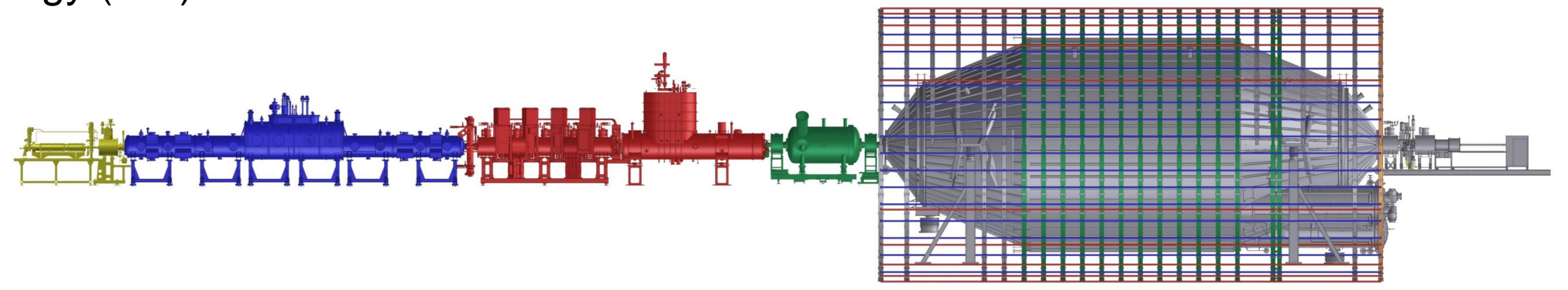


## The Karlsruhe Tritium Neutrino Experiment

- direct & model-independent neutrino mass search
- with unprecedented sensitivity **200 meV (90% CL)**



