

UA9 scintillators and GEM data analysis

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Outline

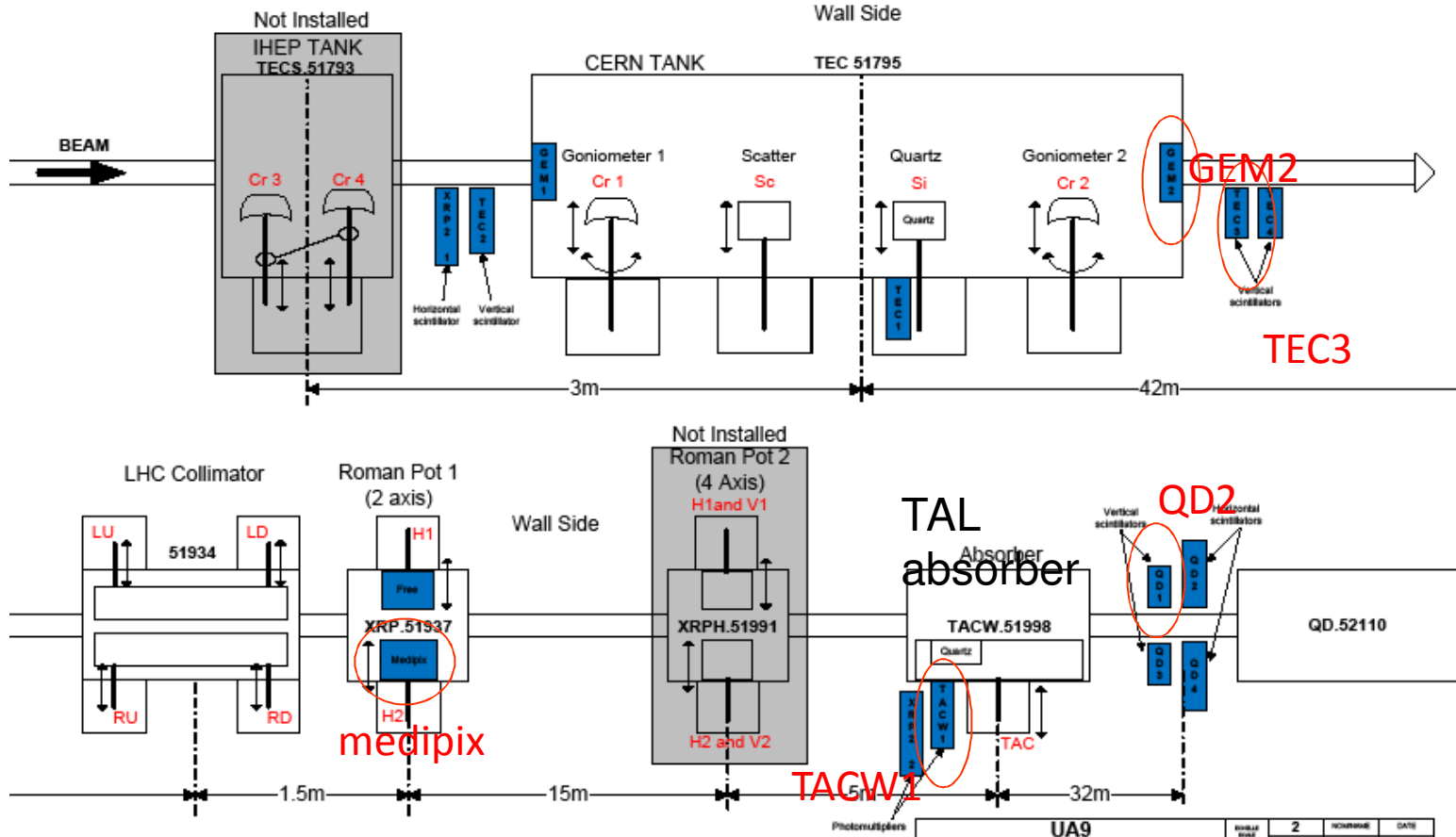
- Set-up
- Data analysis of
Aug 11th (RM/LNF) and Sep 22nd MD
- Evidence of channeling

Information already circulated within the coll

Scint and GEM systems

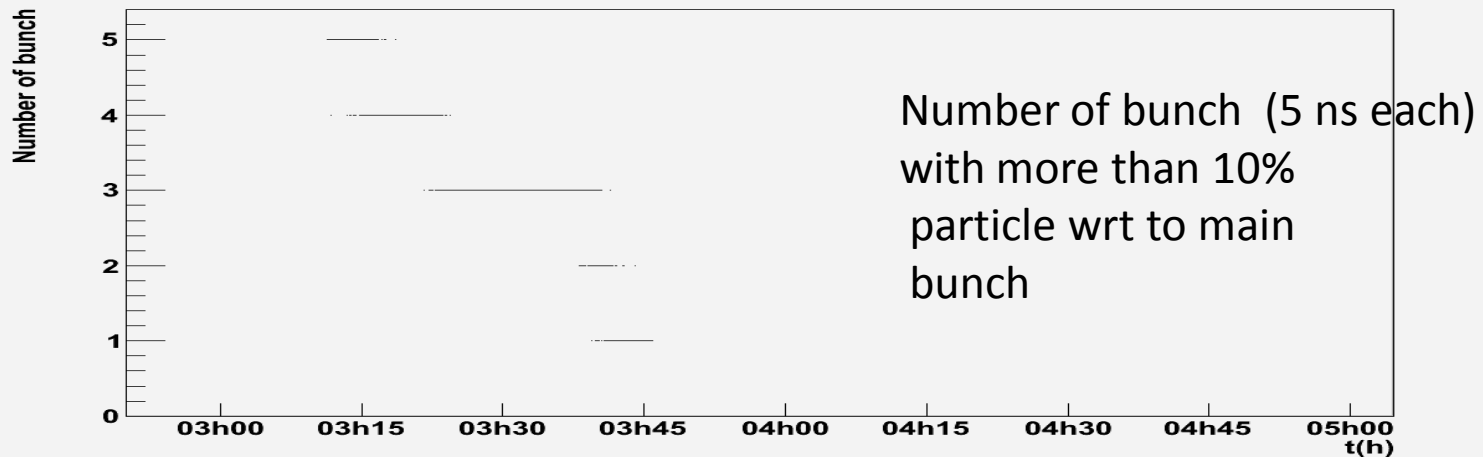
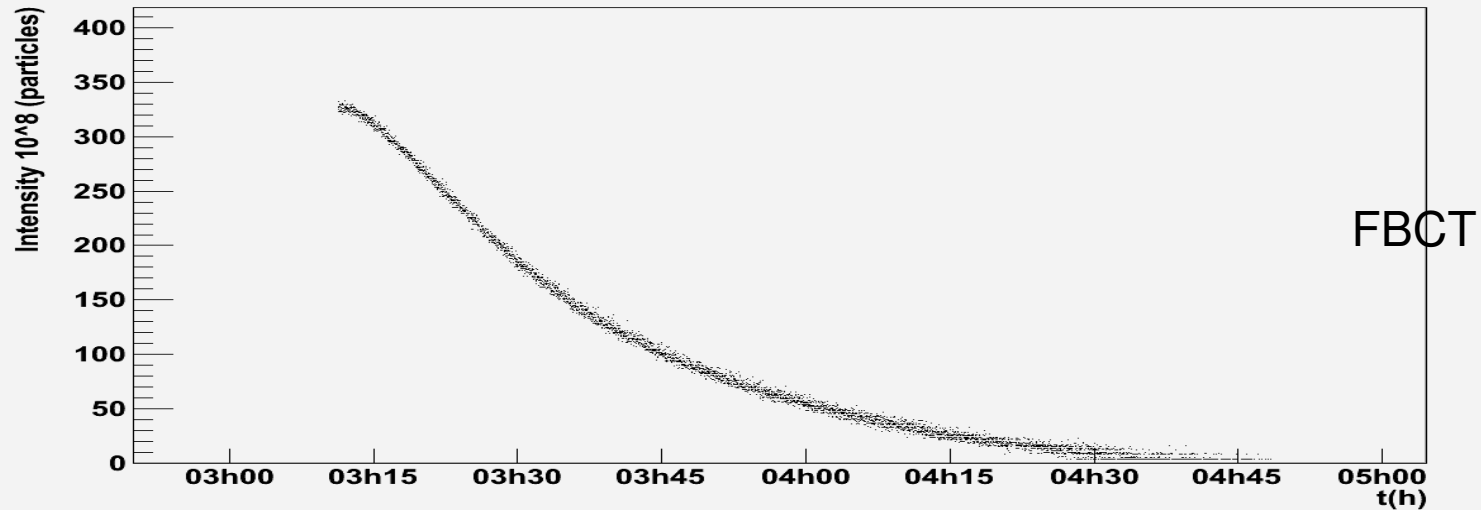
- Rate measurement (at 1Hz)
 - Single rates, coincidence
 - GEM segmented in 16x16 pads
- Scint and GEM info available online too.
- Include rates from Cerenkov detector too
 - On Nov runs also amplitude meas. for C. det.
- ROOT file with all devices data synchronized
 - With crystal pos., BLM, FBCT, motor position, LHC coll.
 - Available for the collaboration on DFS
 - http://dfs.cern.ch/dfs/Experiments/UA9/analysis/yyyymmdd/sincro_xx.root

