IHEP cosmics

Companion of LNF Runs 219,228
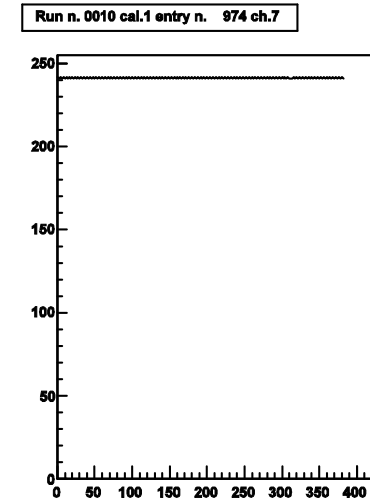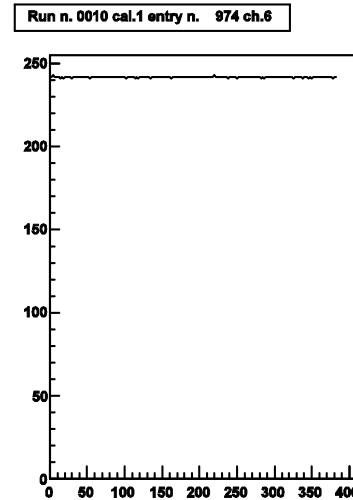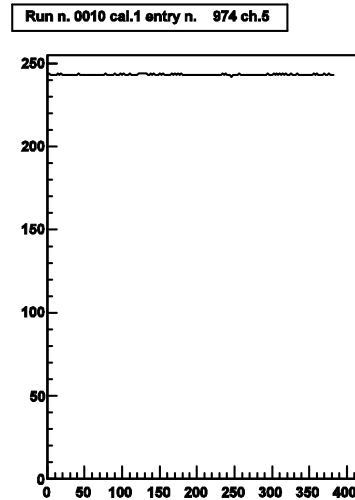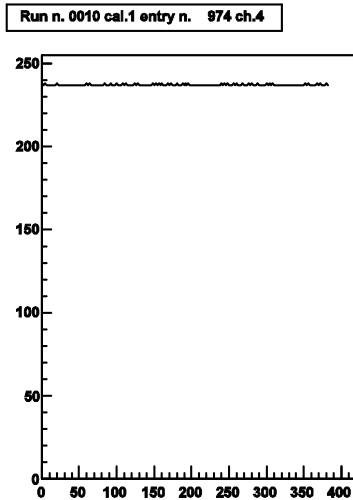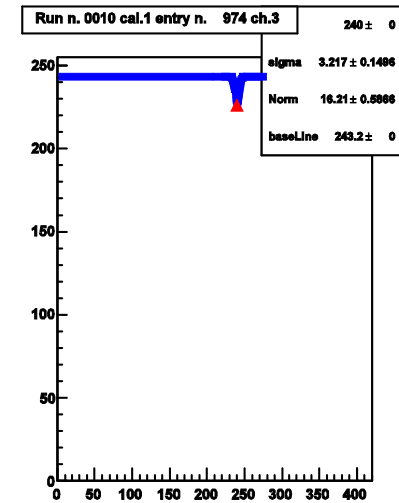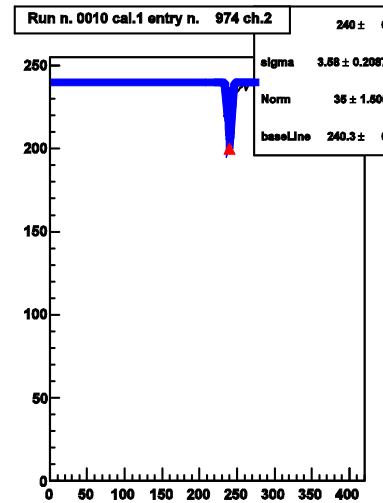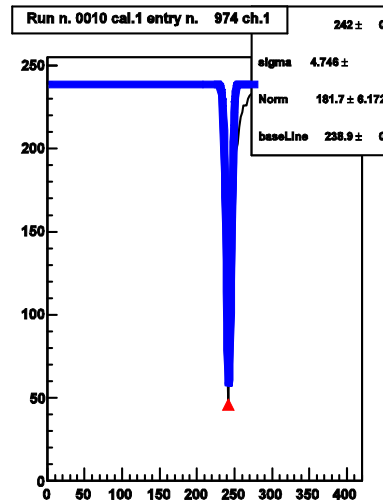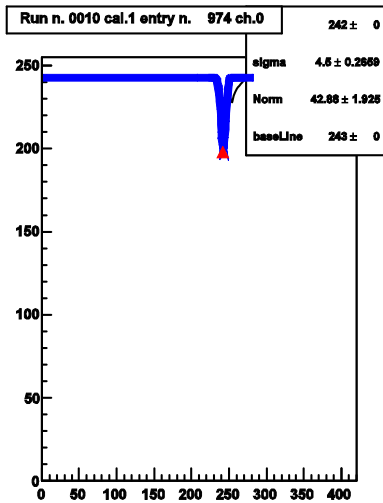
Runs 10,11,12,13 at IHEP

- "up" and "down" minicalorimeters
- HV: "Frascati" 1.4 kV points, gain $\approx 1.2 \cdot 10^6$, Happy Box present
- Autotriggered, majority 3 channels
- One-channel trigger: baseline-4cts (16 mV)
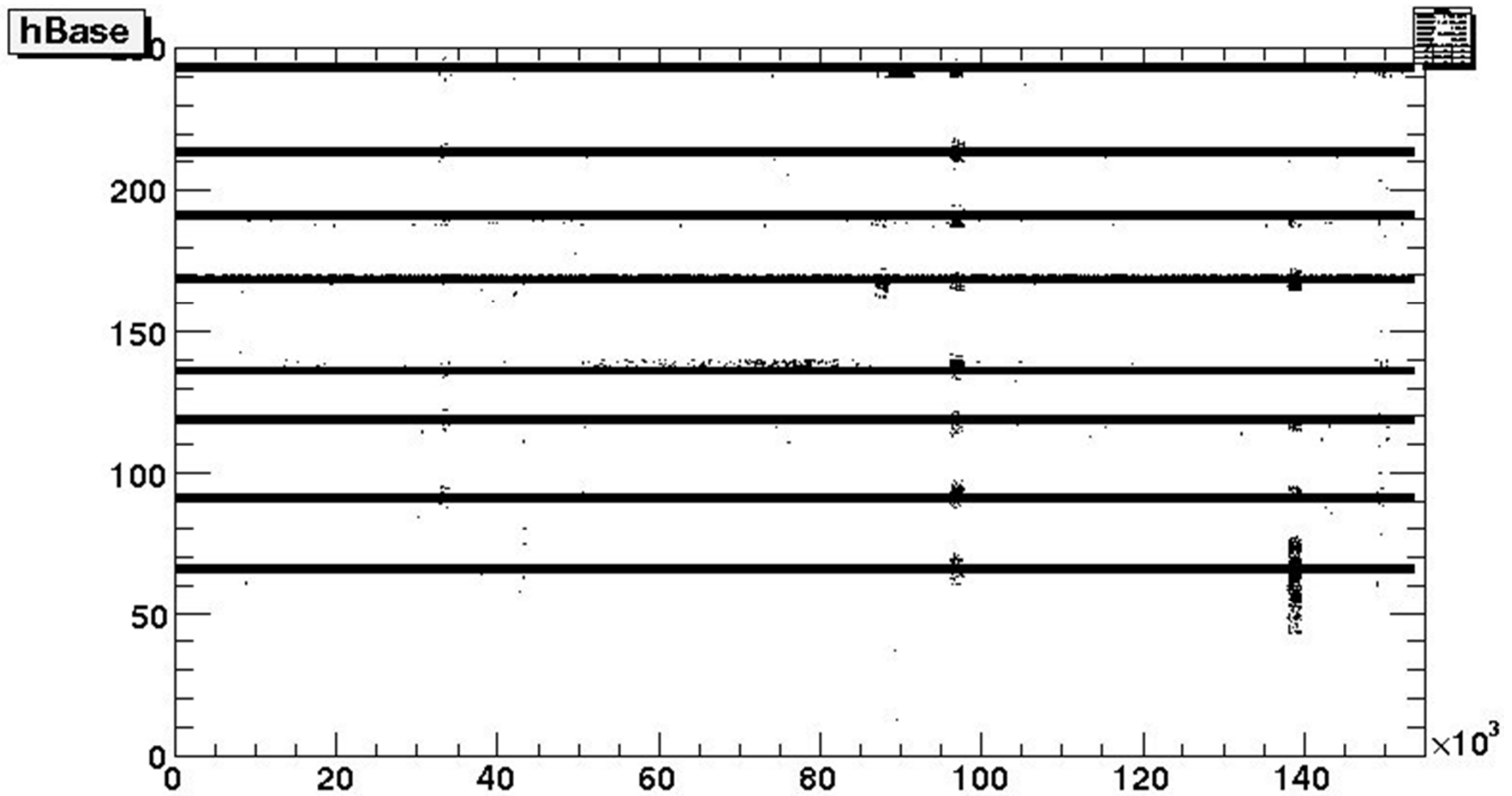- Independent trigger and DAQ on each minicalorimeter