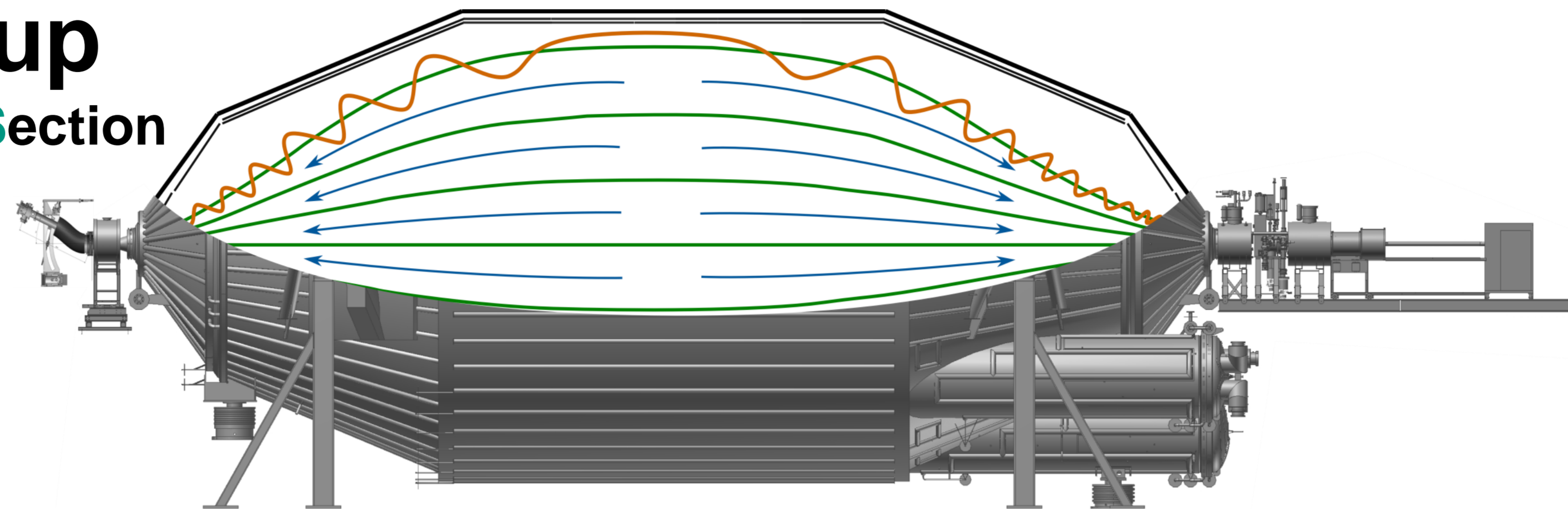
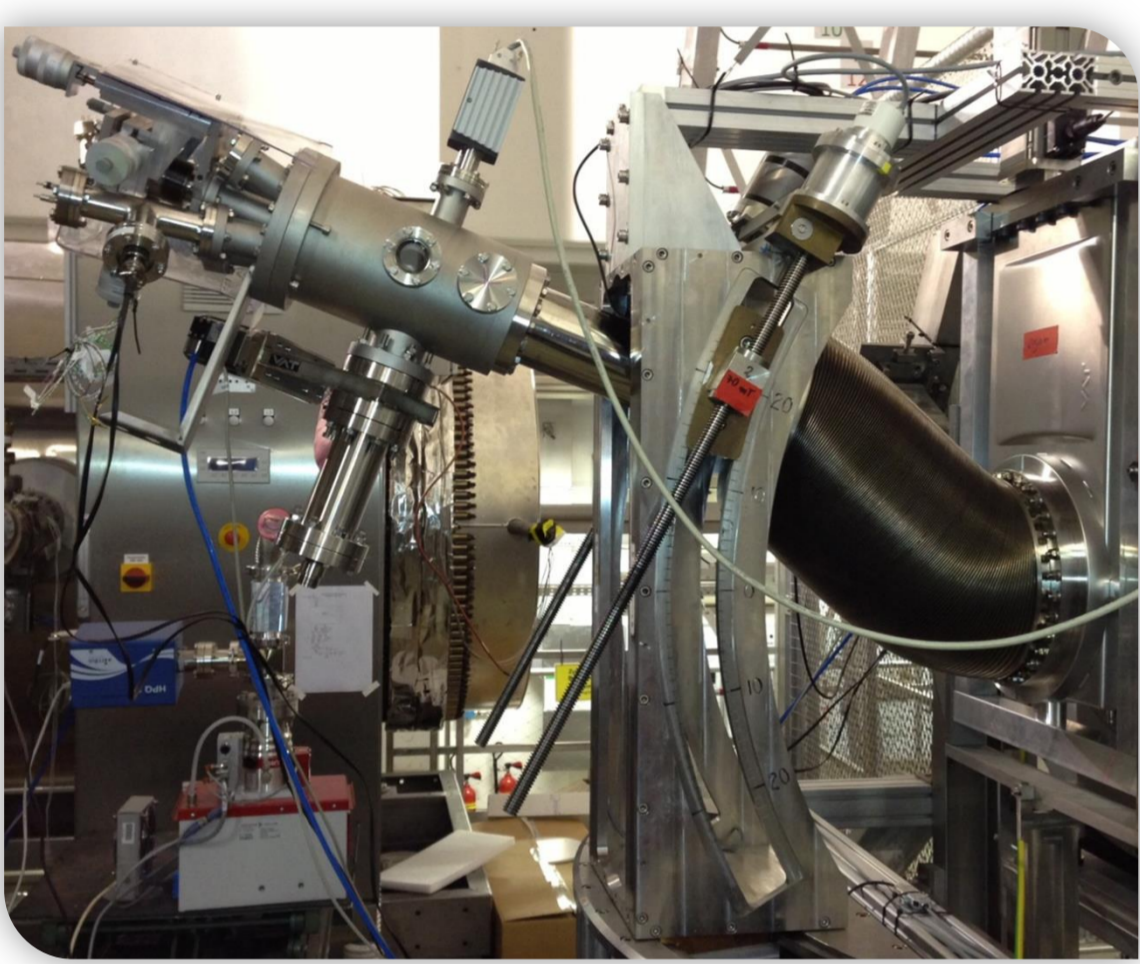
## SDS Phase I Setup

