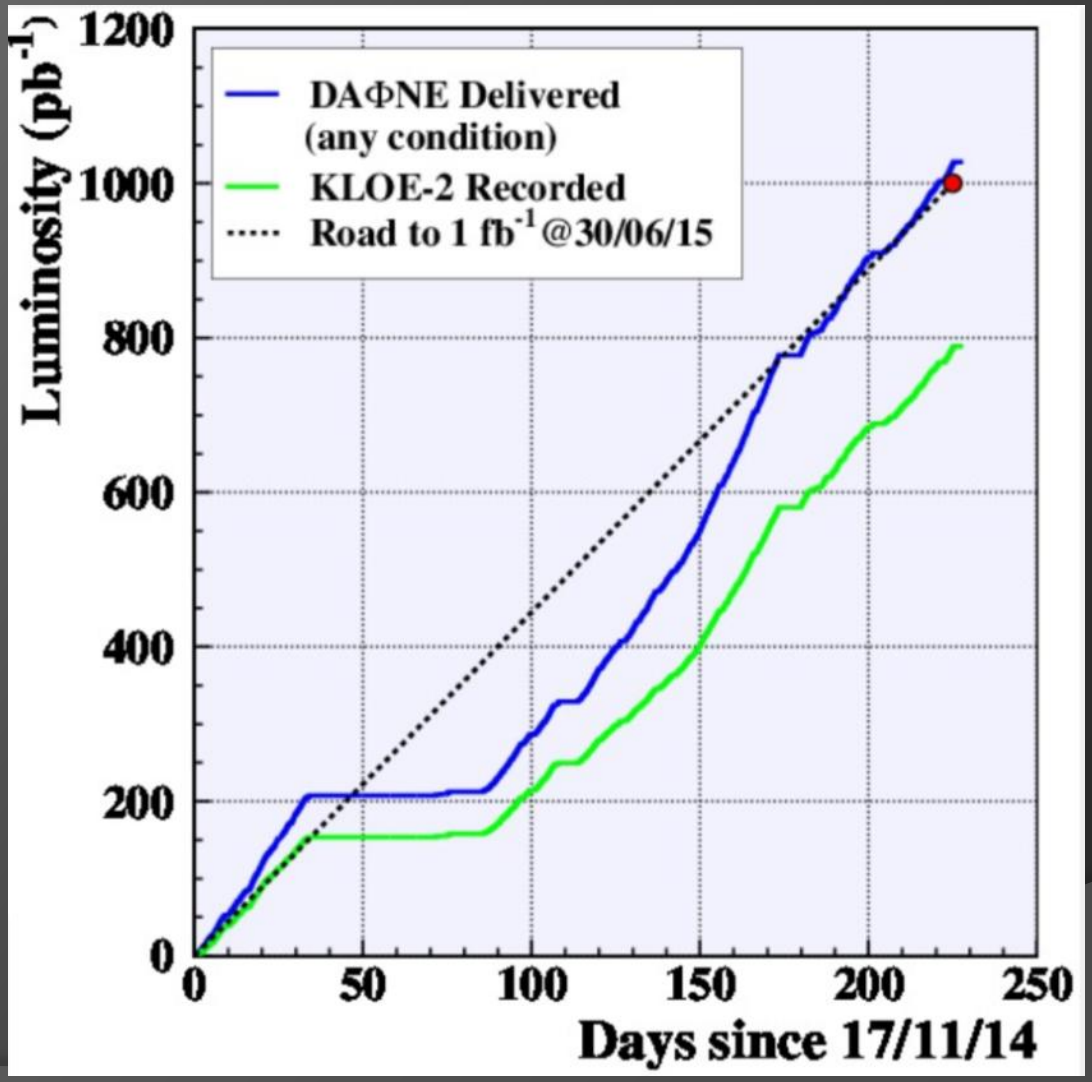
STATUS OF DATA-TAKING AND DETECTOR OPERATION

D. Domenici
on behalf of the KLOE-2 collaboration

Data-taking

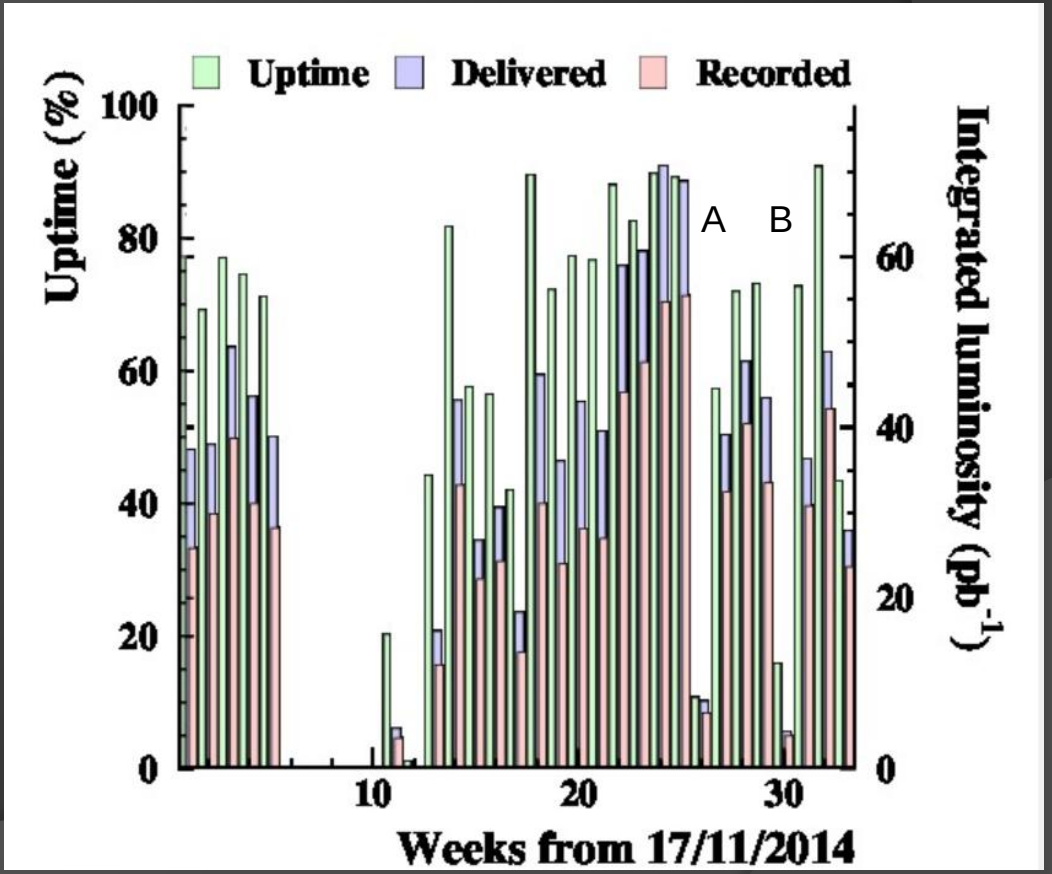
Integrated luminosity history

- DAFNE delivered: 1030 pb^{-1}
- KLOE recorded: 790 pb^{-1} (77% efficiency)



Weekly detail

- A: week 26 - 11 May. Problem in cryogenic plant due to air in the circuit. Several water leaks one of which compromised the correct functionality of a wiggler. 5 days of stop.
- B: week 30 - 8 June. Planned stop to maintenance of the cooling system. 5 days of stop
- In the following weeks of operation the (very good) performance achieved in April have not been reached. A problem on a kicker is preventing the best positron injection (fix in July)

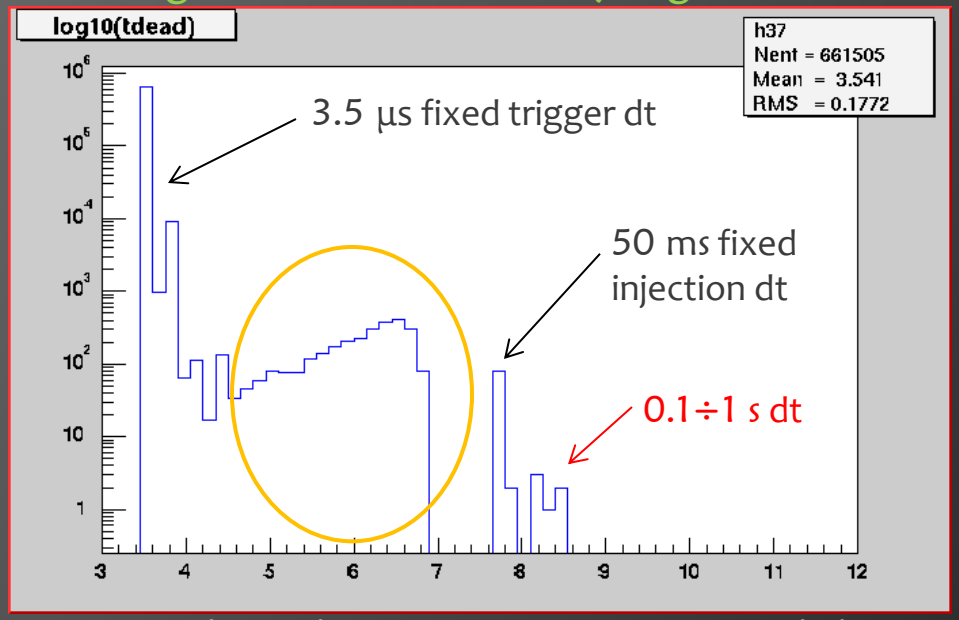


Best 2 weeks: 24 and 25
27 April - 10 May
71 pb^{-1} and 69 pb^{-1} delivered
55 pb^{-1} and 56 pb^{-1} recordered