Experimental set-up (Aug)



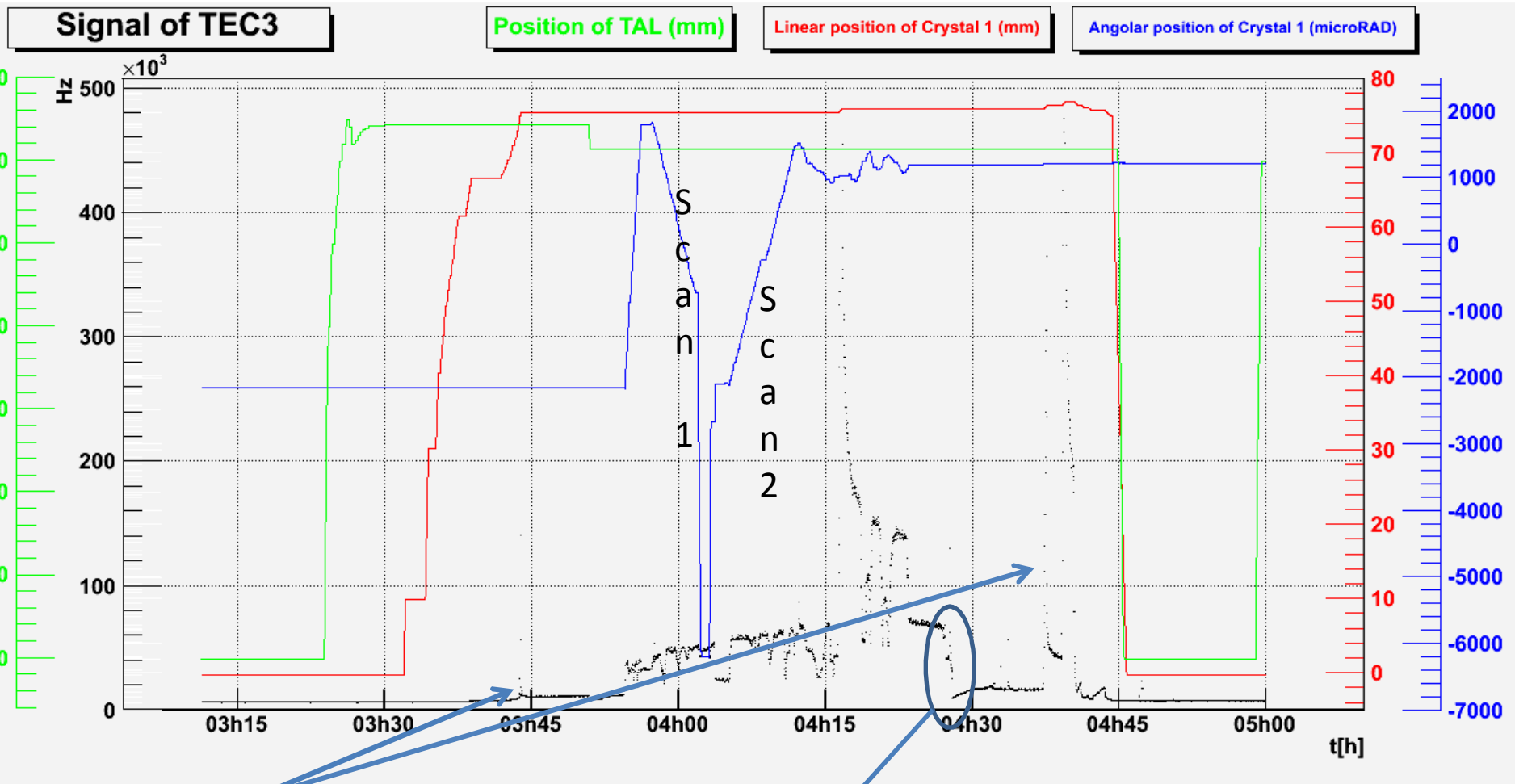
- Observe rates close to crystal on tank TEC3 (scint+PMT) and GEMs (before and after crystal)
- Observe rate on TAL absorbers laterally DISPLACED to see ONLY channeled particles (TACW)
 - QDX (scint.) correlated with other devices

Beam intensity (Aug)



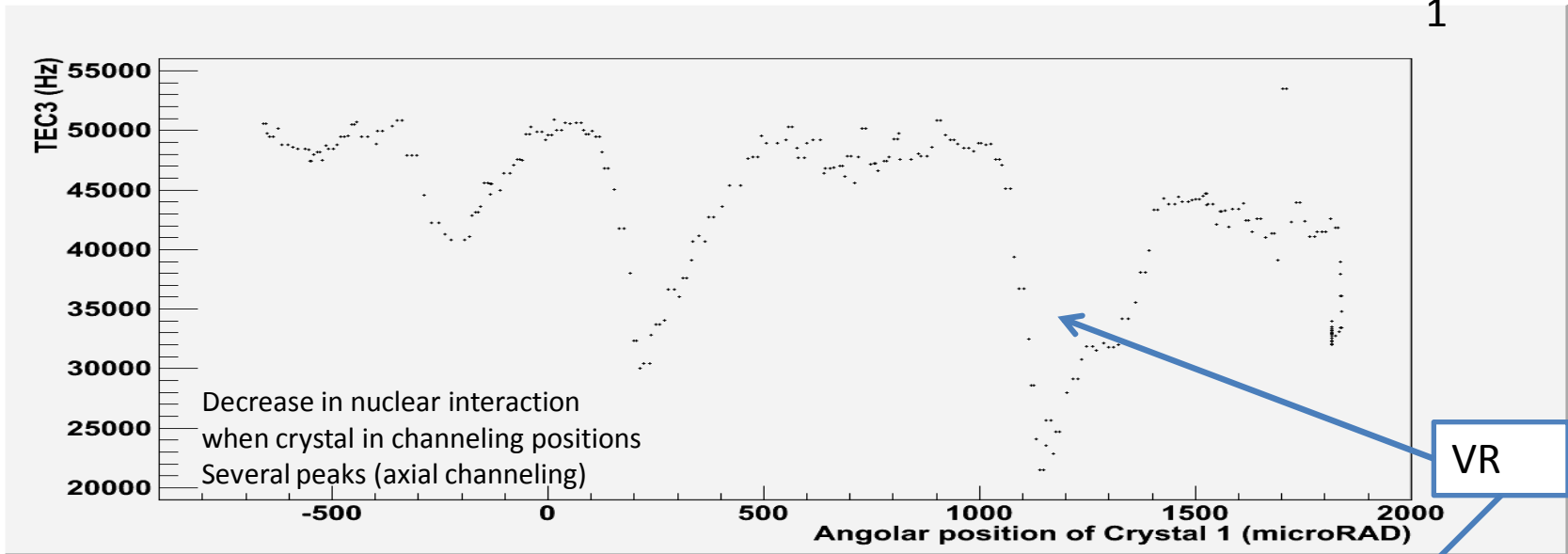
TEC3 rates (Aug)