### Spectrometer – Detector – Section

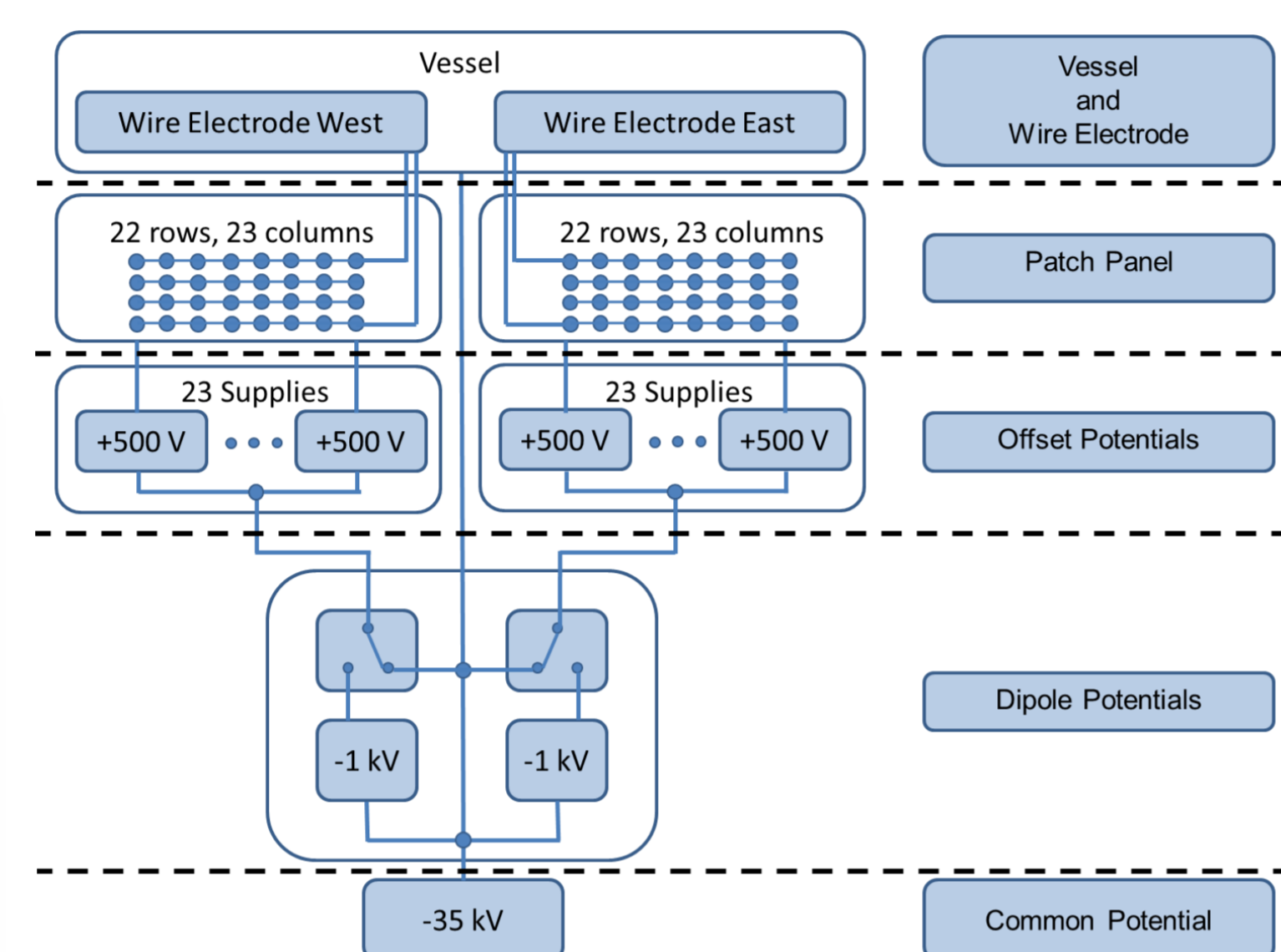
#### Electron Gun

##### Requirements

- Sharp energy distribution