Scanning waveforms

- First 80 ns data (40 samples) used to find the 8 baselines and baseline standard deviations on a per-event, per-waveform basis
- Bad event, rejected if one σ is > 0.5 cts (2 mV)
- Samples 41 to 196 (82 to 384 ns) used to find the signal peak, and time of peak
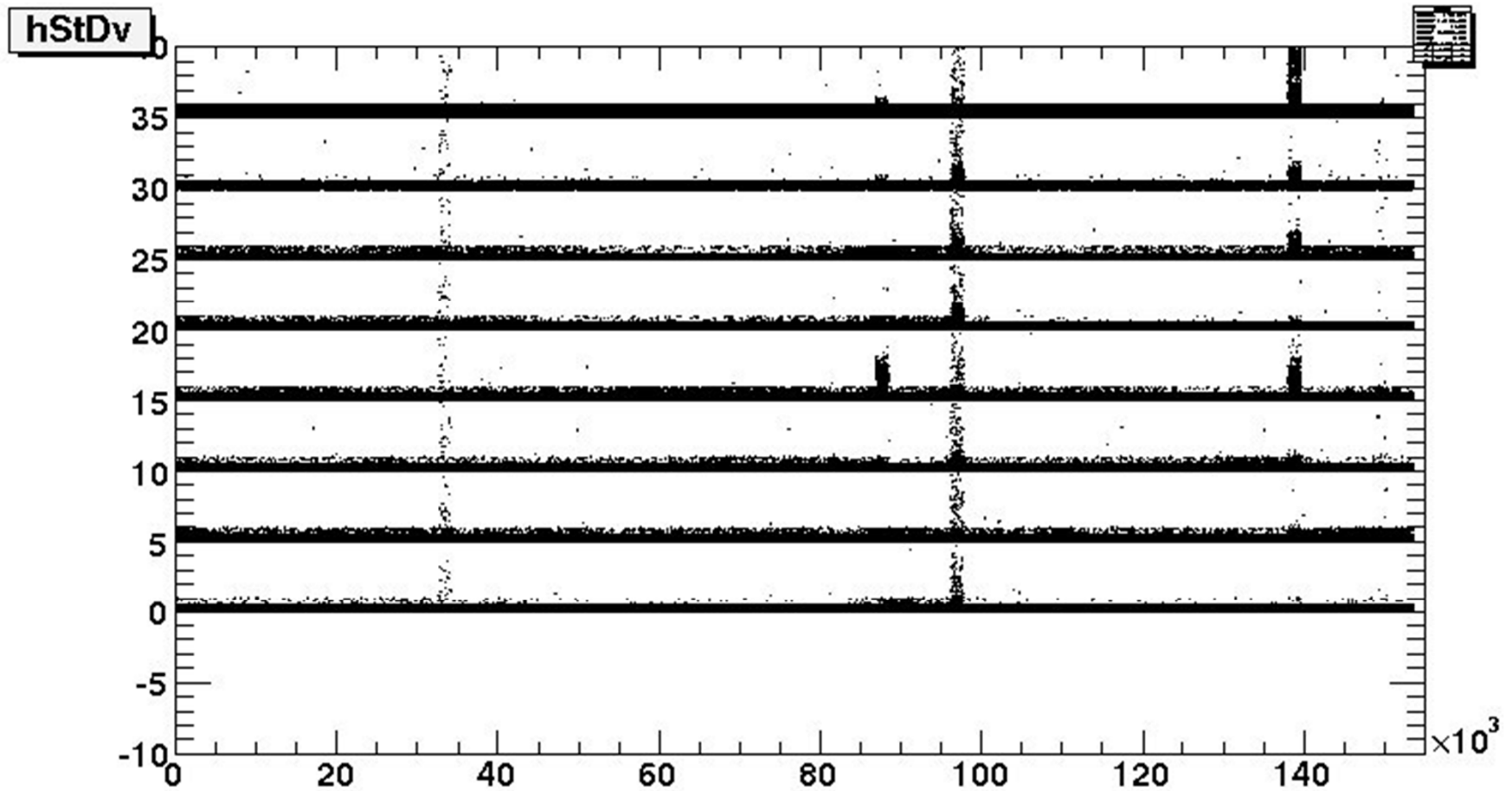- Bad event, rejected if one peak out-of-time (between 140 and 230 ns)
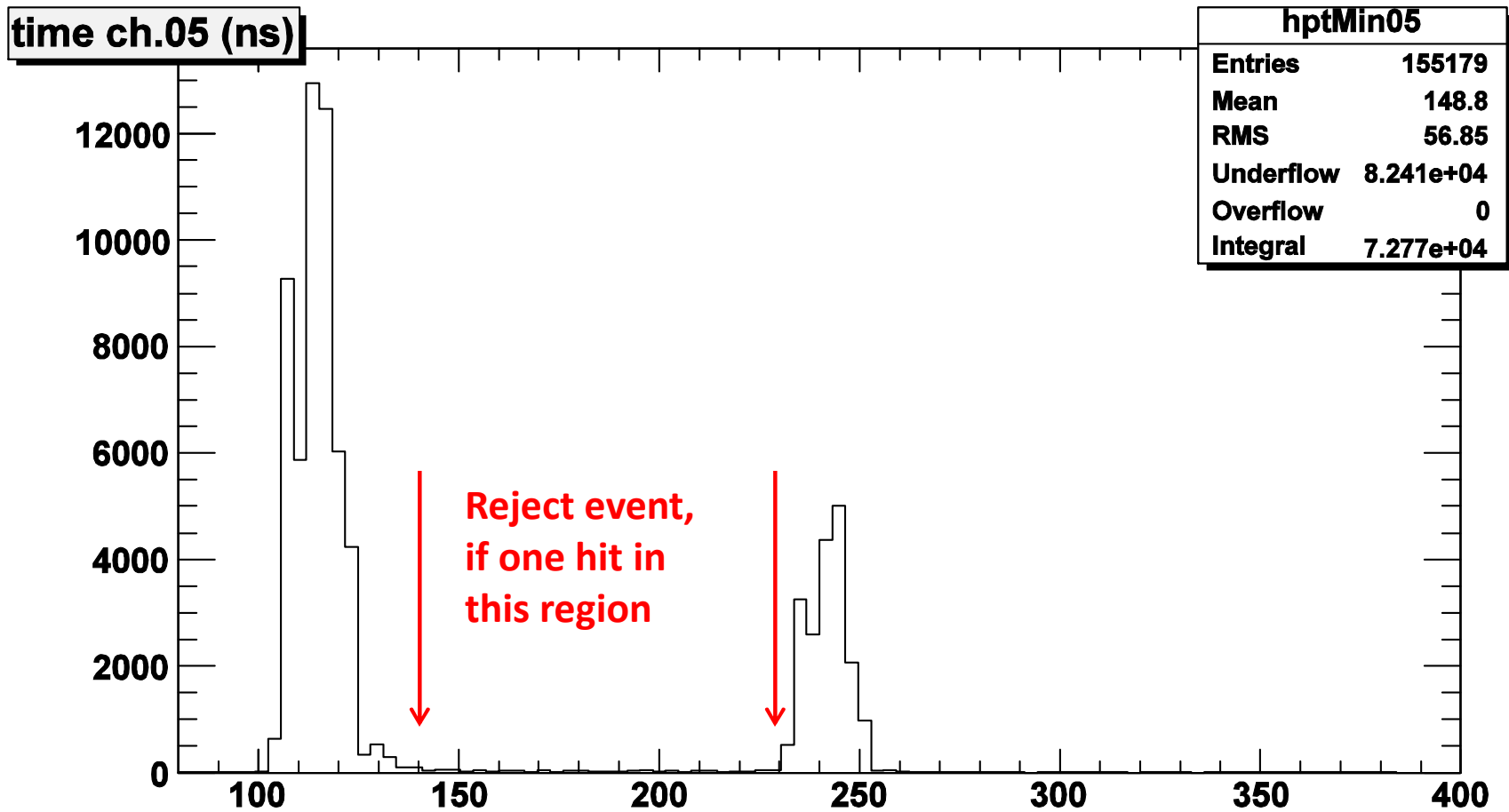
One event from minical 1 ("up")
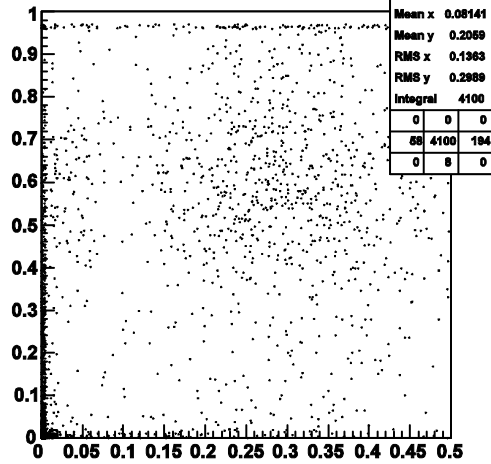
Noise, seen on baselines

Noise, seen in baseline σ's

Bad times...