Unfortunately during the KLOE dead-time crisis

Dead-time issue

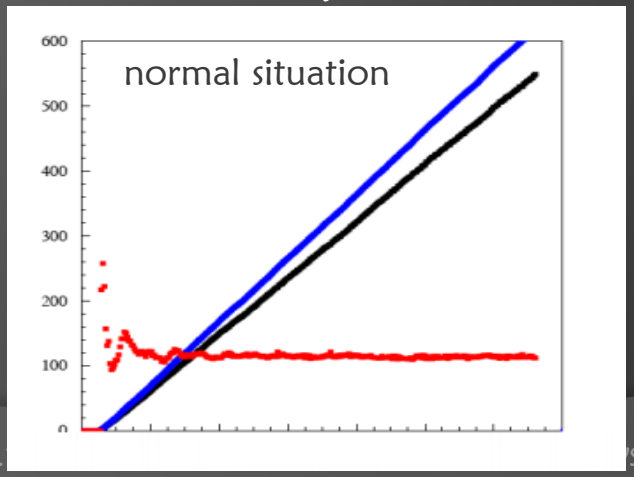
From middle of February to middle of April we have been running with an abnormally high dead-time

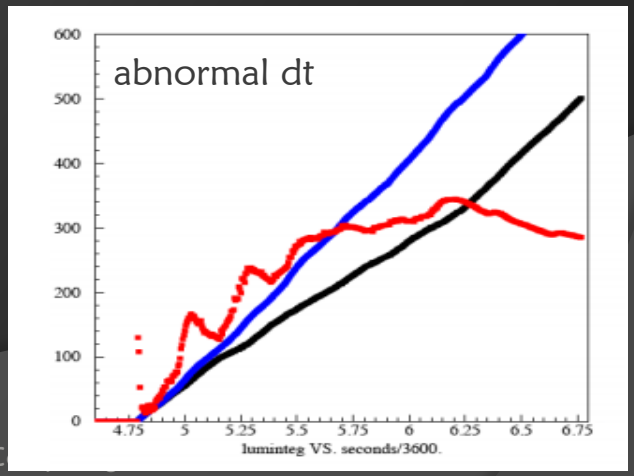


appeared in 2012 after network change infrastructure

under test

$$\frac{\text{actual int. luminosity written on disk}}{\text{computed int. luminosity from instantaneous lumi}}$$





DAQ efficiency optimization

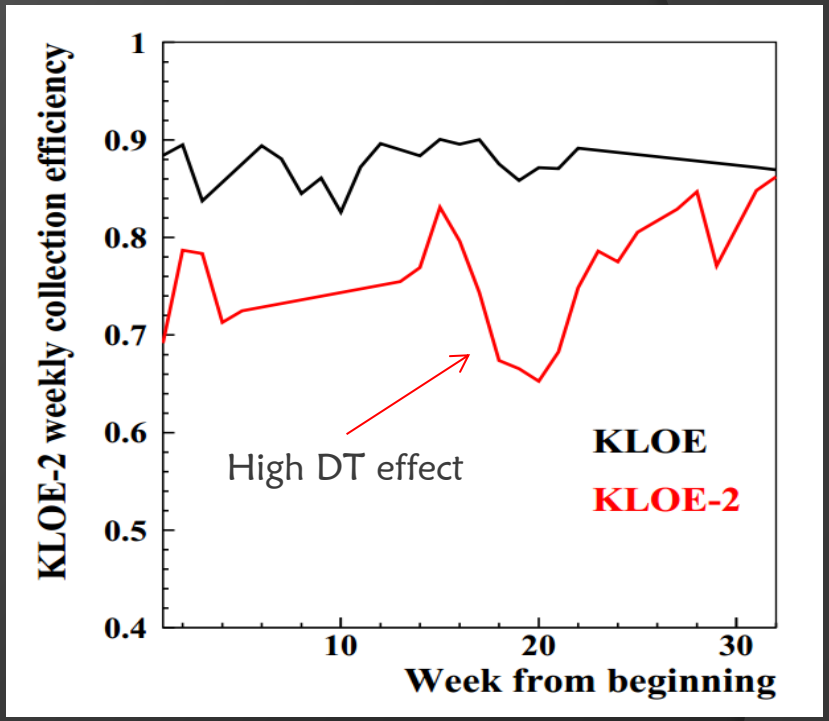
Problem of anomaloud DT definitely fixed by F. Fortugno on 14 April: some disks were not working properly after a shutdown forced in February due to a strong power glitch

2 main components affect data-taking inefficiency:

- DAQ dead-time (~10% depending on conditions)
- DAQ down-time: run change or run stopped by DC trip or bad conditions

In order to minimize inefficiency the run size has been increased from 500 nb^{-1} to 1500 nb^{-1}

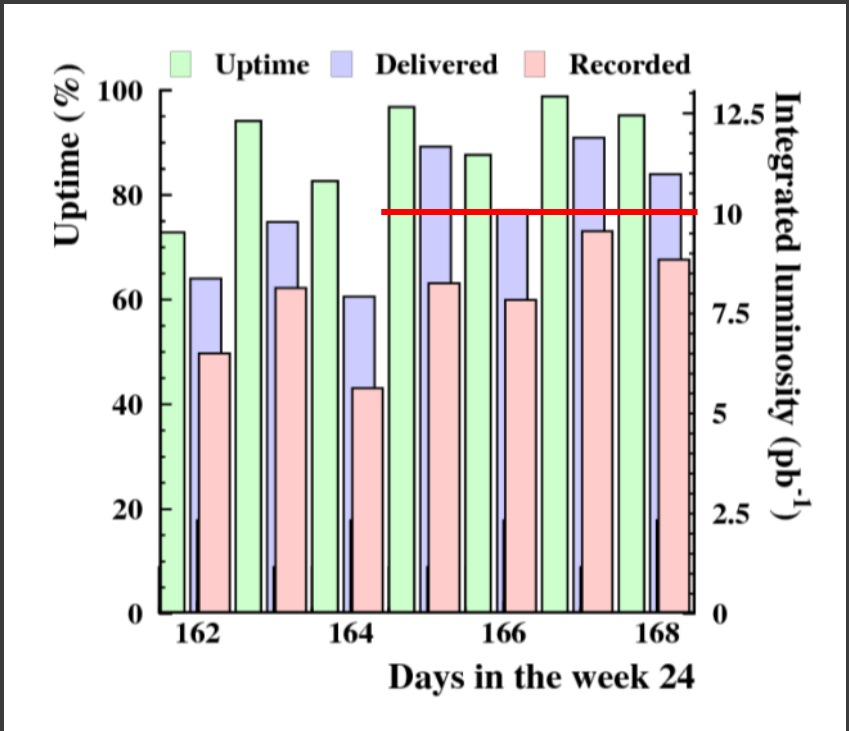
Now at the level of KLOE-1

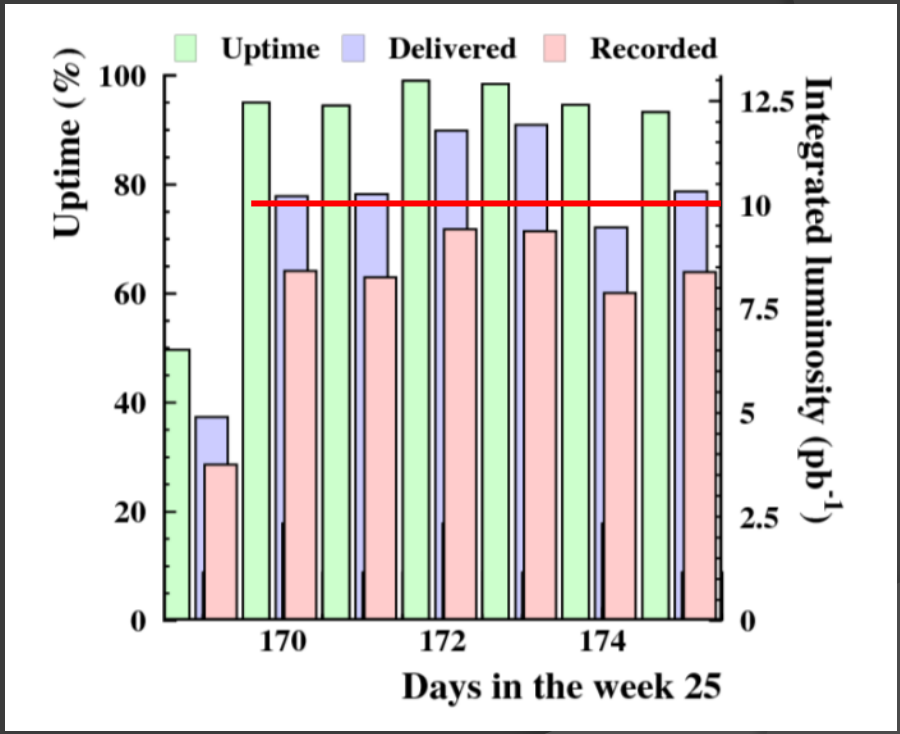


comparison between data-taking efficiency of KLOE-2 (since Nov 15) and KLOE (since Jul 04)

June goal reached

- 1 fb^{-1} integrated before the end of June
- 10 pb^{-1}/d integrated for at least 4 consecutive days