- Angular selectivity
- Flux tube scanning

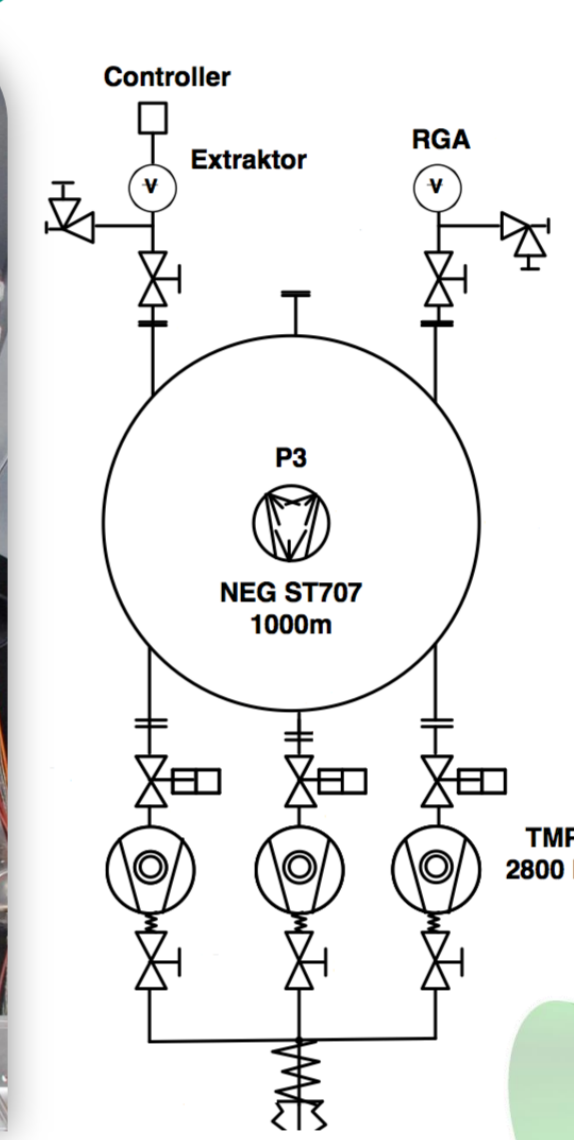
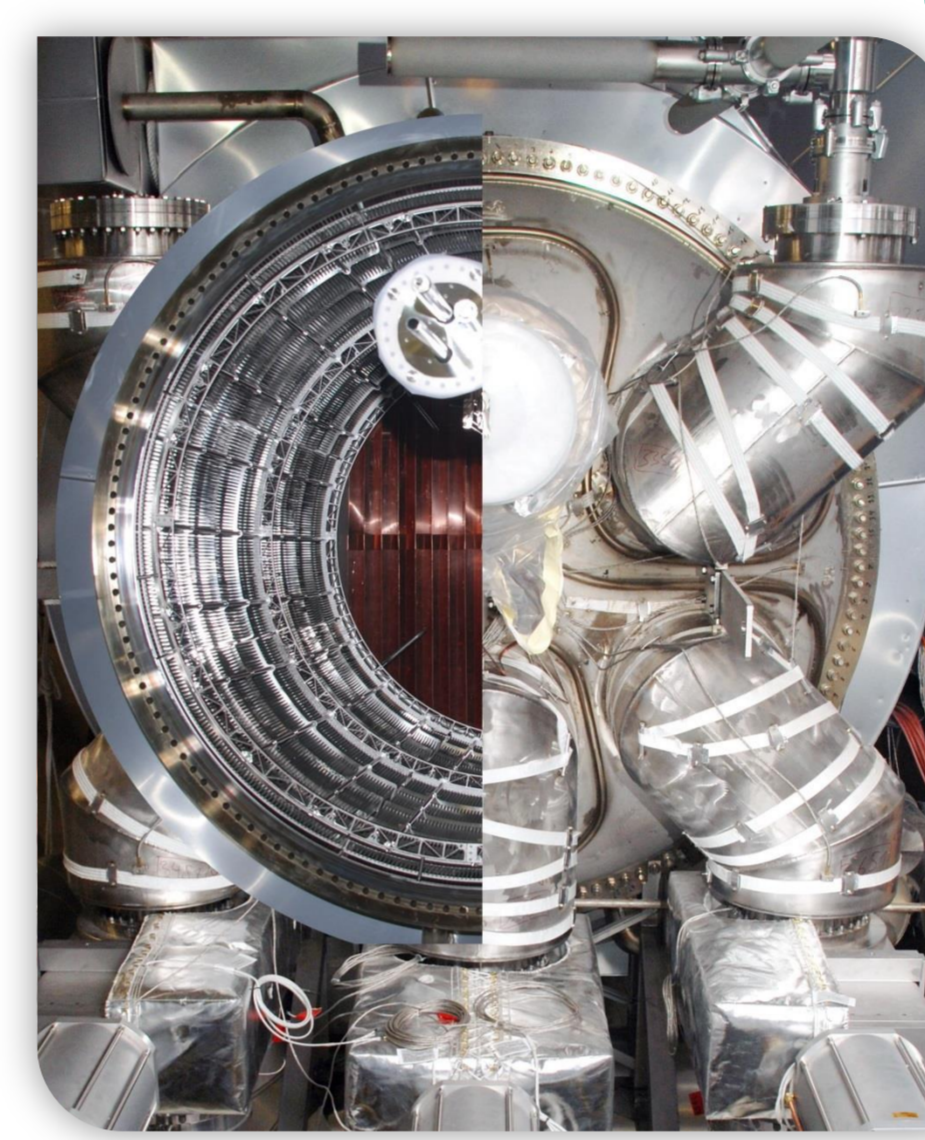