Crystal 1: strip

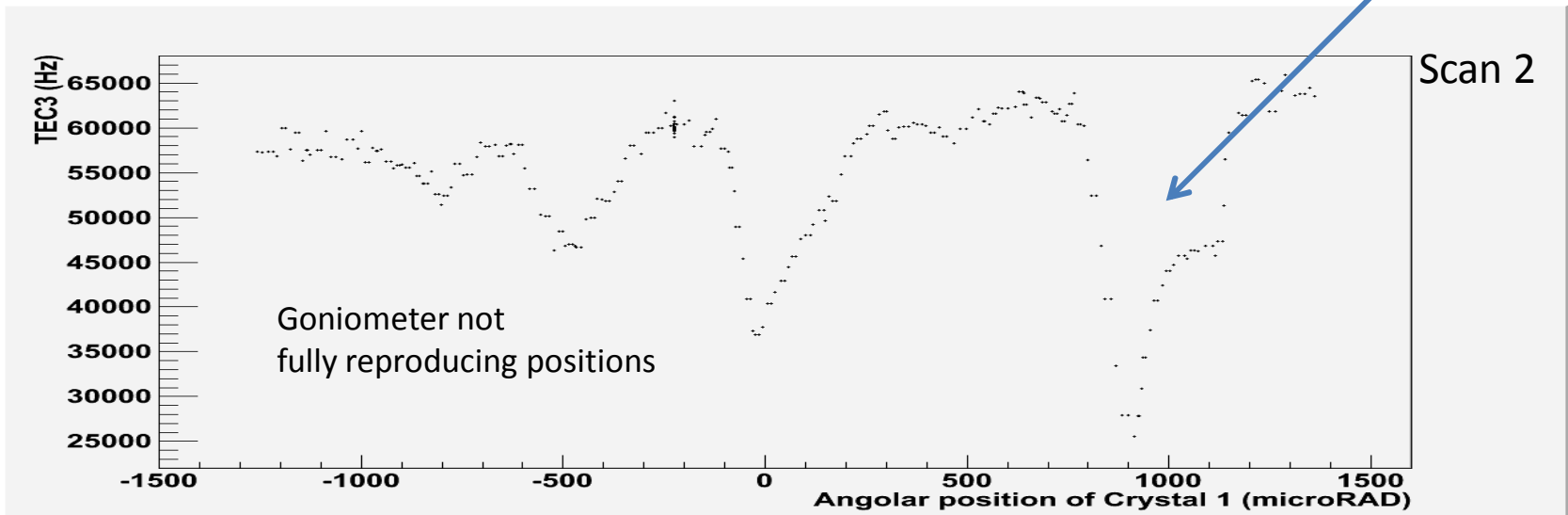


Channeling positions

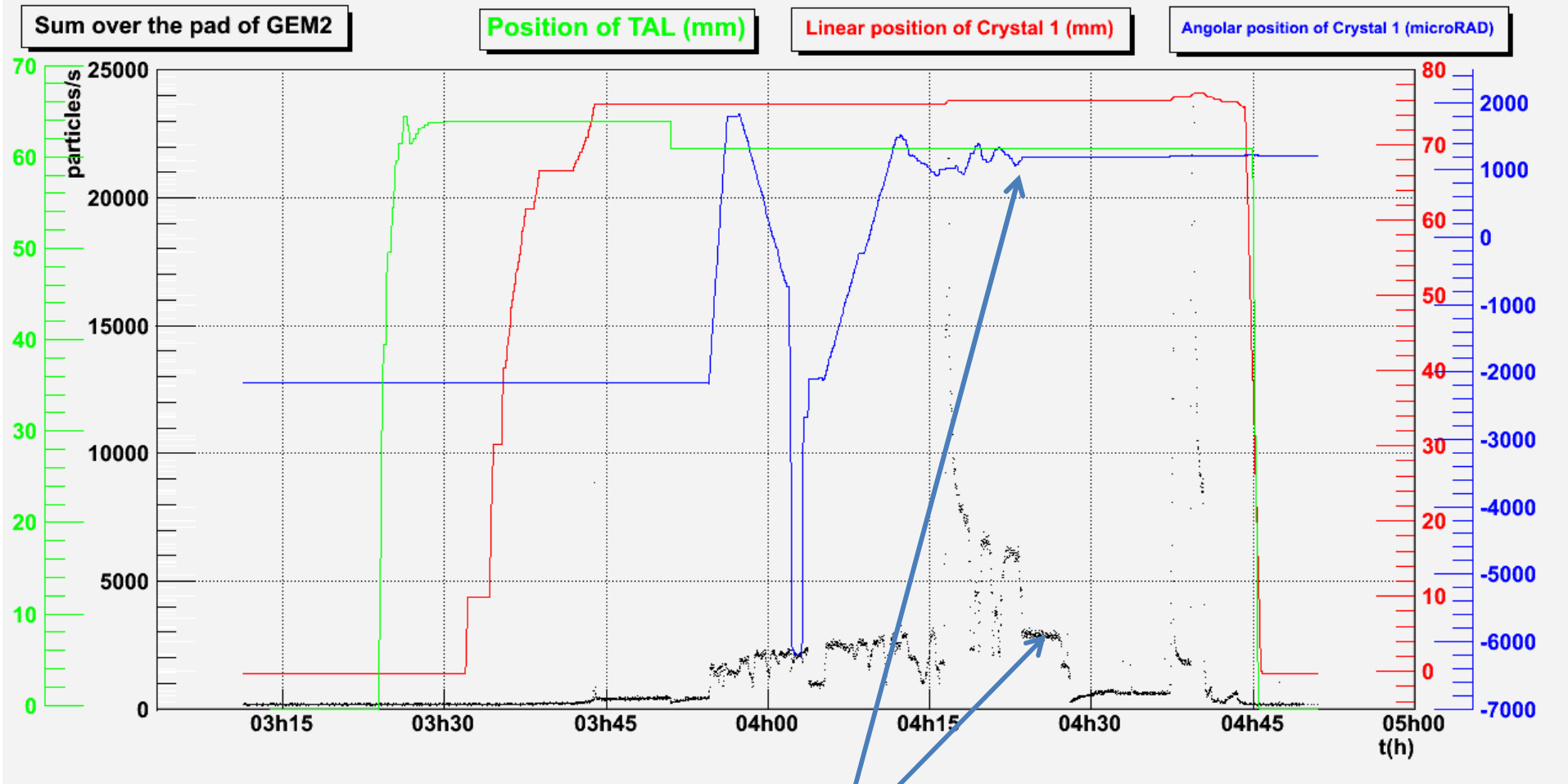
Scan
1



Scan 2

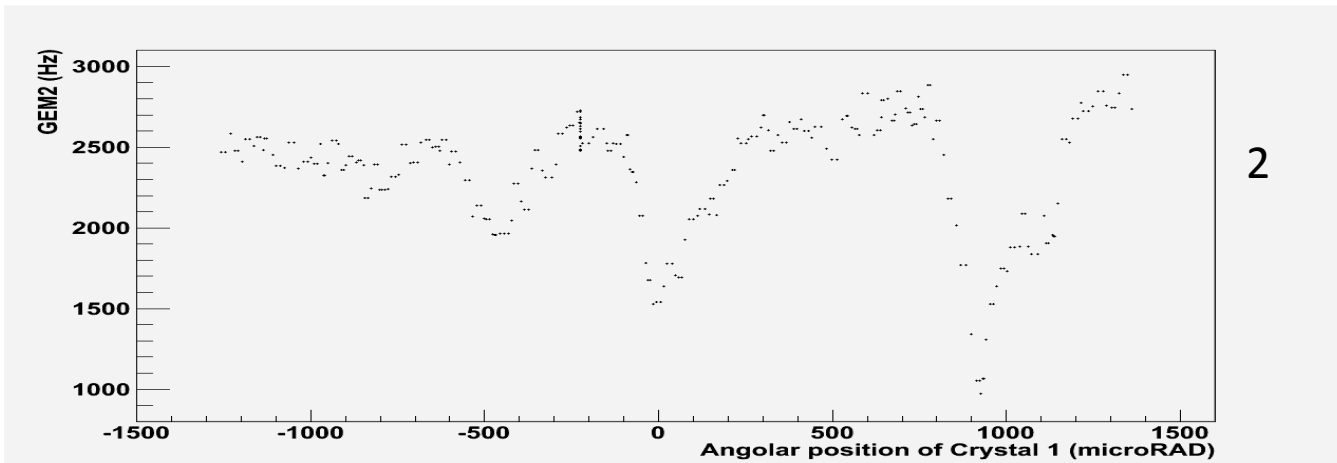
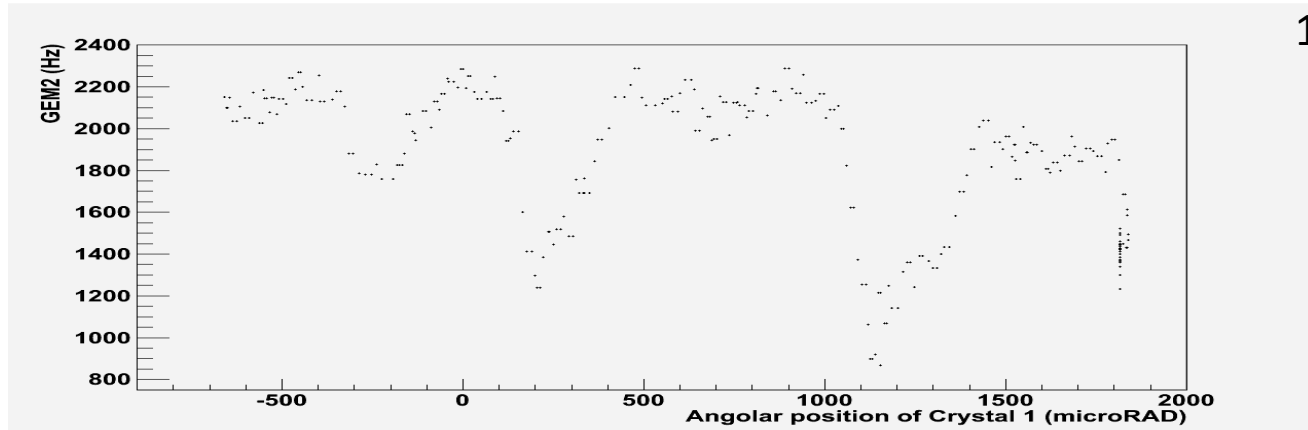


GEM2 rates (sum over all pads)