Best week detail

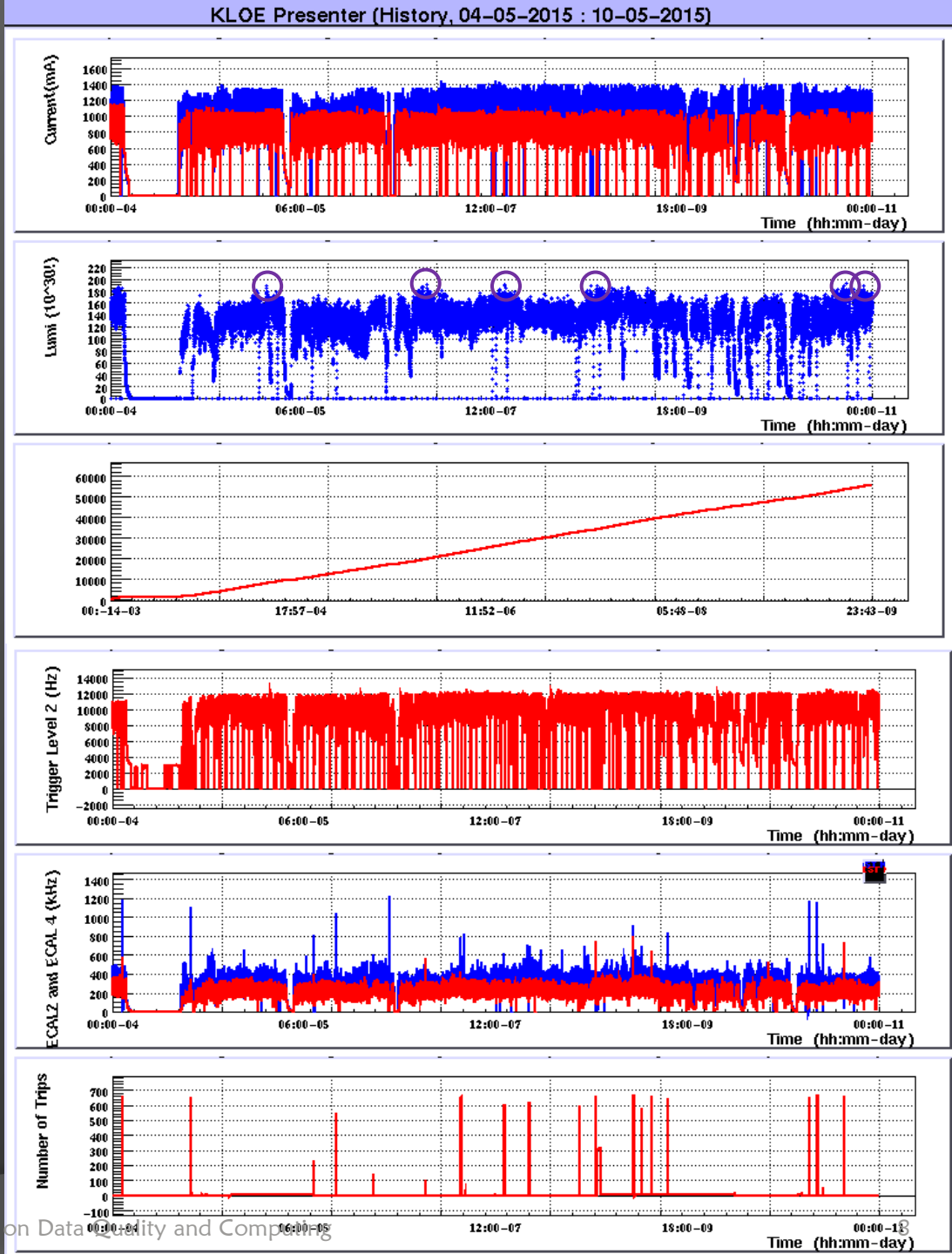
Peak lumi reached 6 times
~1.9 x 10^{32}
(never in the best day)

55 pb^{-1} integrated

T2 trigger rate: 10-12 kHz

Background rates on Endcaps
Hot counters:
<400 kHz for positrons
<500 kHz for electrons

Beam loss rate still high: ~20 DC trips in one week

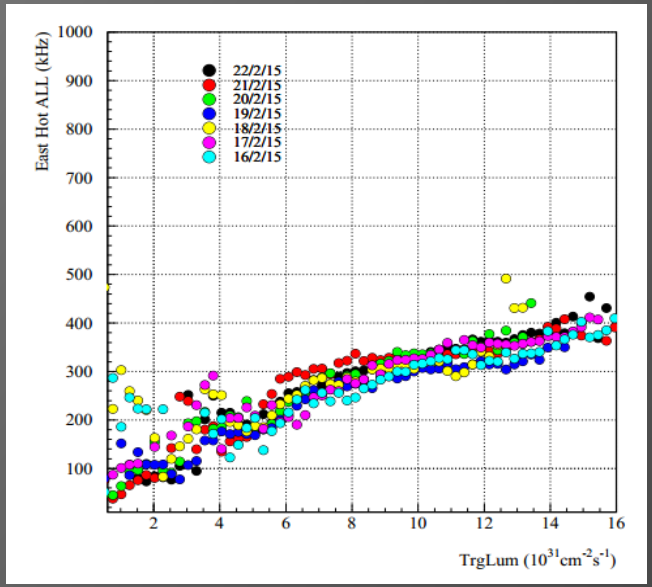


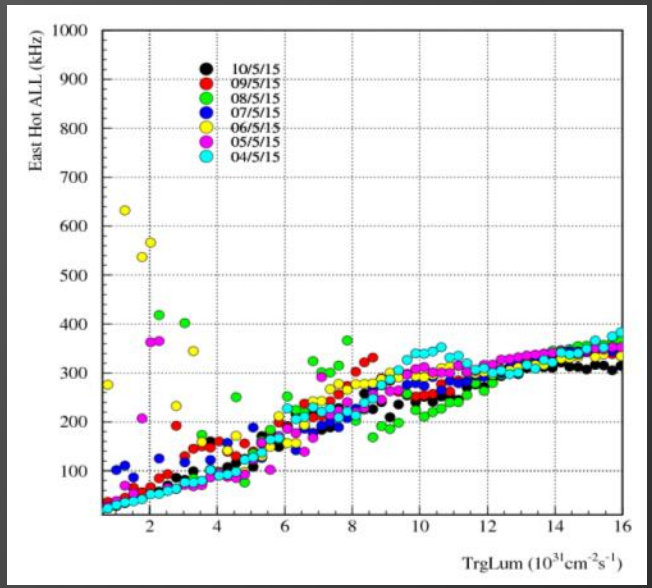
Background Improvement

Hot Endcap Feb15

Hot Endcap May15

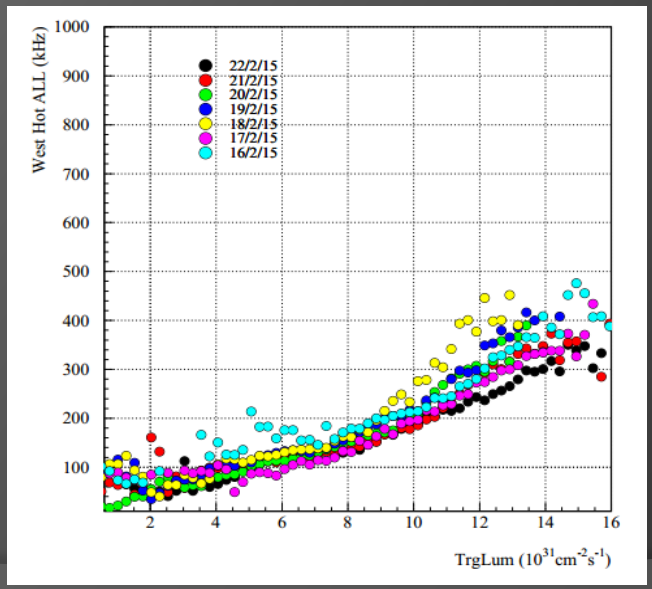
Electrons

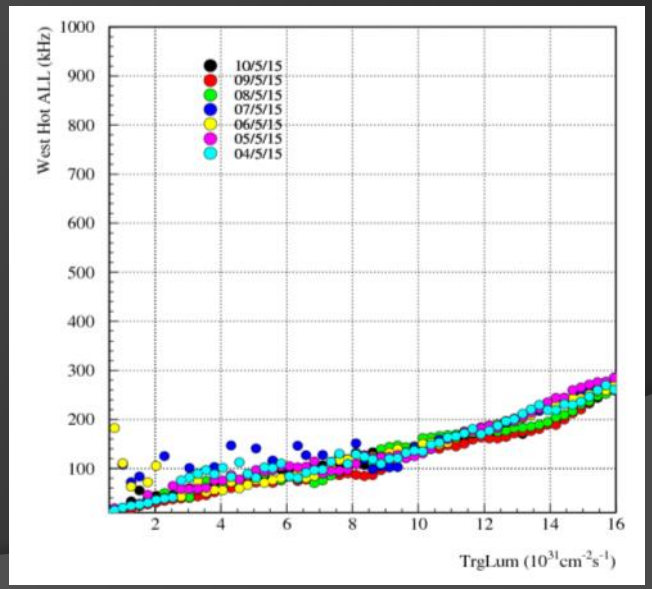




Electrons
300-350 kHz
@1.4 x 10^{32}
(10% improv.)

Positrons





Positrons
200-250 kHz
@1.4 x 10^{32}
(30% improv.)