#### High Voltage System



- Voltage on vessel up to 35 kV
- Precision monitoring, ppm level

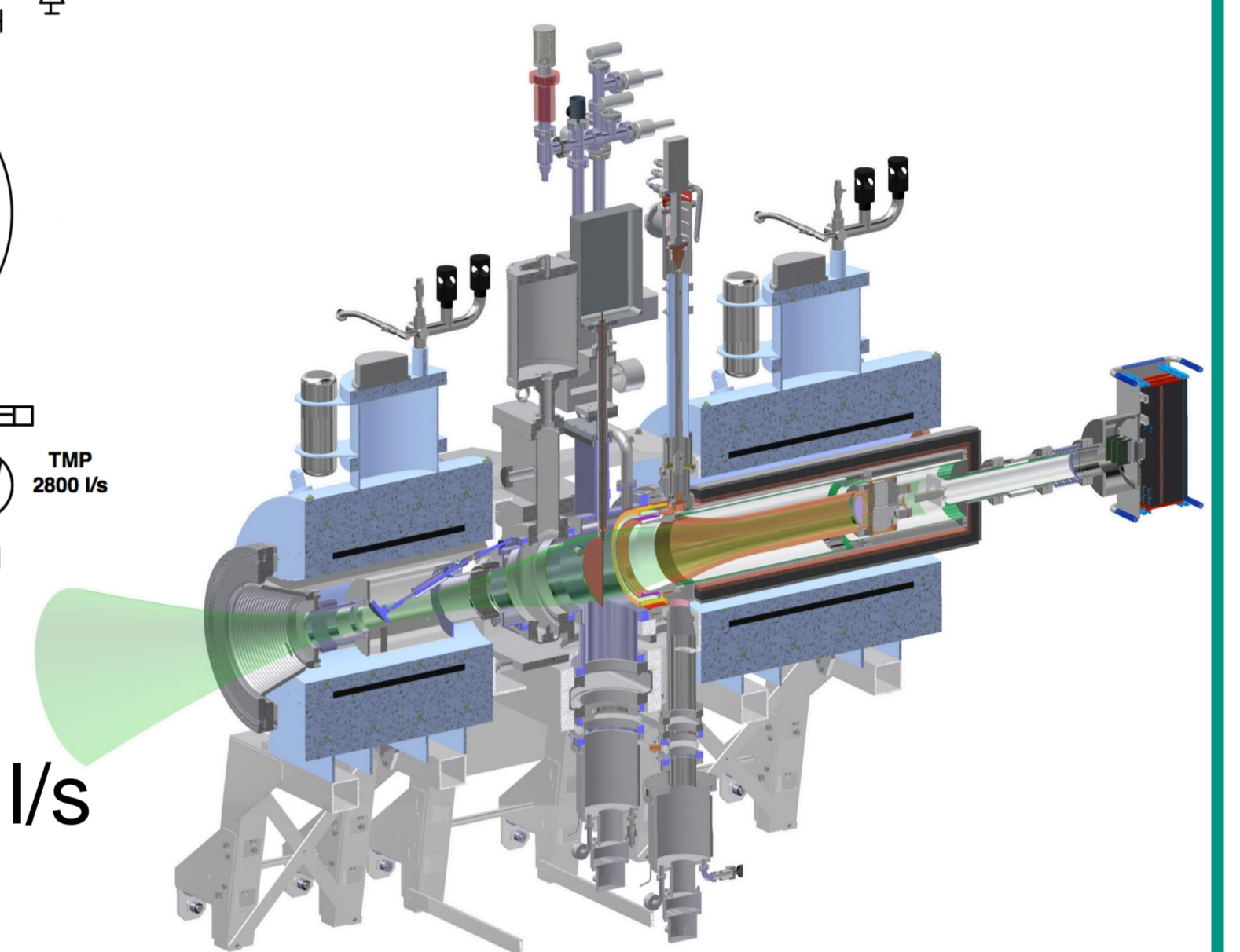
#### Vacuum System



- 3 km NEG strips: 930 000 l/s
