BCM1F time resolution and HV scan with ADC

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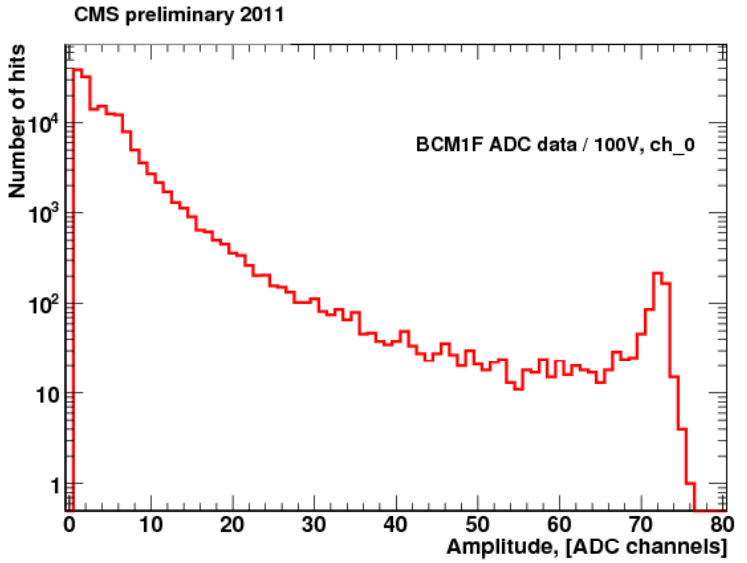
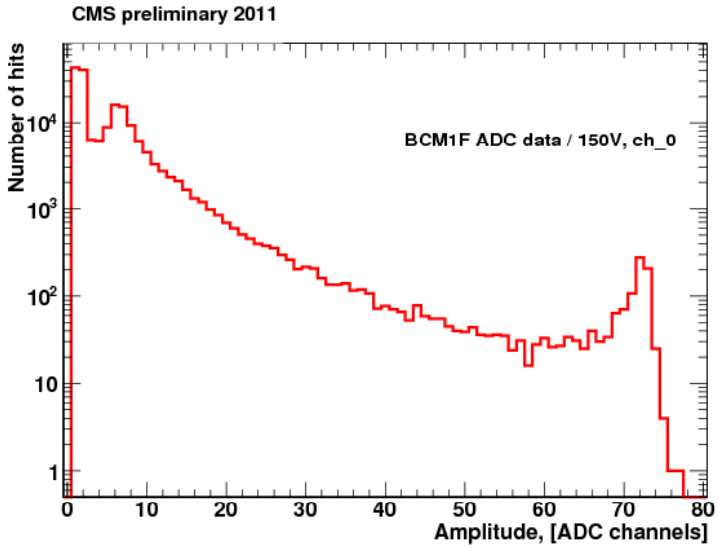
DESY

HV scan

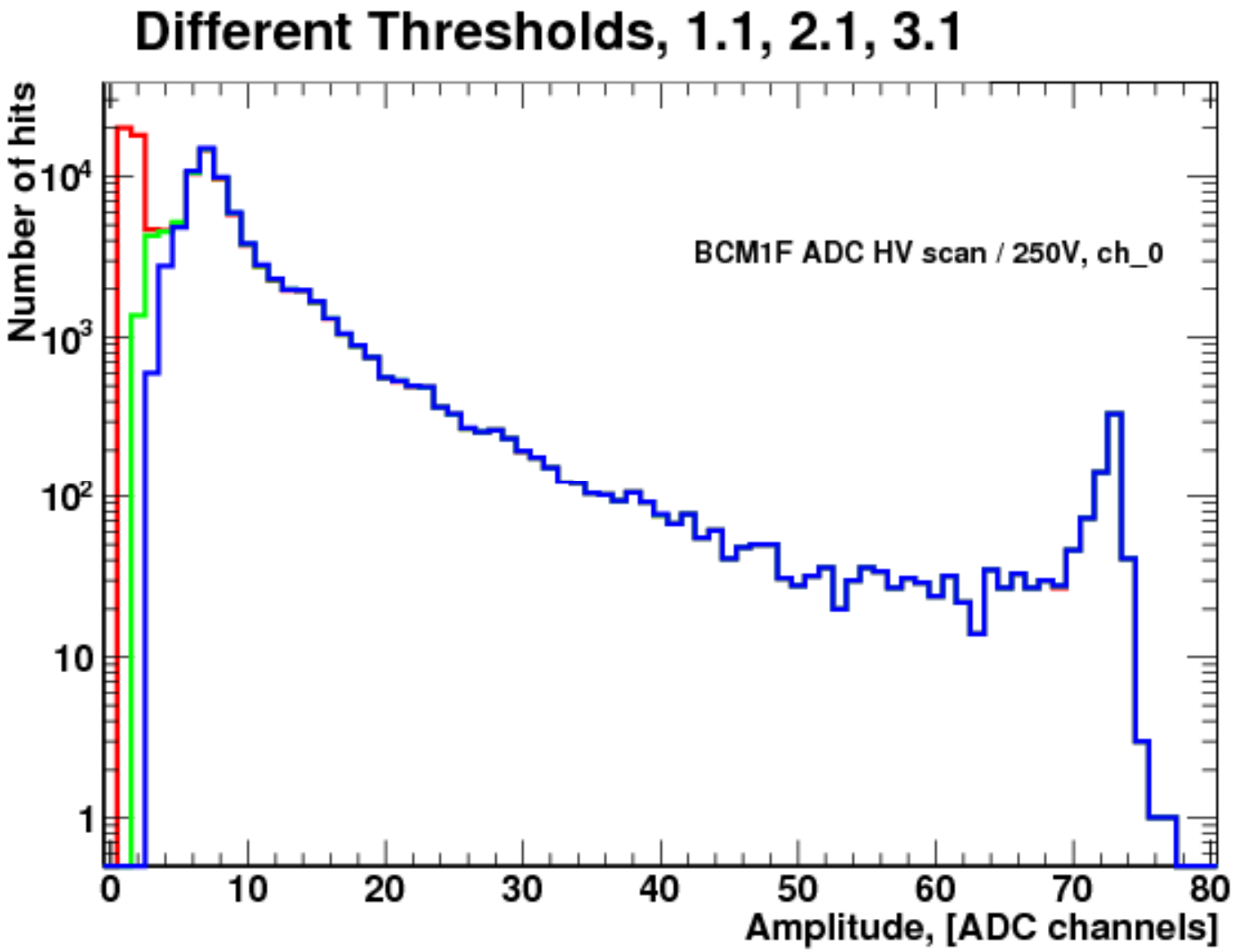
- It is known, that signal from BCM1F voltage dependent
- For investigation HV dependence for amplitude spectra test measurements with 100, 150, 200, 250 V for all channels of BCM1F were done with ADC
- Peak Finder algorithm in respect to baseline was applied for full orbit measurements
- Thresholds are taken 1.1 ADC counts
- Increasing HV from 100V to 150V showed better amplitude spectra MIP peak separation from pedestal