time ch.05 (ns)

hptMin05	
Entries	155179
Mean	148.8
RMS	56.85
Underflow	8.241e+04
Overflow	0
Integral	7.277e+04

Reject event, if one hit in this region

Pulse height correlations (LNF)
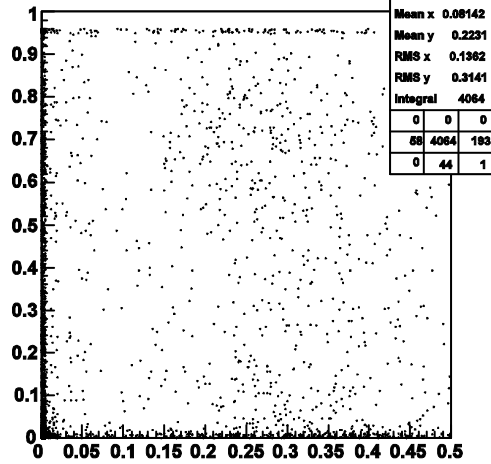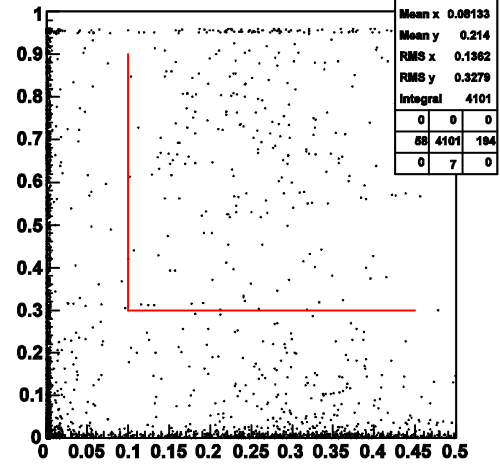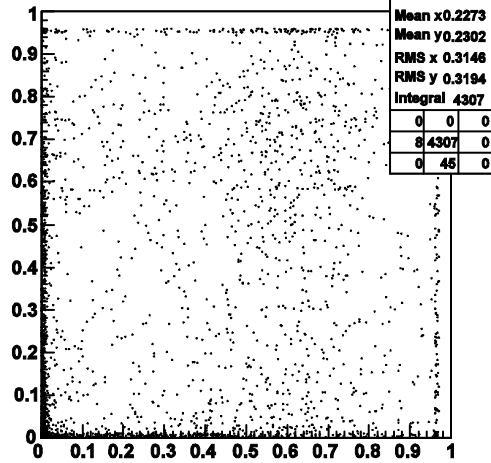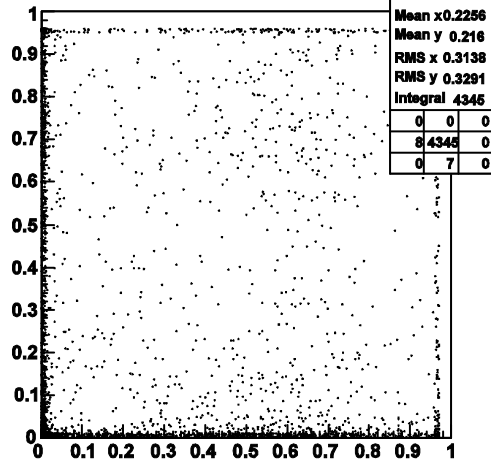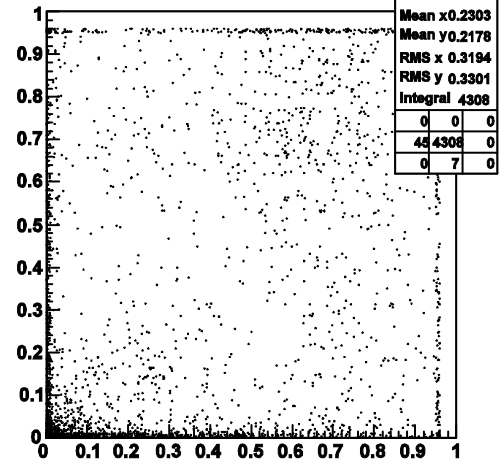
LNF Run 219 after trigger cleanup
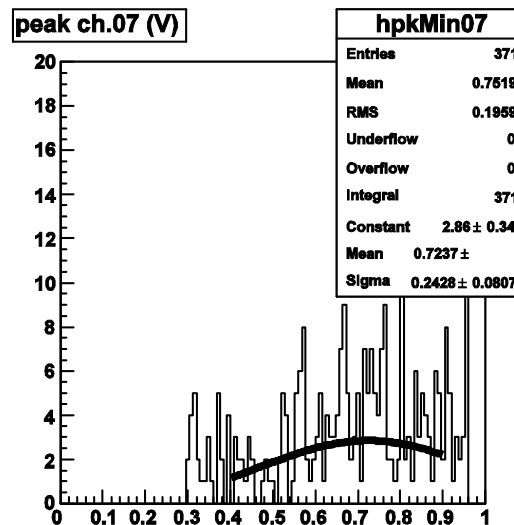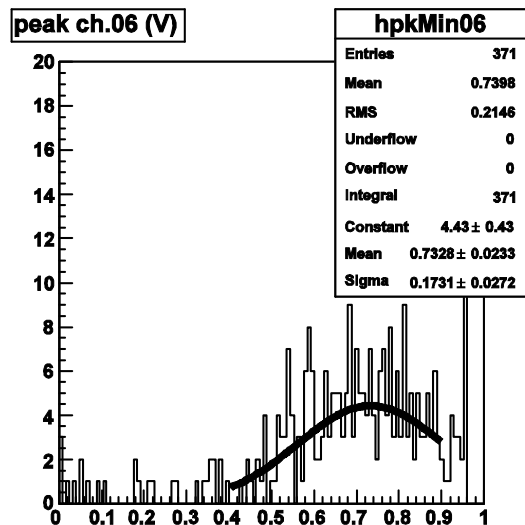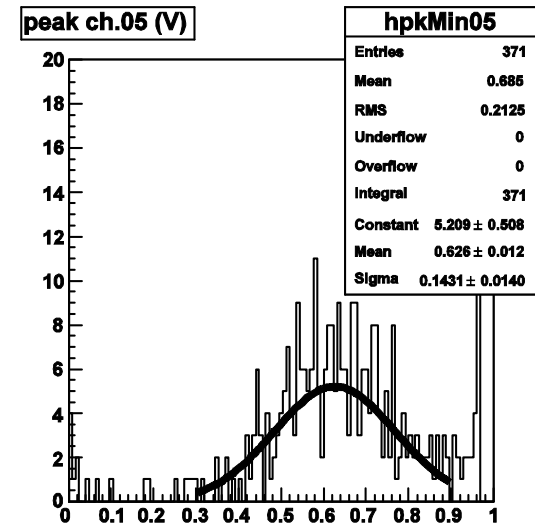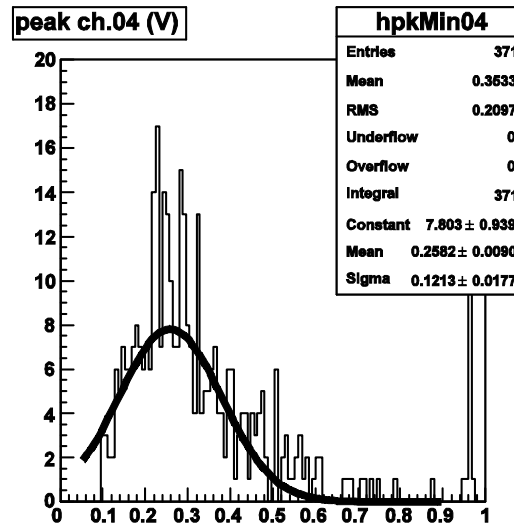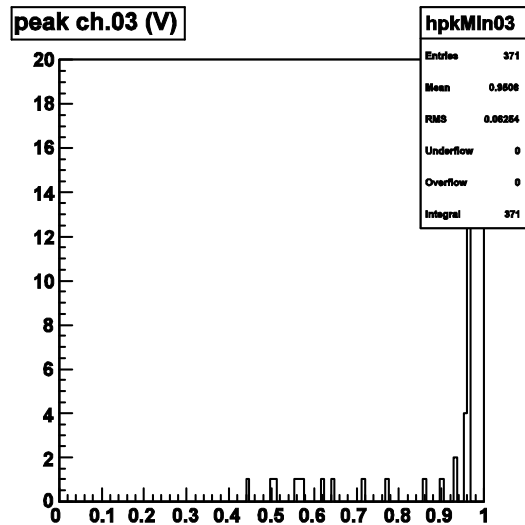
Peak in channels 5,6,7 is a factor 2 higher than in channel 4, just as expected. This is a good thing!

LNF Run 228 after trigger cleanup
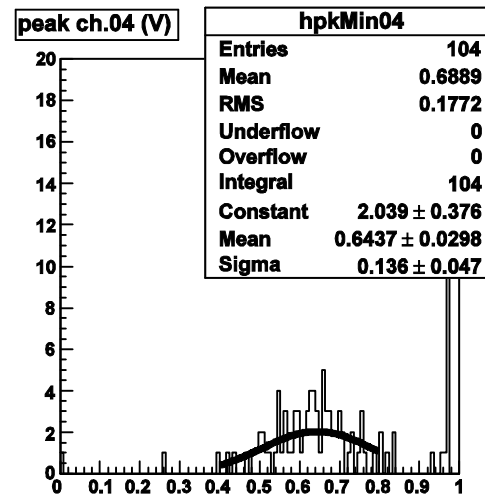
Peak in channels 1,2,3 is a factor 2 higher than in channel 0, just as expected. This is a good thing!

