SPI STATUS

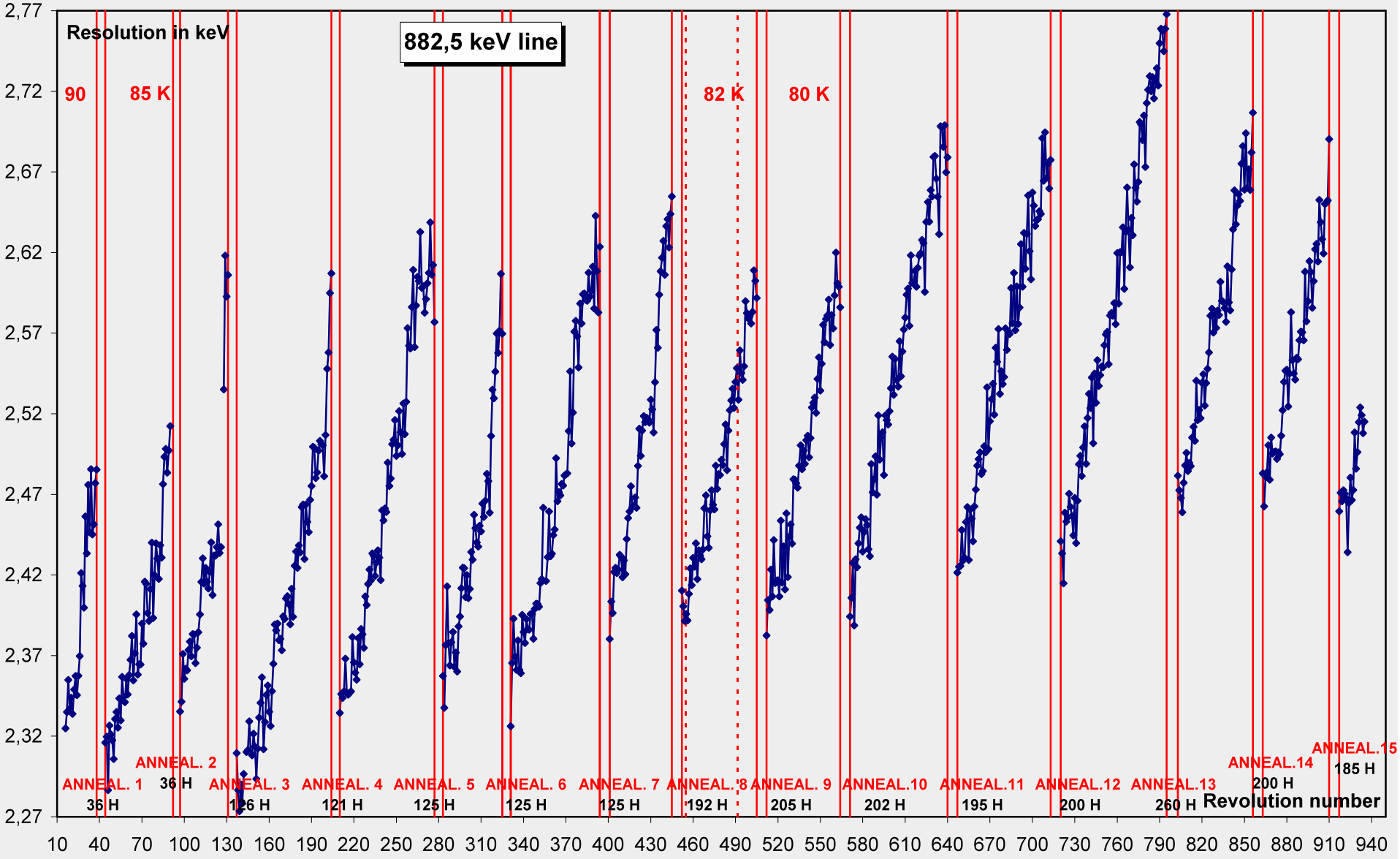
ANNEALING: 15th SUMMARY

- Start: March 30th
- 185 hours at 105C
- April 15tht: Camera reactivation

- Nominal HV settings at 80K