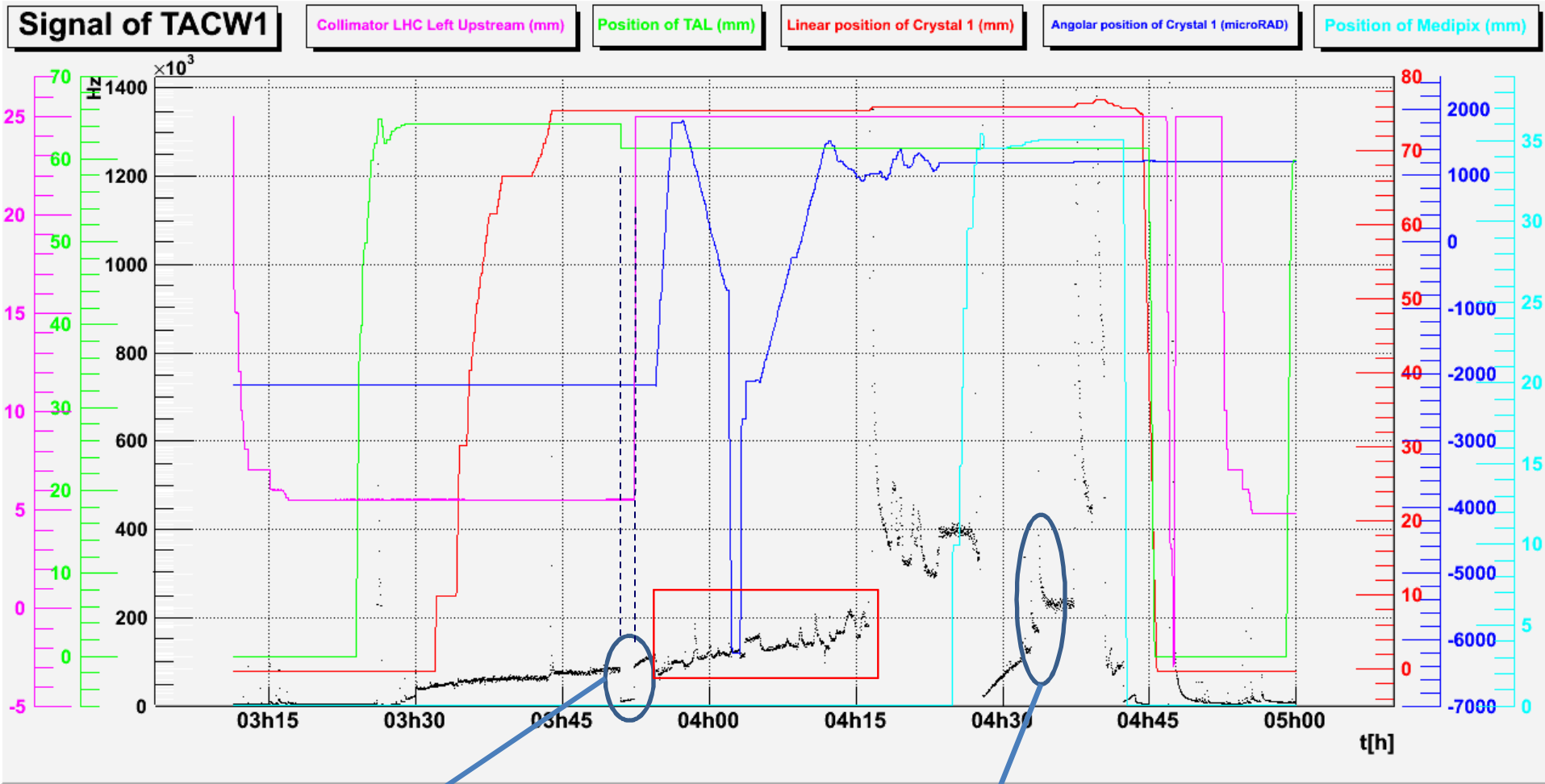
Channeling !

Channeling seen by GEM2



GEM2 and scintillator signals perfectly correlated
GEM1 rate is 20 Hz (as expected being upstream of the crystal)

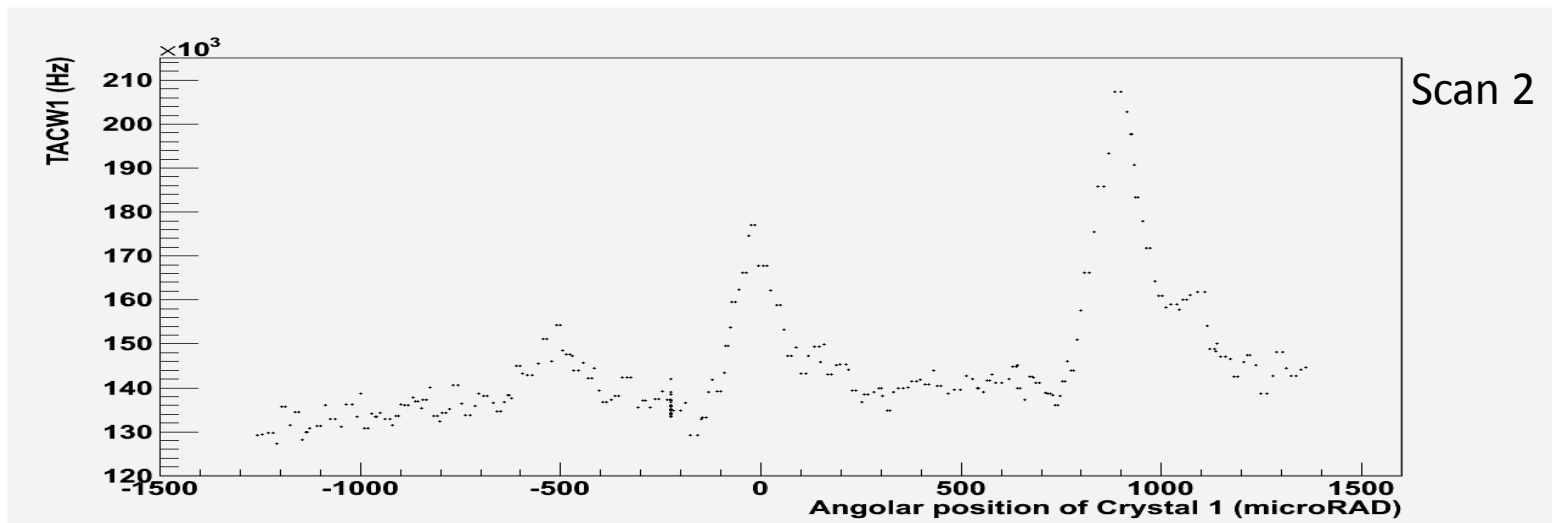
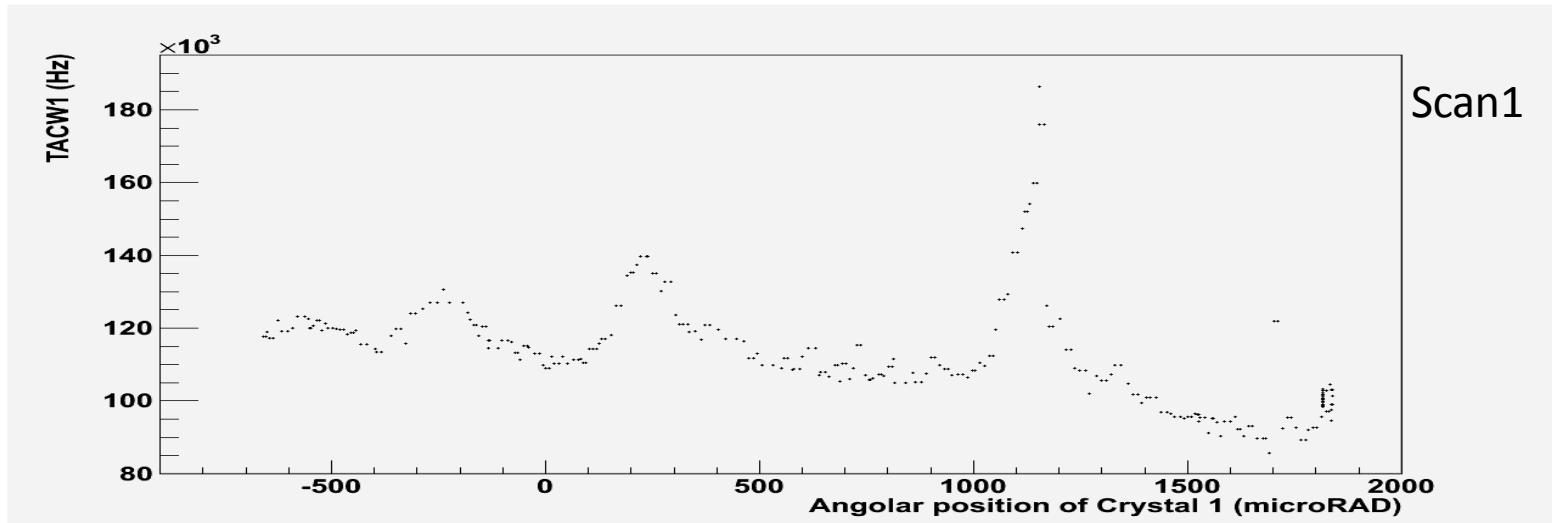
Cerenkov det. on TAL absorber



TAL and LHC coll. movements

Medipix movements

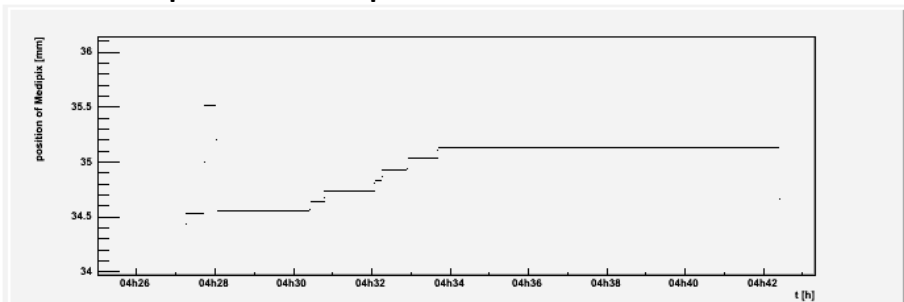
Channeling peaks seen at TAL!