Minical 0("dn") at IHEP
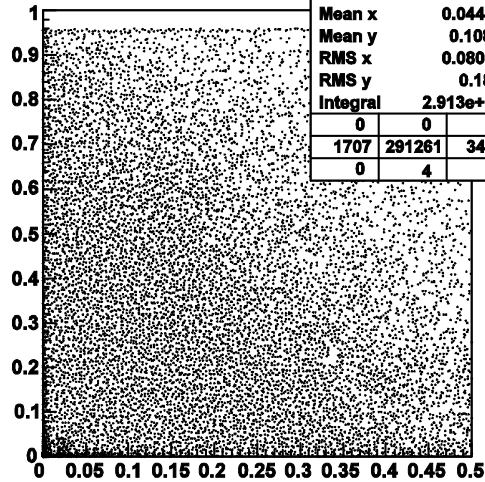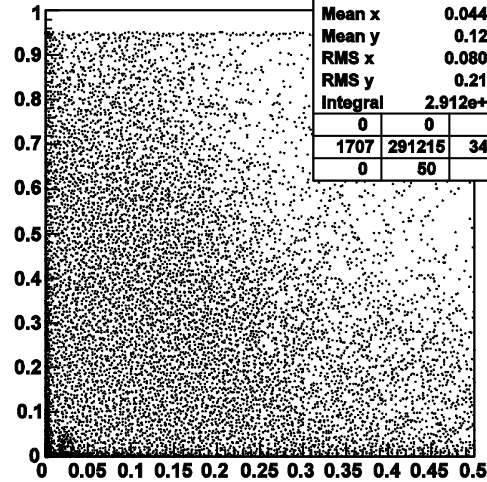
11
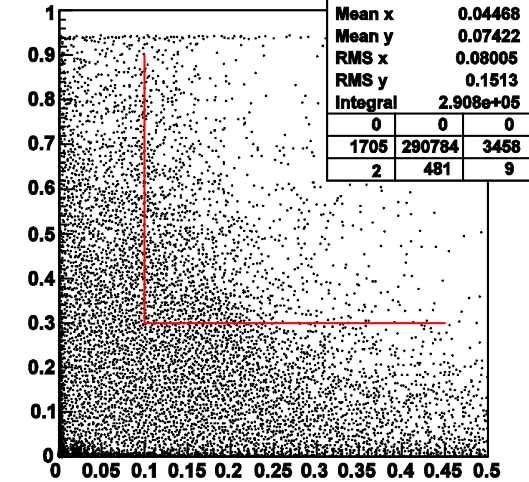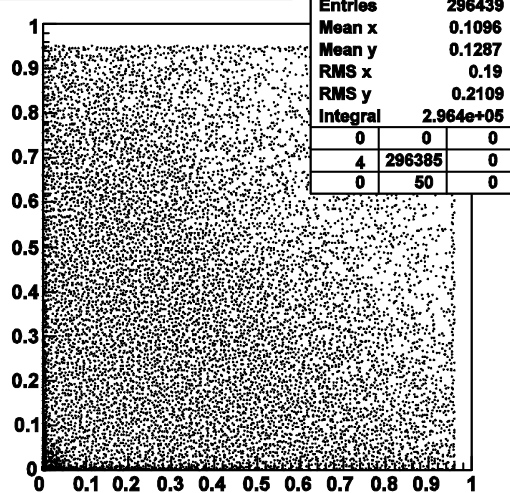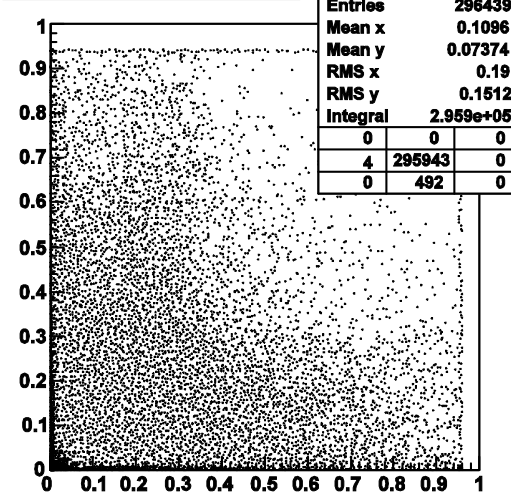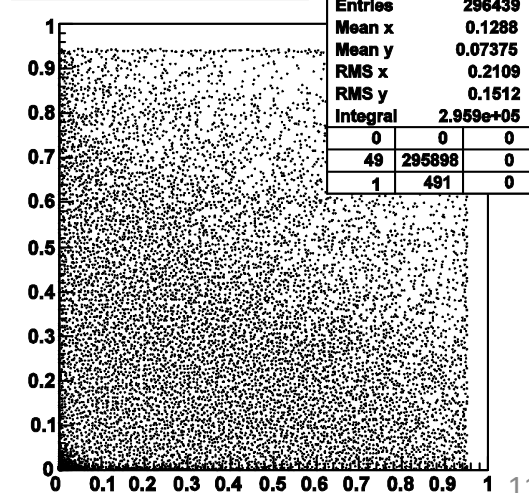
"LNF" cuts on IHEP data

Minical 0

Minical 1
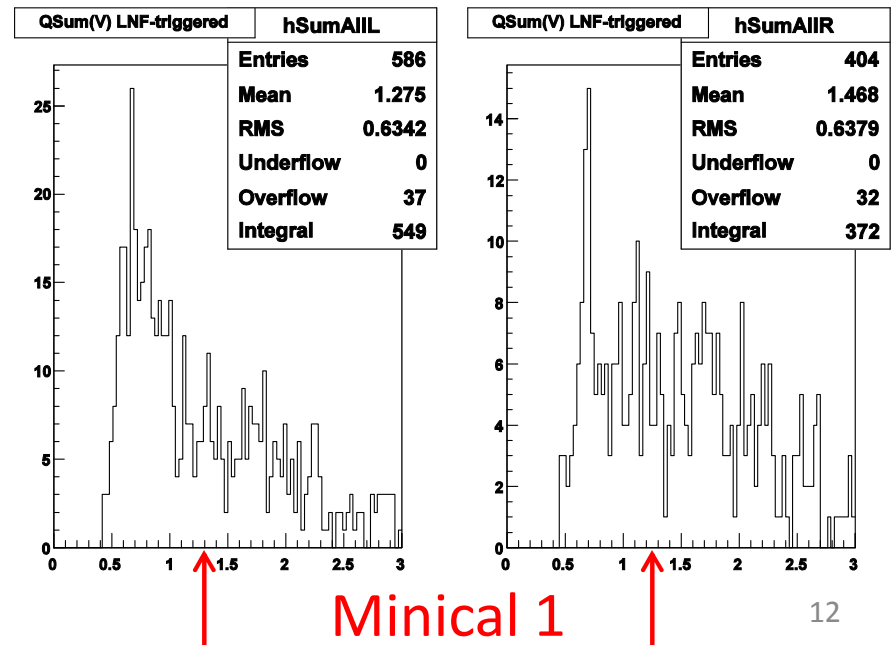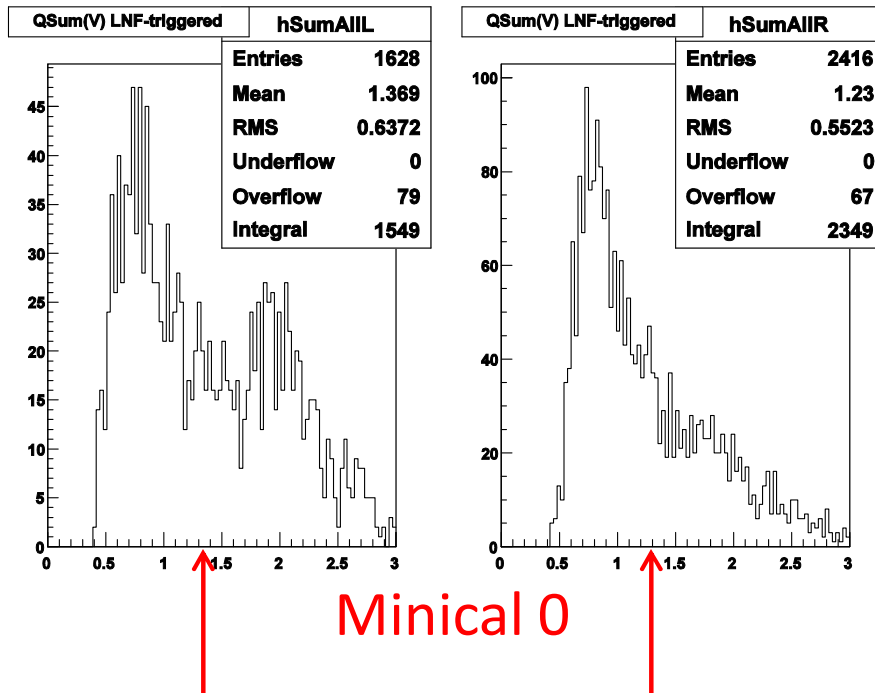
Summary of facts