- Good recovery
- Nominal performance of the CDE's

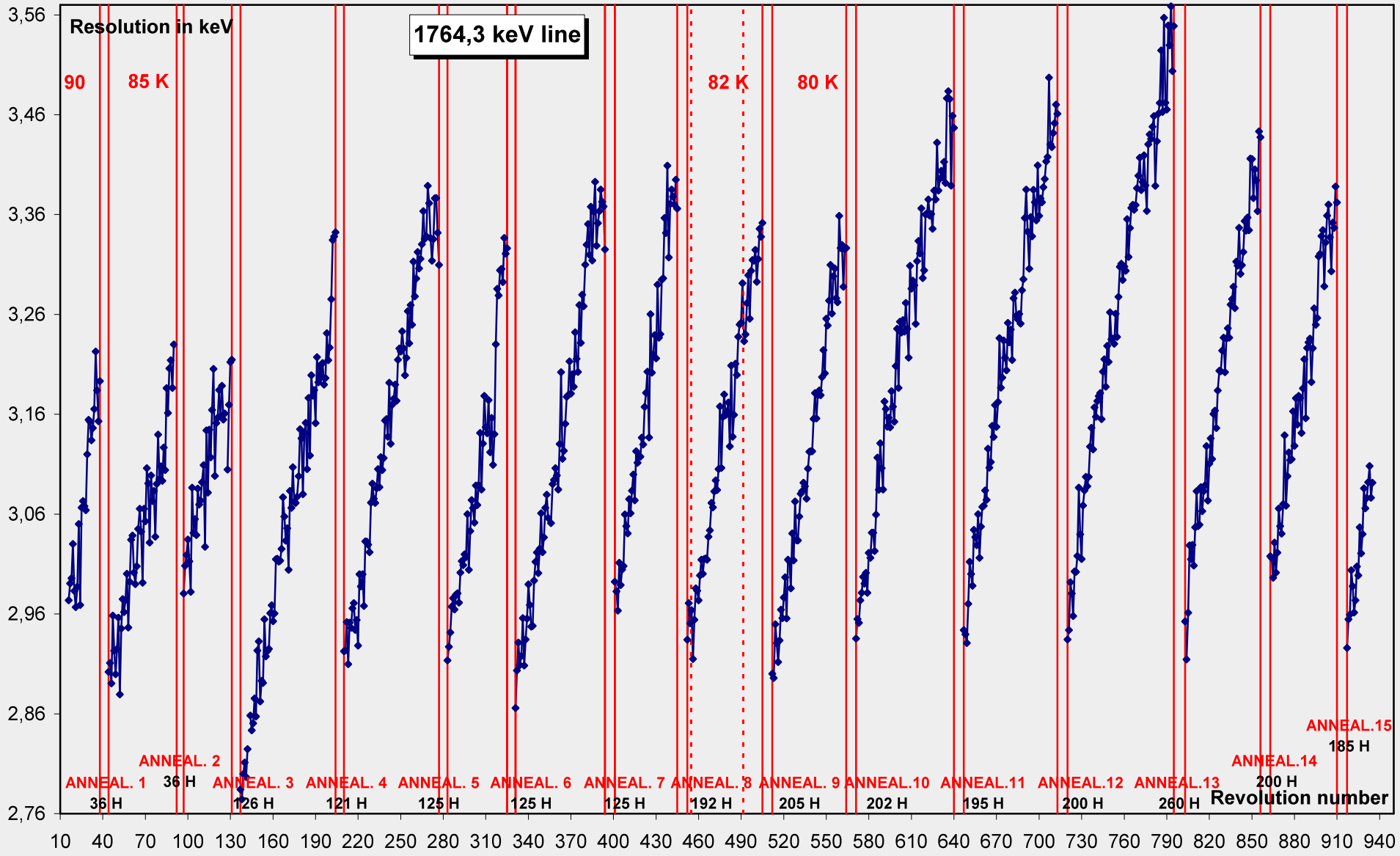
ENERGY RESOLUTION HISTORY: 882.5 keV

- Regular annealing (GeD at 105C) restore GeD energy resolution.



