

Tony's Macro for TIB Long Term test

Riccardo Ranieri

INFN and Università di Firenze

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Outline

- Some changes on ARCS root macro **arcs_macro_6_1.cc** to run with Long Term test root files
 - aka "Tony's Macro"
 - see also Patrick Gartung's December talk
 - » <http://hep.fi.infn.it/CMS/moduletest/tkwdic03/gartung-ltarcs-dec2003.pdf>
- Definition of the **optimal set of cuts** to identify bad channels (for **TIB** Module Test)
 - TIB3ib2 modules
 - layer 3, 6" single sensor, 61x117mm²
 - 4 APVs, 120 μm strip pitch
 - where to download:
<http://hep.fi.infn.it/CMS/marchett>



Bad channels in ARCS

- The definition of bad channels from ARCS root output files is given in the official document (Torino'03 Task Force)
 - Module Test procedures (using ARC Systems)
 - Version 1.4 October 23, 2003
 - » http://hep.fi.infn.it/CMS/moduletest/tkwoct03/test_procedures.pdf
- Two kinds of cuts applied:
 1. "Absolute" cuts:
 - NoiseCuts
 - PeakTimeCuts
 - [PinholeCuts]
 2. "Percentage" cuts:
 - PulseHeightCuts
 - PedestalCuts
 - GainCuts

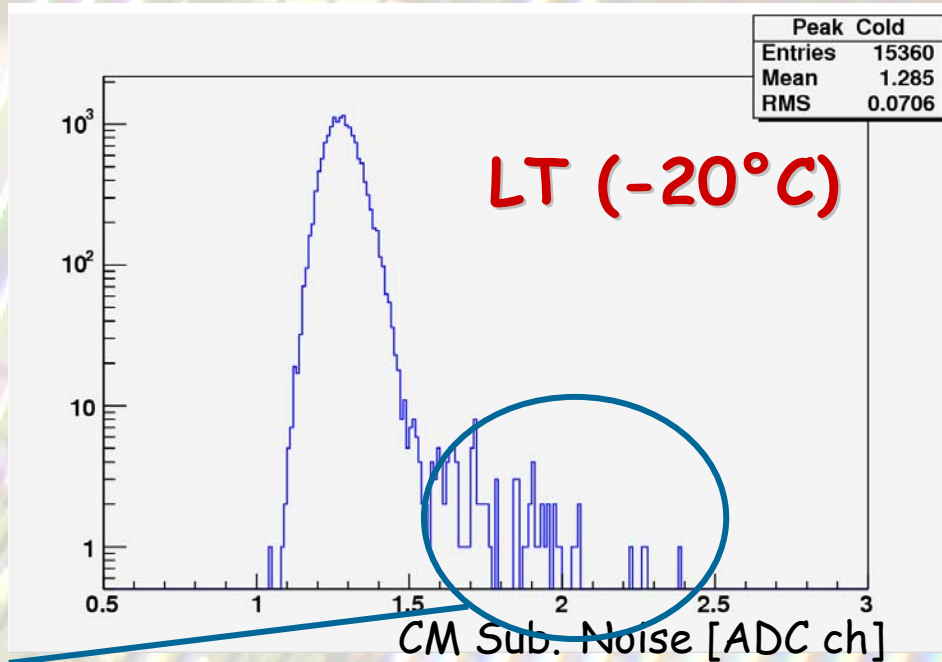
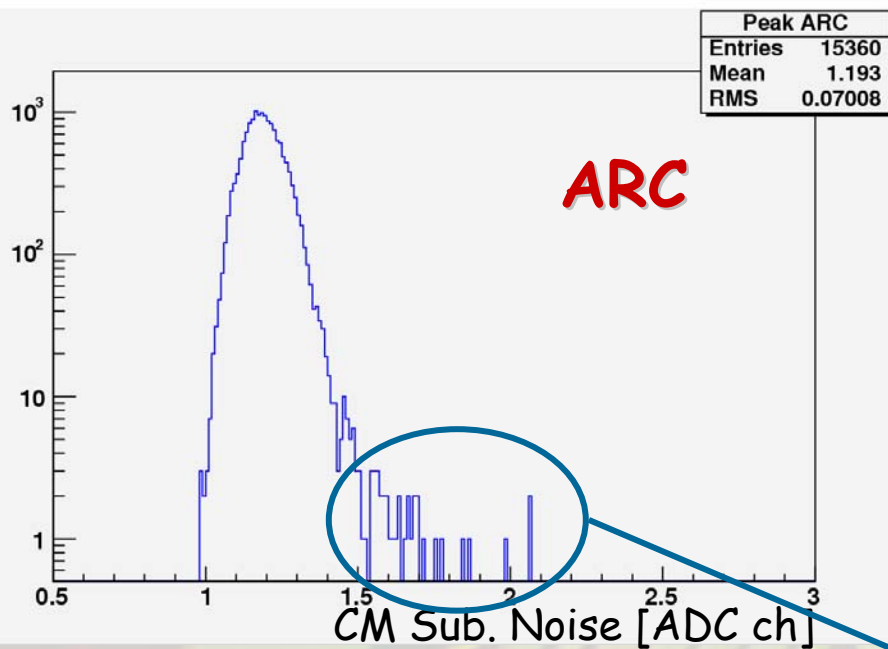