- The LNF-style criteria are useless at IHEP
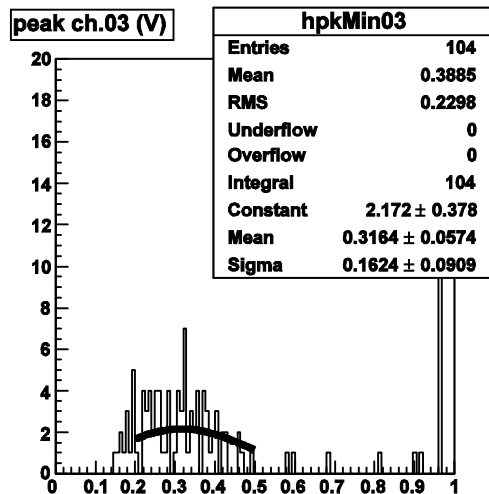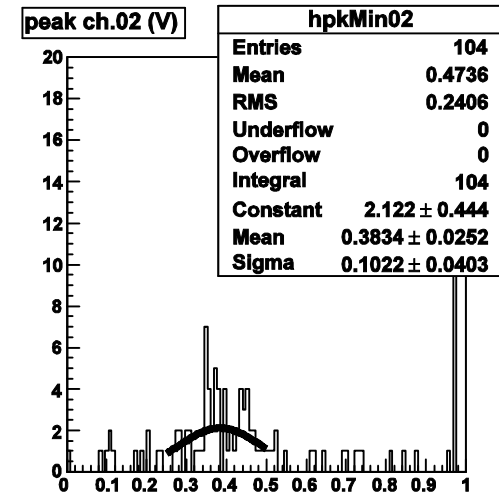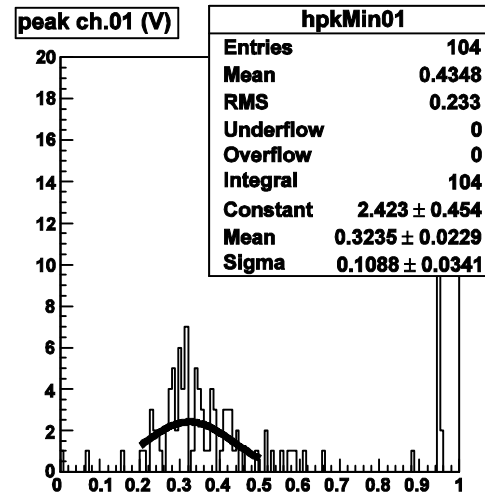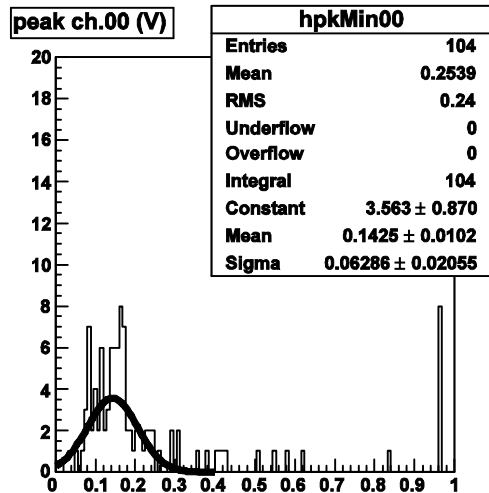- Cosmic rays are much rarer (factor 3 less if angular distribution $\sin^2\vartheta$ taken seriously, possibly factor 10? *30-10 evts/day*)
- Very hard to identify and use cosmic rays using a simple cut on pulse heights
- Must investigate other techniques

Use masks

- A "mask" is a configuration of contiguous hit cells
- 2 "type 0" masks:
- 2 "type 1" masks:

- 4 "type 2" masks:
- 4 "type 3" masks:

Which masks are more frequent?

Singles for minical 0
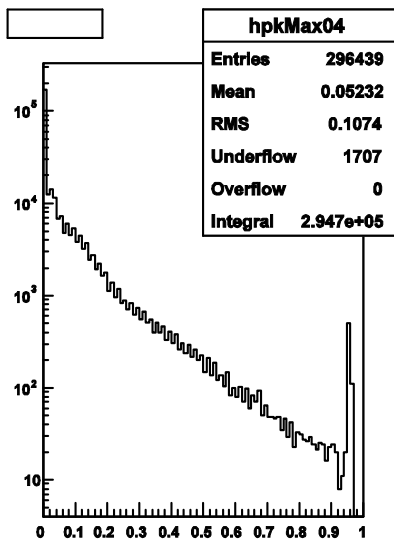
Mask-trigger, minical 0

Singles, minical 1

hpkMax00	
Entries	225121
Mean	0.03516
RMS	0.08886
Underflow	3085
Overflow	0
Integral	2.22e+05