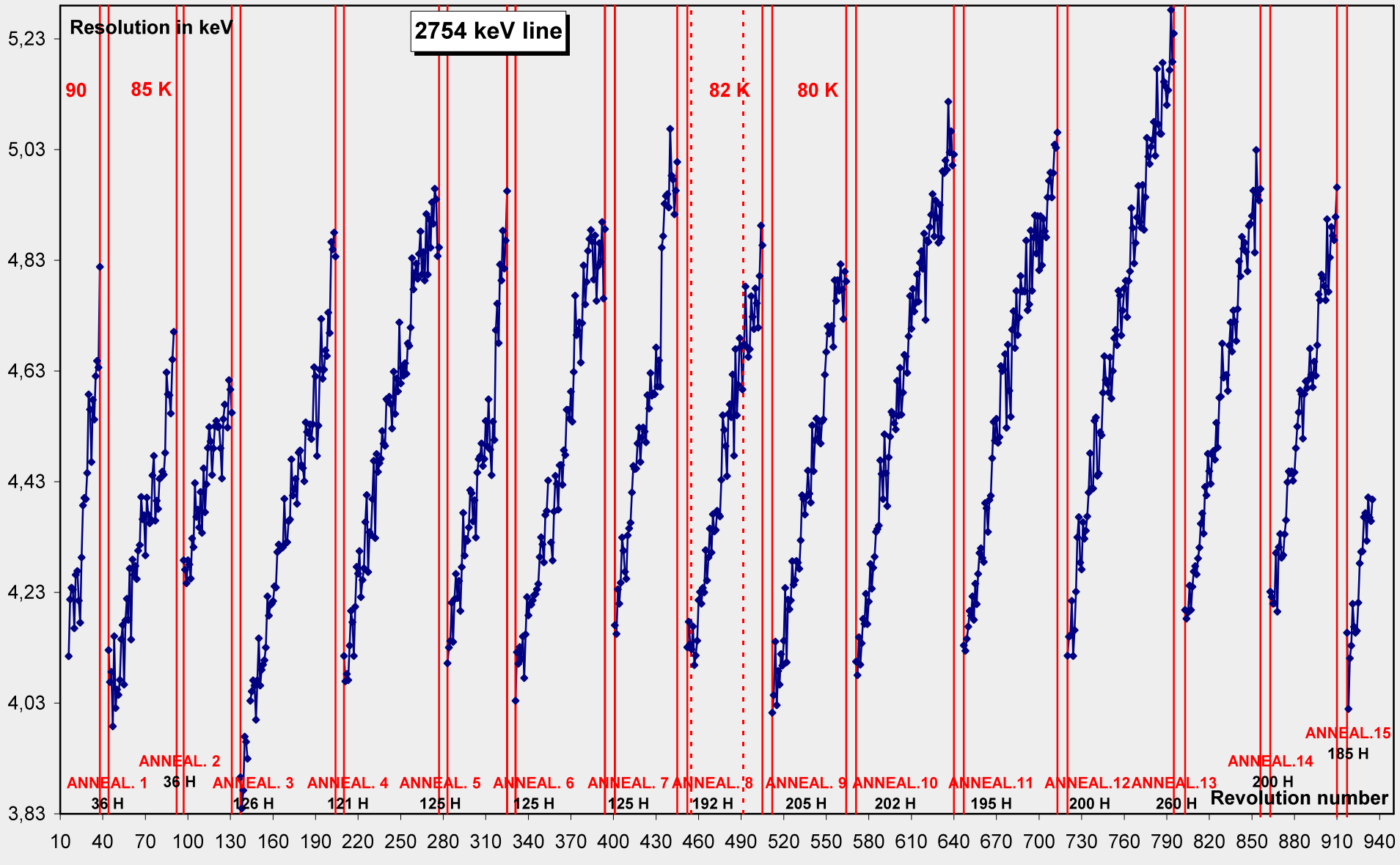
ENERGY RESOLUTION HISTORY: 1764.3 keV

- Regular annealing (GeD at 105C) restore GeD energy resolution.



ENERGY RESOLUTION HISTORY: 2754 keV

- Regular annealing (GeD at 105C) restore GeD energy resolution.



GeD 1 FAILURE

- May 25th GeD 1 stopped.
- Counting rate increase 2-3 seconds before
- Then preamp blocked with anomalous offset
- Similar to the other failures
- No clear explanation
- However seems to be linked to the HV
- Can we reduce the risk ?
- Yes, if we can reduce the HV

THE HV AND GERMANIUM DETECTORS

- HV value:
  - Set the electric field in the crystal
  - Determine the charge collection in the Ge
- Then the derived parameters are:
  - The conversion gain of the detector: line peak position
  - The conversion gain distribution within the volume
  - The energy resolution and its distribution in the active volume
  - The active volume of the detector
- Operation at an “enough high” voltage ensures that all these parameters are set to the optimum.
- The optimum of 4KV comes from on-ground knowledge of the GeD
- Is this optimum still valid ?

GERMANIUM DETECTOR EVOLUTION SINCE LAUNCH

- Main evolution come from the annealings:
  - At 105 C the lithium that compose the central (+) electrode drifts.
  - Then the electrical diameter of the central hole increases.
  - The electric field distribution in the detector changes
- In a coax detector E is very intense in the innermost regions.
  - The increase of the central diameter result in a significant increase of E in the whole volume
  - Thus improving charge collection efficiency
- Thus for the same result – charge collection efficiency" we should be able to reduce the HV.
- However, other effects (due to irradiation) could mitigate this.

