/L1/1 link} * 17 \text{ bits/hit} * 100 \text{ kHz} = 1.7 \text{ Mbits/sec/link}$$

→ A stuck pipeline increases the bandwidth budget due to noise by 100%

→ A stuck channel increases the signal bandwidth by 13%

→ Deadtime ?

Impact on Pattern Recognition

Stephen Haywood : (private communication)

a) Noise

" ...PR is little affected until noise exceeds 0.2%"
cf. Indet -No-085 figures 112/113

b) Inefficiencies

" ... one would not wish to degrade module efficiency by more than a few percent .."
cf. Indet-No-085 figure 111

Summary

- 3 out of 11 modules have a chip with one non-maskable channel
 - one stuck pipeline (8% K5–301)
 - one possible stuck derandomisation buffer (~12% KB–B048)
 - one of unknown origin (0%/100% kb–103)
- One channel (on KB–B048) exhibited time-dependence
- The other two were already bad on the hybrid level; they have been flagged as perfect in the wafer test database.
- SCTDAQ flagged these channels in most cases (PipelineTest)

Some Questions:

Cause of non-maskable channels on modules:

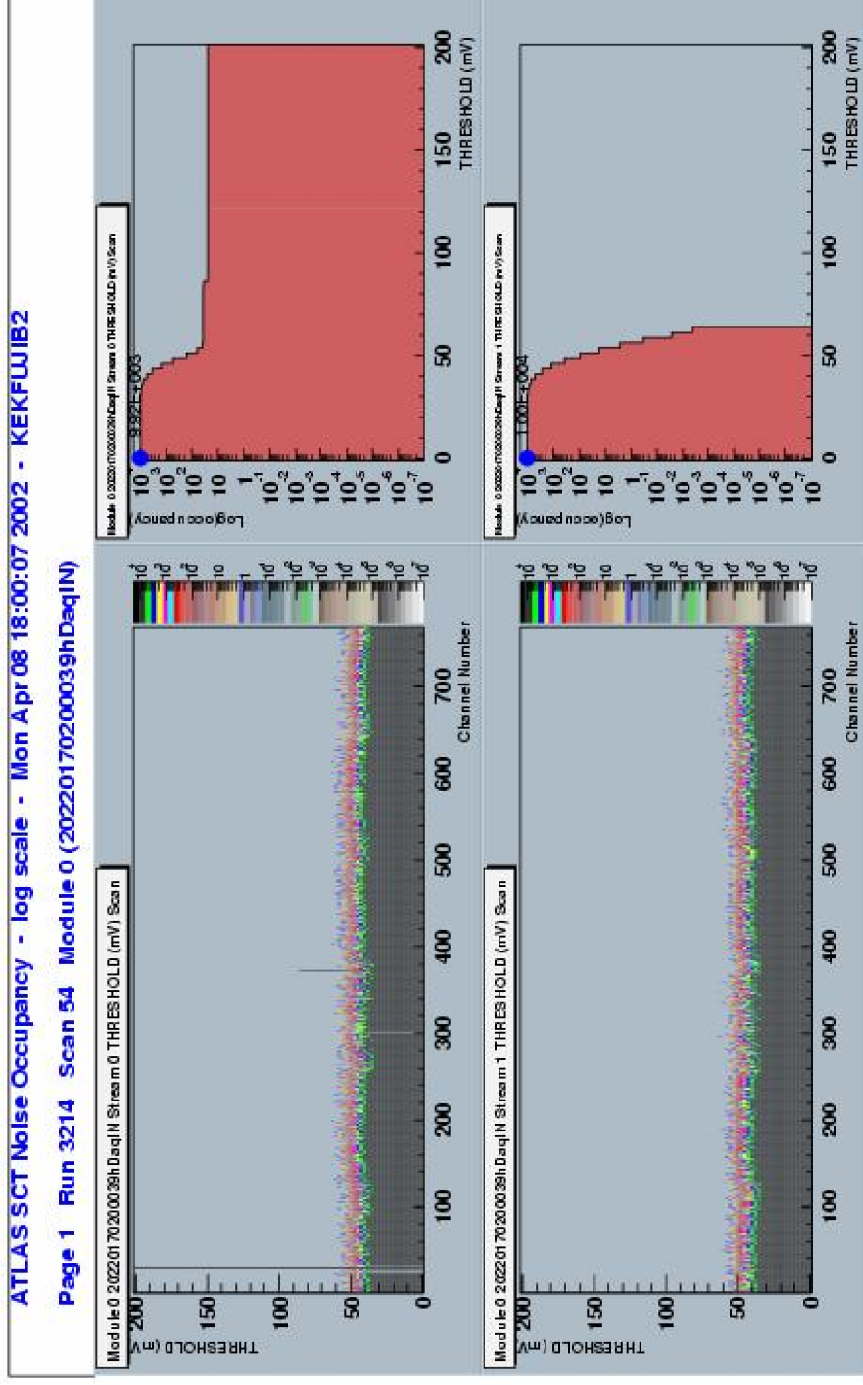
- ◆ Problem in the Wafer Testing ? S-Curves might help ...
- ◆ Design ?
- ◆ Infant Mortality → Burn-in Procedure ?
- ◆ ...