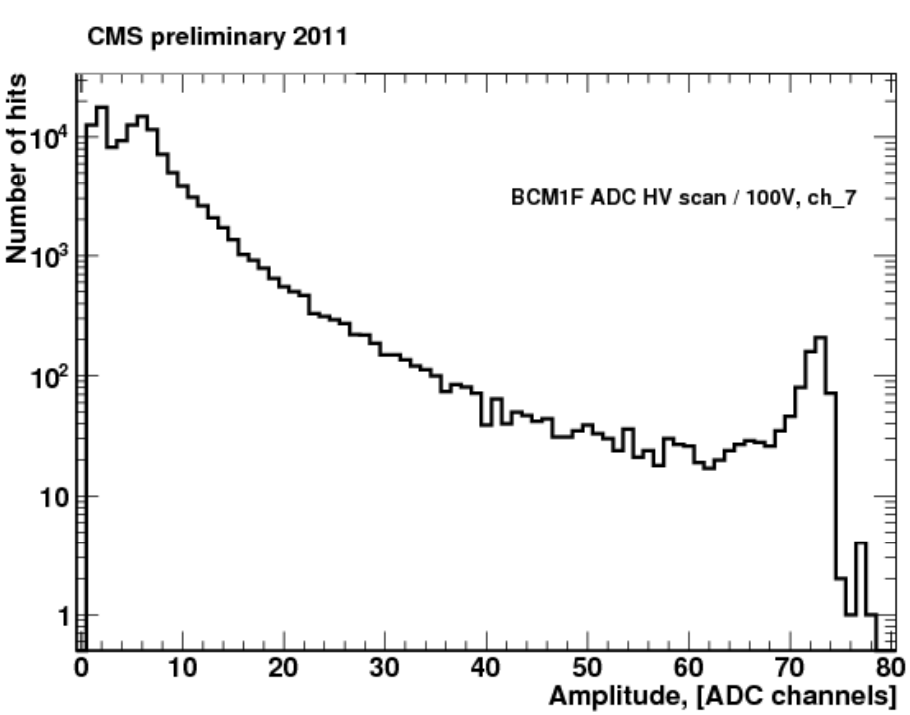


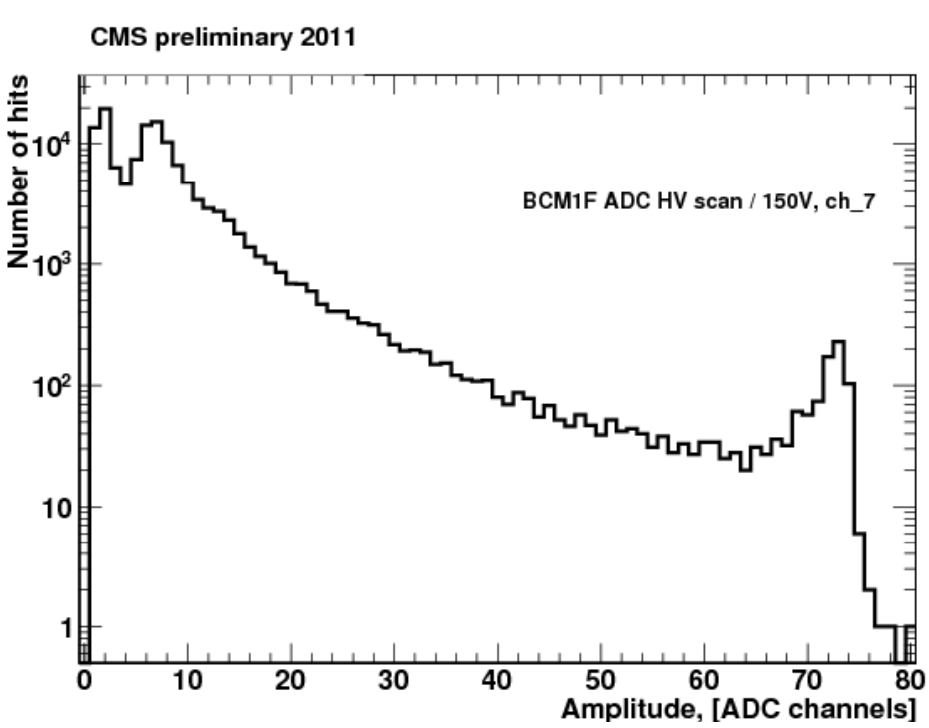


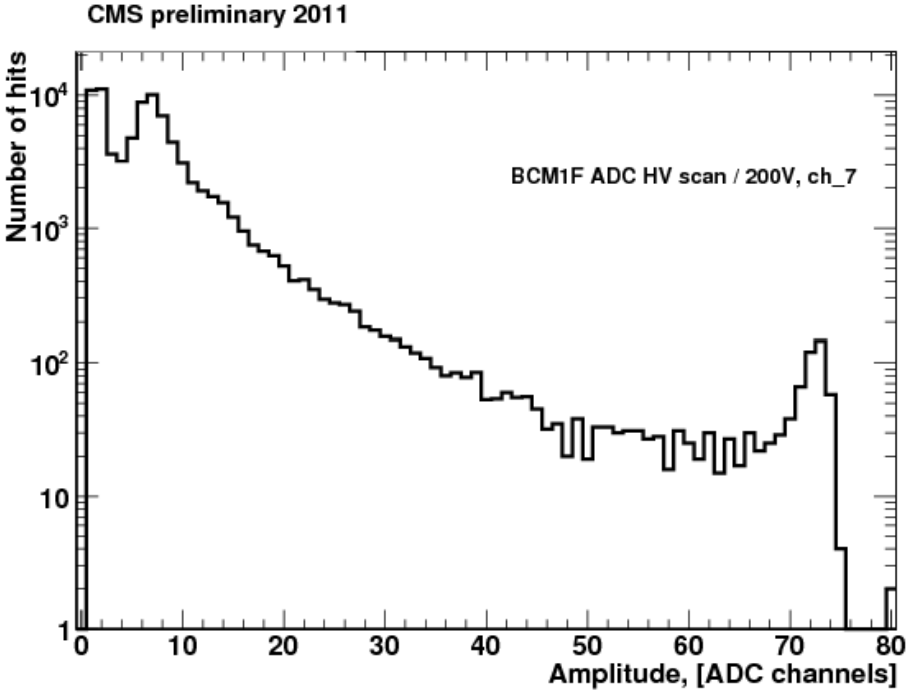
Thresholds check

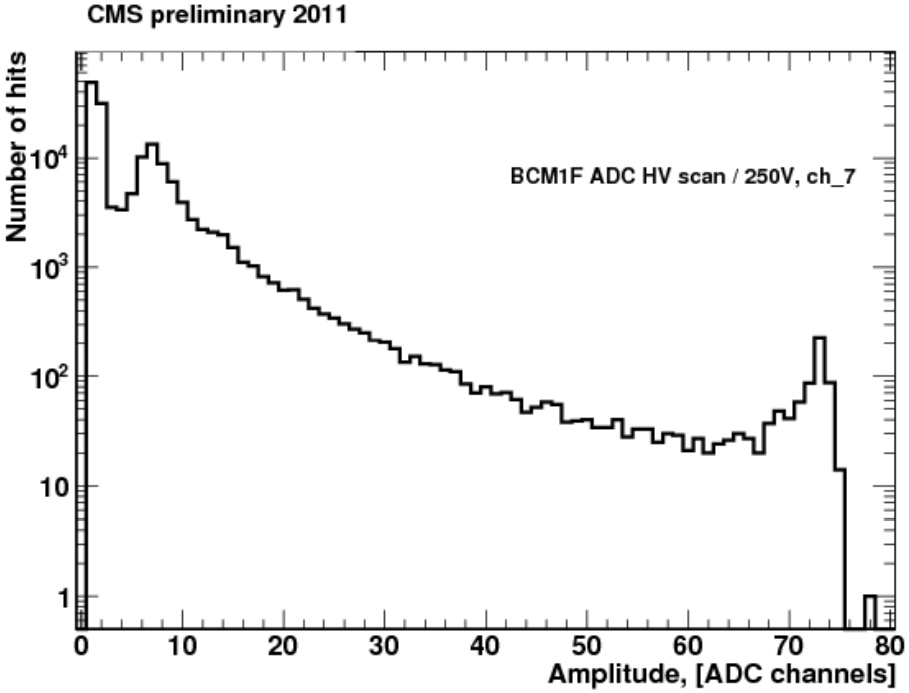
- To see if different thresholds do not affect MIP peaks and only pedestal peak, 3 