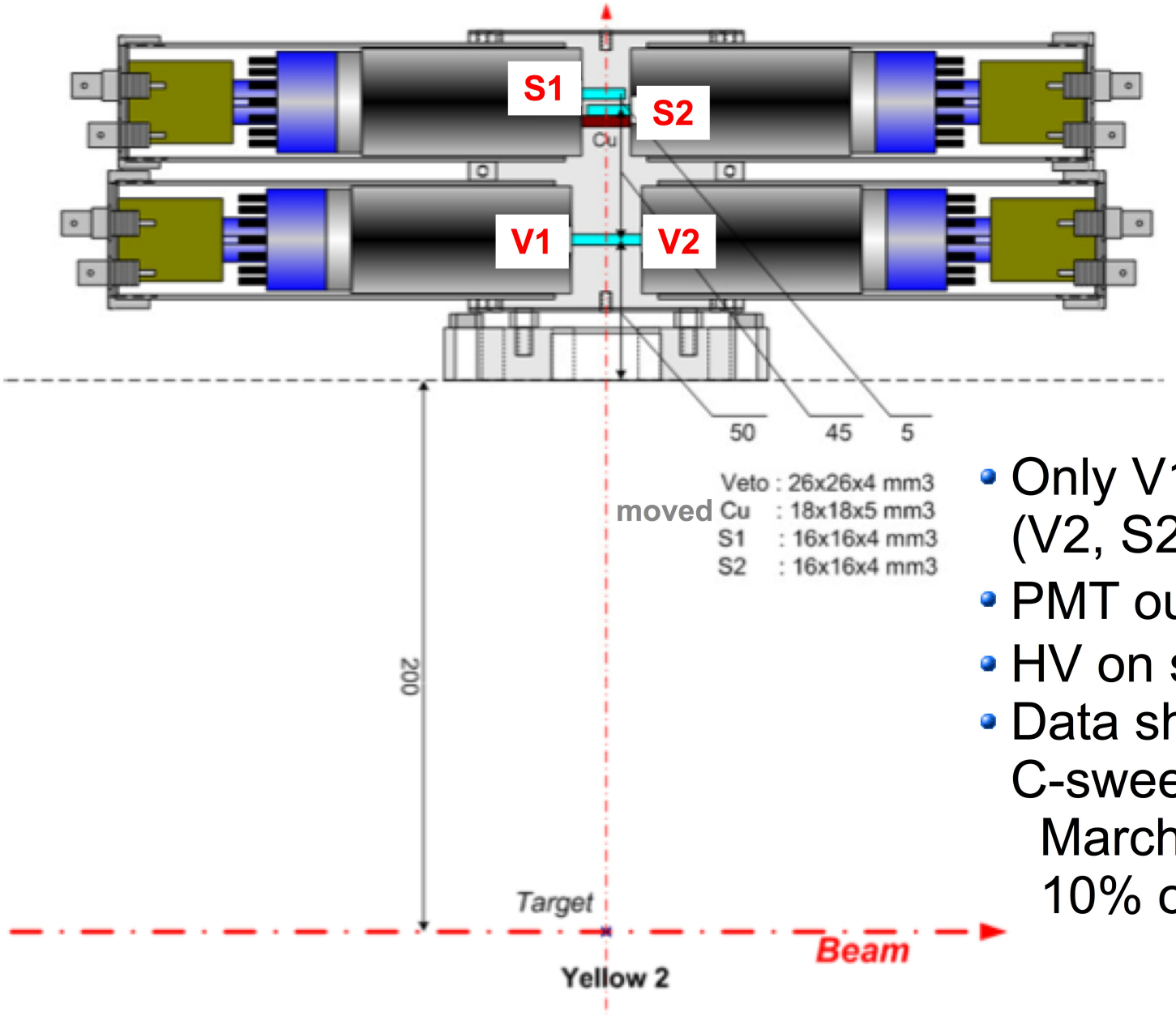
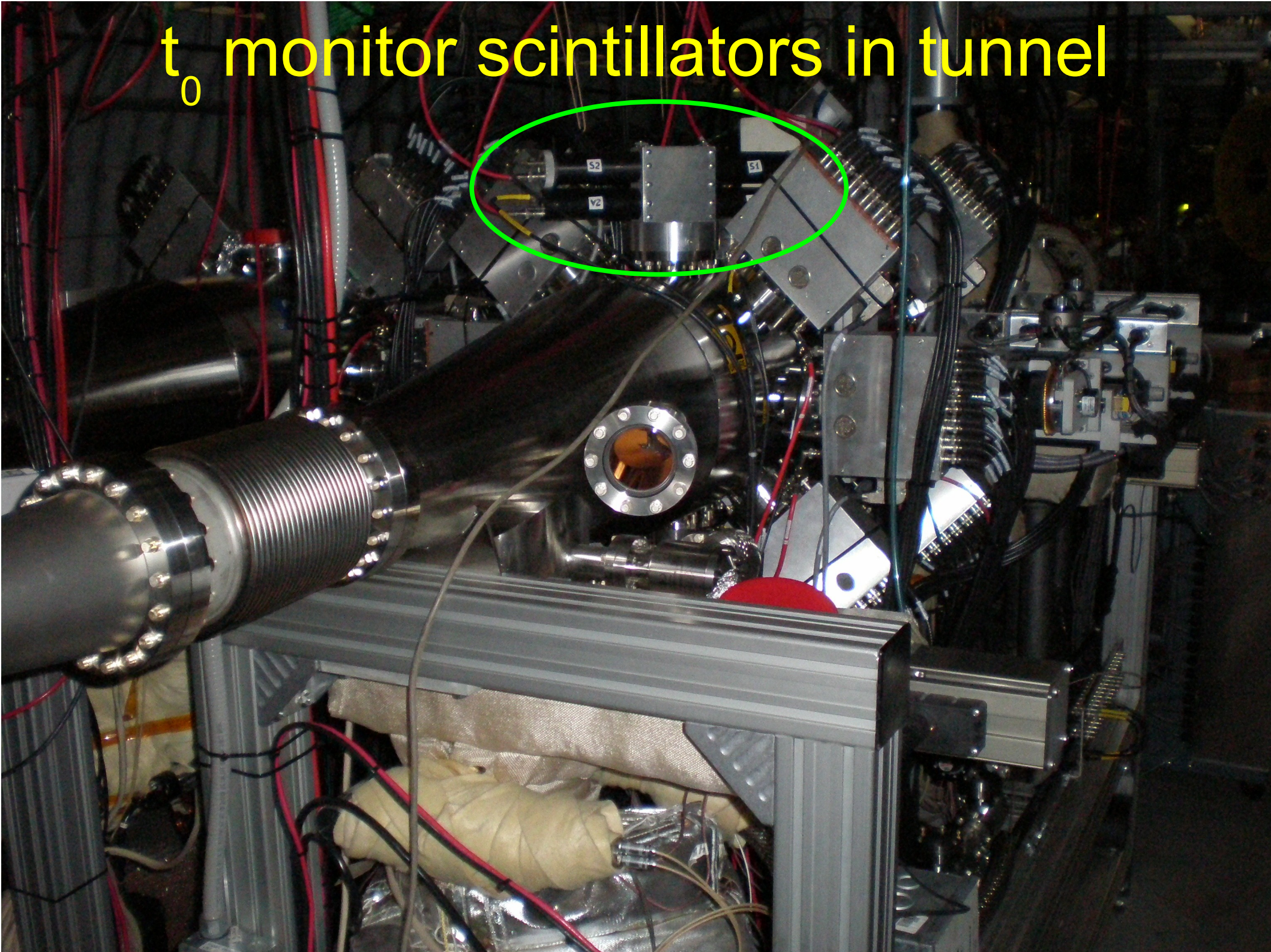
t_0 monitor scintillators: 1st look 24.03.11