Can we live with chips with non-maskable channels ?

- ◆ DAQ
- ◆ PR
- ◆ Overhead (Database)
- ◆ Module Efficiency
- ◆

Barrelhybrid B39

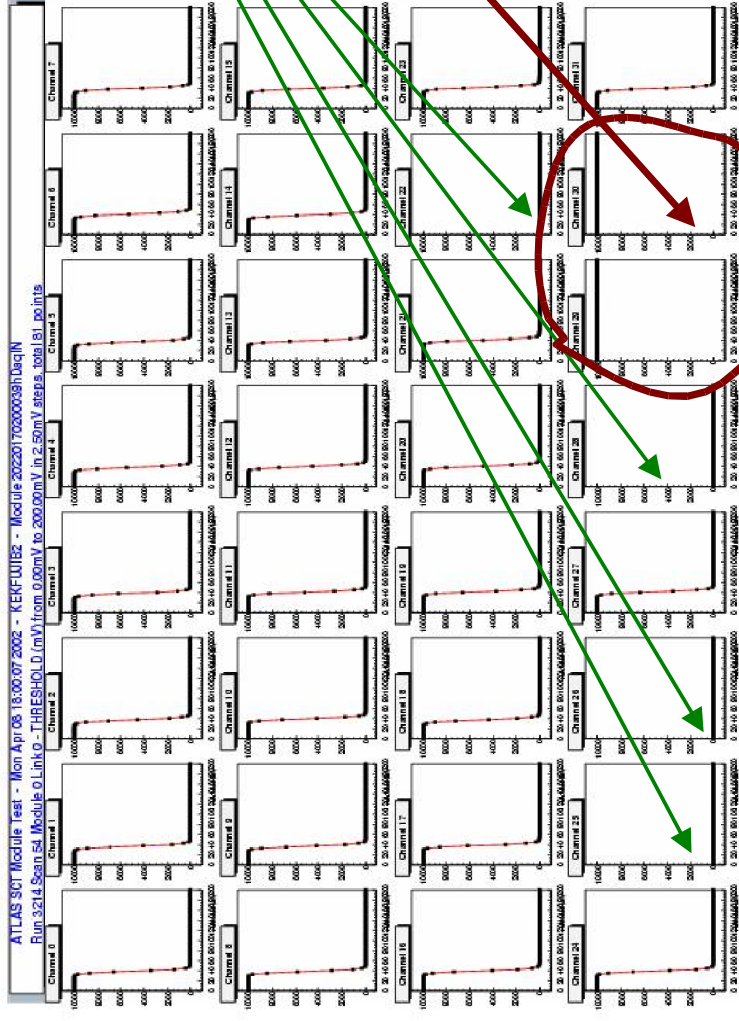
NoiseOccupancy



Data courtesy Nobu Unno

Barrelhybrid B39

Hybrid:



22,25,26,28,32
masked 'noisy'

29,30 masked
'untrimmable'

=> similar to kb-103

Data courtesy Nobu Unno

WaferTest S-Curves:

... no problem seen...