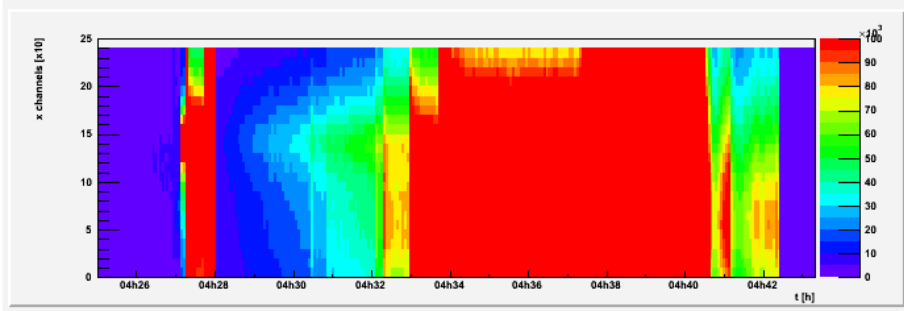
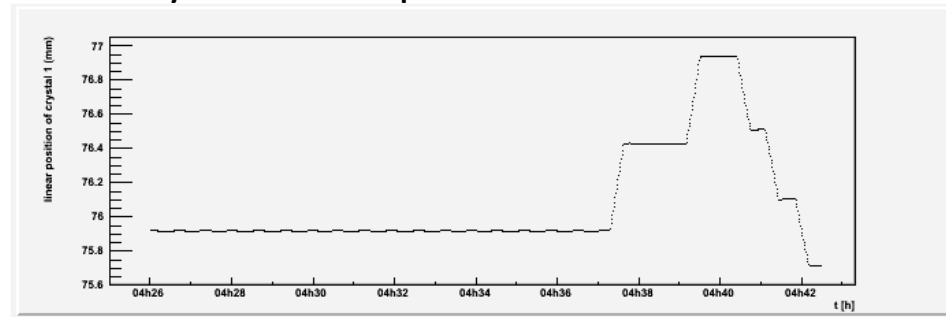
Moving Medipix into the beam

Medipix rate projected on x coordinate (550 micrometers bins)