Data-taking and Manpower

- 10 Institutes participated in data-taking (7 Italian and 3 Foreign)
- 60 people are in the authors' list of KLOE-2 for publications
- 54 people have done shifts since November consisting in:
  - 21 data-taking shifts per week
  - 10 DAQ/Subdetector expert on-call shifts per week
  - 1 Run Coordinator shift per week

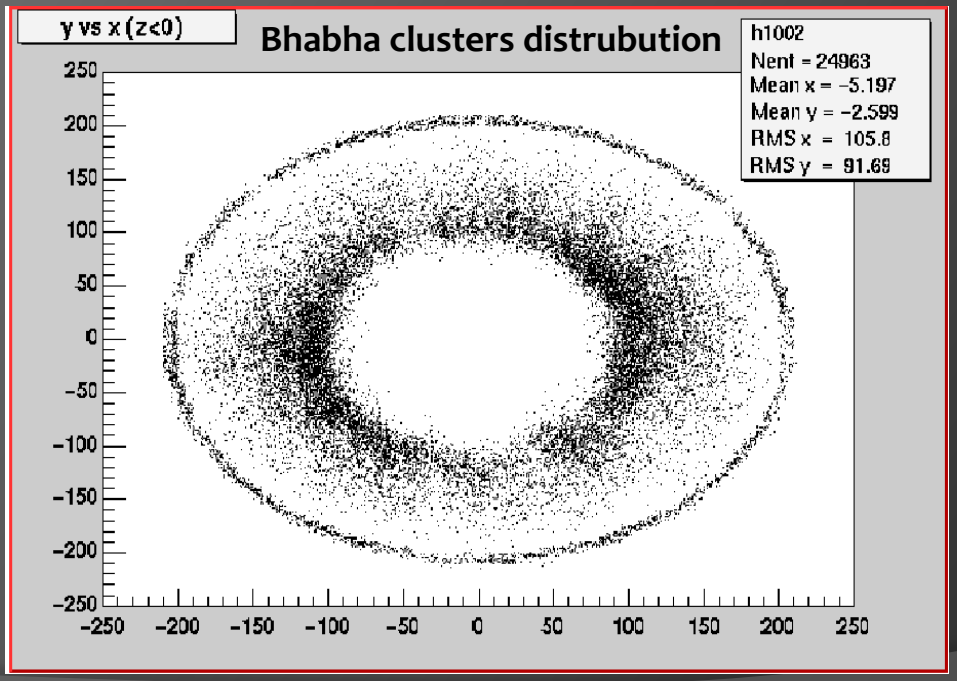
Our coverage capability of all the data-taking duties is at limit

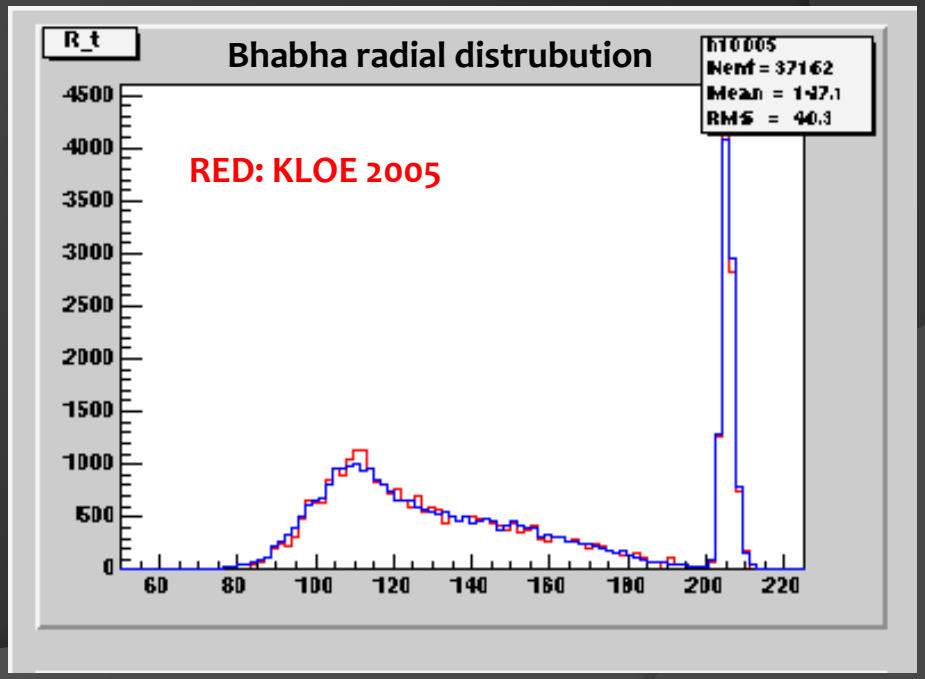
Even few new people would be very helpful

Sub-detectors

Calorimeter Status

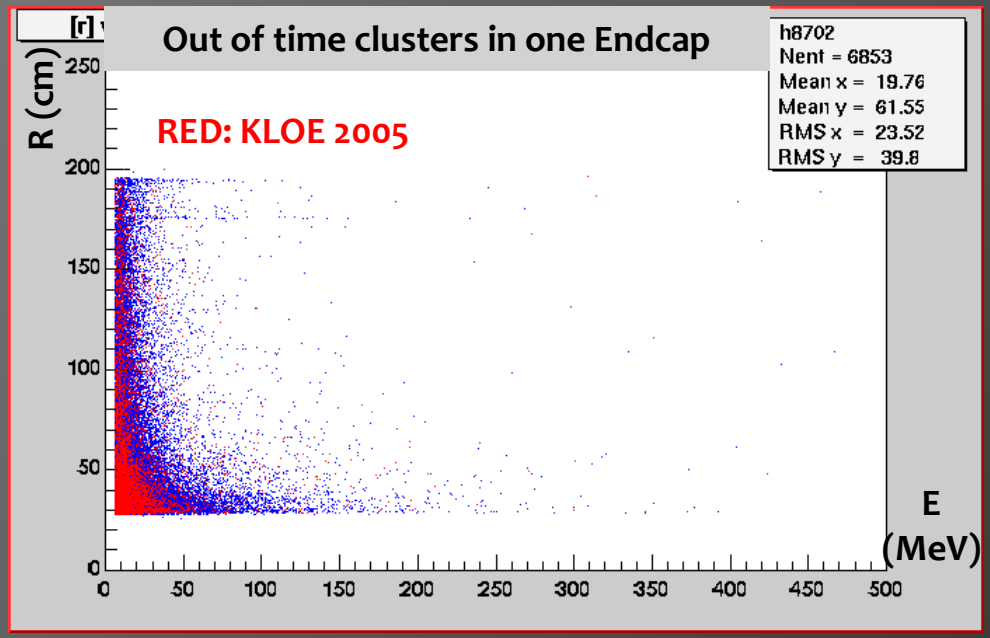
- Hardware require continous maintenance, but it's still >98% alive
  - ✓ HV essentially OK
  - ✓ 5 fully dead channels
  - ✓ 50÷70 channels with single problems, spread over the detector (more in ECAPS)
- Detector functionality generally OK
- Calibration requires special cares both for the increased machine background and to take into account new detectors' material

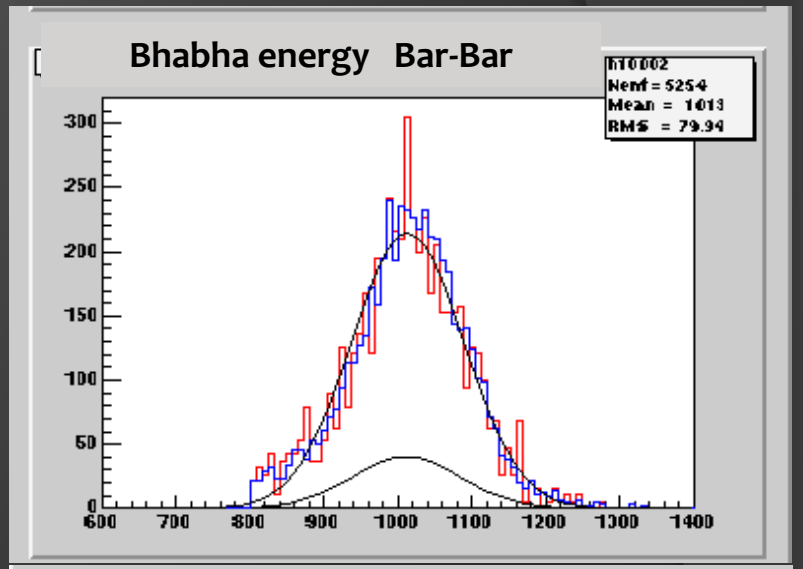


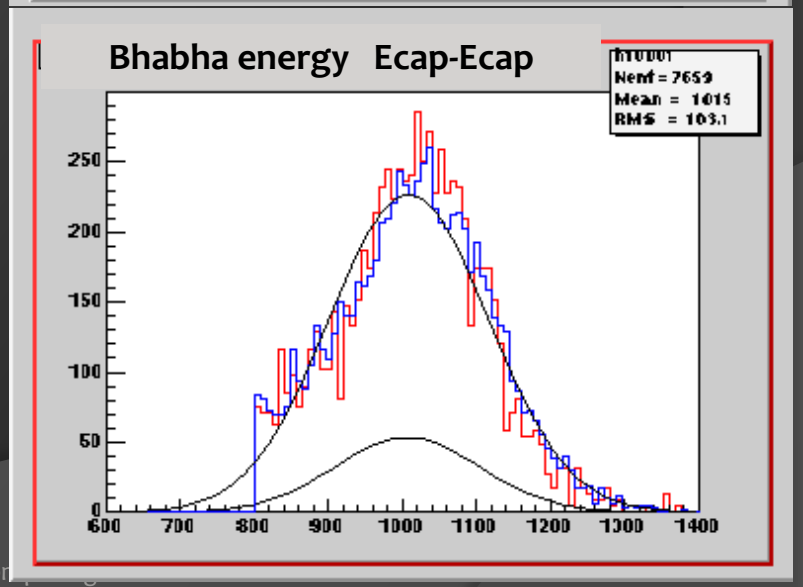


Calorimeter Background

- Calibration requires special cares both for the increased machine background and to take into account new detectors' material