different thresholds in peak finder were used (1.1, 2.1, 3.1 ADC channels in respect to base line)

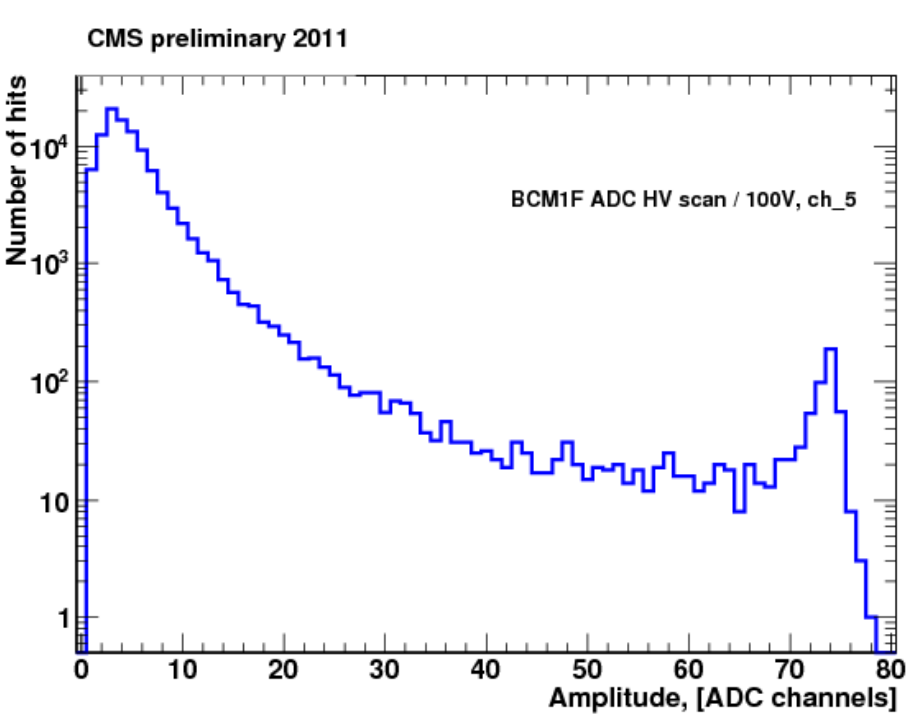


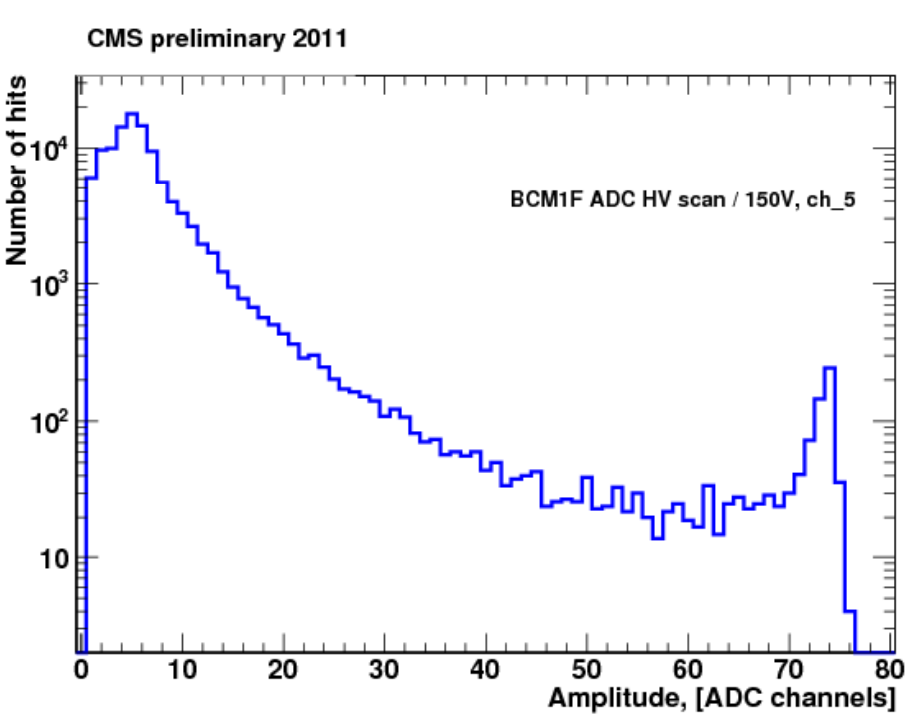

CMS preliminary 2011
BCM1F ADC HV scan / 100V, ch_7
Number of hits
Amplitude, [ADC channels]