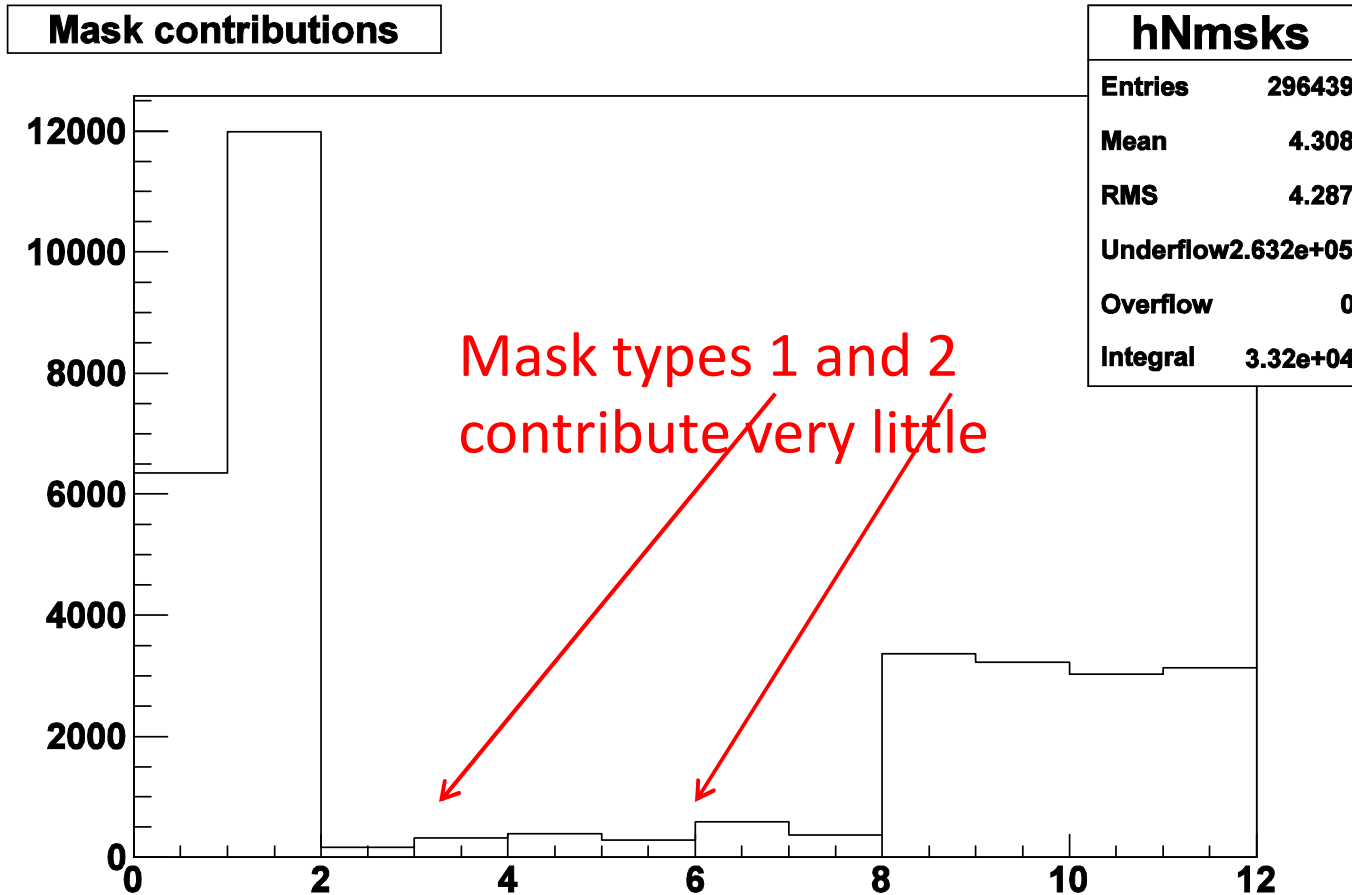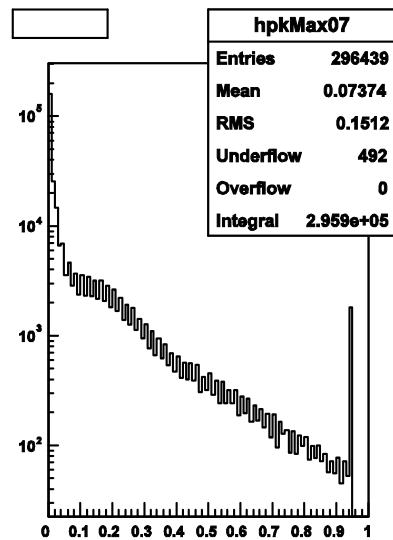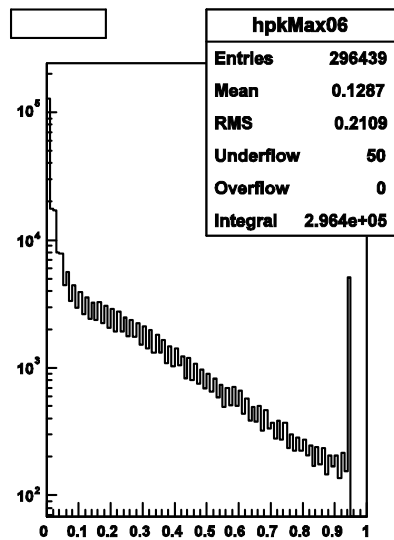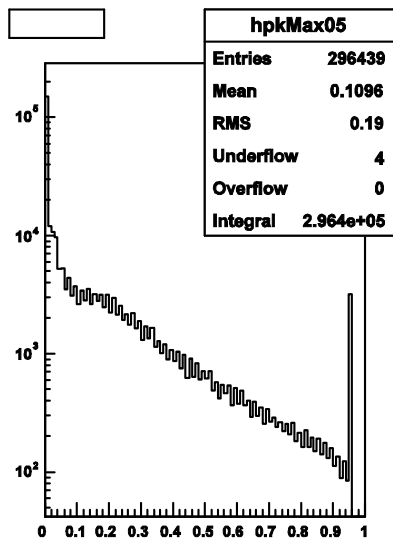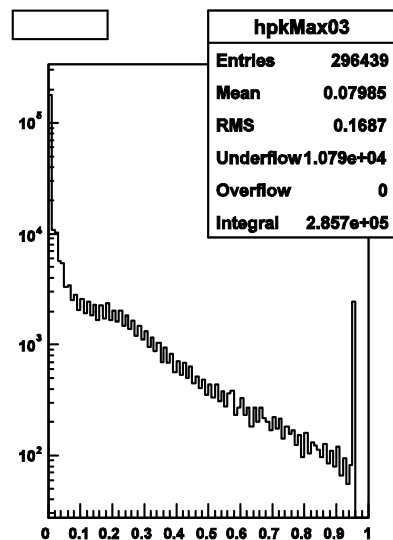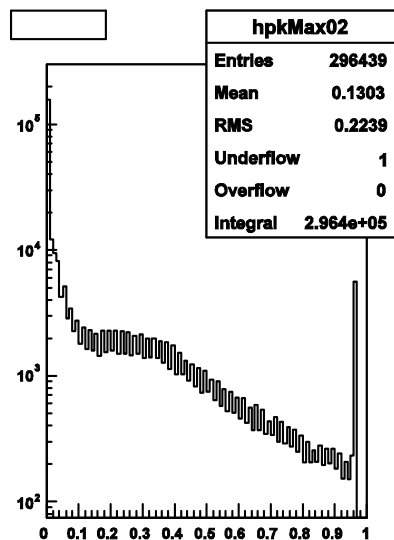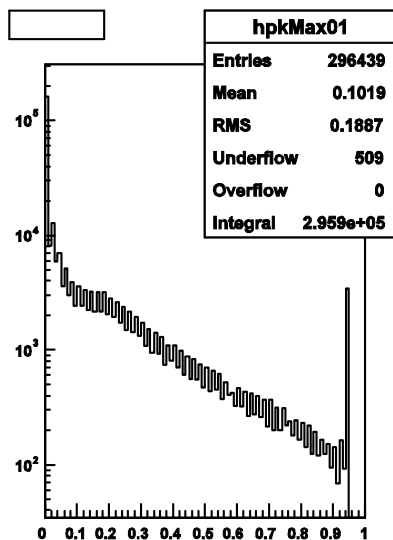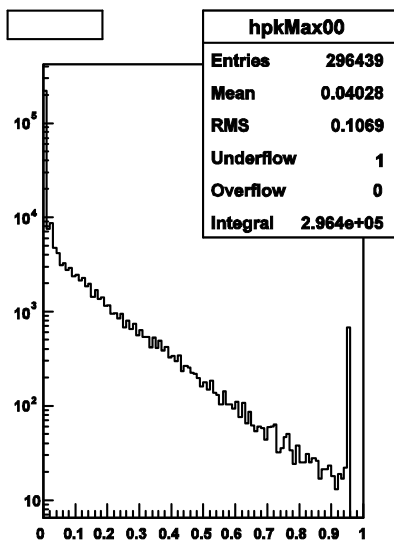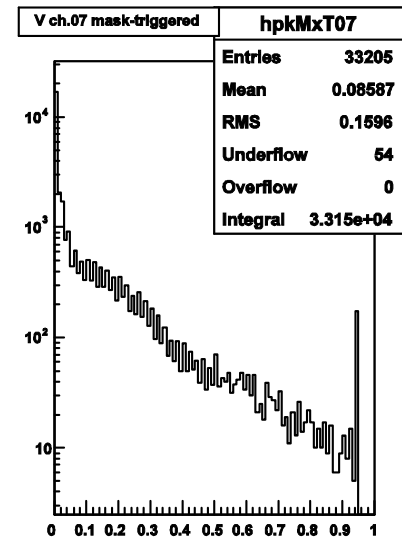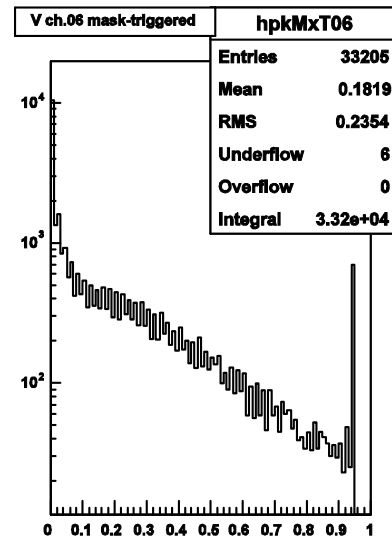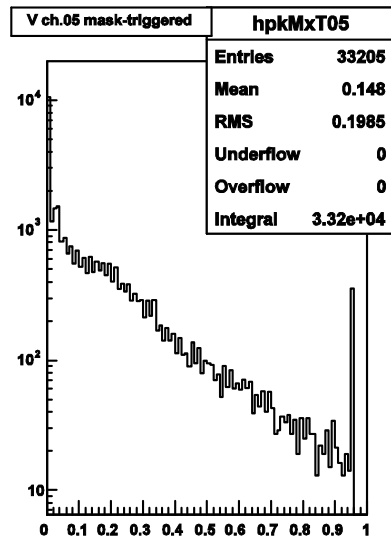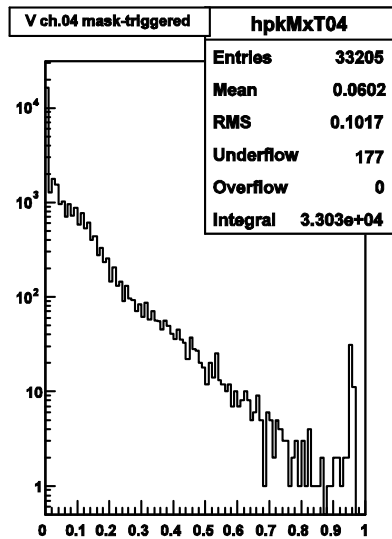| hpkMax01	
Entries	225121
Mean	0.06196
RMS	0.1364
Underflow	0
Overflow	0
Integral	2.251e+05

hpkMax02	
Entries	225121
Mean	
RMS	0.1672
Underflow	3
Overflow	0
Integral	2.251e+05

hpkMax03	
Entries	225121
Mean	0.06149
RMS	0.1397
Underflow	29
Overflow	0
Integral	2.251e+05

hpkMax04	
Entries	225121
Mean	0.03122
RMS	0.08985
Underflow	808
Overflow	0
Integral	2.243e+05

hpkMax05	
Entries	225121
Mean	0.08231
RMS	0.1573
Underflow	
Overflow	0
Integral	2.251e+05

hpkMax06	
Entries	225121
Mean	0.09163
RMS	0.1729
Underflow	3421
Overflow	0
Integral	2.217e+05

hpkMax07	
Entries	225121
Mean	0.0591
RMS	0.1258
Underflow	0
Overflow	0
Integral	2.251e+05