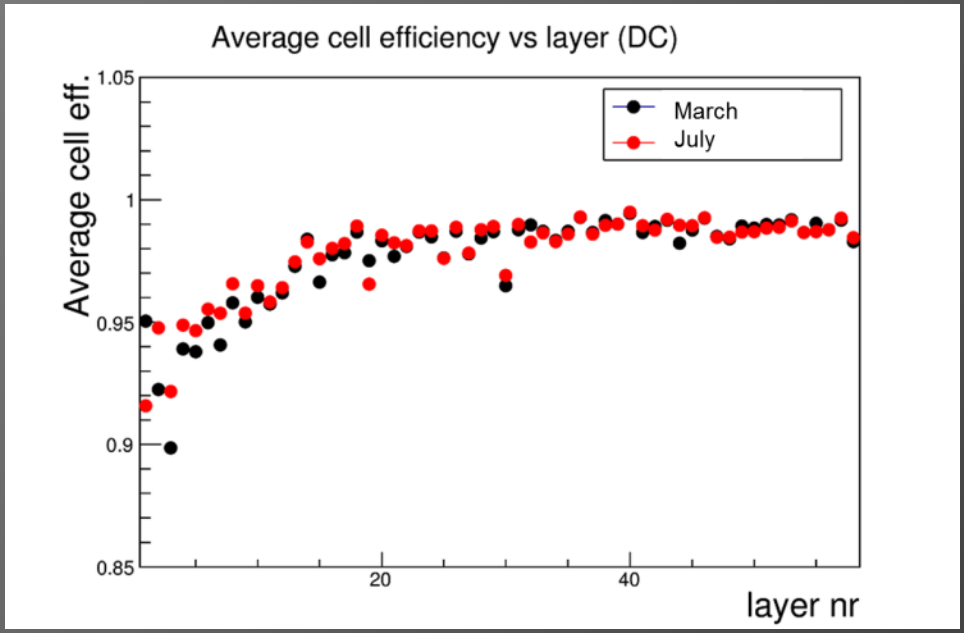


High energy machine background contamination

Total energy in Bhabha is correct

Low energy tail cut-out to cope with background

DC Performance

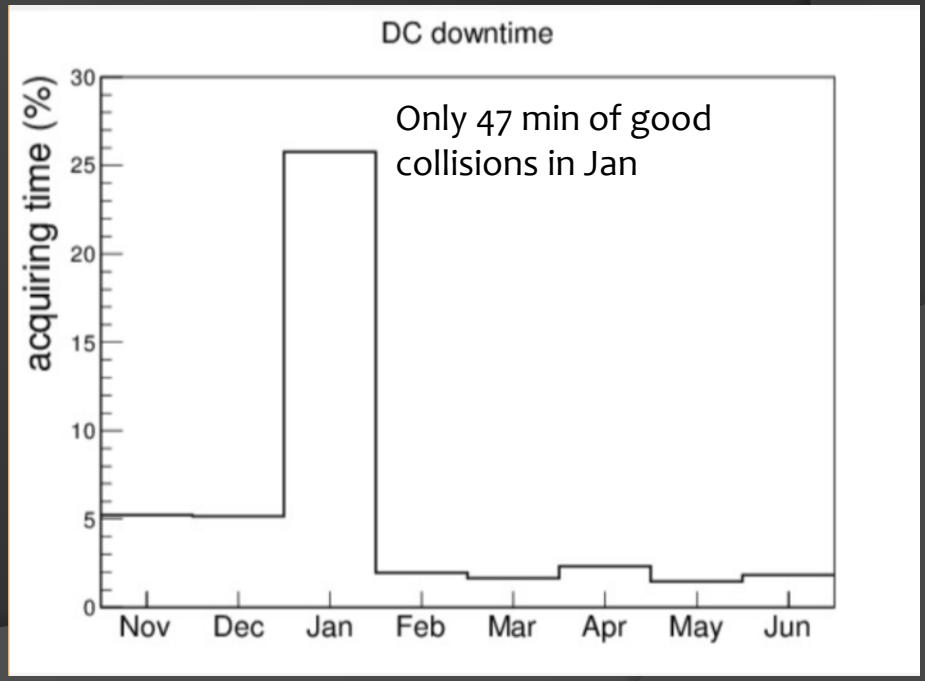


Overall good DC performance

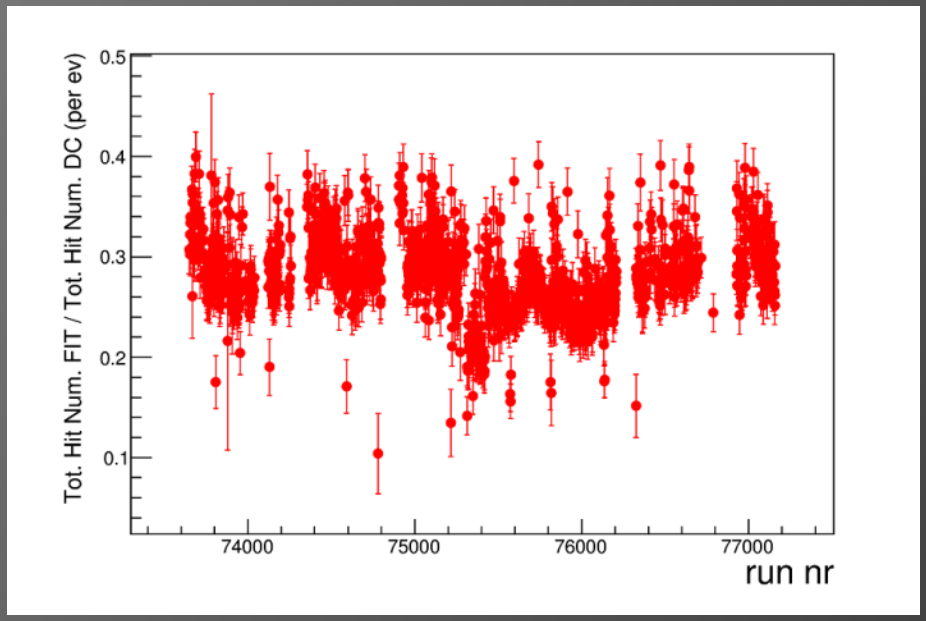
Stable efficiency for all layers

Downtime defined as the ratio

$$\frac{\text{(DC OFF) \&\& (Dafne ON) \&\& (DAQ ON)}}{\text{(Dafne ON) \&\& (DAQ ON)}}$$



DC Background and Trips

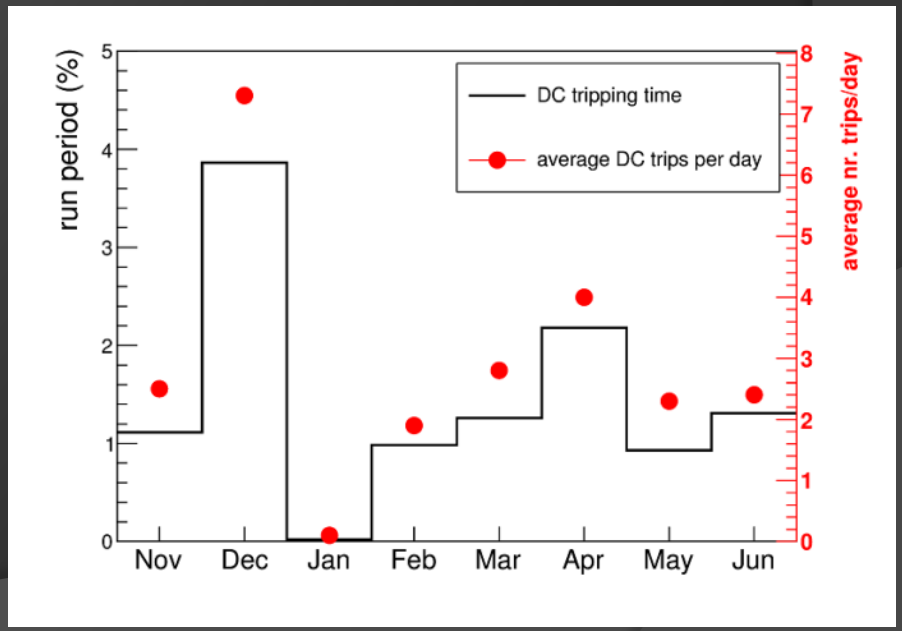


Fraction of hits used to fit a track in an avent (it was 0.9 in 2005)

Oscillations correlated with machine background

DC is OFF for TRIPPING 1.5% of the run time

We have 2÷3 trips per day produced by beam losses or blow-ups



Criticalities on FEE and HV

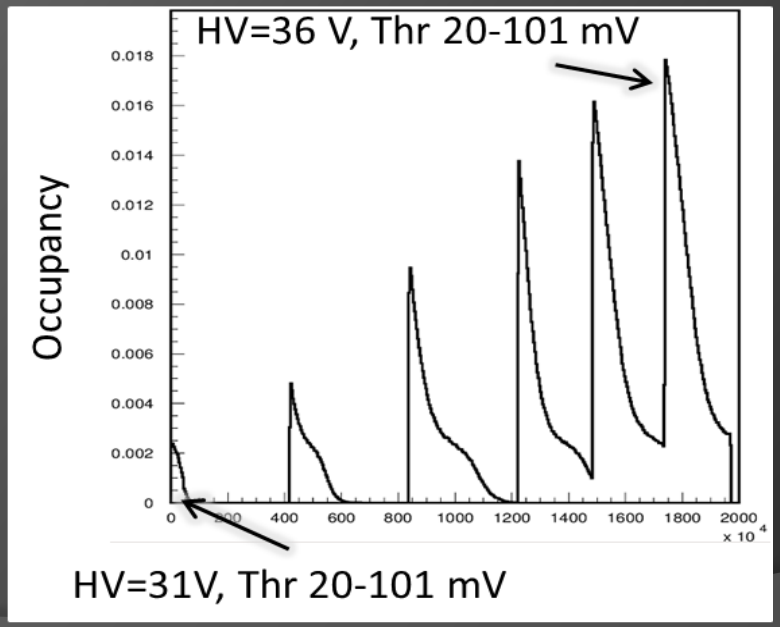
- EMC-TDC
  - 164 installed on the apparatus
  - 8 problematic spares recovered by cleaning (4 on loan by CCALT)
  - 5 board not working (CAEN will refurbish)
- EMC-ADC
  - 164 installed on the apparatus
  - No spares: 29 boards not working (CAEN will refurbish)
- EMC-HV
  - 210 installed on the apparatus
  - 8 spares
  - 5 under repair by CAEN (wet ones)
- DC-TDC
  - 129 over 132 installed on the apparatus
  - No spares: 21 boards not working (wait for SEA-TDC for spares)
- DC-ADC
  - 40 boards intsalled on the apparatus
  - 8 spare boards
- DC-HV
  - 30 boards intsalled on the apparatus
  - 5 spares