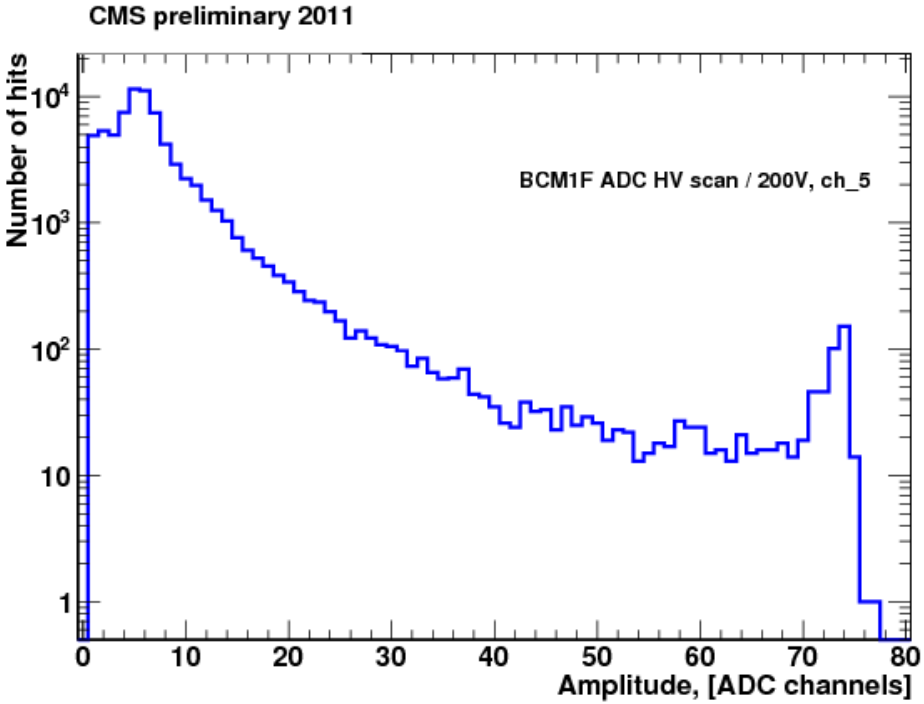

CMS preliminary 2011
BCM1F ADC HV scan / 150V, ch_7
Number of hits
Amplitude, [ADC channels]

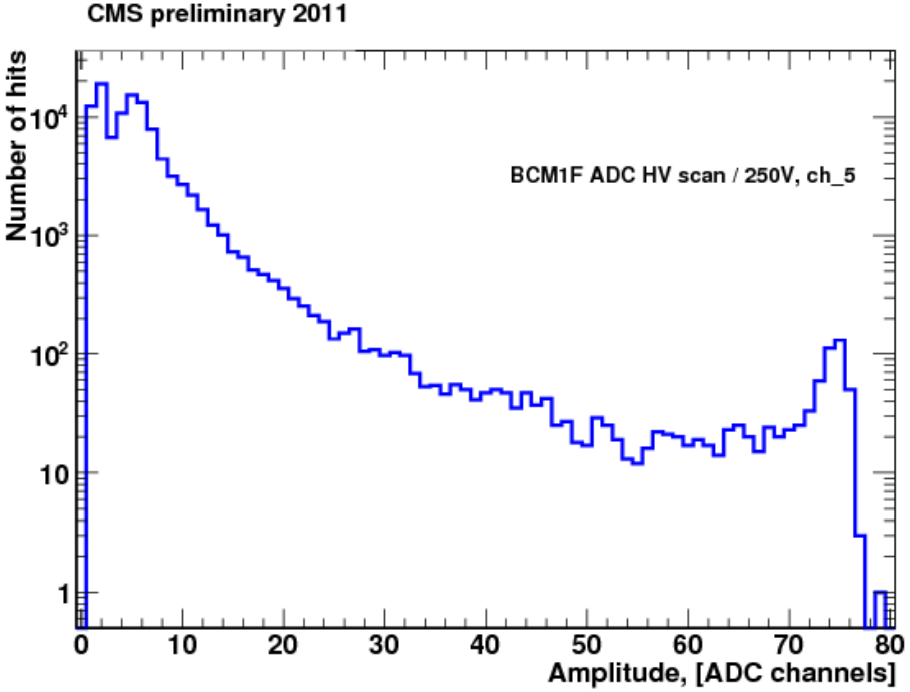

CMS preliminary 2011
BCM1F ADC HV scan / 200V, ch_7
Number of hits
Amplitude, [ADC channels]


CMS preliminary 2011
BCM1F ADC HV scan / 250V, ch_7
Number of hits
Amplitude, [ADC channels]