- 6 TMPs: 10 000 l/s

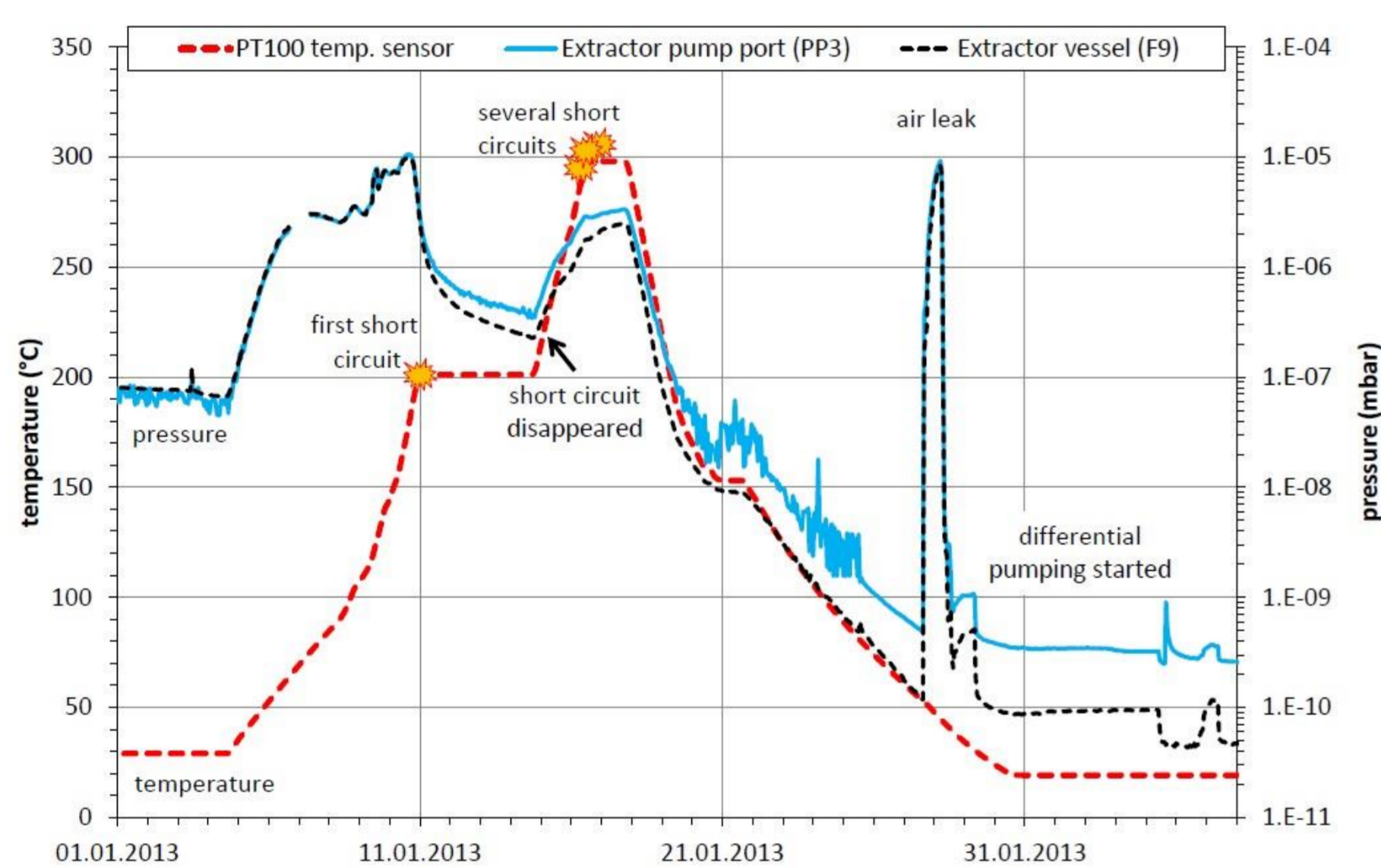
#### Focal Plane Detector

- Si-PIN diode detector
- High detection efficiency
- Low intrinsic background



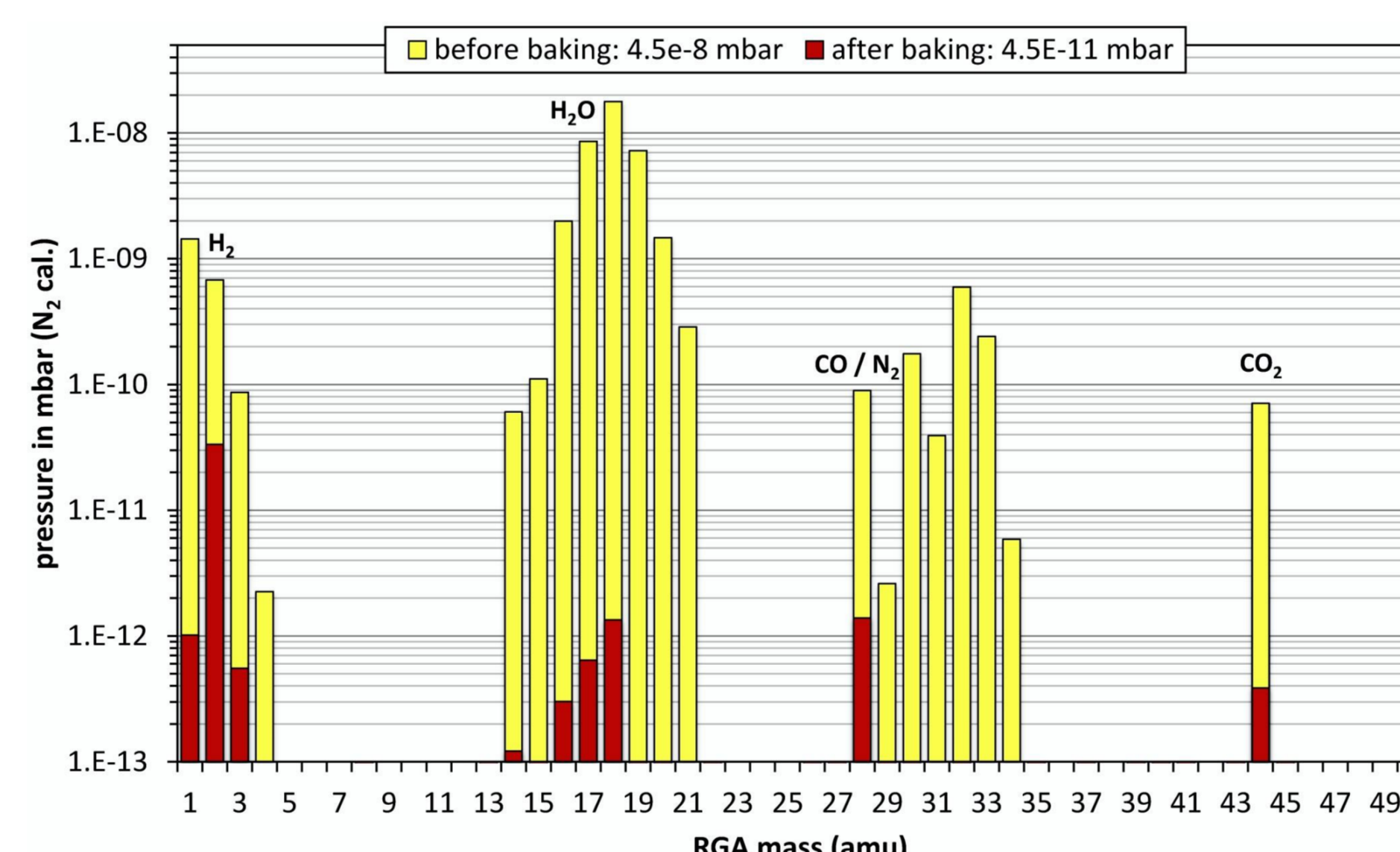