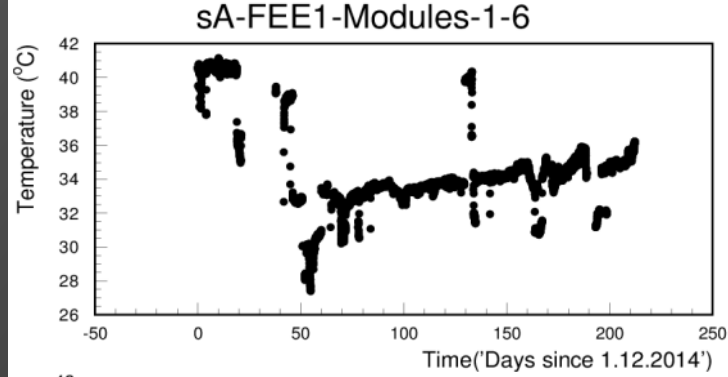
New cricital issue for this year: high TDC and ADC faults

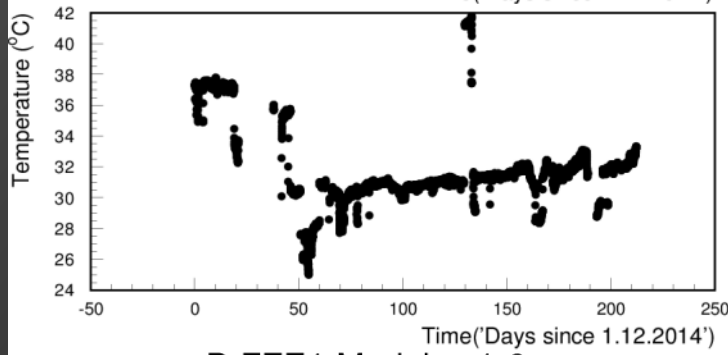
Maintenance deeply based on SEA and CAEN support

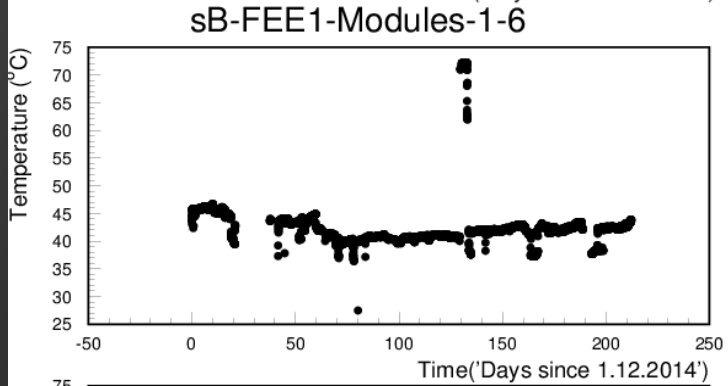
QCALT

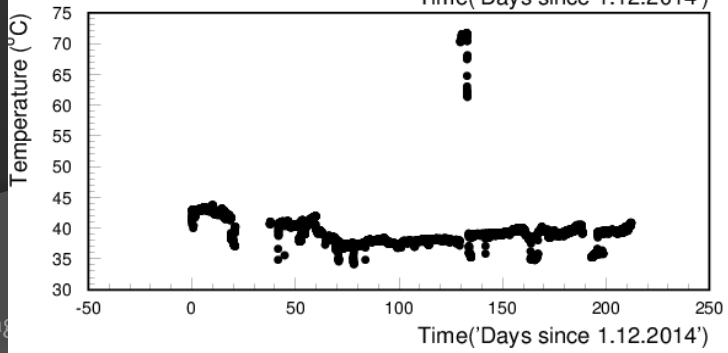
- Software
  - ✓ Slow control: ready and debugged
  - ✓ Mapping: debbugged
  - ✓ Monitoring: monitoring of the cooling system to be finished
- Running conditions under control (new air pipes to decrease temperatures on side B needed)
- Limit number of hours for the compressor reached
- Gain equalization and calibration almost ready
- Time calibration with cosmics/collisions in progress





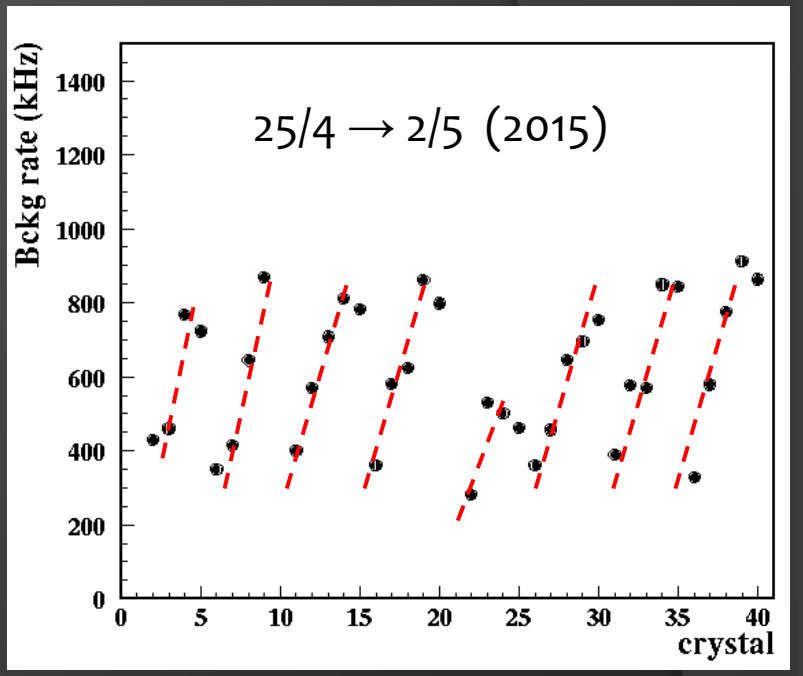




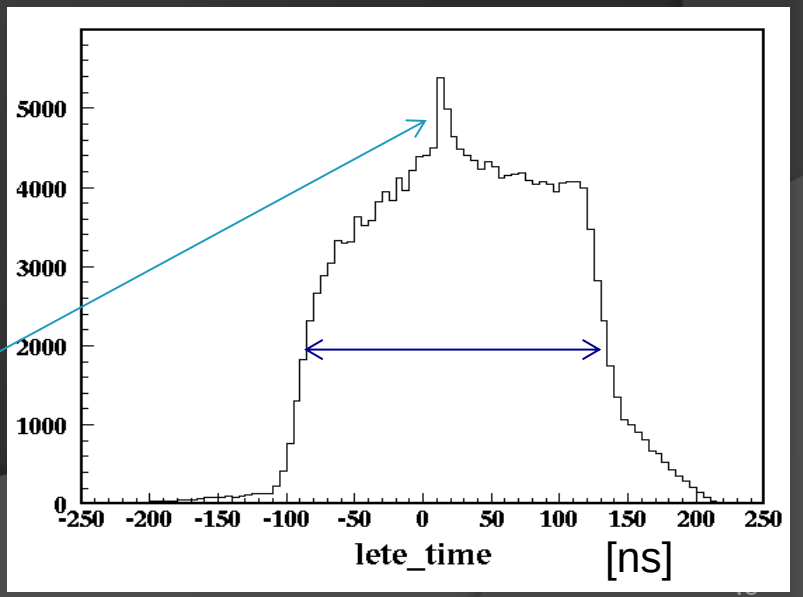


Low Energy Tagger

- LET calibration:
  - equalization with MIPs
  - time alignment w.r.t. the EMC
- LET operation with circulating beams
  - ⇒ high background environment
  - bckg rate evaluated from out-of-time hits
- Rough (over)estimate of the radiative Bhabha expected rate with e+ or e− on the whole LET (from Babayaga MC) ≈ 30 kHz



- Example of time distribution from data
  - ⇒ peak over a large background
  - Work in progress to understand these events with LET "in time" with the EMC