- Grigor *et al.* installed scintillators to monitor t_0; in vertical port Y2Up:

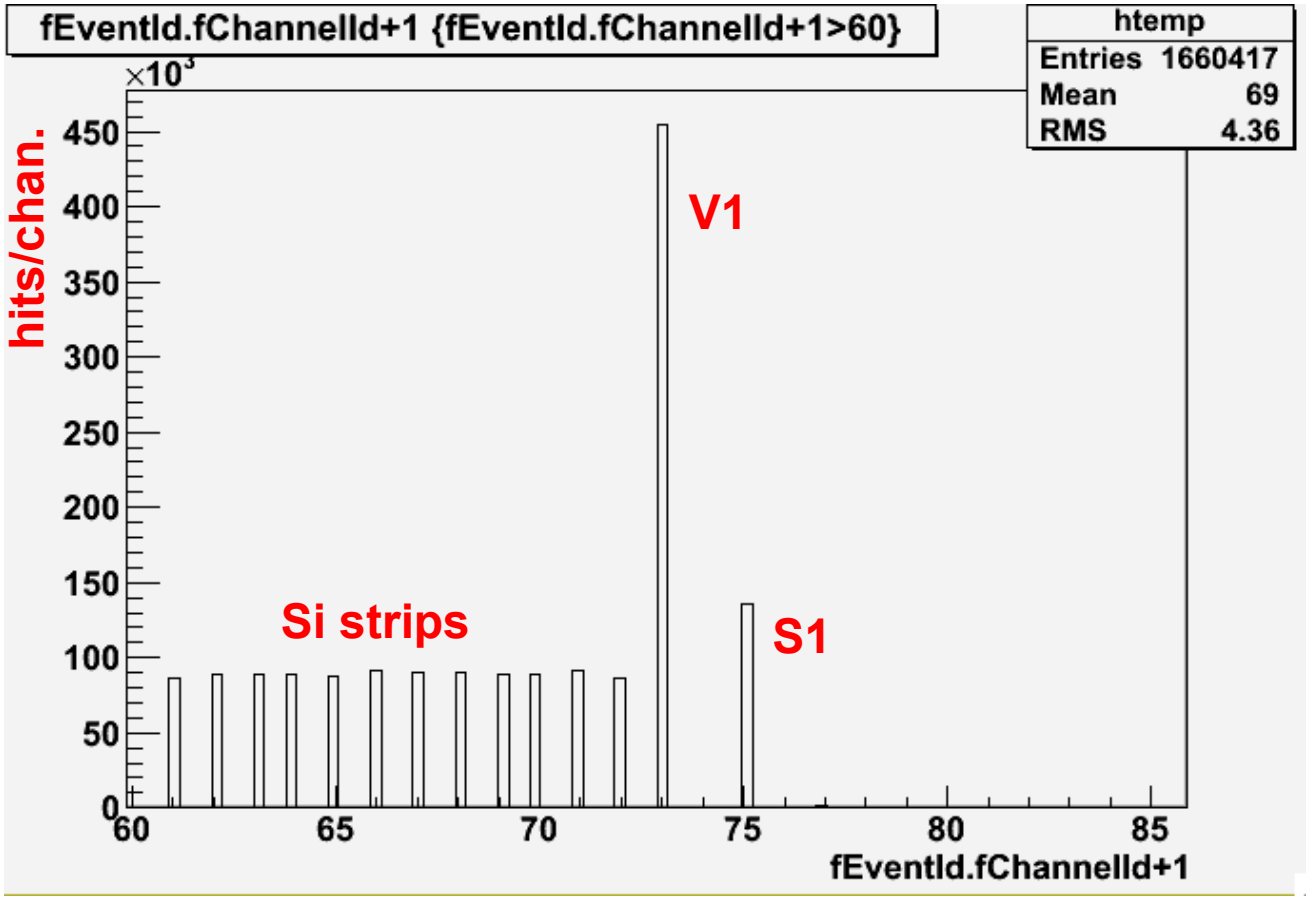


- 3 scint.: V, S1, S2
  4 mm thick
- viewed by 4 PMTs:
  V1, V2, S1, S2

- Only V1, S1 have HV on
  (V2, S2 need higher I supply)
- PMT output → ⫴ → WFDs
- HV on since ??.??.??
- Data shown here from
  C-sweep Run 15303.303
  March 17
  10% of events analyzed