These cuts have to be "translated" to use Tony's macro with Long Term



Noise cuts

- Comparison of the noise distribution between ARCS and LT (Peak and Deconvolution, InvOn+InvOff)
 - sample: 15 modules fully tested (statistics is enough)
 - 15 modules x 512 strips/module x 2 entries/strip = 15360 entries



mostly border chip strips



Average Noise

- Average Common Mode subtracted noise (in ADC channels)
 - center of ARC and LT Noise distributions
- useful to define a renormalization of extensively tested ARC noise cuts to be used for Long Term

Avg Noise [ADC ch]	ARC	LT (+20°C)	LT (-20°C)
Peak	1.19±0.07	1.31±0.07	1.29±0.07
Dec	1.67±0.11	1.84±0.13	1.99±0.12



Noise cuts renormalization

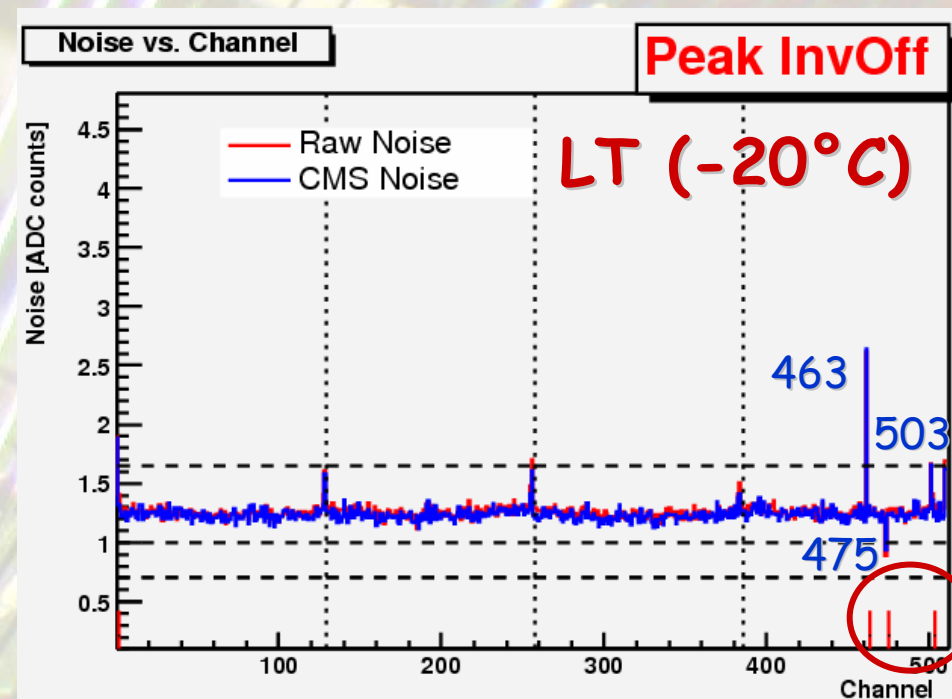
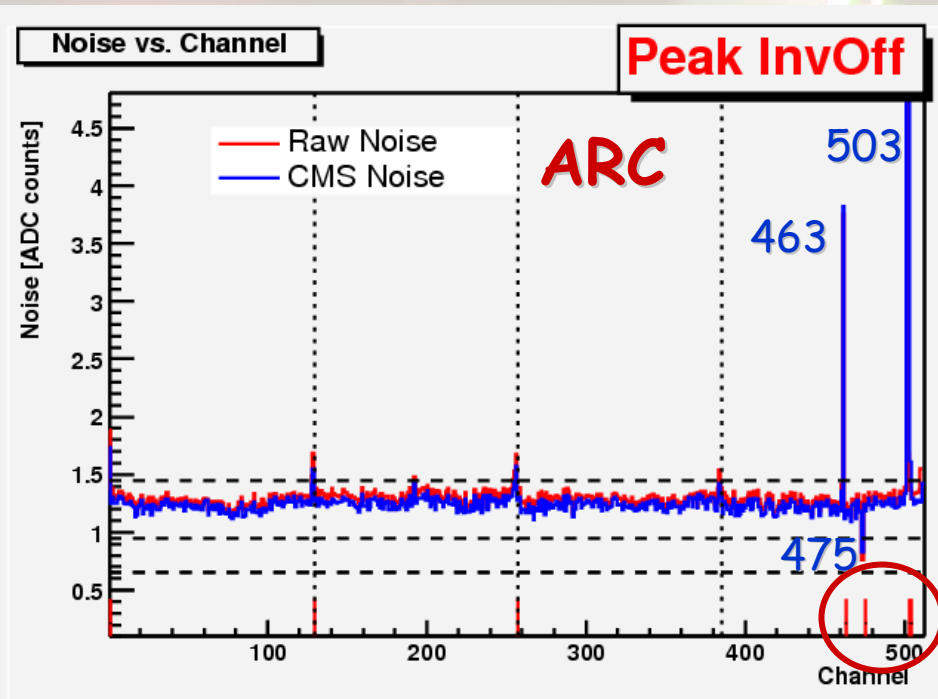
- The same cuts can be applied to both warm and cold LT runs
 - based on the ratio between average value of the Common Mode subtracted noise between ARC and Long Term test