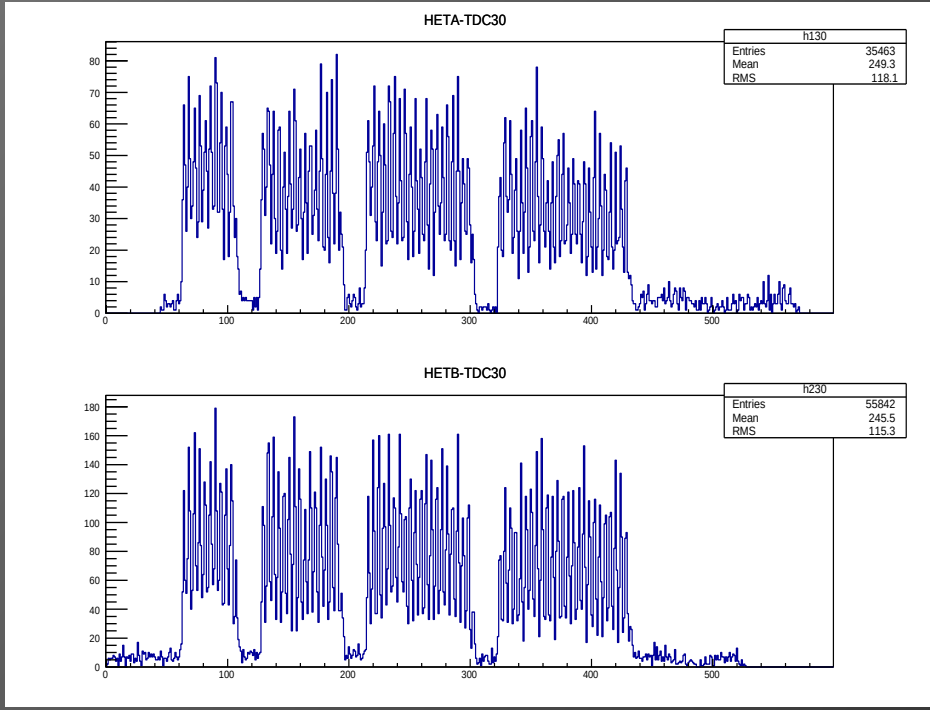
High Energy Tagger

Dafne «bar-code» run

Dedicated run with special buch structure

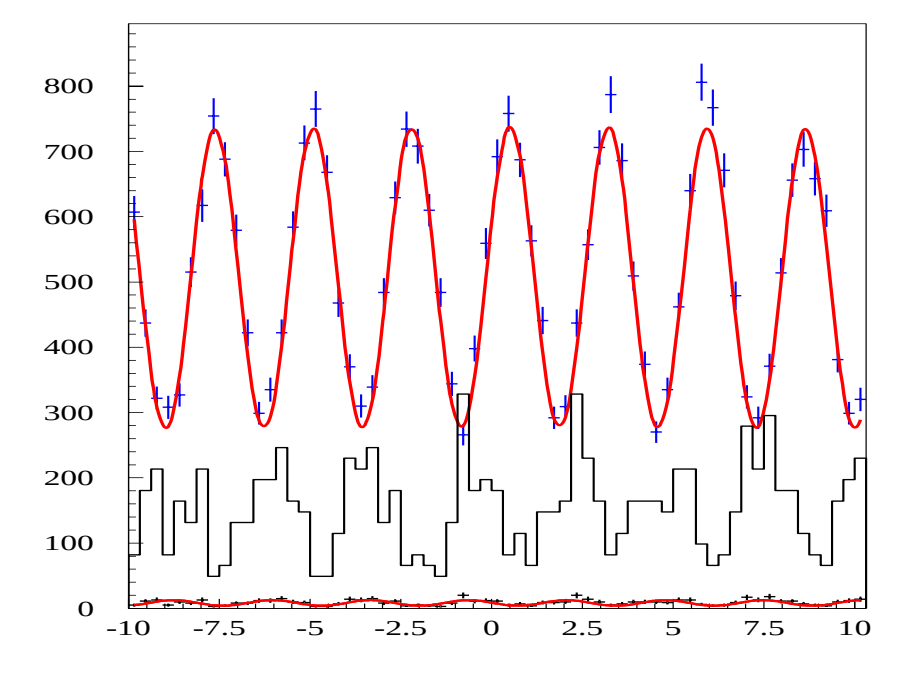
5-10-5-15-5-20-5-25

correctly reconstructed by HET



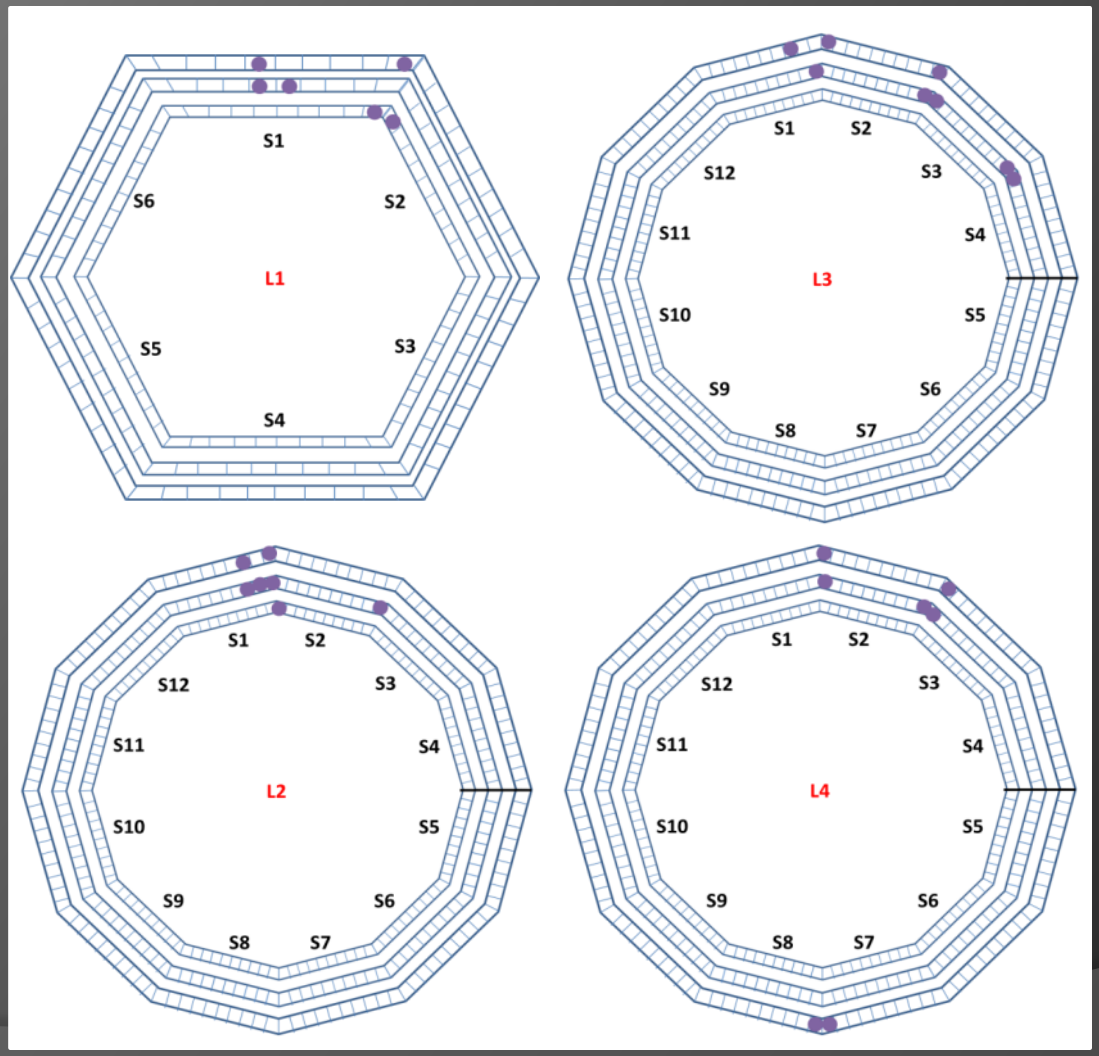
Dafne «no-collisions» run

Touschek effect contribution to HET background is 5÷10%



IT issue with beam losses

Unexpected rate of occurrences of sectors with high leak current as a consequence of discharge events mainly triggered by beam losses or blow-up



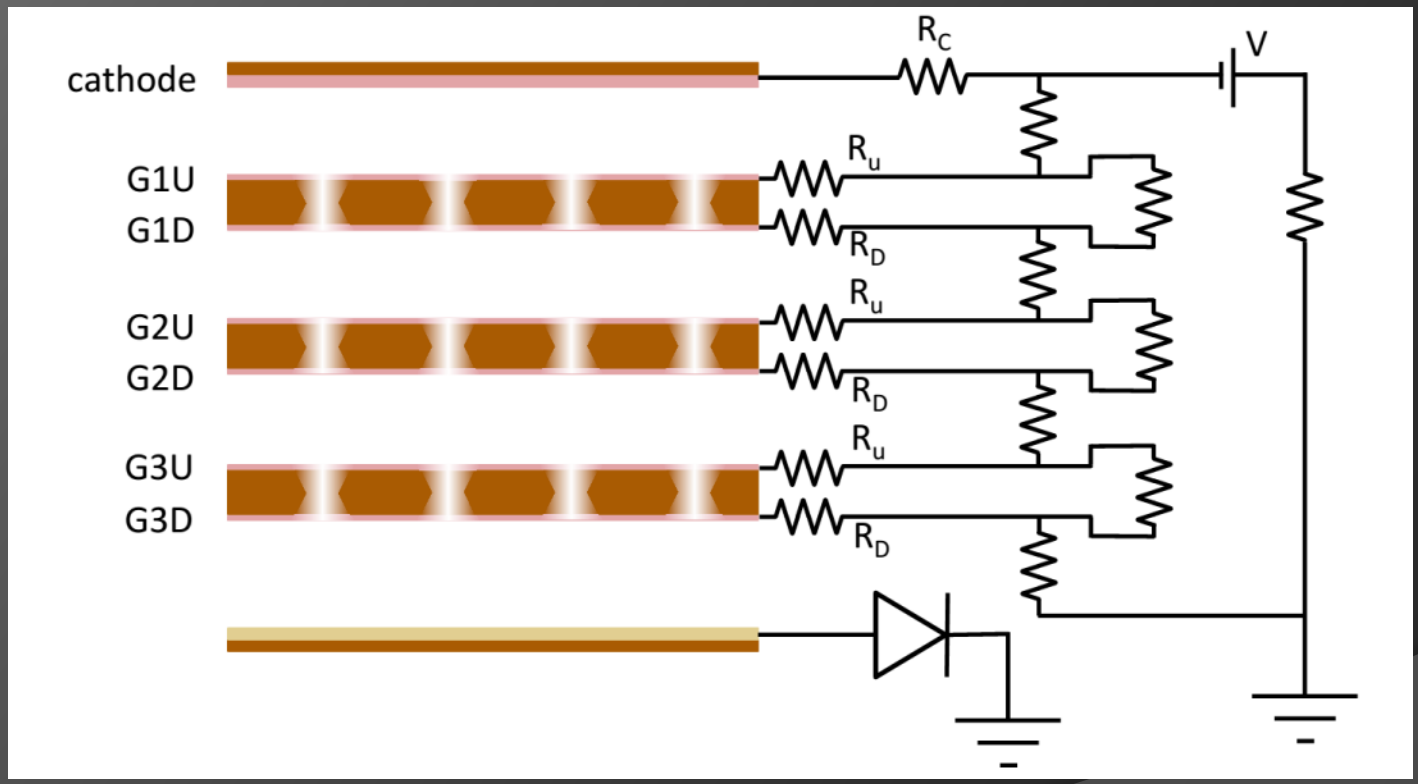
Very desctructive single event on 10 April.
28 HV sectors lost corresponding to 5% of readout strips