NEW DETERMINATION OF THE GeD DEPLETION CURVES

- Measure of the peak position and energy resolution for various HV values
- Need to use a line at “high” energy (> 1 MeV) to be sensitive to charge trapping.
- Long integral time needed.
- An initial plan started today:
  - 24 hr at 3.5 kV
  - 24 hr at 3.0 kV
  - 12 hrs at 2.5 kV
  - 2 hrs at 2.0 kV
  - 2 hrs at 1.5 kV

GeD HV DECREASE ?

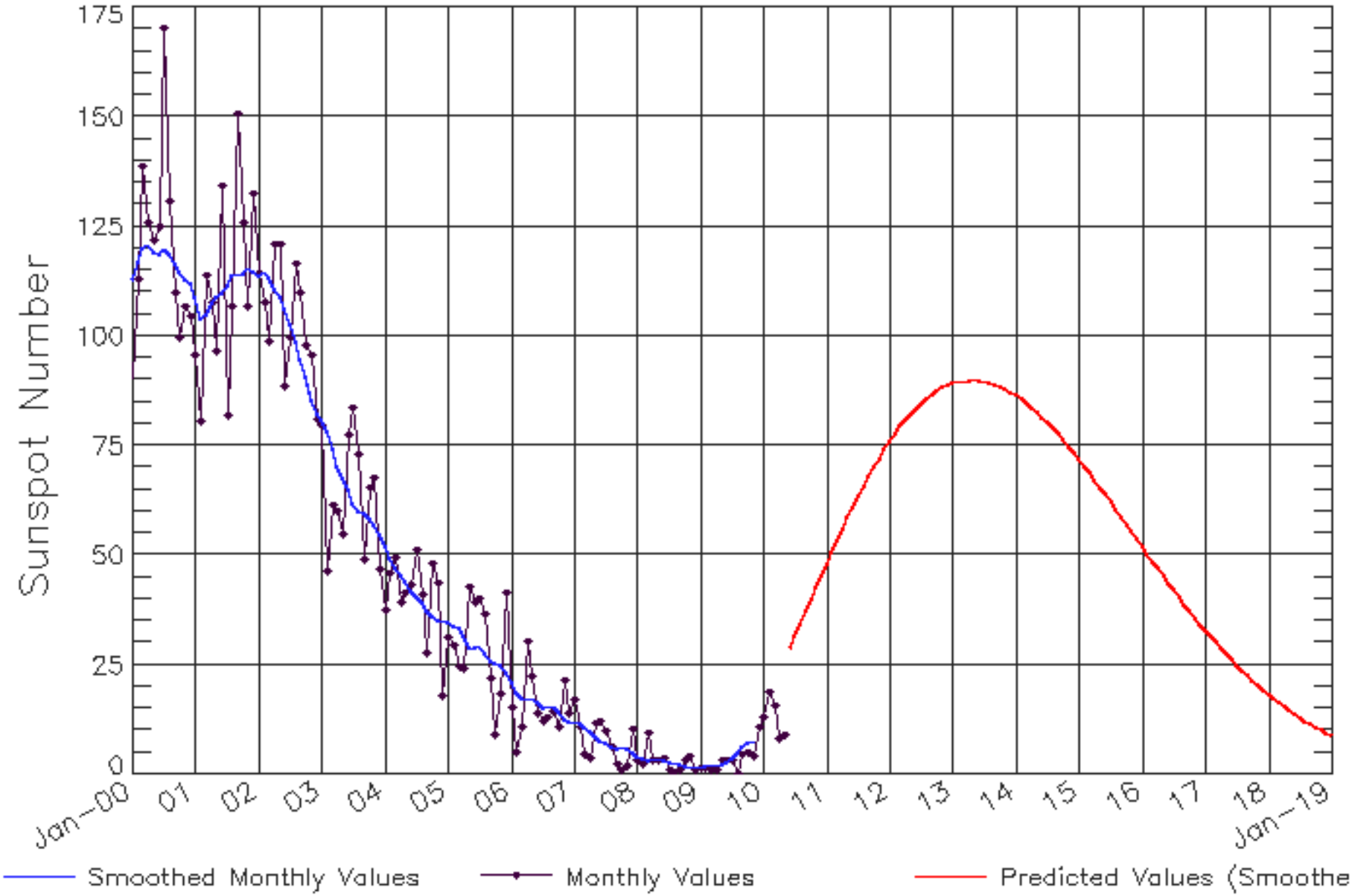
- If possible we will decrease the GeD HV aiming to keep the same scientific performances.
- We will have to control the effect of irradiation and the efficiency calibration.