CM Sub. Noise [ADC ch]	Peak		Deconvolution	
	ARC	LT	ARC	LT
Pinhole	<0.65	<0.70	<1.00	<1.15
Open	0.65÷0.95	0.70÷1.00	1.00÷1.30	1.15÷1.40
Healthy	0.95÷1.45	1.00÷1.65	1.30÷2.00	1.40÷2.45
Noisy	>1.45	>1.65	>2.00	>2.45



Noise Test: an example

- A module with some problems...
 - 463 noisy both ARC and LT (high current, fails I_{strip})
 - 475 open both ARC and LT (pinhole, fails I_{diel})
 - 503 noisy both ARC and LT

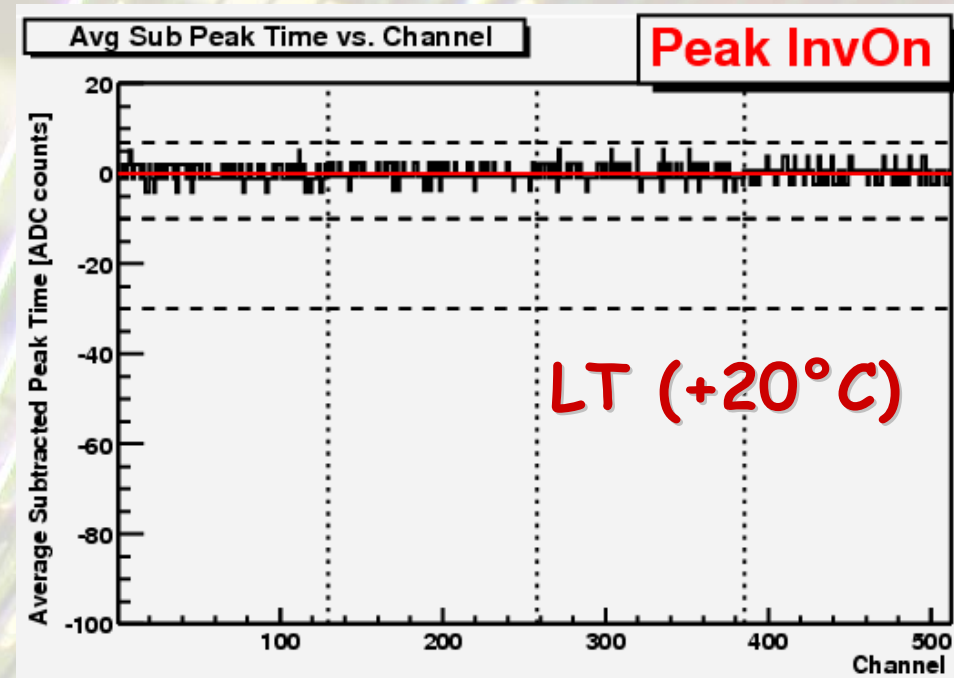
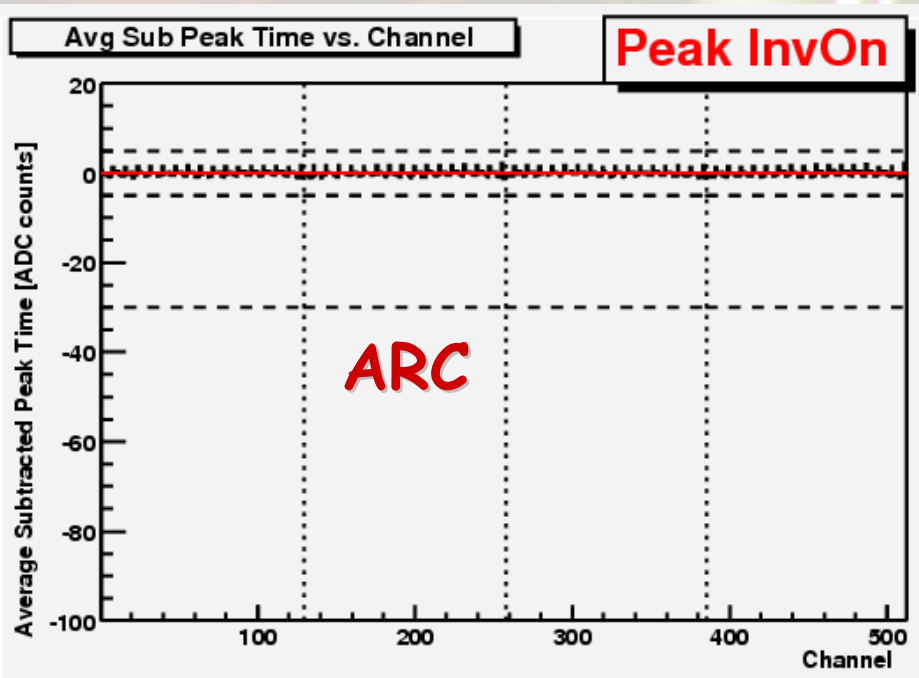


Mod.30200020033035



Peak Time

- ARCS: average subtracted Peak Time is used for bad channel flagging
 - $(\text{channel Peak Time}) - (\text{chip mean Peak Time})$