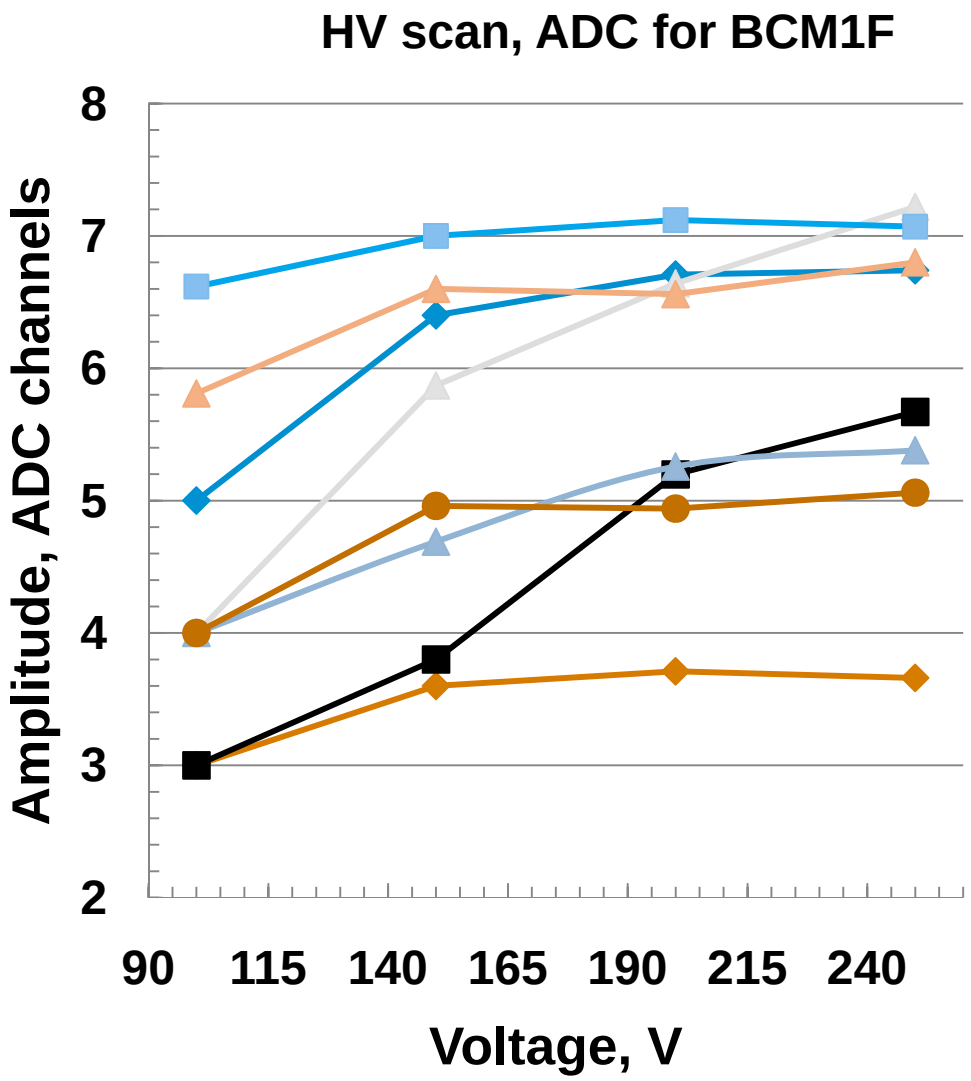

CMS preliminary 2011
BCM1F ADC HV scan / 100V, ch_5
Number of hits
Amplitude, [ADC channels]


CMS preliminary 2011
BCM1F ADC HV scan / 150V, ch_5
Number of hits
Amplitude, [ADC channels]


CMS preliminary 2011
BCM1F ADC HV scan / 200V, ch_5
Number of hits
Amplitude, [ADC channels]


CMS preliminary 2011
BCM1F ADC HV scan / 250V, ch_5
Number of hits
Amplitude, [ADC channels]

Results for all channels

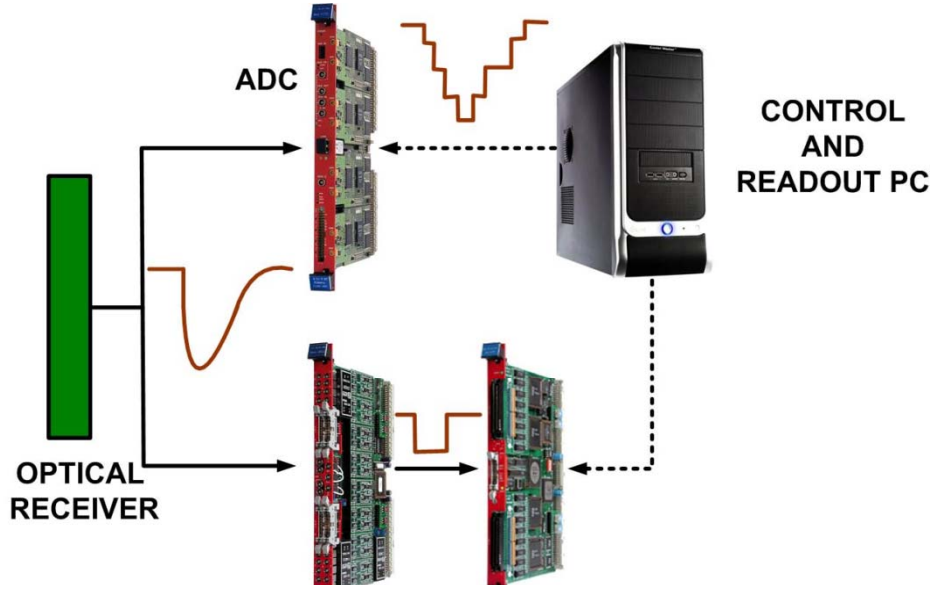


	HIGH VOLTAGE, V				
Channel 0	channel	100	150	200	250
Channel 1	0	~5	6,4	6,708	6,74
Channel 2	1	~3	3,6	3,71	3,66
Channle 3	2	~4	5,87	6,64	7,219
Channel 4	3	~3	3,8	5,198	5,67
Channel 5	4	`4	4,69	5,257	5,38
Channel 6	5	~4	4,96	4,94	5,06
Channel 7	6	6,617	7	7,12	7,07
	7	5,81	6,6	6,56	6,8

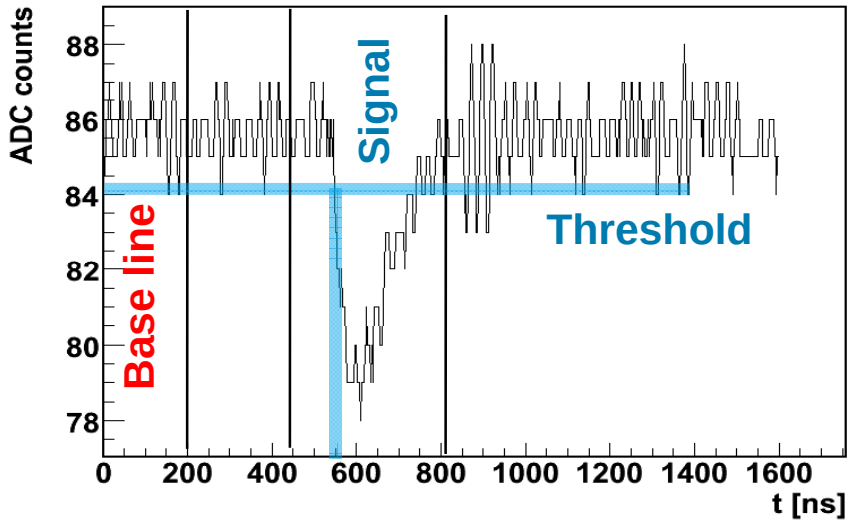
> **All MIP peaks are good recognizable after 150V**