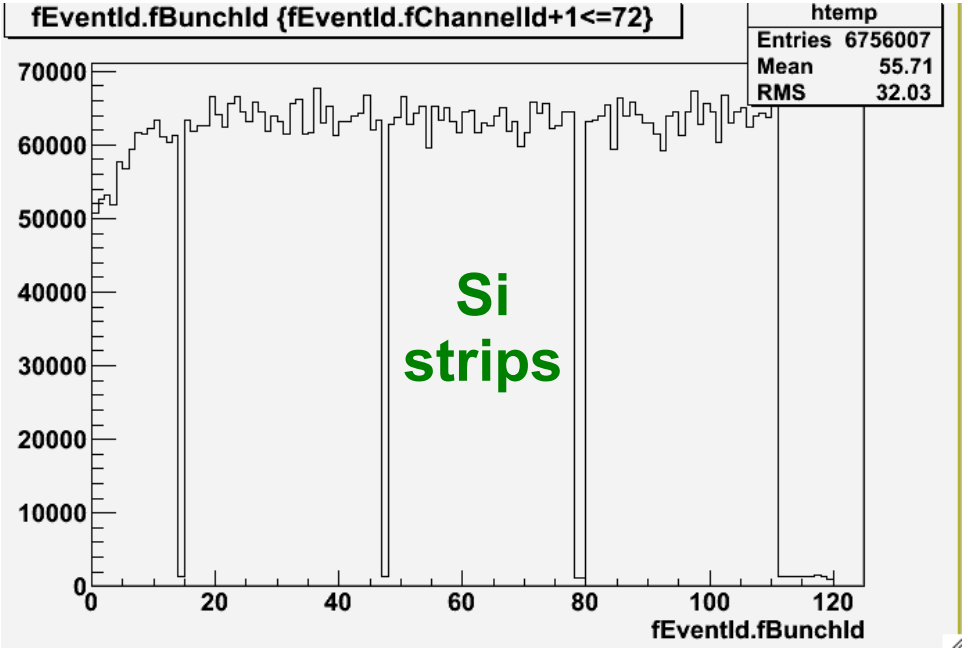

t_0 monitor scintillators in tunnel
S2
S1
Y2

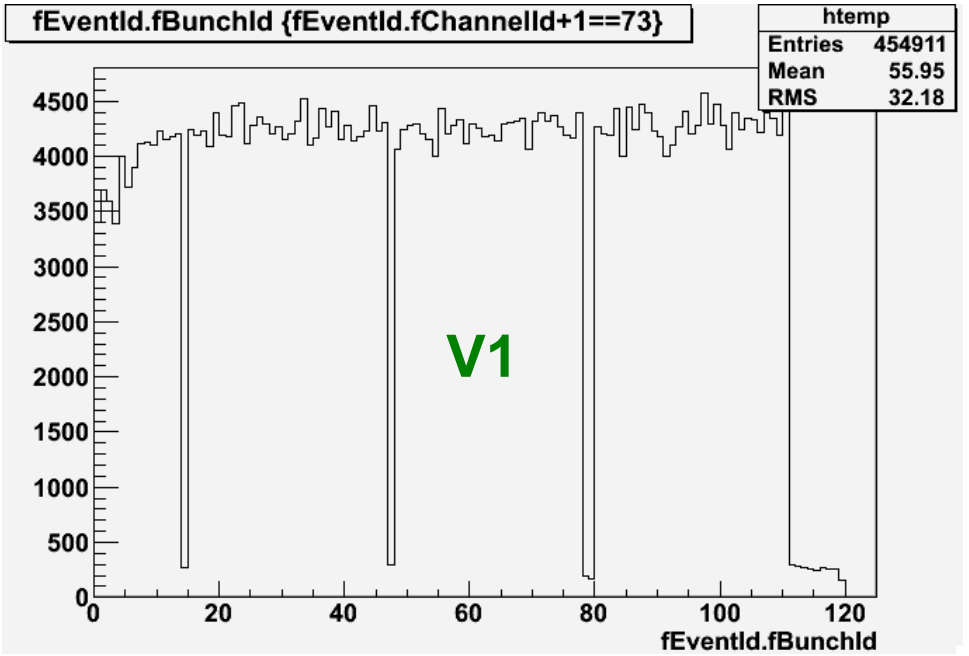
Scint.: channels, rates

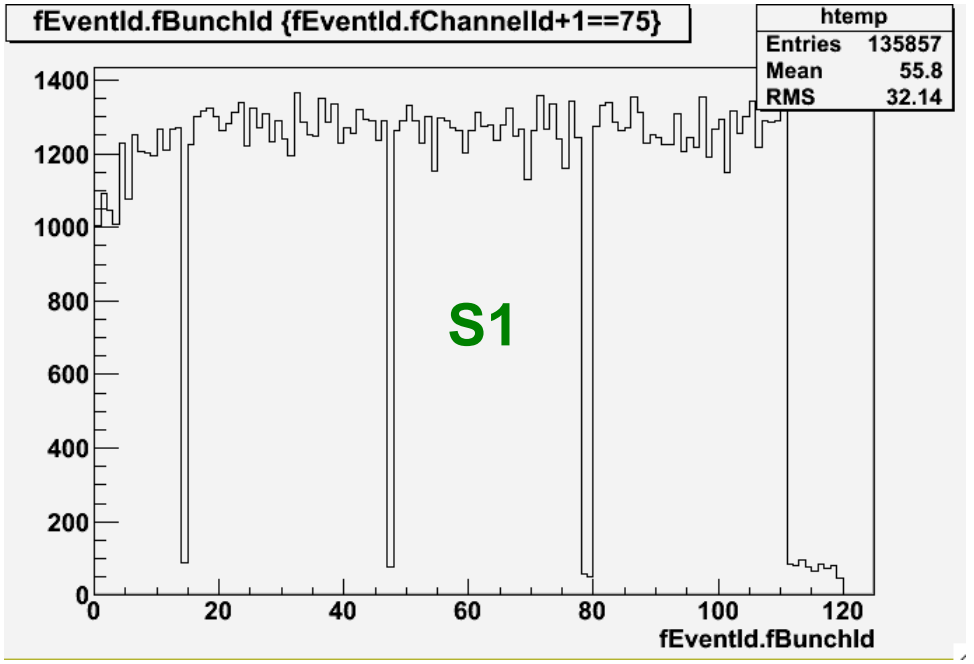


- Scint. read out in Y2Up: ch. 73/74/75/76 = V1/V2/S1/S2
- Similar magnitude rate as Si strips
- S1 is smaller than V (16×16mm vs. 26×26mm)
- S1 is farther from target than V (300mm vs. 250mm)
- Smaller solid angle accounts for S1/V1 rate difference