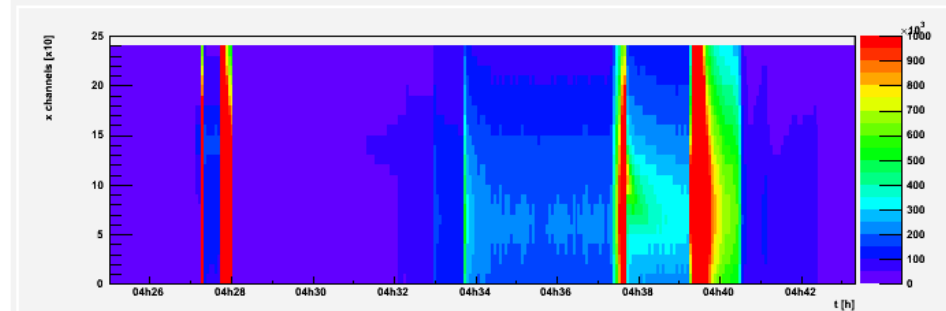
Medipix lateral position



Crystal lateral position



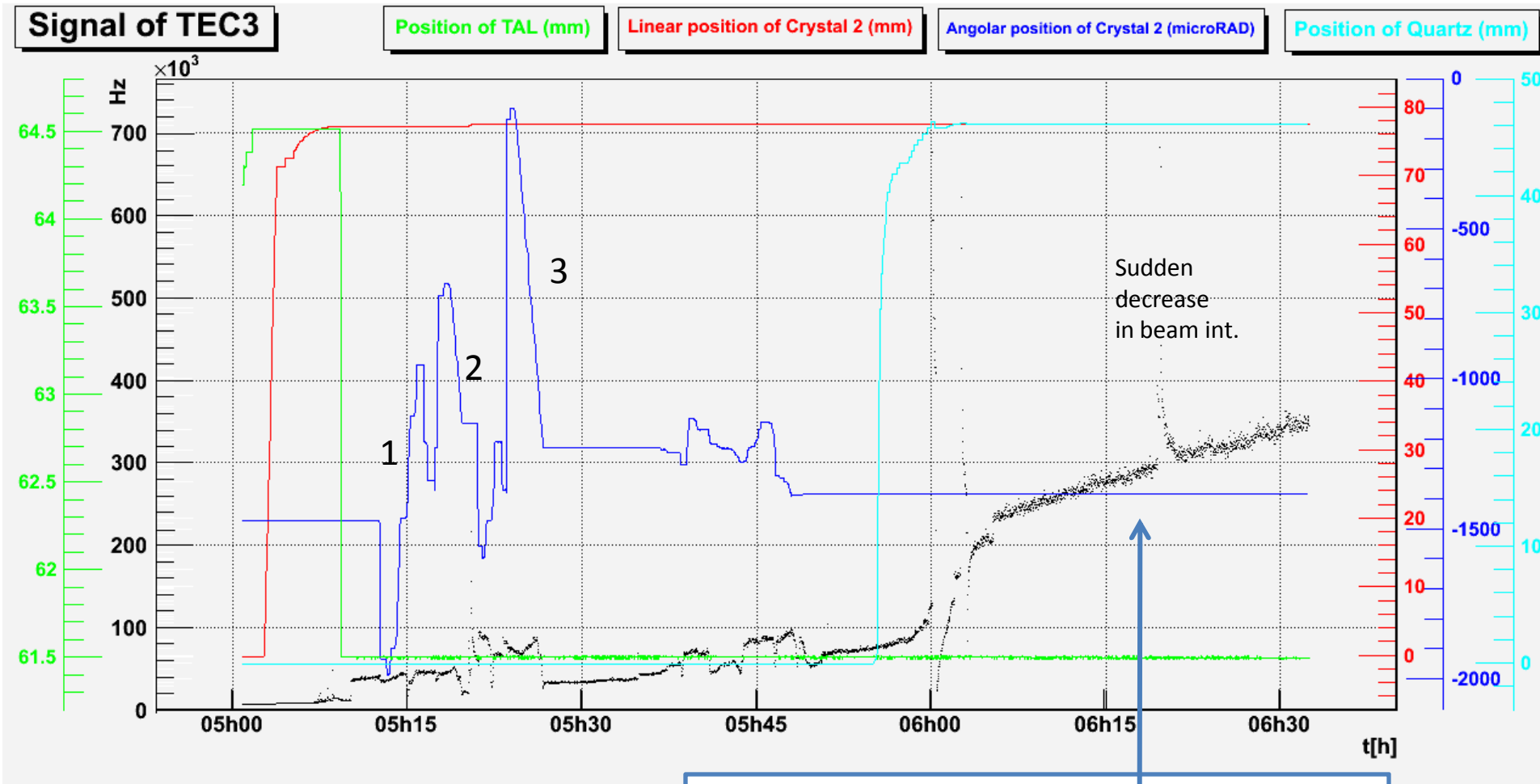
time



time

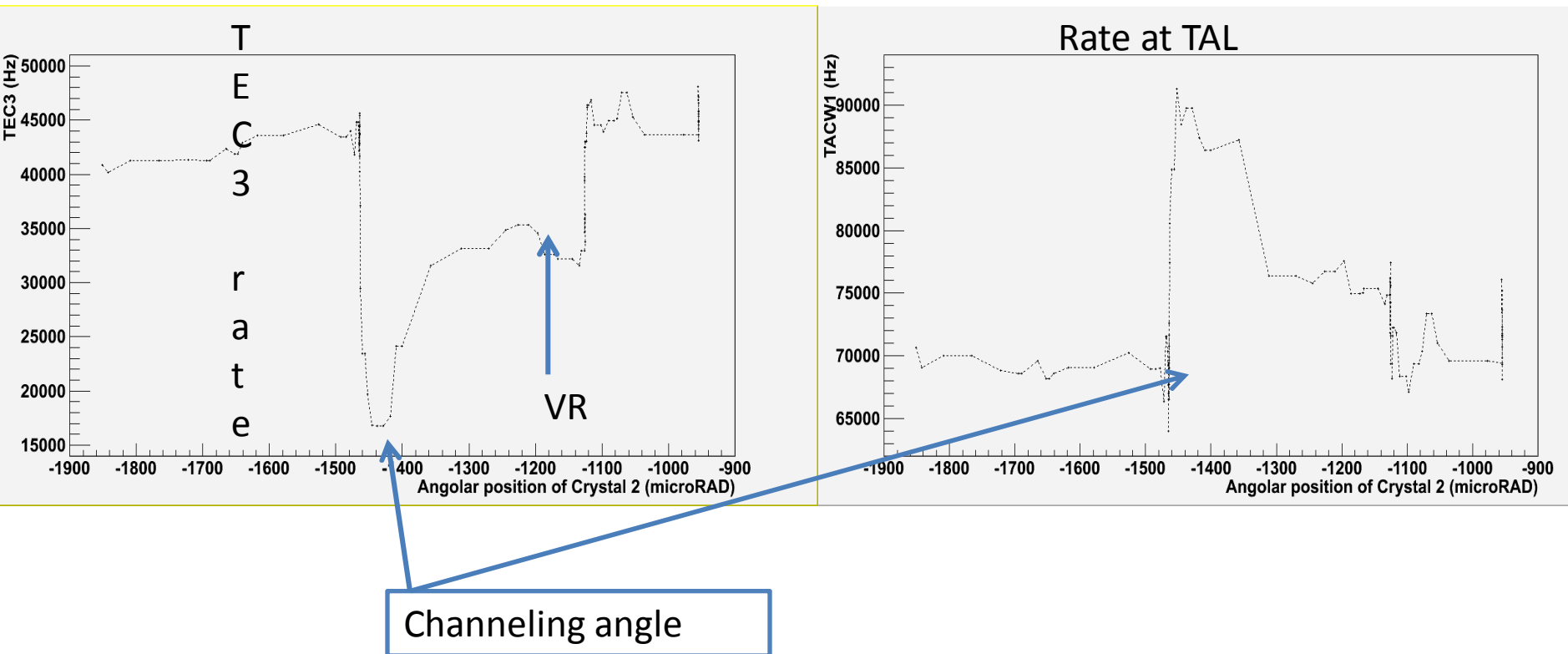
Higher rate in Medipix when Medipix closer to beam center
Higher rate in Medipix when crystal closer to beam center

Quasi mosaic crystal scans

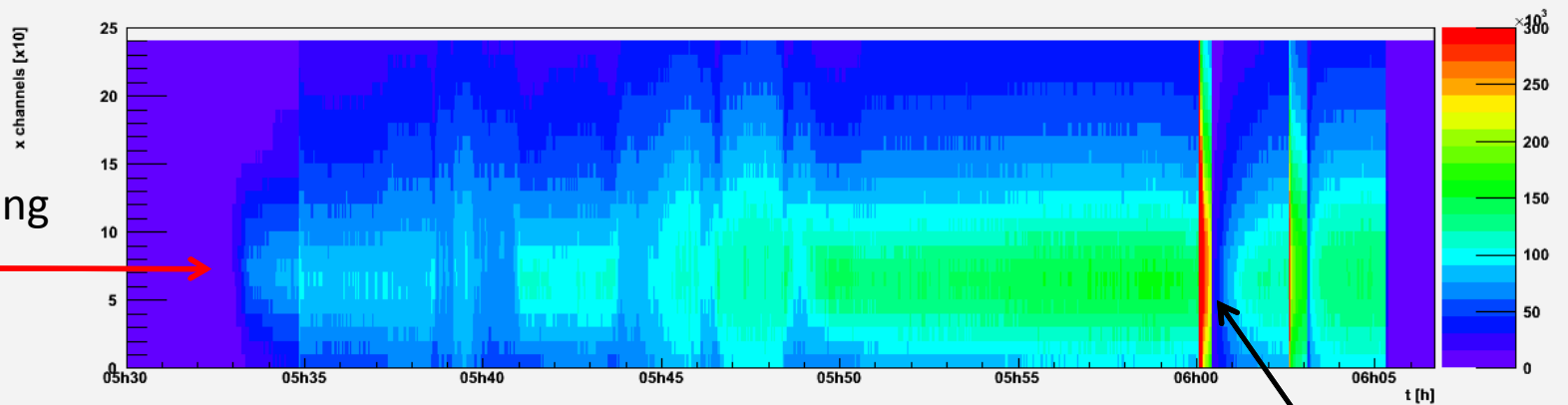
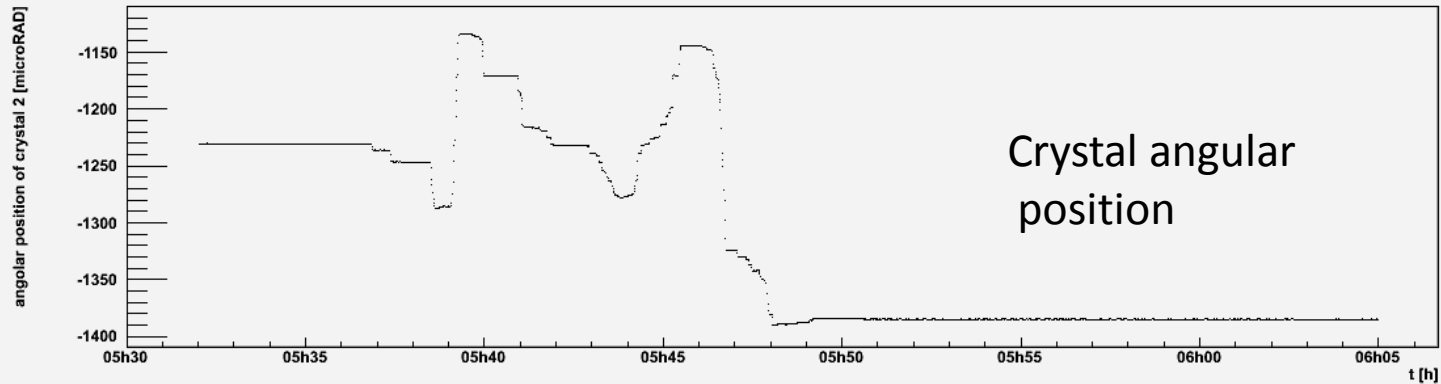


Loss increase! Beam quality decreasing?
Correlated with Cerenkov quartz detector
close to crystal ?!?

Full angular scan (crys 2)