Measurements idea

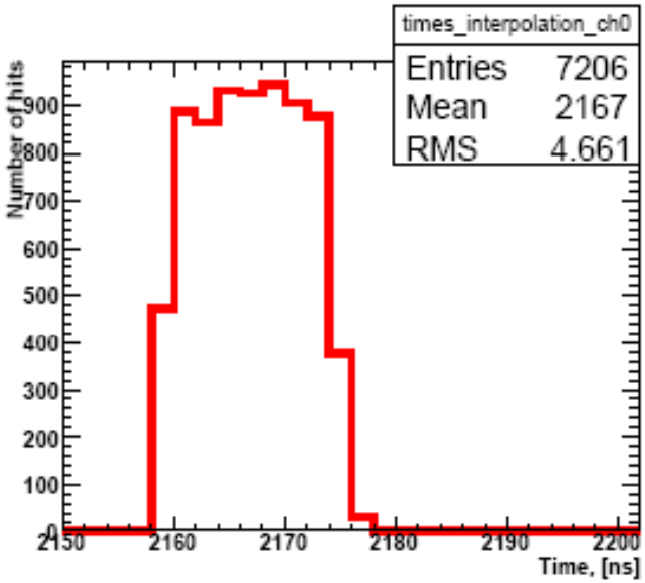
- To separate particle threshold is applied
- Time over threshold can be obtained in 2 ns precision or with linear interpolation in a few ADC counts
- Time can be measured on respect to ADC clock or in between two ADC channels
- Intrinsic time resolution – is defined from difference of two ADC channels (Halo particles passing by two sensors)

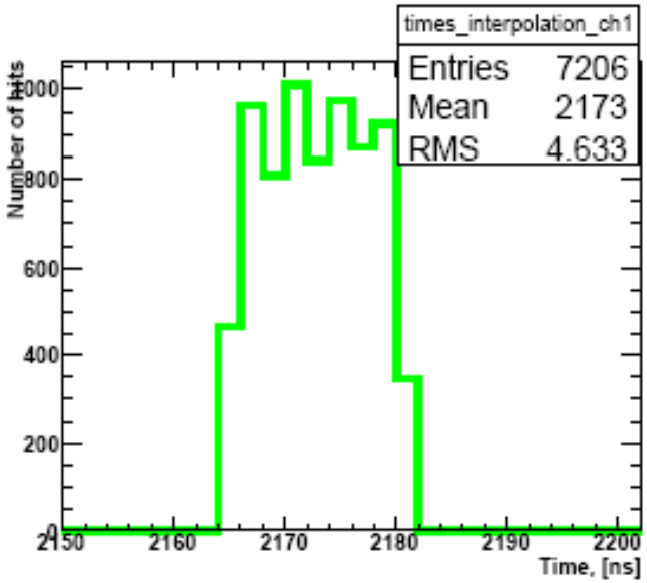


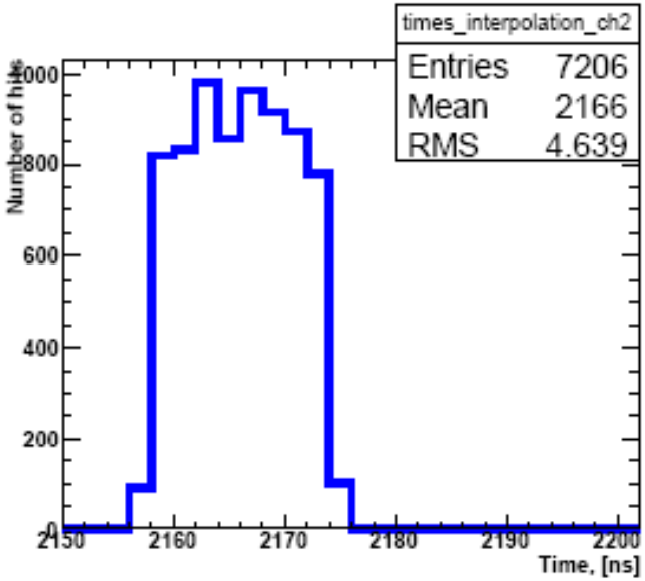
Signal example from ADC

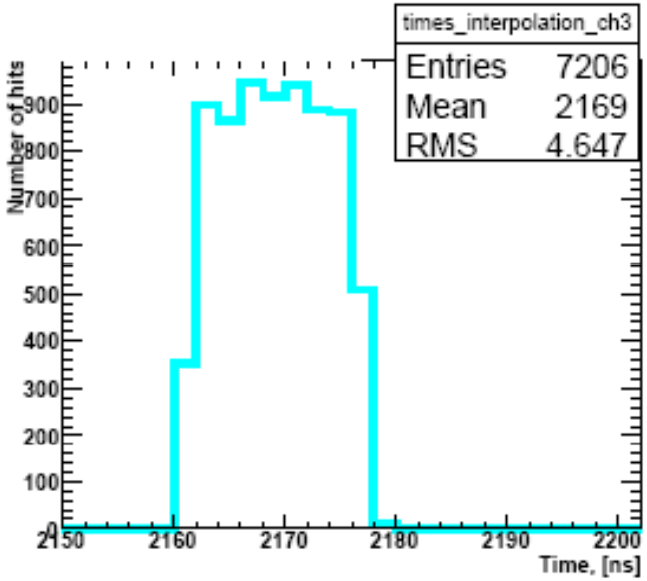


Time resolution (in respect to ADC clock)