Scint.: bunch structure



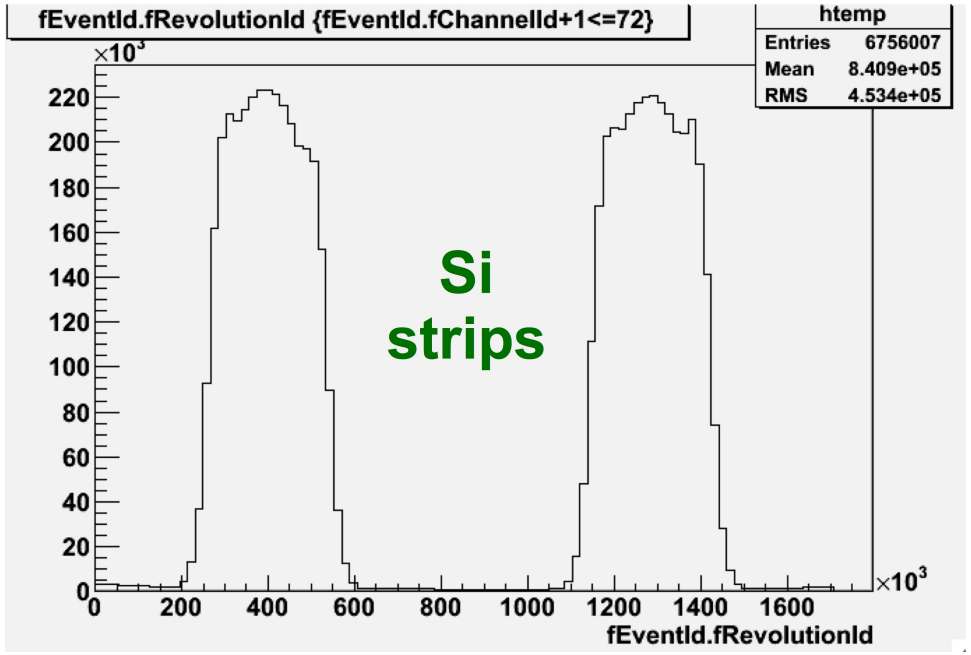


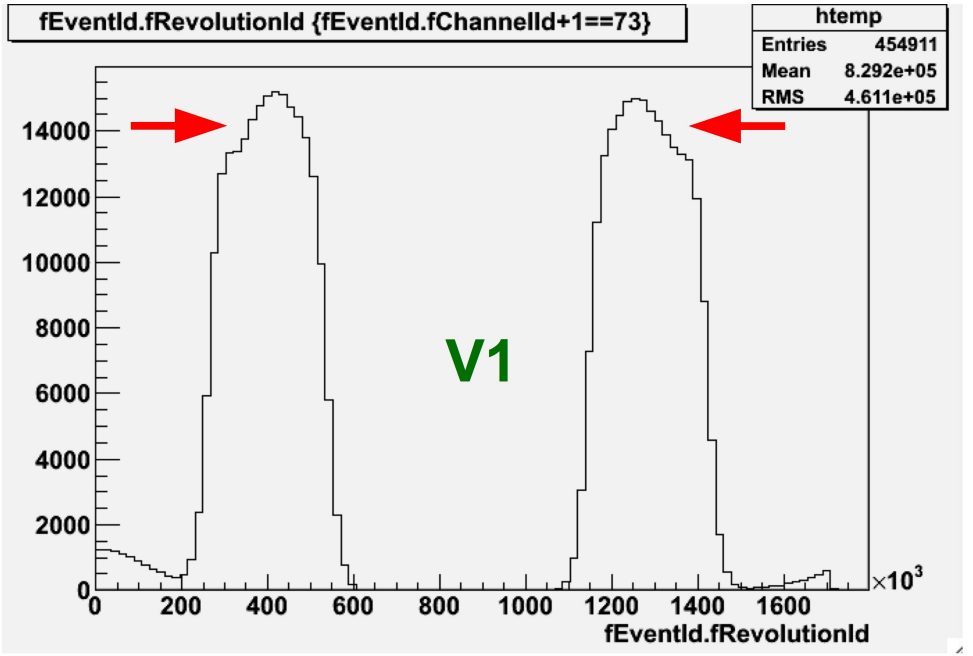


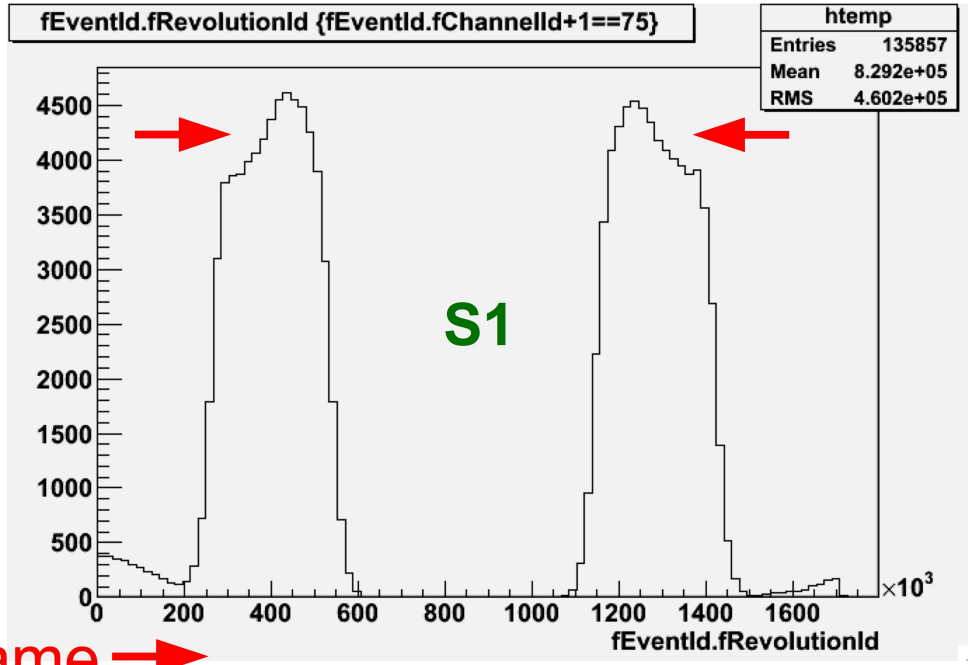
- Scint. same bunch structure as Si strips
- ⇒ Scint. hits associated with proton beam

Scint.: sweep time structure

- Use revolution # as time
- Familiar rate vs. time
  for C-sweep:



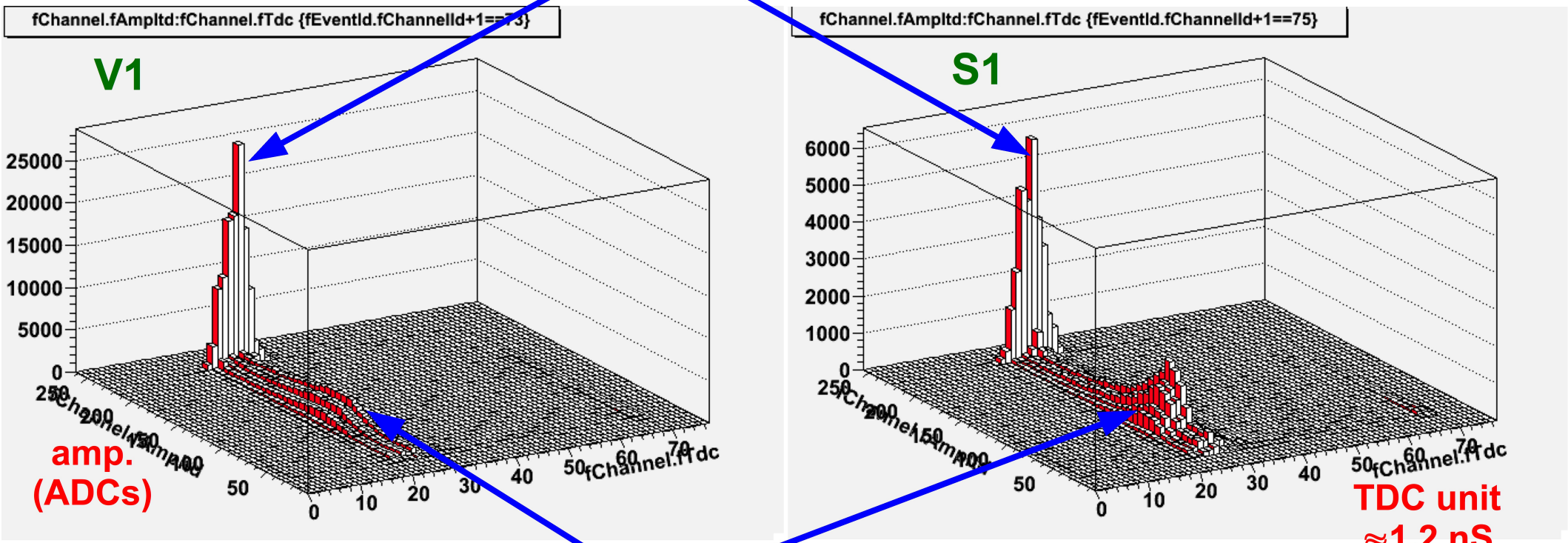




- Scint. same time structure
  as Si strips
- ⇒ Scint. hits associated with
  p-C scattering products
- Maybe shadowing from target frame →