Mod.30200020035080



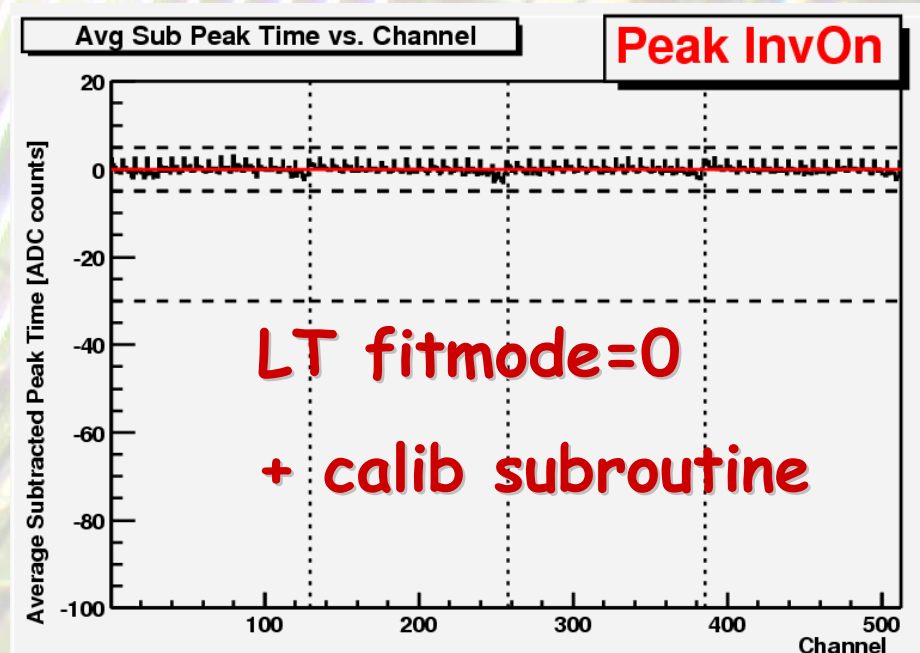
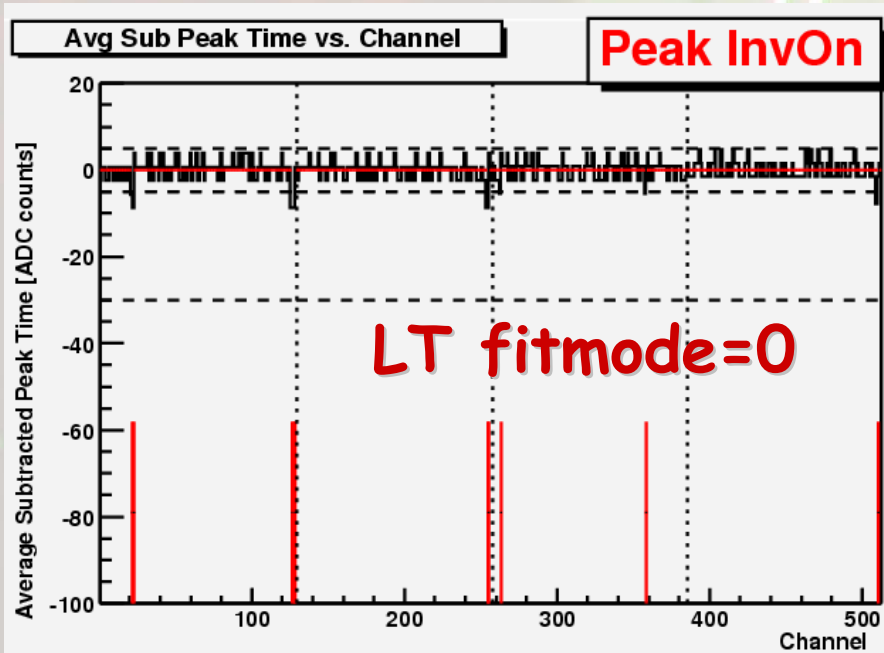
LT Calibration algorithms

- Three different fit algorithms can be used during Long Term test to calculate Pulse Height and Rise Time
- **fitmode** tag in **CalProfRunDescriptor** (settings.xml file)
 - **fitmode = 0 (default)**
 - Pulse Height = max. height bin
 - Rise Time = max. height bin center (3ns bin width)
 - **fitmode = 1**
 - quick Gaussian fit (max. height bin \pm 5)
 - **fitmode = 2**
 - ARCS algorithm, fit with two different functions
 - » Peak Mode fit range: {PeakTime -40ns÷PeakTime+100ns}
 - » Deconvolution Mode fit range: {Peak Time \pm 20ns}