## SDS Phase I Commissioning

### Vacuum Conditioning



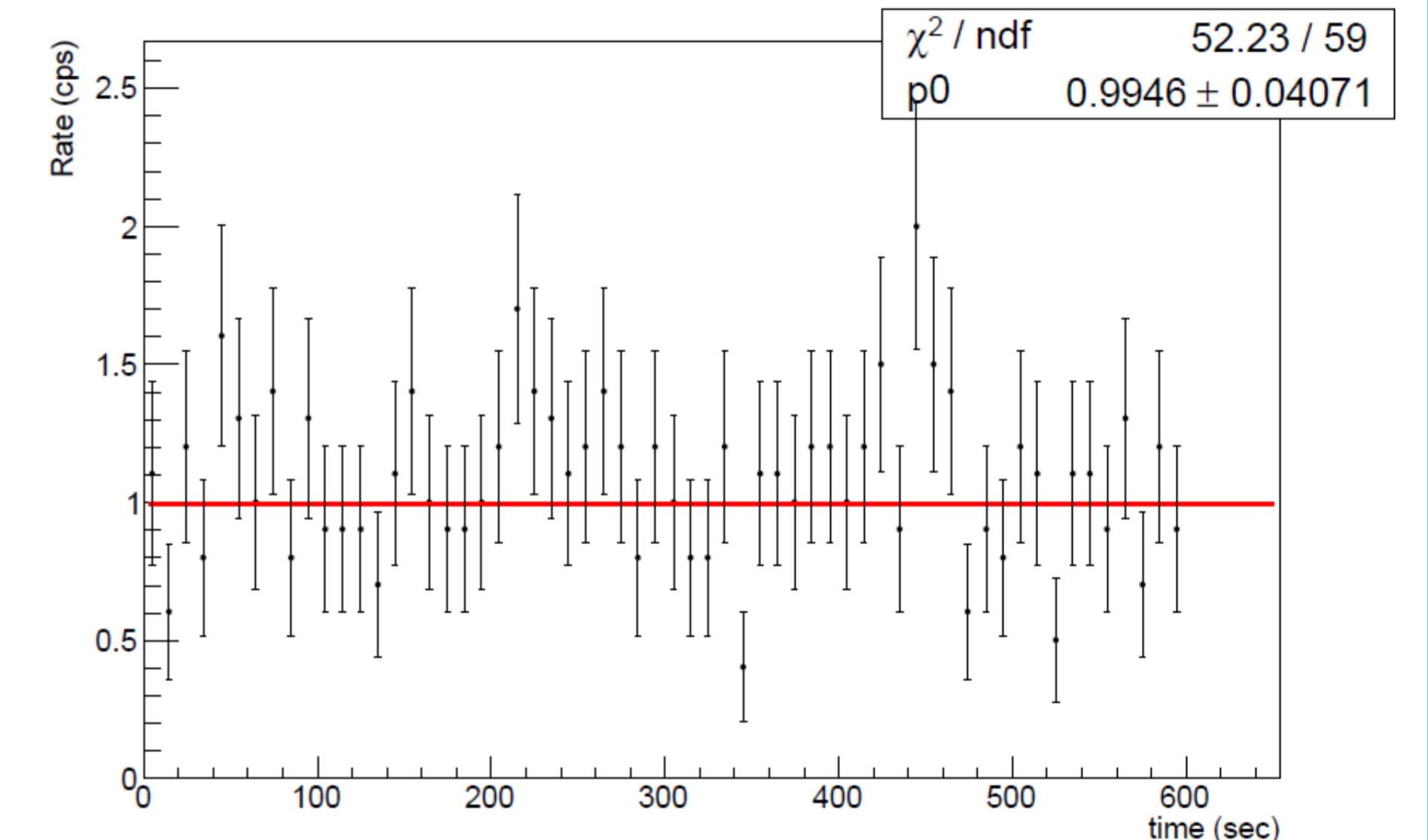
- Automated baking cycle in 2013
- Short circuit in electrode:
  - temperature limited to 300°C