GeD's FAILURE SCIENCE IMPACT

- Sensitivity reduction: sqrt (15/19)
- Imaging loss:
  - Little: the "multiplexing" decrease from 19x25 down to 15x25

ISES Solar Cycle Sunspot Number Progression

Observed data through May 2010



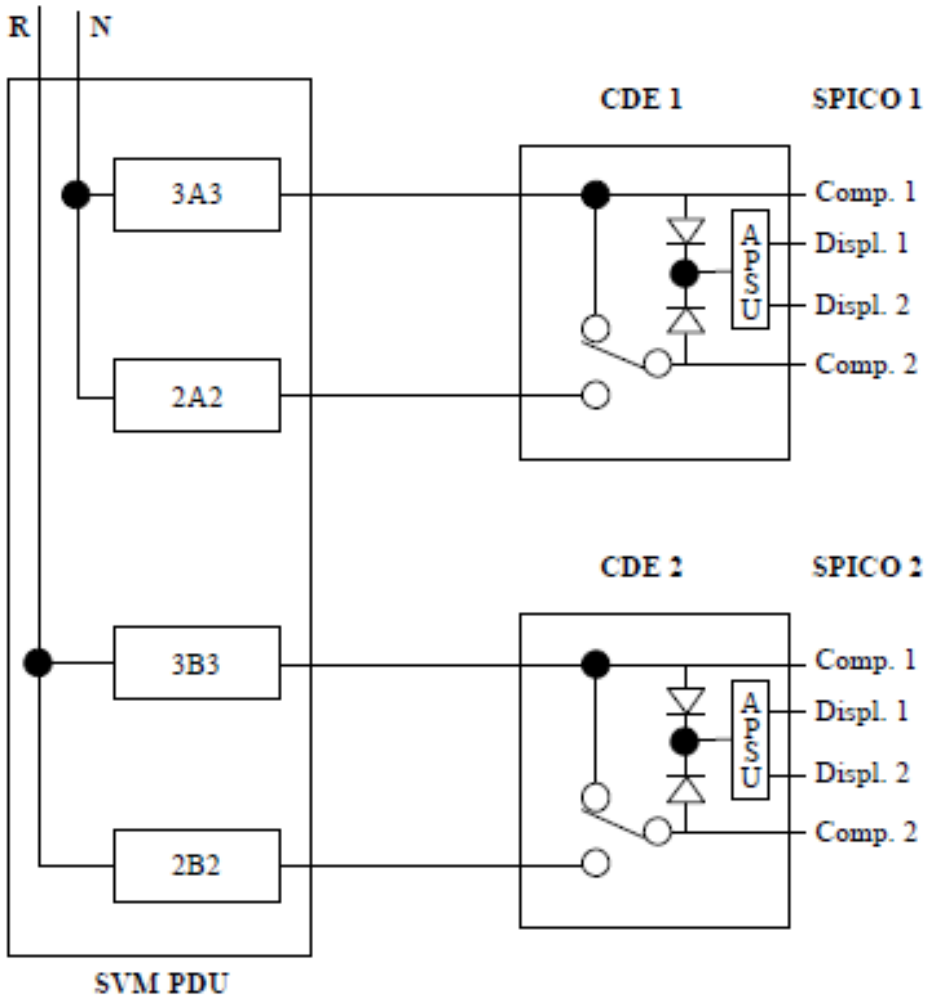
Updated 2010 Jun 8

NOAA/SWPC Boulder,CO USA

LCL “ANOMALY”

- LCL trip are more and more frequent
- Consequences on SPI are very high
- This case was easy…in case of problem over night on the master CDE it would have been worse
- We have to retry to switch to backup configuration:
  - 1 LCL per compressor.
- Done for CDE2, still to be retried for CDE1

CDE “backup” configuration



First attempt in April the relay didn’t move….

Marginal design of the relay command

Test again with repeated pulses….

FUTURE CALIBRATIONS

ONE PATTERN (50ks) PROVIDES « ENOUGH » STATISTICS UP TO ~ 200 keV

- Each annealing increases the central hole size: the high energy efficiency will necessarily decrease.
- 4 Revs allows a good control of SPI up to ~2 MeV
- AIM is to obtain

RELIABLE DATA UP TO A FEW MEV
IN THE STANDARD 5X5 PATTERN
AND
REFERENCE SPECTRA FOR CROSS-CALIBRATION

« good » cross calibration only exists for 16 ks !