Peak Time patch

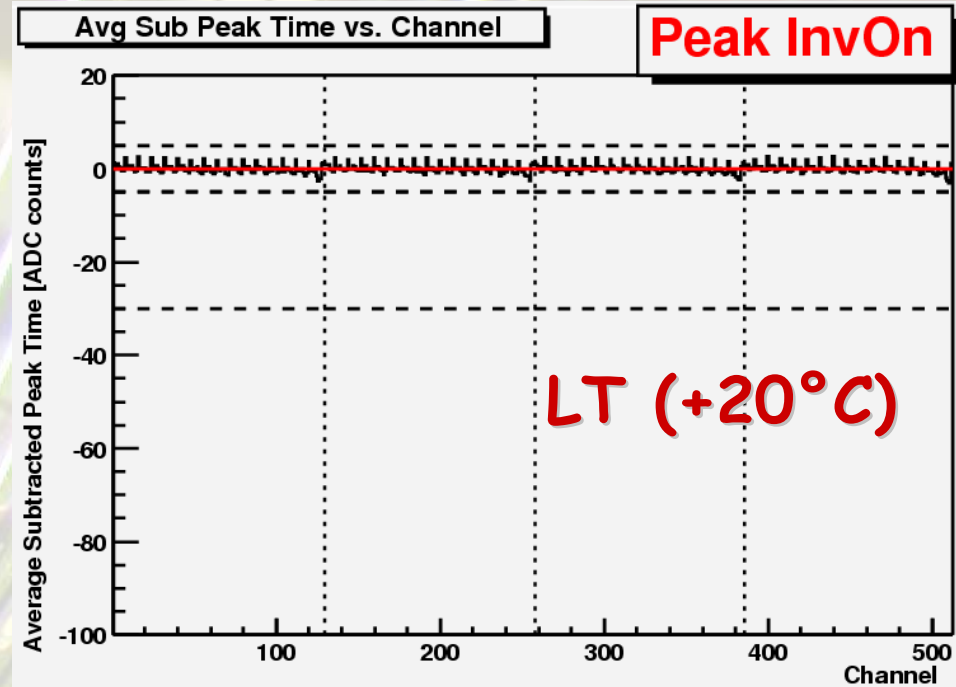
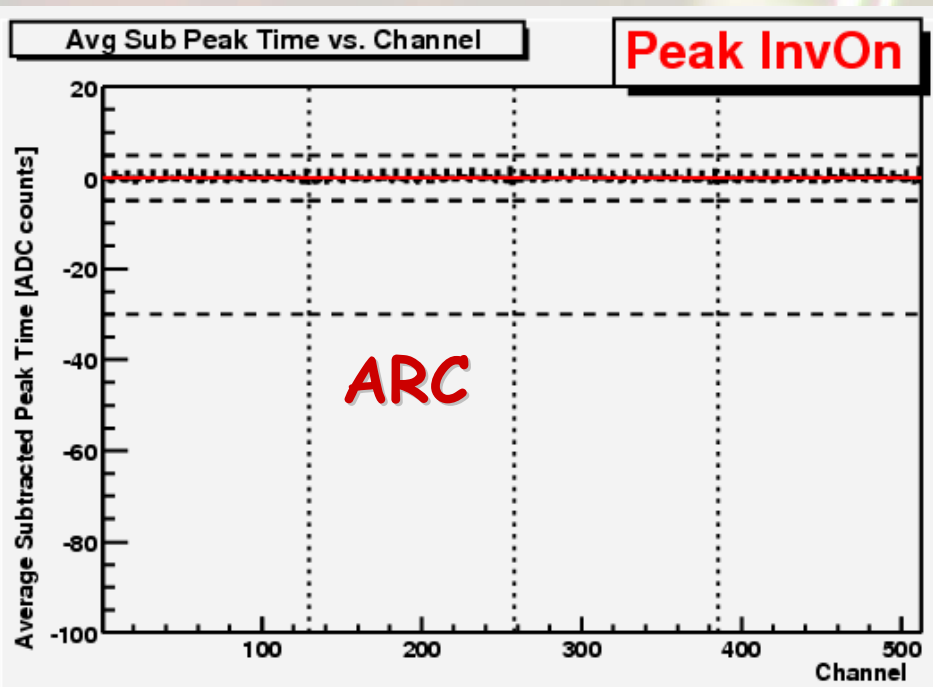
- TIB community has used (up to now) the default algorithm (fitmode=0)
 - only "discrete" values in steps of 3ns
- I have added a subroutine calib to recalculate peak time
 - quick Gaussian fit
 - fluctuations are reduced, same ARC cuts for LT





Peak Time with LT

- From now on we will use ARC routine to calculate Pulse Height and Rise Time during LT
 - fitmode = 2 in **CalProfRunDescriptor** (settings.xml file)