Mask-triggered, minical 1
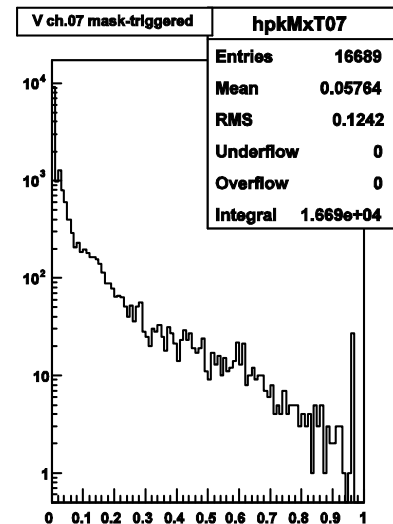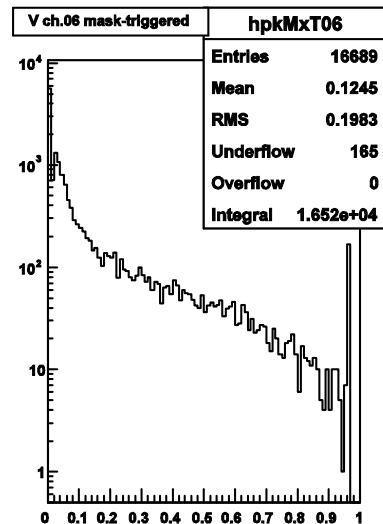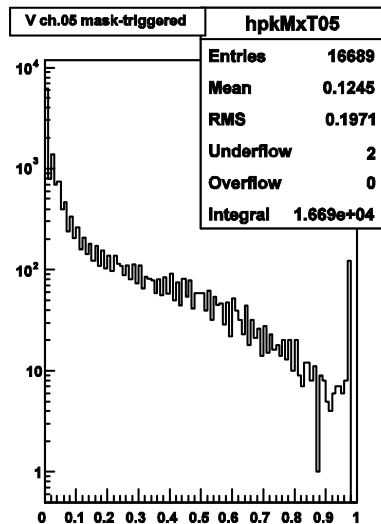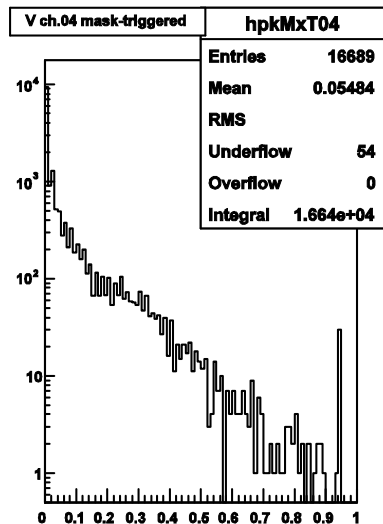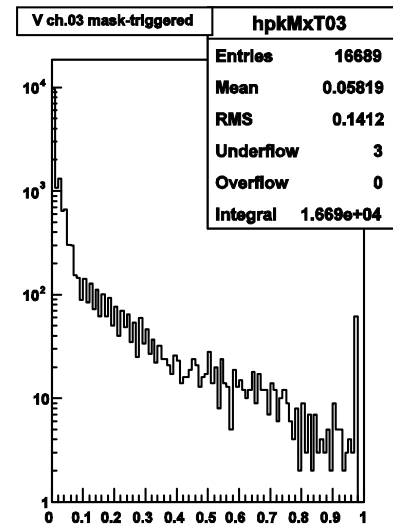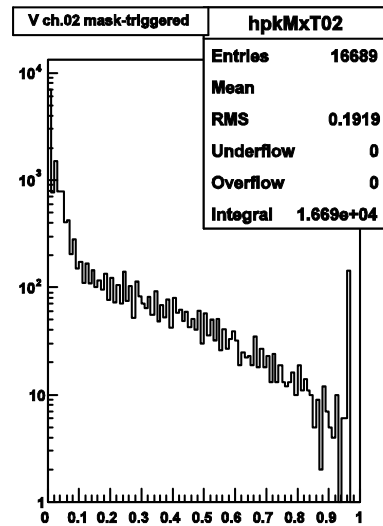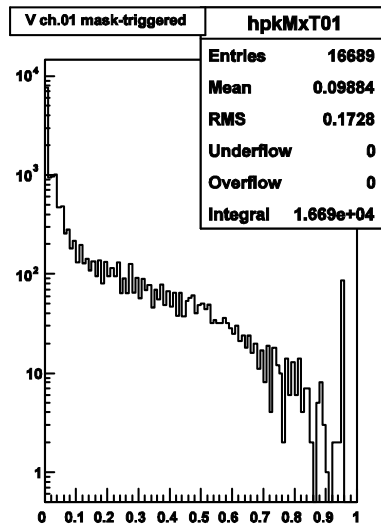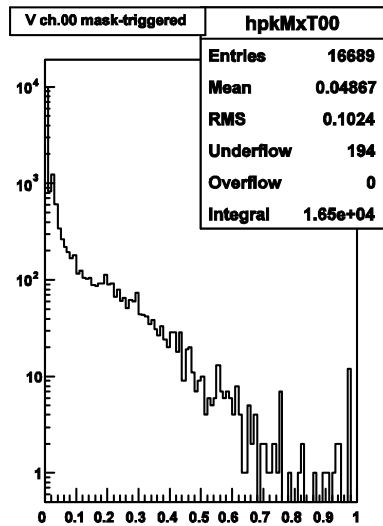
Using masks, minical 0

QSum(V)
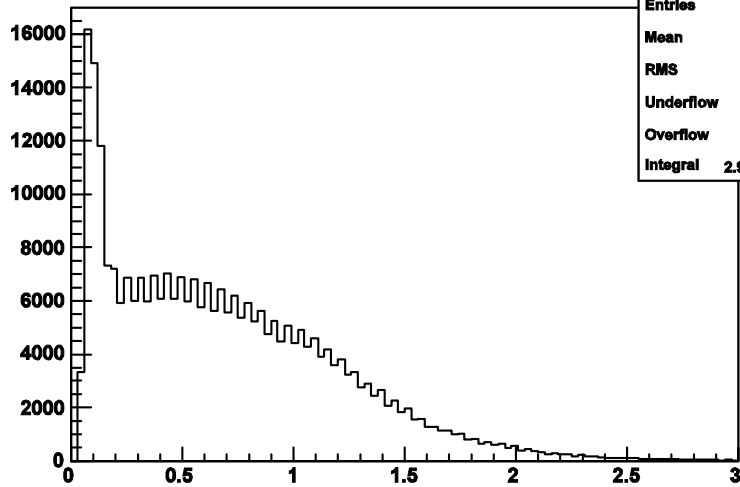
hSumAll	
Entries	296439
Mean	0.7002
RMS	0.5101
Underflow	0
Overflow	940
Integral	2.955e+05

QSum(V) mask-triggered
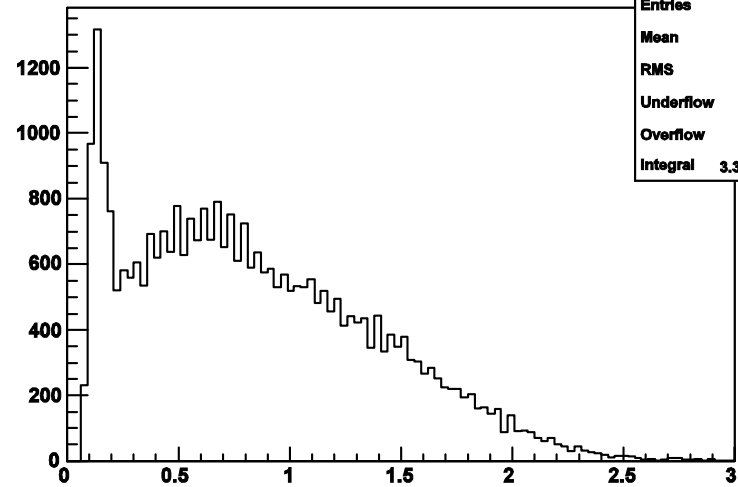
hSumAllT	
Entries	33205
Mean	0.8537
RMS	0.5405
Underflow	0
Overflow	27
Integral	3.318e+04