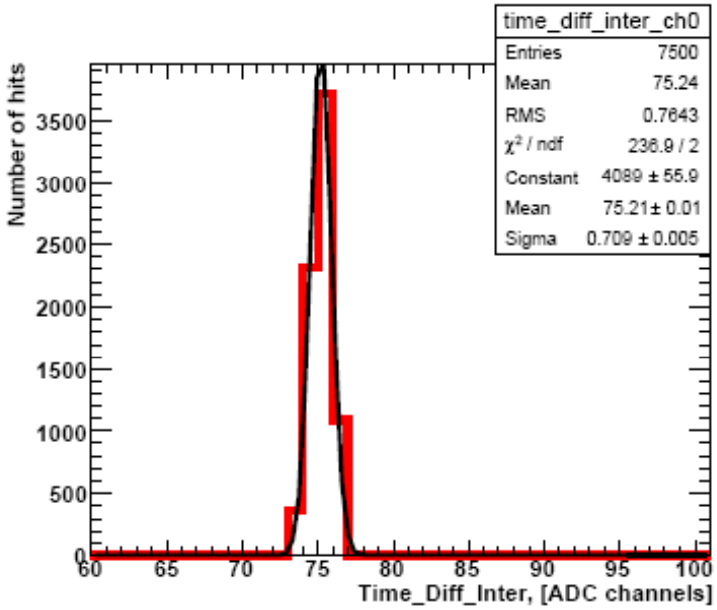


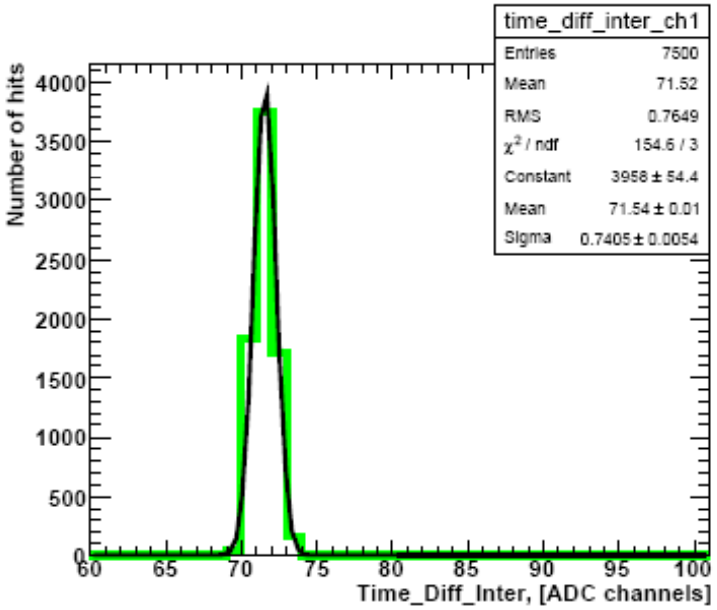


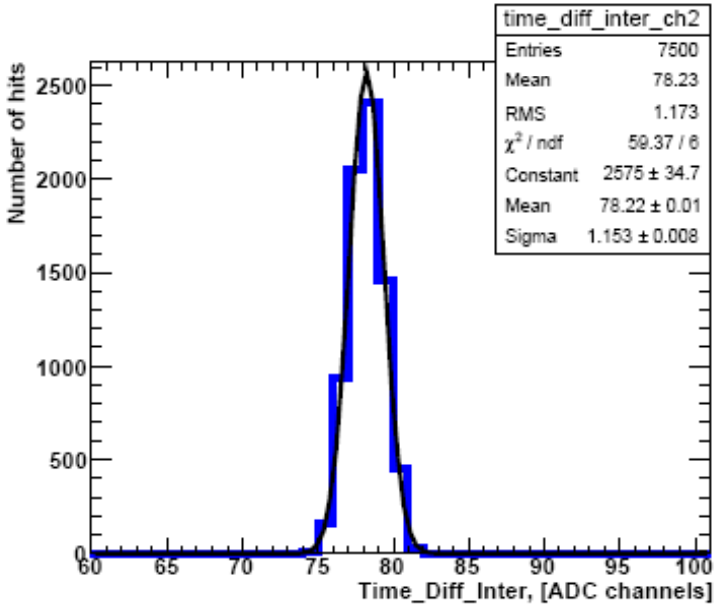


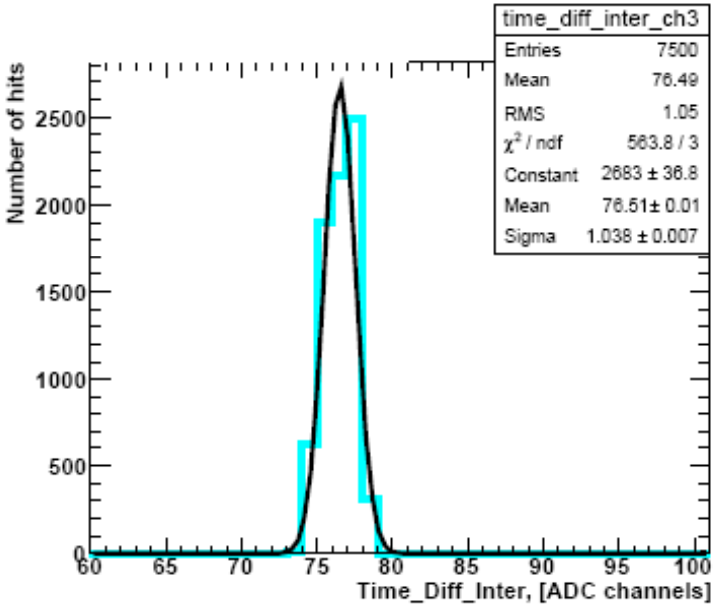
- Arriving time over threshold with interpolation procedure in respect to ADC trigger start
- CERN, test pulses measurements

Intrinsic time resolution (in between two ADC channels)