Mod.30200020035080



Peak Time cuts

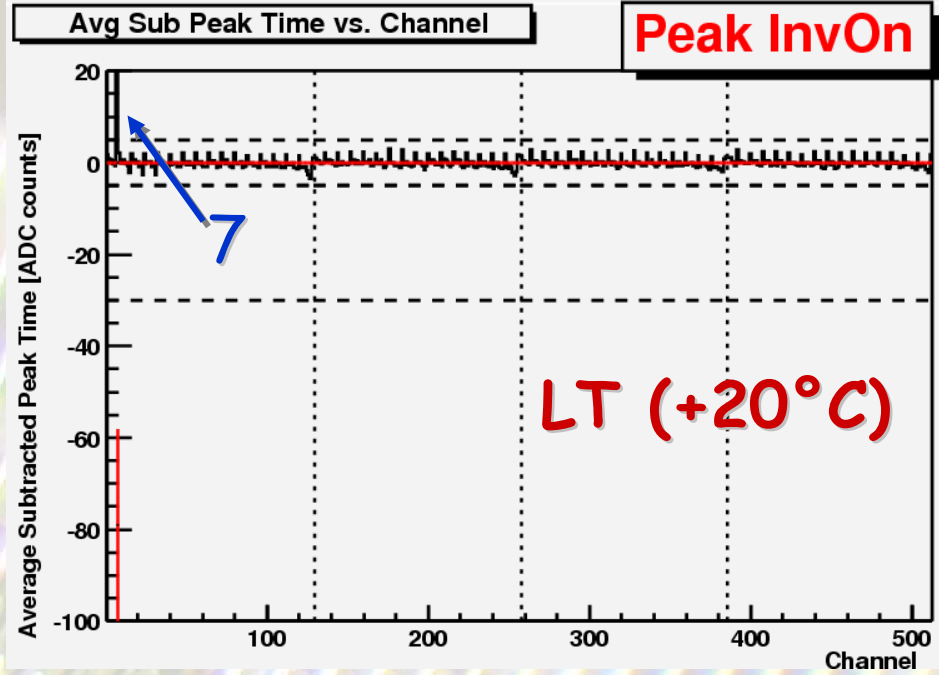
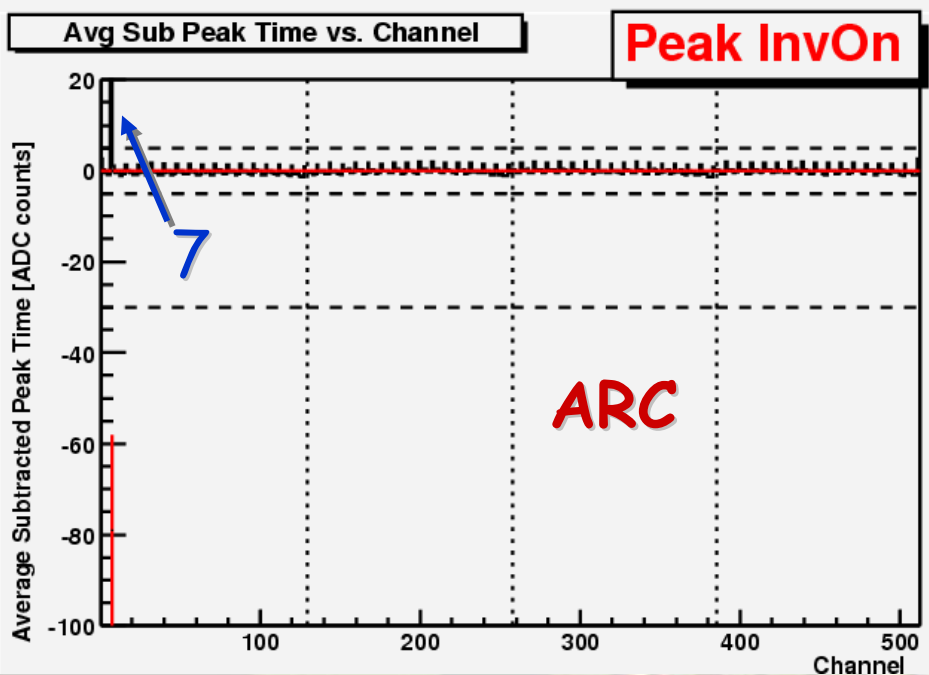
- No need to change PeakTimeCuts
 - caveat: using my calib patch a small number of channels can be flagged as bad

Avg. Sub. Peak Time [ns]	Peak		Deconvolution	
	ARC	LT	ARC	LT
Pinhole	<-30	<-30	<-30	<-30
Open	-30÷-5	-30÷-5	-30÷-3	-30÷-3
Healthy	-5÷+5	-5÷+5	-3÷+5	-3÷+5
Noisy	>+5	>+5	>+5	>+5



Peak Time Test: an example

- A module with a suspicious channel
 - bad channel flag on strip 7



Mod.30200020033059



Pulse Height cuts

- "Percentage" cuts, same thresholds can be applied for both ARC and LT
 - chip normalised Pulse Peak
 - (channel Pulse Peak)/(chip mean Pulse Peak)