Scint.: amplitude vs. time

- ADC saturation peak

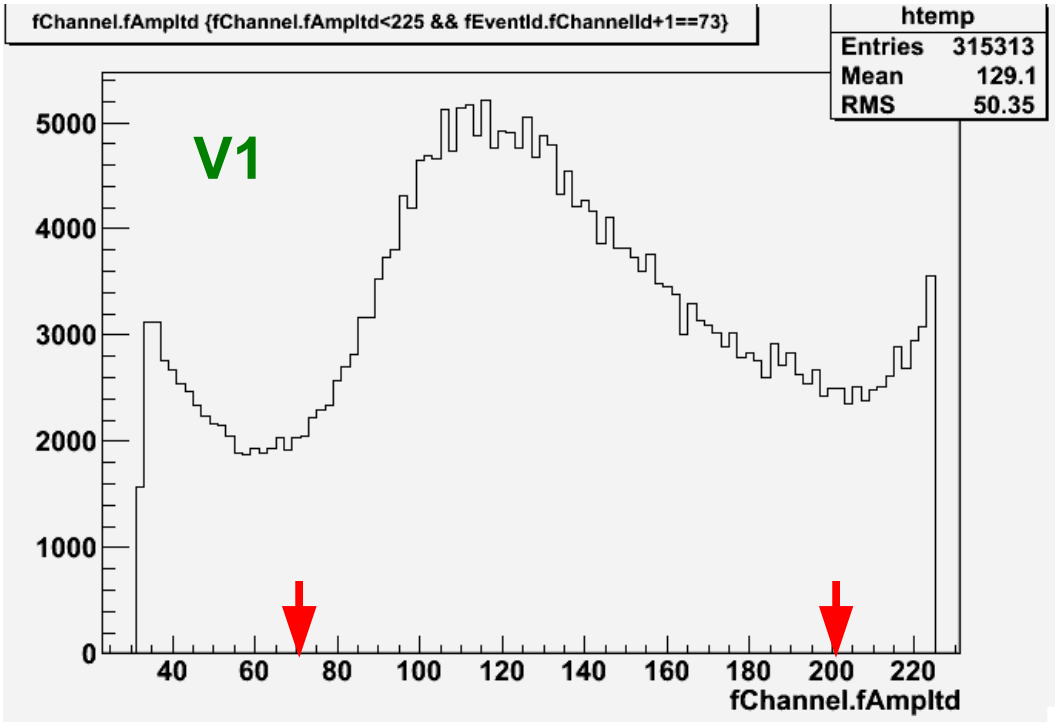


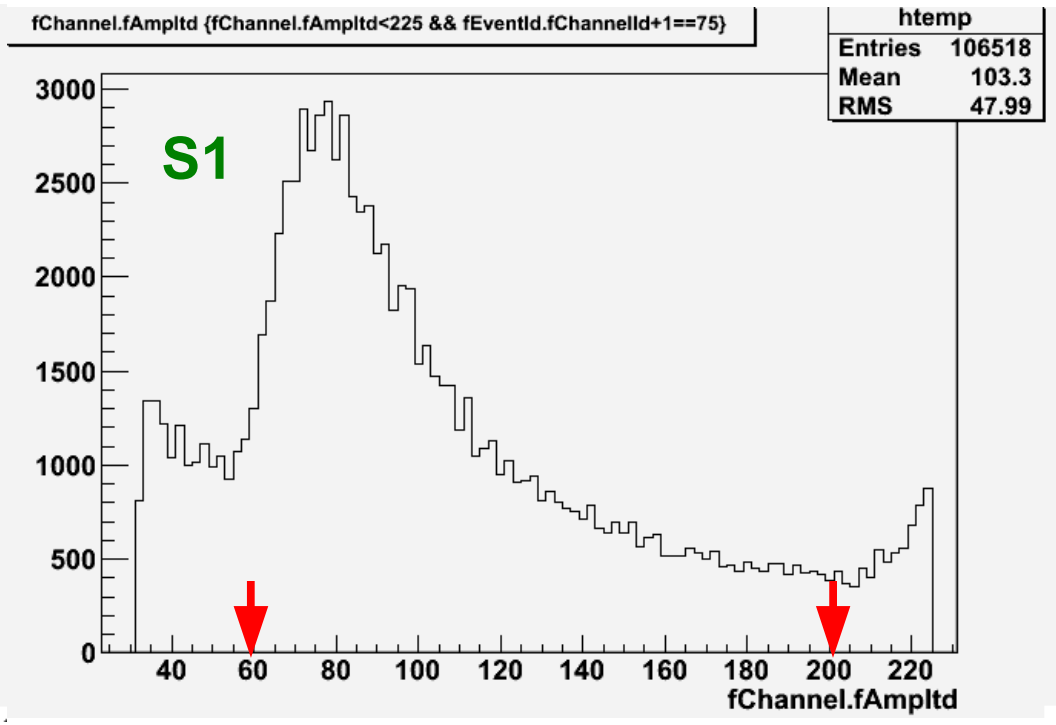
- low p.h. peak

- Scint. pulses are in a narrow time range

Scint.: amplitude

- Cutting out the ADC saturation peak:

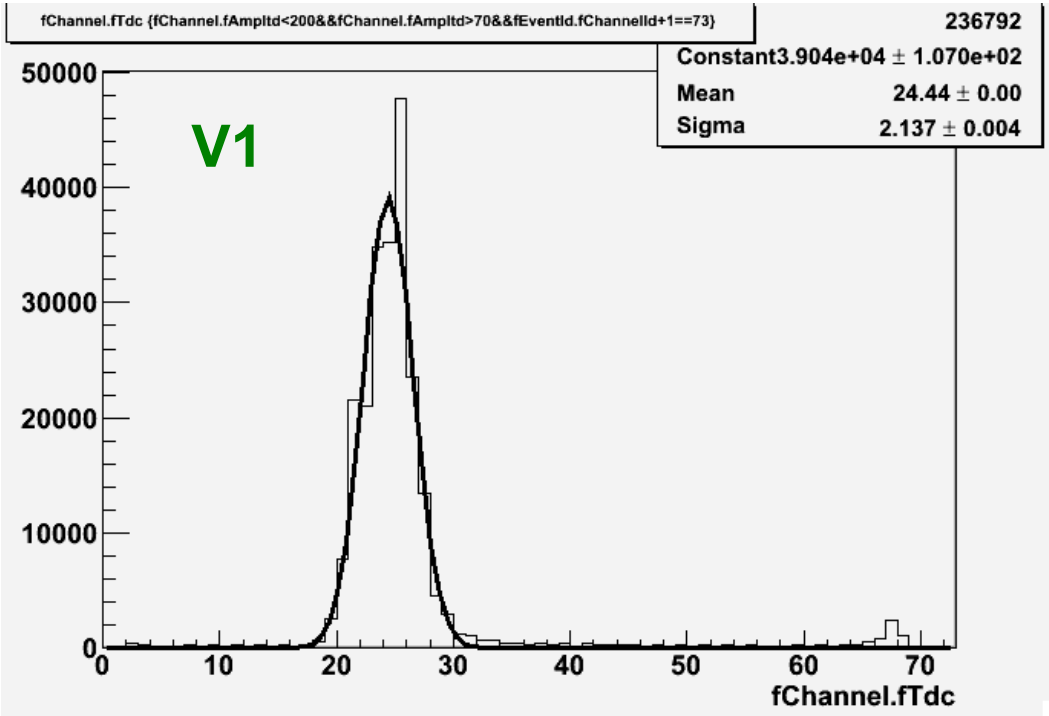


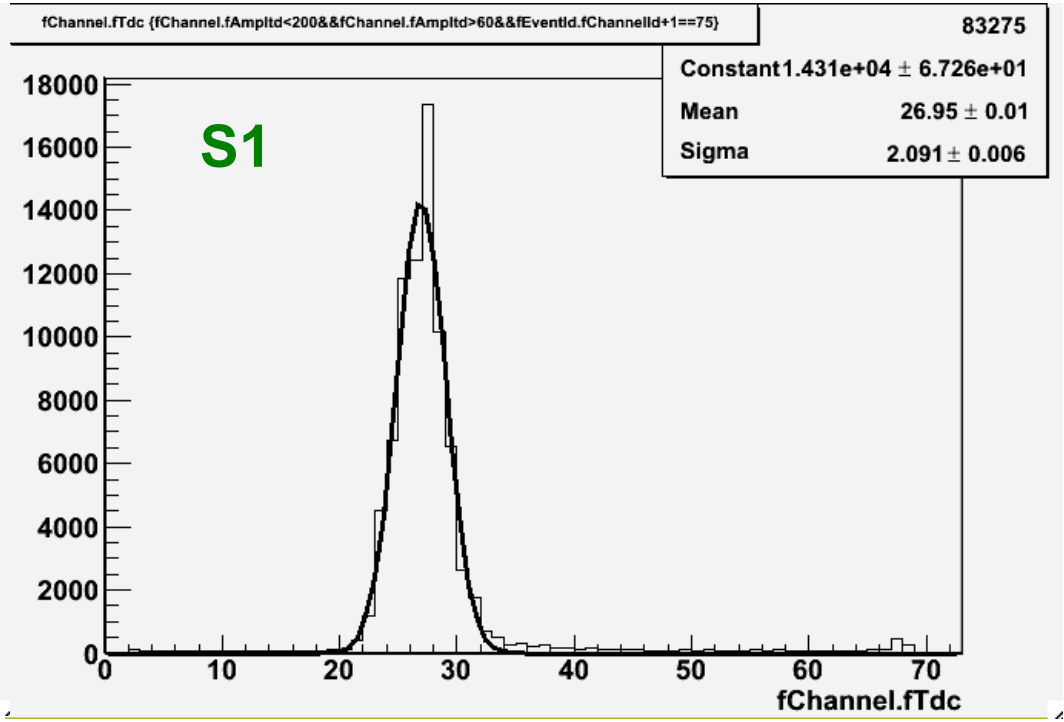


- These look a lot like mip peaks
- If so, PMT gain nicely matched to WFDs (Grigor)
- Look at t-distribution in mip range: ↓ ↓

Scint.: time

- With gaussian fits:



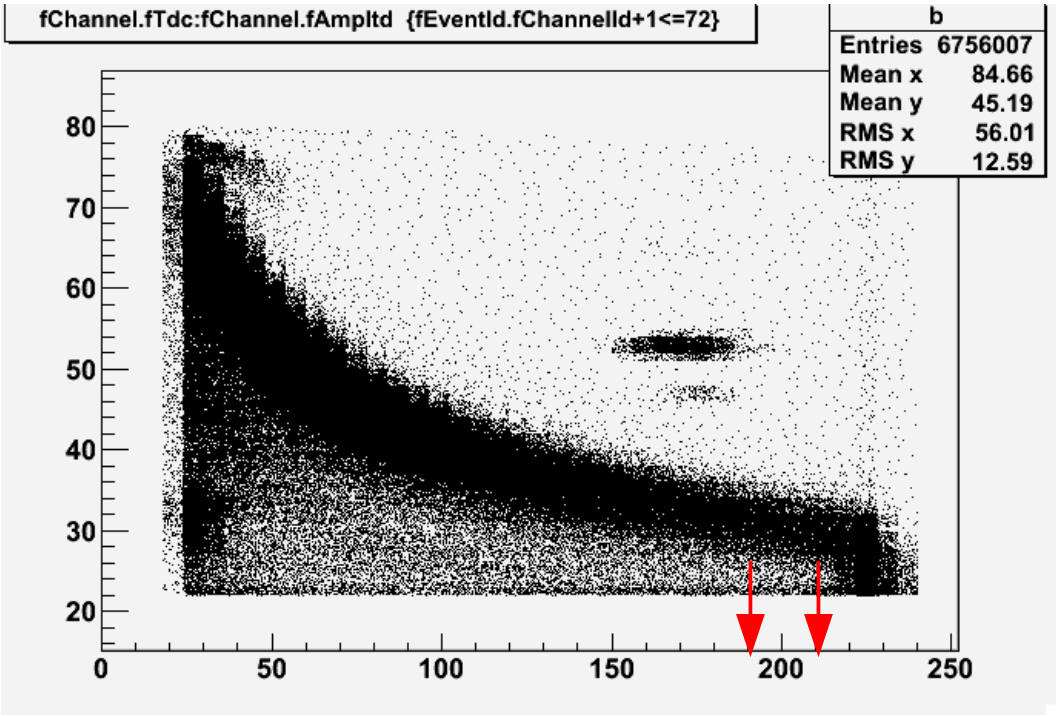


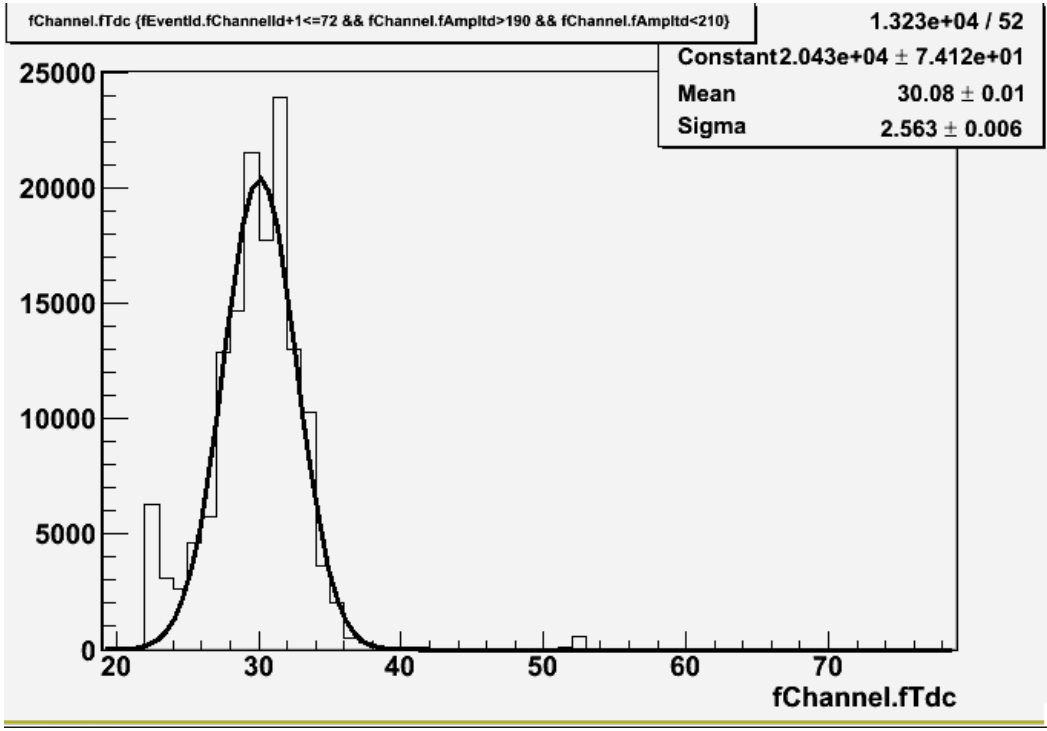
TDC unit ≈1.2 nS

- Fit to mean (t_0) negligible stat. uncert.
- Fit $\sigma \approx 2.5$ nS, this must be the p-beam length (next slide)
- Bin-to-bin fluctuations larger than stat.;
  t-reconstruction not linear, lumpy (3 ADCs, gains)

Scint. vs. C time width

- Slice of banana time in narrow E-range:

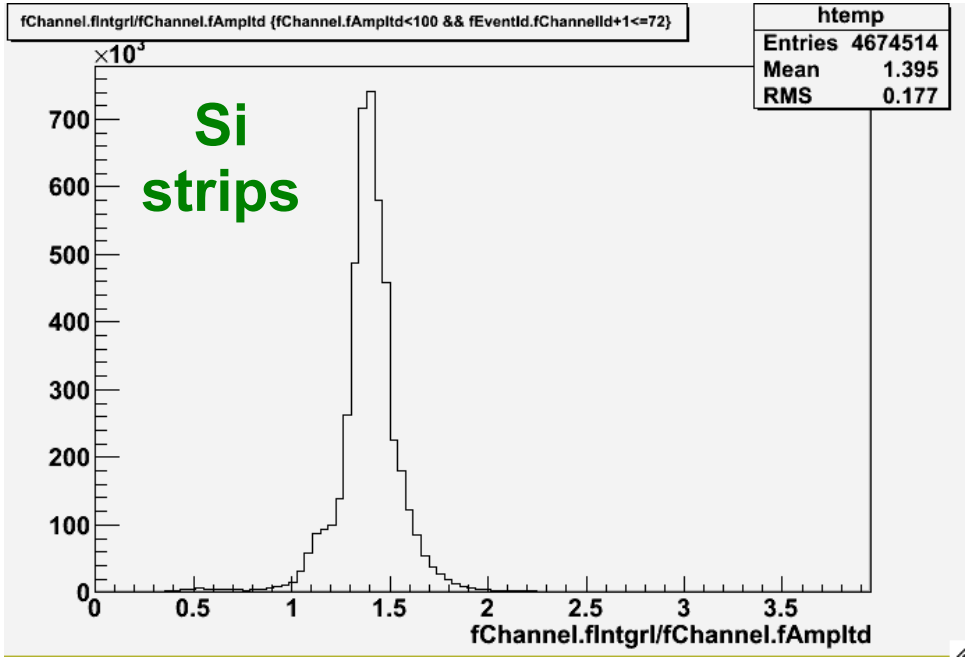


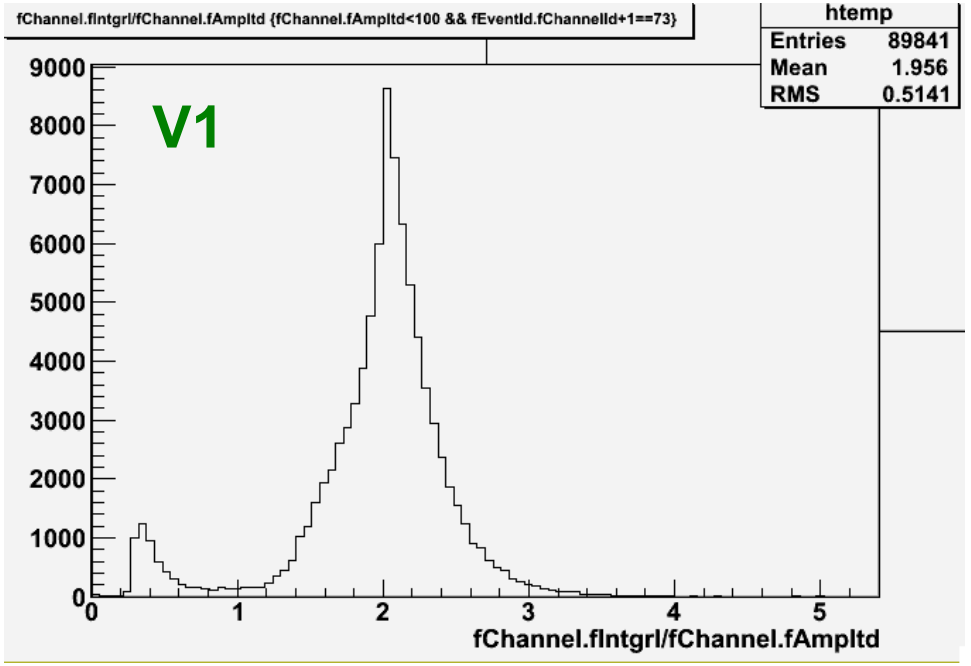


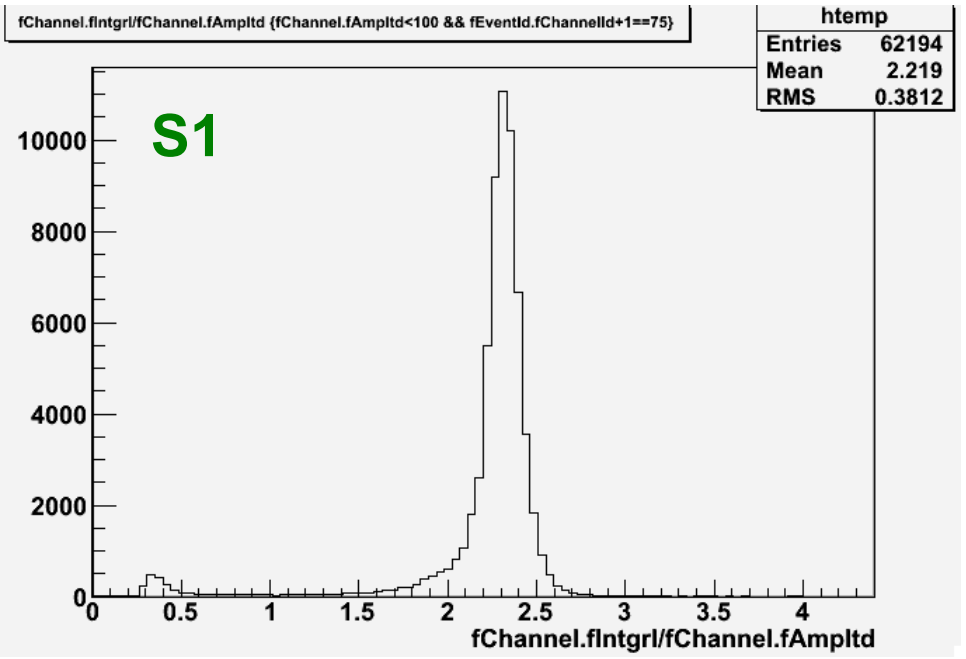
- Fit $\sigma \approx 3.1$ nS
- With smearing due to E-resolution ~consistent with scint. t-width
  p-beam length

Scint.: pulse width

- From waveform v(t) WFDs reconstruct
  amplitide: Amp = max[v(t)]
  integral: Int = $\int v(t)\,dt$
- Then Int/Amp is a measure of the pulse width:







- Scint. pulses are wider than Si strip pulses
- May be worth investigating: data w/ samples, t-recon.

t_0 monitor scintillators: summary

So far:

- Scint. see pC scattering products, high rate ~Si strips
- Pretty clean mip's, narrow t-distribution (p-beam width)
- Statistically accutrate t_0 measure

Immediate next steps:

- Correlate V1/S1 hits: clean signal, improve t-resolution (good already)
  (I need the next level of root sophistication...)
- Take some data with samples: t-recon.?
- **But the main event: see how t_0's vary, evolve with time (more fills)**

  perhaps include t-info in polarization measurement

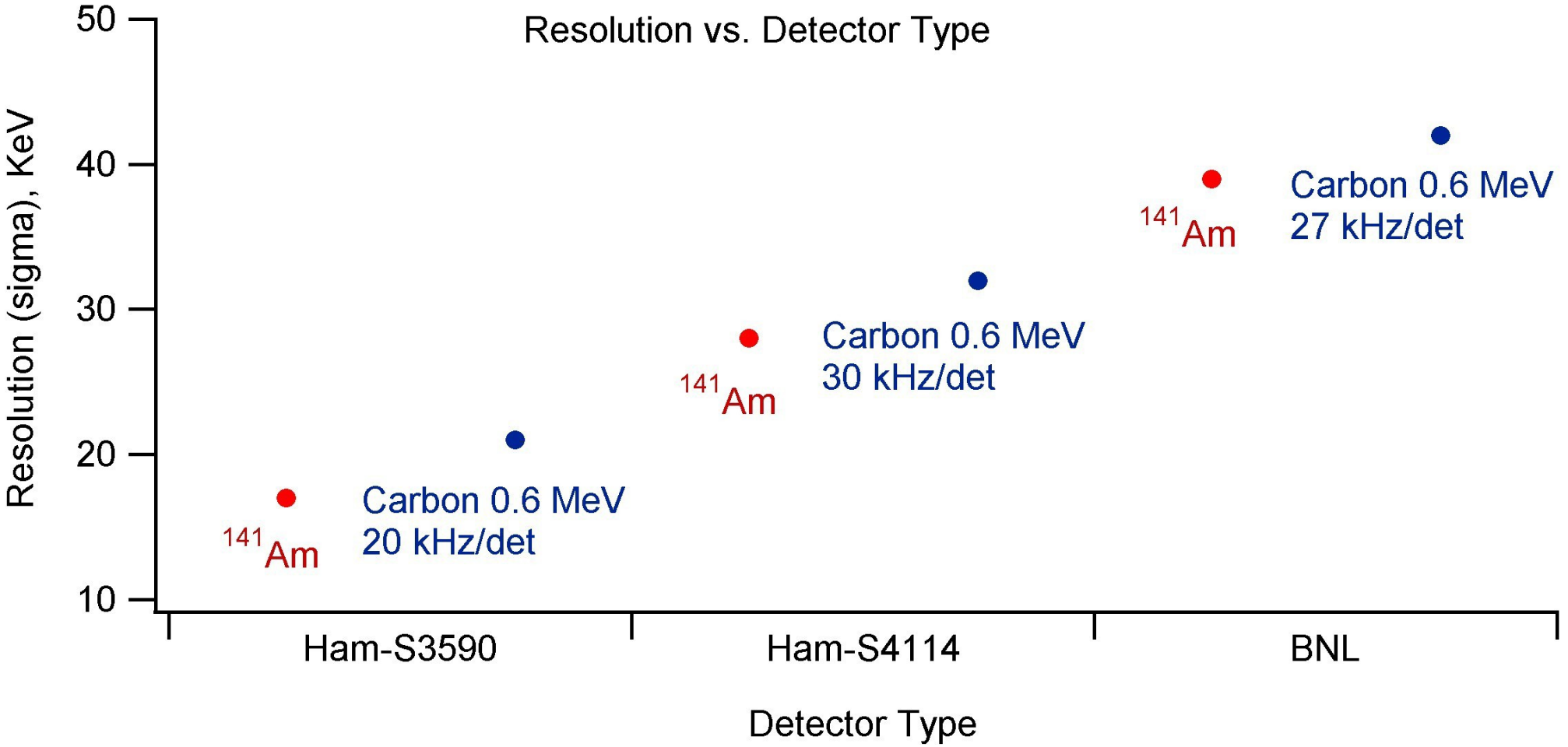
Further down the line:

- HV all 4 chan.?
- More important: scintillators in Blue ring (Run 11+?...)

EXTRAS

Old CNIPol web page → Analysis Archive → Si detector tests at Tandem

Grigor, Ron, Boris



Old CNIPol web page → CNI Group Meetings → old meetings → August 2007

Aug. 23, 2007: Si tests at Tandem (Boris)

PD vs SD