Preventing moves:

1. Change of the HV system with a safer voltage divider
2. Investigate possibility of setting up a DAFNE beam dump

IT HV Voltage Divider

Supplying the 7 GEM elecrodes independently allows a fine tuning of single electric fields but is not recommended in very harsh environments where high currents (of both polarities) flowing in the electrodes lead to unpredictable real values of operating voltages

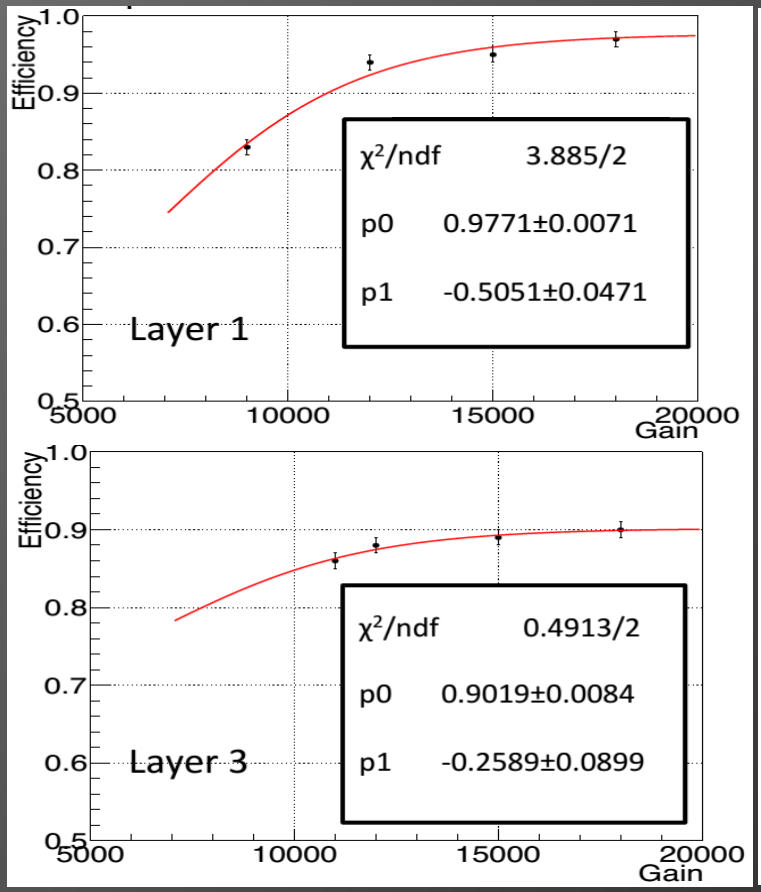


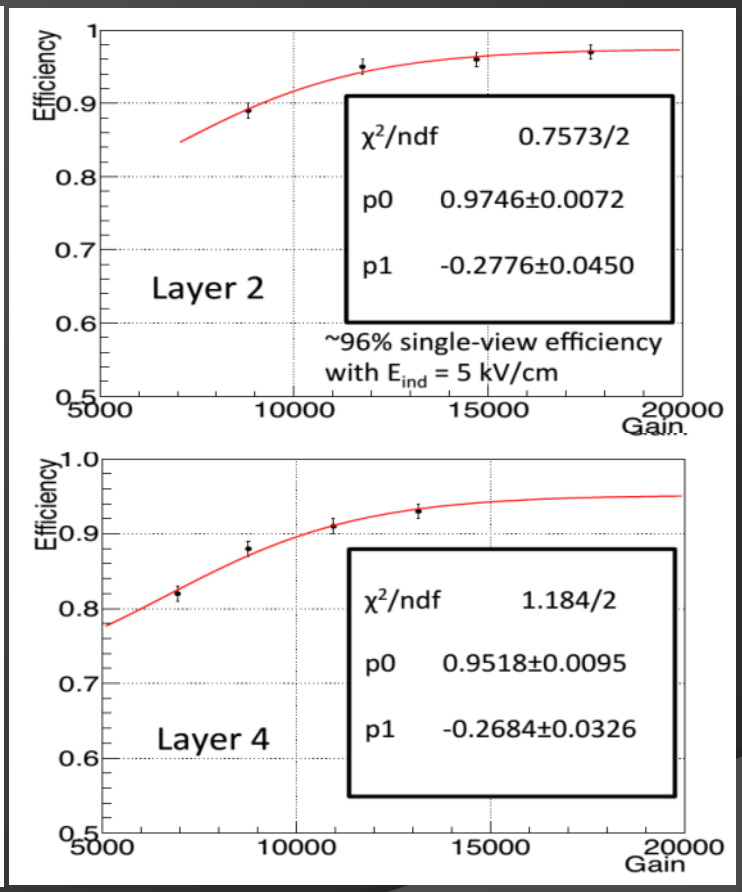
HV passive voltage divider installed to guarantee the safest operation

IT Efficiency

Efficiency normalized to DC reconstructed tracks crossing IT in 2 points

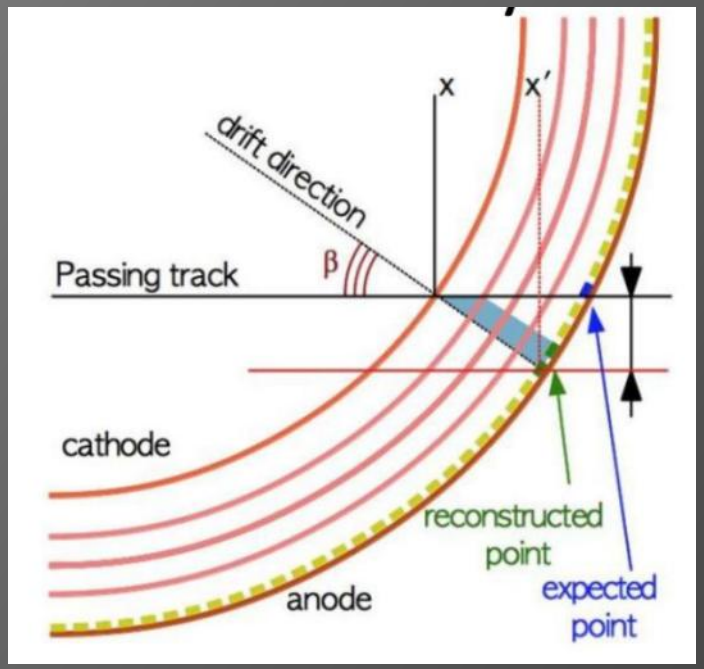
Expected efficiency is now reached after the Induction field has been increased from 5 to 6 kV/cm (while keeping the same discharge probability)





Similar efficiencies are obtained with the new HV voltage divider

IT Alignment and Calibration



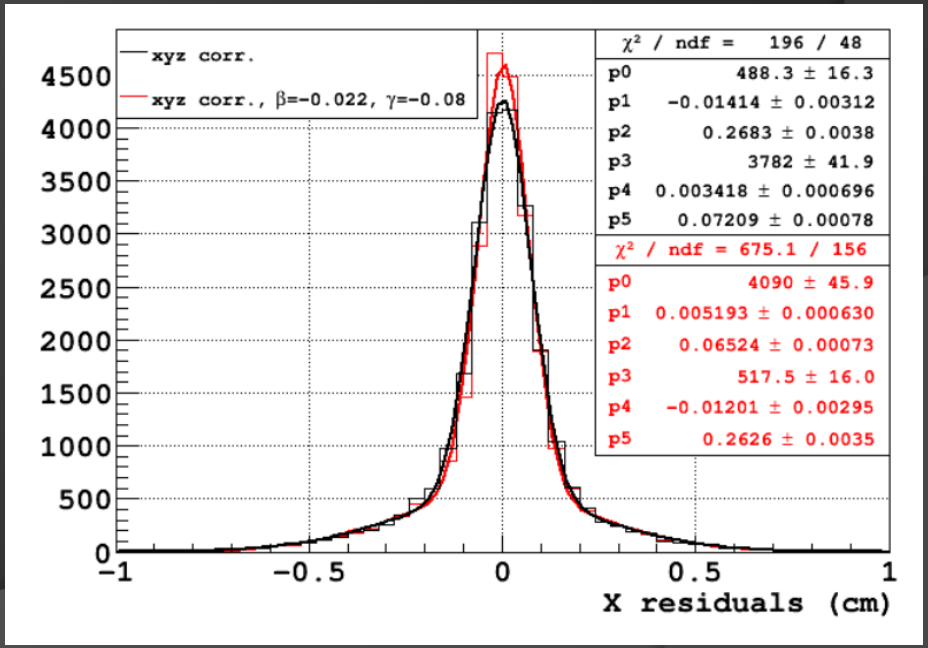
Detector has been aligned using cosmic muon tracks with the magnetic field off

Correction applied to find the ionization coordinate from the redeout hit

Resolution computed from residuals with DC track extrapolated hits

Δx: 50 ± 10 μm	σx: 650 ± 10 μm
Δy: 36 ± 4 μm	σy: 302 ± 5 μm
Δz: -8 ± 12 μm	σz: 1130 ± 20 μm

Offset parameters and Space resolutions (including DC contribution)



Conclusions

- The performance goal established by the collaboratrion one year ago in Cracow has been honored. 1 fb^{-1} of integrated luminosity since 17 November and 10 pb^{-1}/d for at least 4 consecutive days
- On the other hand the machine background, besides some improvement shown, still remains a concern, mostly on electrons injections. Beam losses can be deeply damaging for the IT. New HV system should increase safety. Possibility of a Dafne beam dump under investigation
- The detector and the front-end are (still) fully operative
- Data-taking efficiency has been continuosly improved up to reaching the 2005 level
- The collaboration has shown to have just the critical mass to conclude the present data-taking period of 9 months. Few new entries are needed for a longer period