Chip norm. Pulse Peak [ADC ch]	Peak		Deconvolution	
	ARC	LT	ARC	LT
Low	$<(1-0.15)$	$<(1-0.15)$	$<(1-0.20)$	$<(1-0.20)$
Healthy	$0.85\div 1.15$	$0.85\div 1.15$	$0.80\div 1.20$	$0.80\div 1.20$
High	$>(1+0.15)$	$>(1+0.15)$	$>(1+0.20)$	$>(1+0.20)$



Bad Channel list



ARC

Chan#	Peak Off	Peak On	Dec Off	Dec On
256			NOIS	NOIS
257	NOIS		NOIS	NOIS

LT (+20°C)

Chan#	Peak Off	Peak On	Dec Off	Dec On
257	NOIS	NOIS		

LT (-20°C)

Chan#	Peak Off	Peak On	Dec Off	Dec On
257	NOIS	NOIS		
385		NOIS		

LT (+20°C)

Chan#	Peak Off	Peak On	Dec Off	Dec On
129		NOIS		
257	NOIS	NOIS		

- A "good" module
- ARC and LT test analysis in agreement using the proposed set of cuts
 - only border chips channels fluctuations

Mod.30200020035082

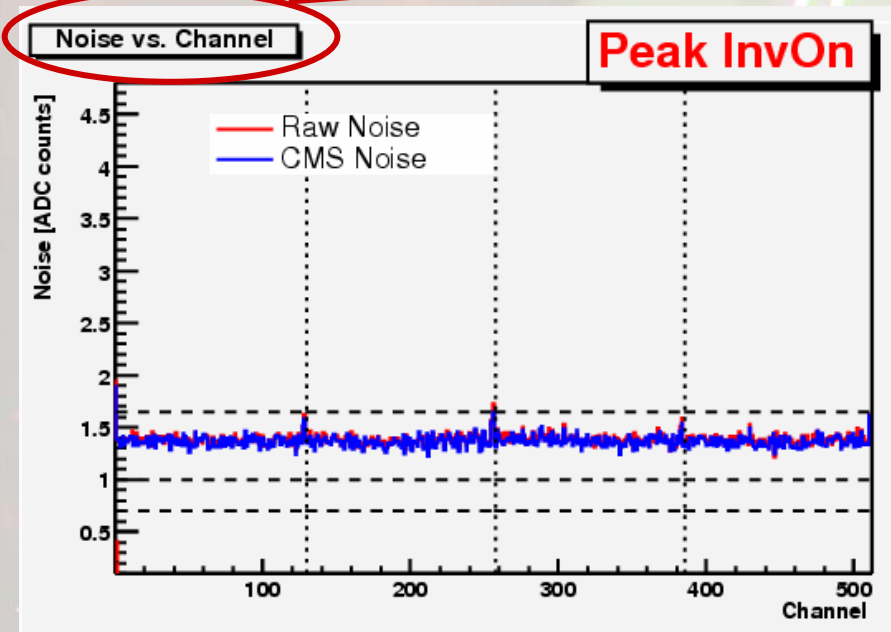


Minor changes

- Logfiles
 - LT sw version
 - LT box temperature
- Labels and titles
 - same for ARCS and LT

```
Bad_channel_list_reslt_M_30200020035080_Rec2_null.dat - WordPad
File Edit View Insert Format Help
[Icons]
Bad Channel Summary for module 30200020035080; Record 2
configFile: LT_TIB.dat
Date: 2004-02-03 13:11:38
TestCenter: Firenze
Version: lt_1_22
Operator: macchiavani
Temperature: -16.0559 C

Chan# Peak Off Peak On Dec Off Dec On
257 NOIS NOIS NOIS
```



- ARCS:
 - rrARCS.cc
 - ARCS_TIB.dat
- Long Term:
 - rrLT.cc
 - LT_TIB.dat



Conclusion

- I have modified Tony's Macro to be used in **TIB** Long Term test
 - P.Gartung did it for TOB in December
- Now we can use it to analyse LT results
 - set of cuts valid both for warm and cold runs
 - ARC and LT results agree
 - fitmode = 2 in **CalProfRunDescriptor** (LT settings.xml file)
 - root macros and configuration files can be downloaded from Module Test Procedures page
<http://hep.fi.infn.it/CMS/marchett>
 - under Windows macros are tested with Root version 3.05.02

«automatic analysis can not completely substitute physicist's analysis (histograms should be checked if too many bad channels are flagged)»