Channeling peak position

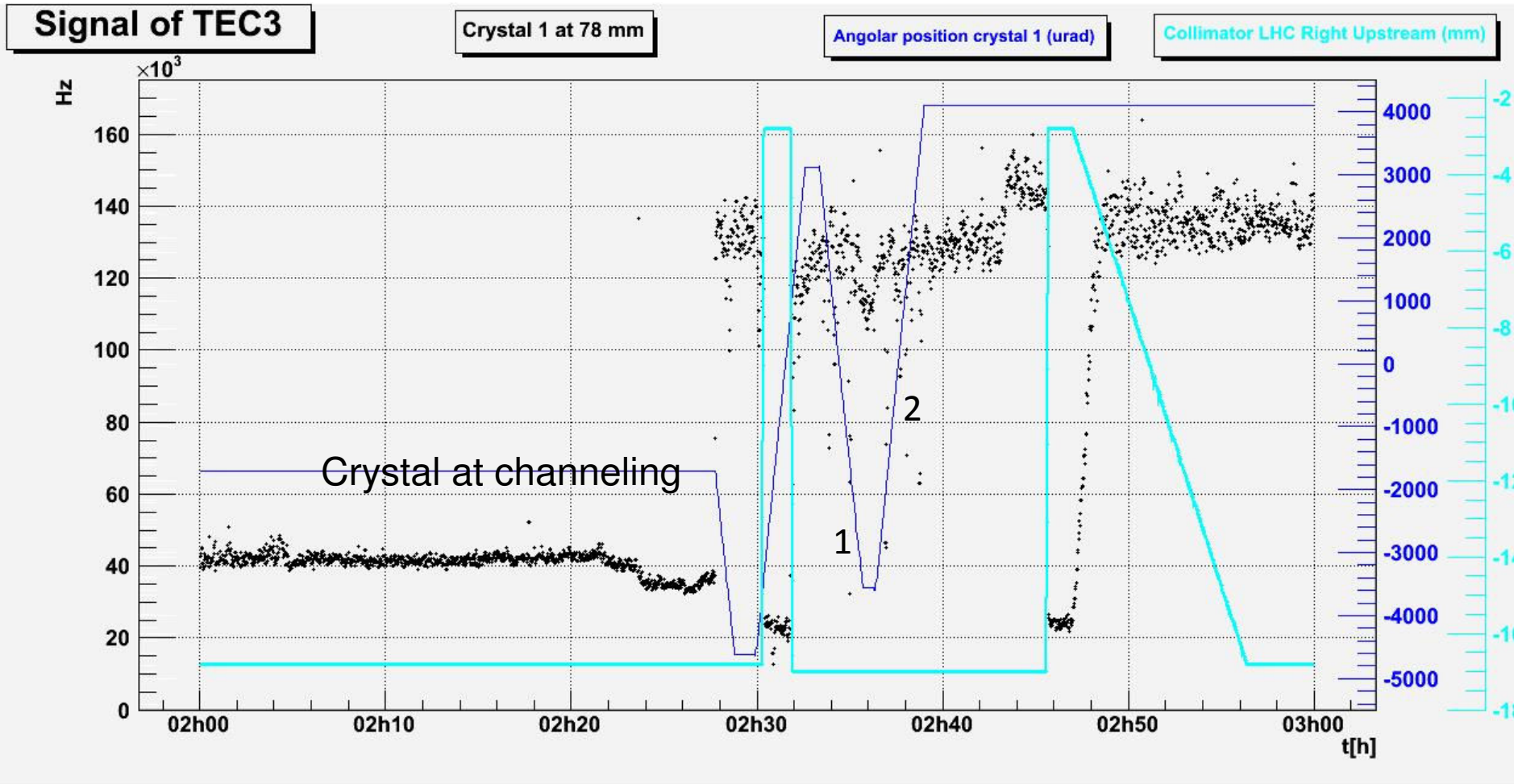


Goniometer not reproducing positions...

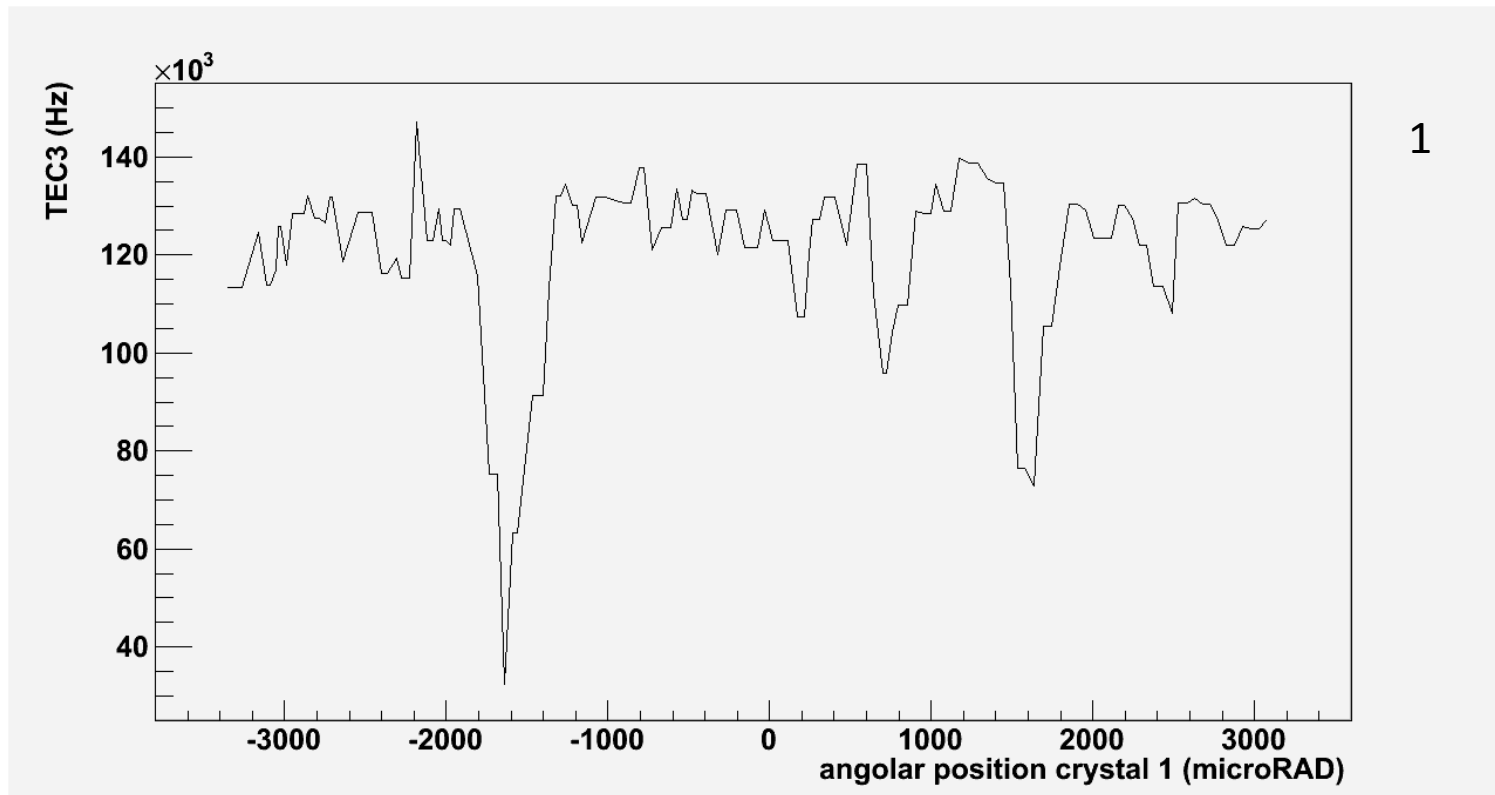
Some comments

- All the scintillators downstream the crystal have rate very well CORRELATED
 - Shown only TEC3 and GEM
- September MD: a pair of QD scint moved more downstream (dispersive region) to monitor losses
- Next slides on Sep MD

Crystal 1: wider ang. Scan (Sep)

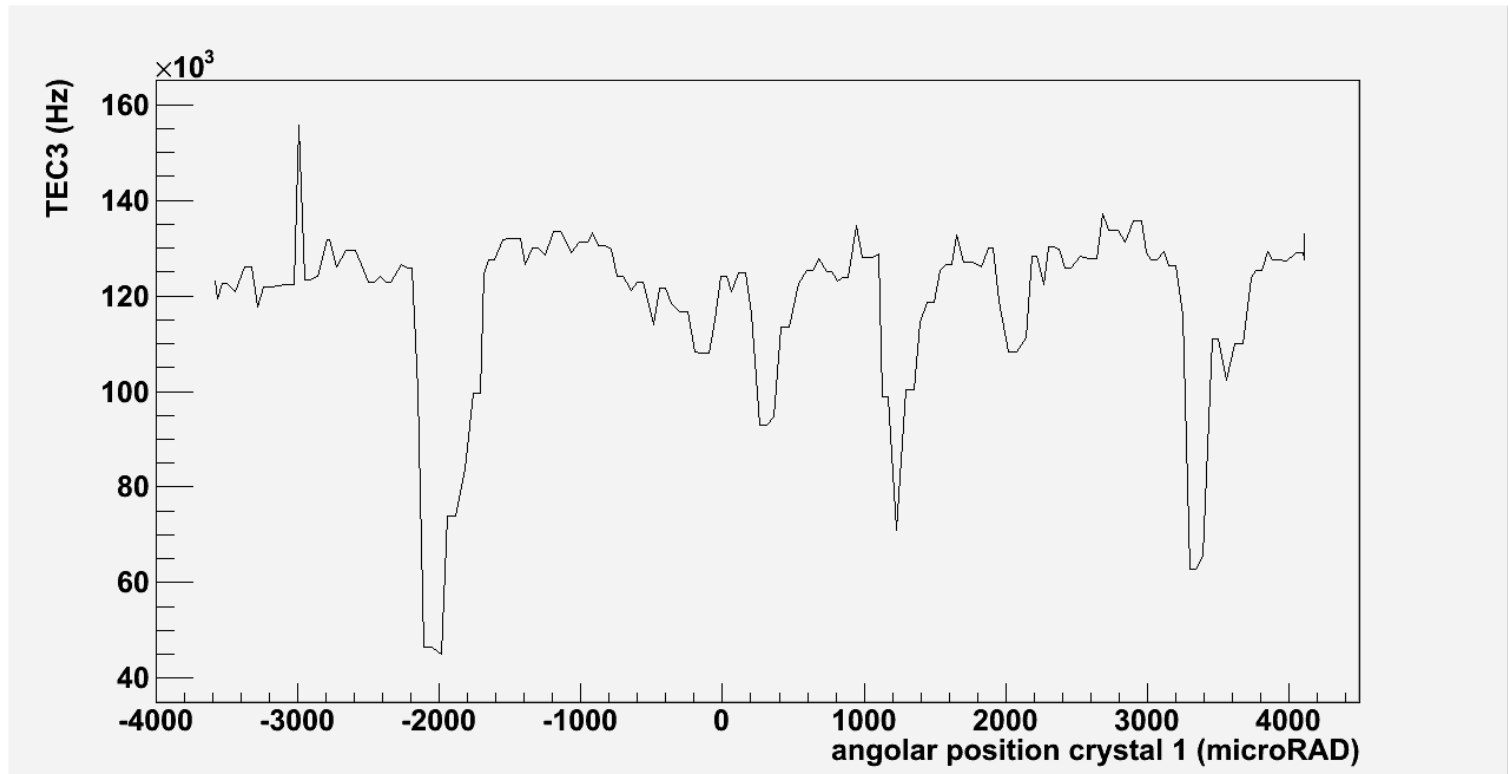


First scan: TEC3 rate



- Clear pattern
(main channeling peak + secondaries)