QSum(V) noMask-triggered
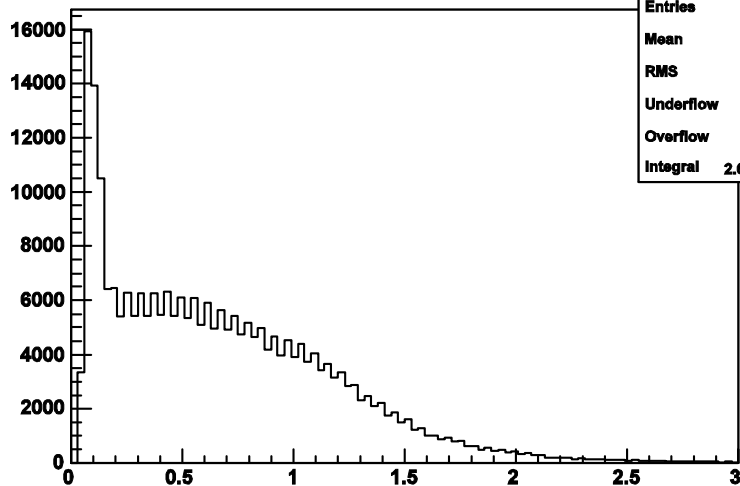
hSumAllN	
Entries	263234
Mean	0.6808
RMS	0.5028
Underflow	0
Overflow	913
Integral	2.623e+05
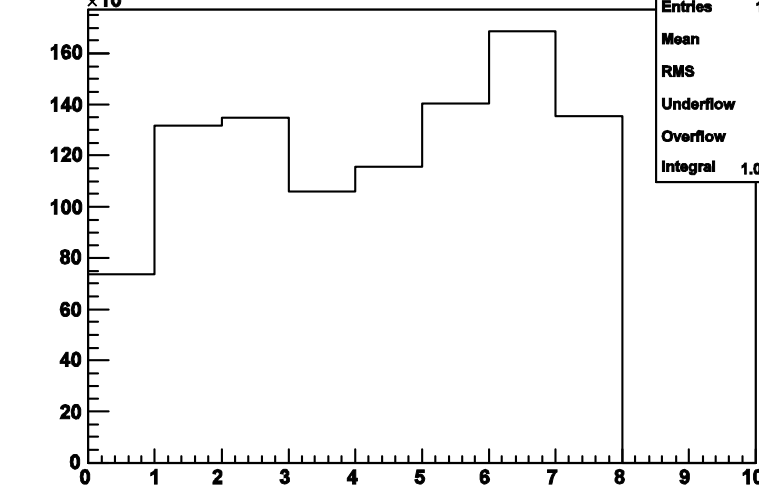
hNtrig	
Entries	1006447
Mean	3.82
RMS	2.231
Underflow	0
Overflow	0
Integral	1.006e+06

Using masks, minical 1

QSum(V)

hSumAll	
Entries	225121
Mean	0.5013
RMS	0.3944
Underflow	0
Overflow	466
Integral	2.247e+05

QSum(V) mask-triggered

hSumAllT	
Entries	16689
Mean	0.6699
RMS	0.4574
Underflow	0
Overflow	8
Integral	1.668e+04

QSum(V) noMask-triggered

hSumAllN	
Entries	208432
Mean	0.4877
RMS	0.3857
Underflow	0
Overflow	458
Integral	2.08e+05

hNtrig	
Entries	724860
Mean	3.682
RMS	2.224
Underflow	0
Overflow	0
Integral	7.249e+05

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Divide by mask type, minical 0
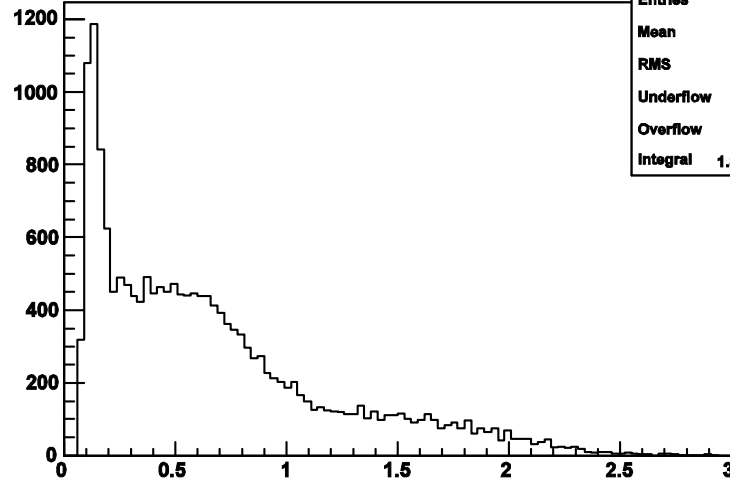
QSum(V) mask 0 (LNF) — hSumAll0

Entries	18332
Mean	0.678
RMS	0.5351
Underflow	0
Overflow	23
Integral	1.831e+04

QSum(V) mask 1 (4 2+2 long) — hSumAll1
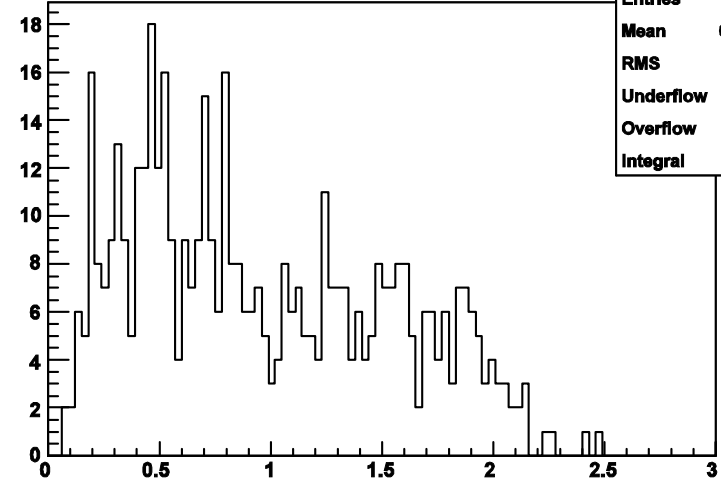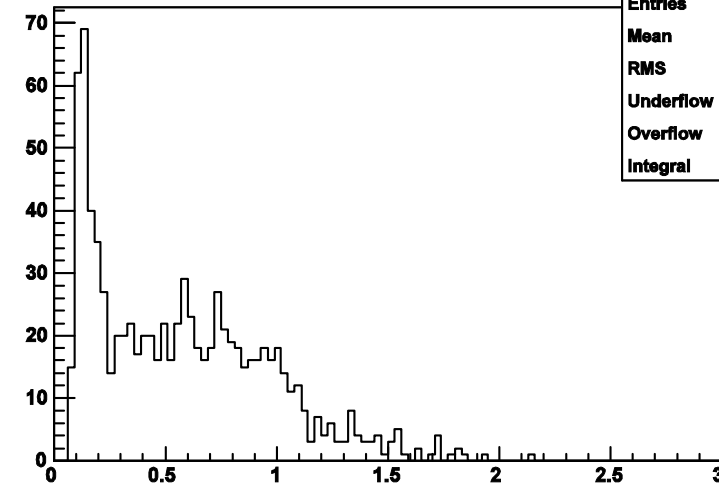
Entries	488
Mean	0.9686
RMS	0.571
Underflow	0
Overflow	0
Integral	488
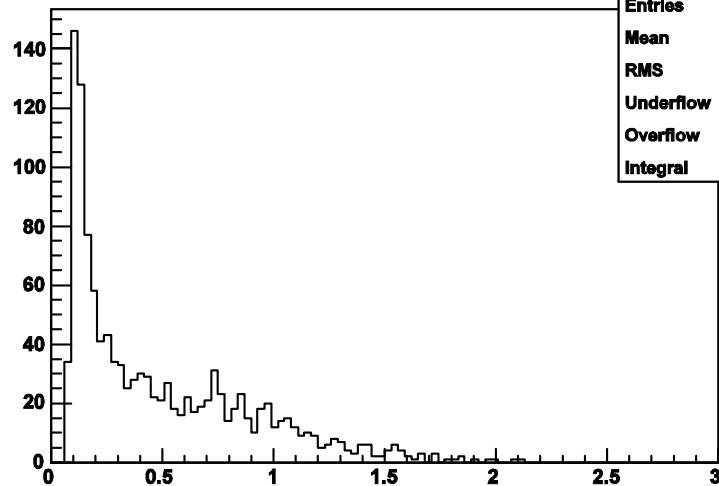
QSum(V) mask 2 (4 1+3) — hSumAll2

Entries	1638
Mean	0.8696
RMS	0.4954
Underflow	0
Overflow	0
Integral	1638

QSum(V) mask 3 (4 2+2 short) — hSumAll3
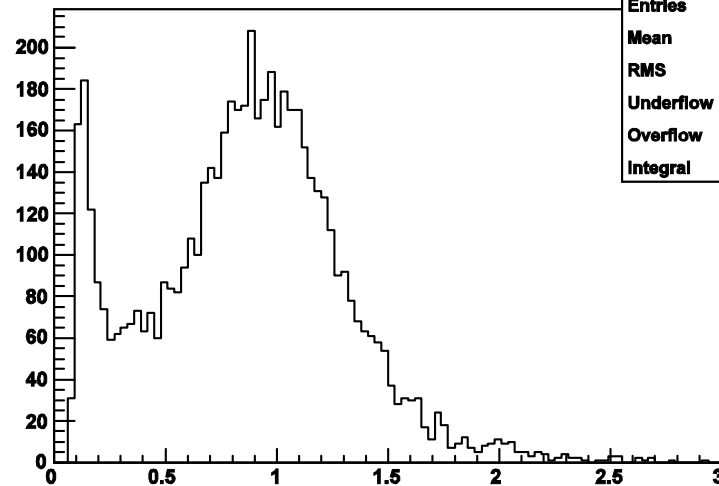
Entries	12747
Mean	1.086
RMS	0.452
Underflow	0
Overflow	4
Integral	1.274e+04

Divide by mask type, minical 1

Conclusions? Ideas, anyone?

- There is little chance of selecting cosmic rays at IHEP like we did in Frascati

- At the level of "singles" differences between minical 0 and 1 are not much apparent

- Using mask-triggered events the sum of all charges is bigger in minical 0. PM gain changed? HV problem? Electronics?

- Why mask type 3 shows such a big charge?