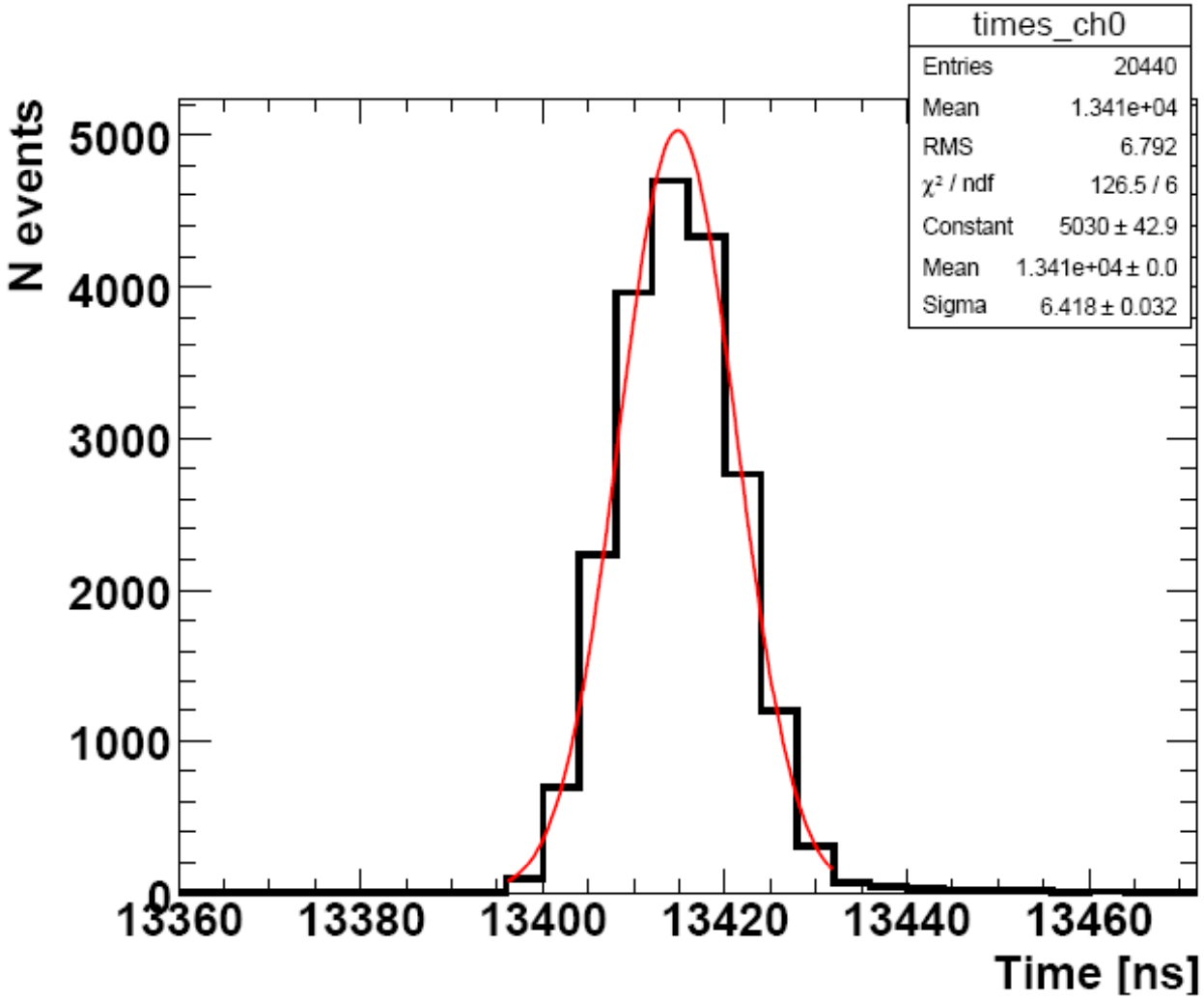








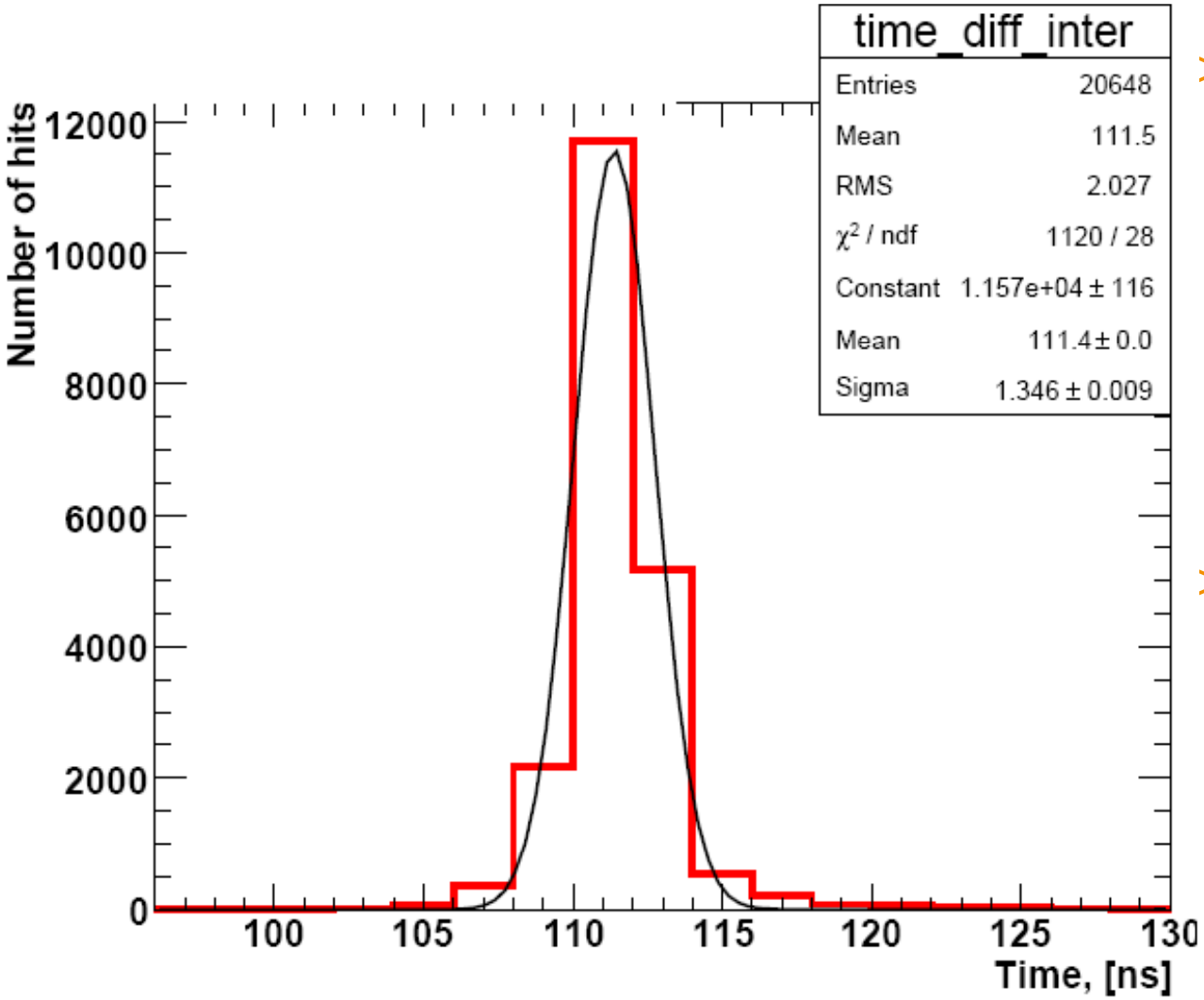
Time resolution (in respect to ADC clock) In Zeuthen



To repeat measurements one BCM1F module was injected with test pulses in Zeuthen.
One ADC channel was receiving pulse from pulse generator.

- **Arriving time over threshold with interpolation procedure in respect to ADC trigger start**
- **DESY, test pulses measurements**

Intrinsic time resolution (between two channels), Zeuthen



- Arriving time over threshold with interpolation procedure in respect to another ADC channel – represented by pulse generator
- DESY, test pulses measurements

Setup in Zeuthen

- Setup in CERN and Zeuthen show similar behavior.
- Time arriving distributions show 6 ns resolution in respect to ADC trig
- Difference of arriving time for two channels shows 1.3 ns

> ***3.2.3. Trigger Clock***
>
> TRG-CLK signal has a frequency equal to 1/8 of SAMP-CLK; therefore a 8 samples "uncertainty" occurs over the acquisition window (16 samples uncertainty with V1731 operated at 1MS/s).

- ADC can measure time arrival difference with good resolution
- I can continue with source measurement of BCM1F module
- Were problems with ADC in CERN, DAQ does not work properly. After restarting VME it recovered, but today again is not detecting signals.