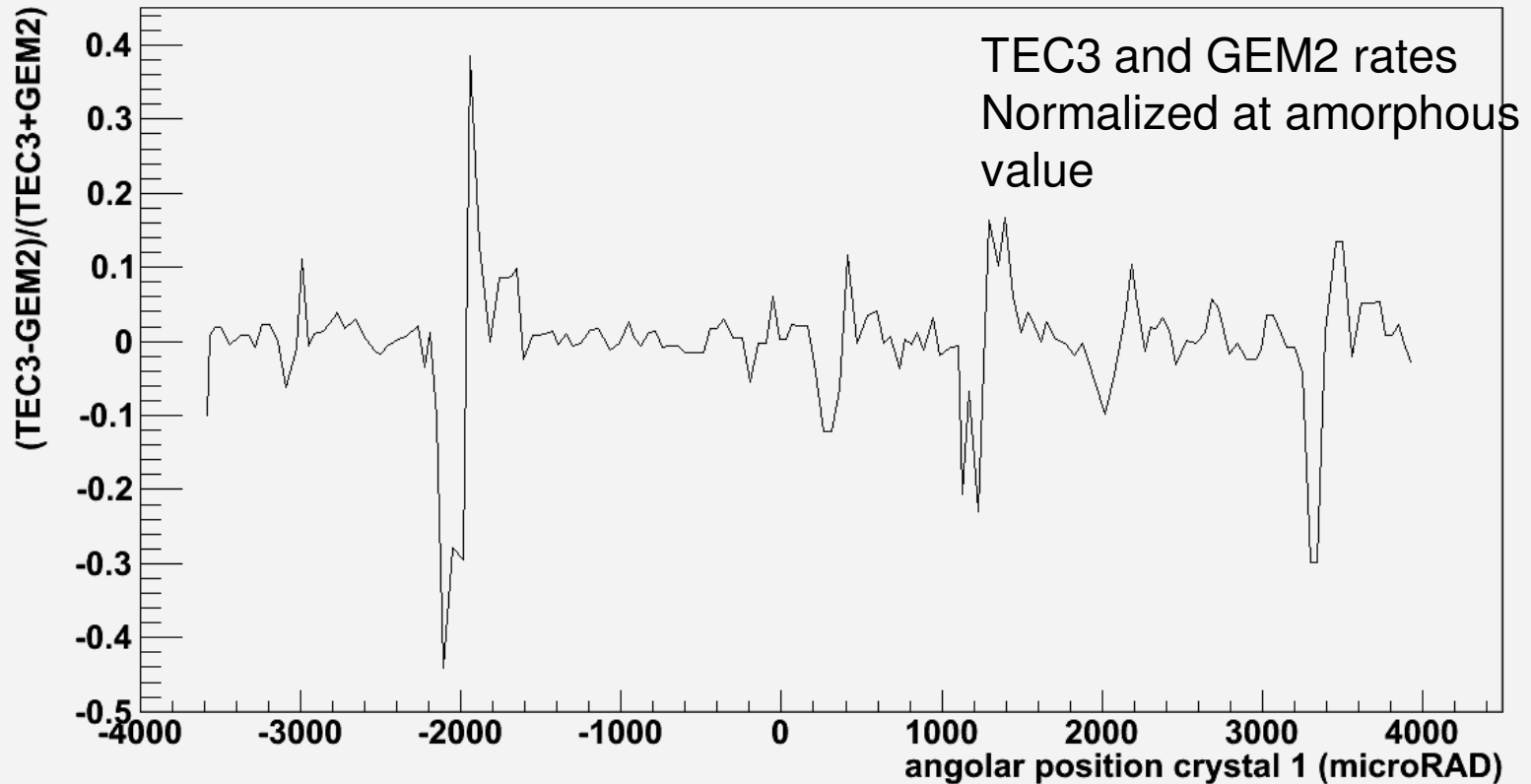
Second scan



- Same pattern (one more peak...)
- Peak at -2000 murad is the MAIN chan. peak

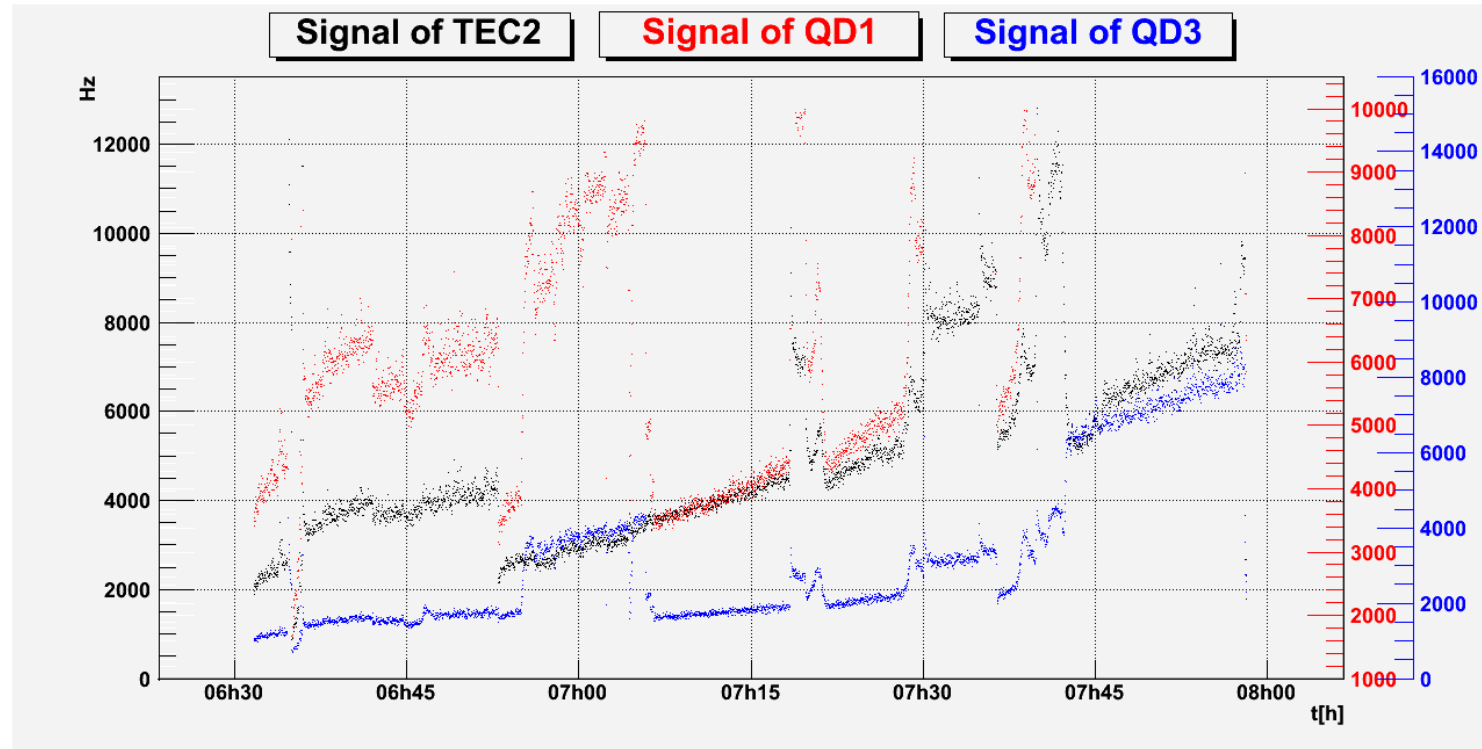
Inner/outer asymmetry ?

TEC3 and GEM2 are on opposite sides with respect to the beam



When crossing the channeling position we see an asymmetry
Volume reflection and inelastic interaction in crystal ?

High intensity beam



- Apart for rapid changes (correlated to movements of various devices) a **rate increase** on longer timescale is observed : machine instability ?

What's next?

- Look at Nov data
- Correlate scint rate with crystal and LHC collimator position (loss rate differences)
- Check rate increase with beam at low int. with crystal in amor. and chan. Position (is a machine instability or a crystal feature?)
- Correlated scint/GEM rate with Medipix counts (intercalibration)
- Study GEM2 pattern (lateral distribution of rate): information on inelastic interactions?