### Vacuum after Baking



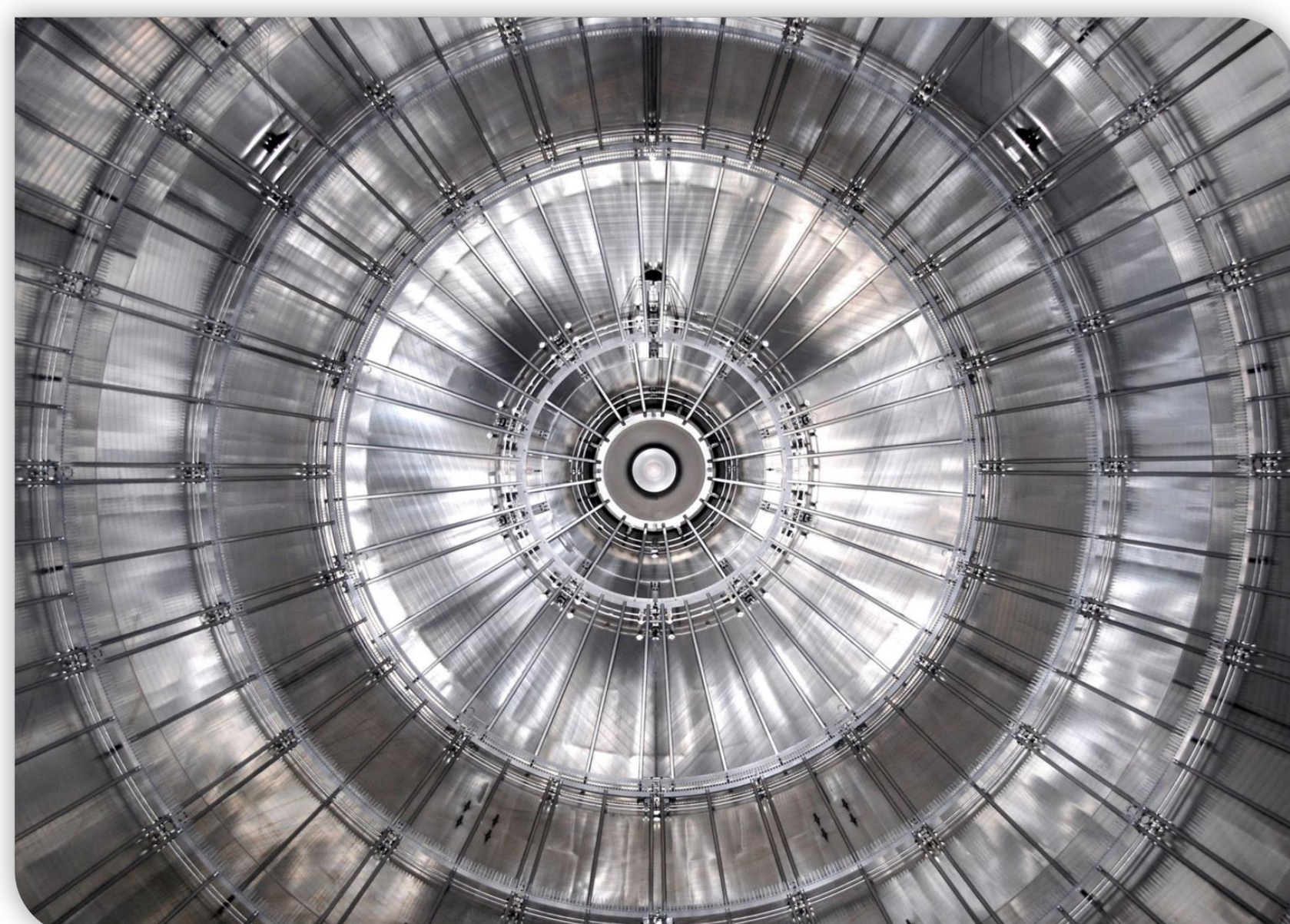
- Pressure improved by factor 1000
- Mass spectrum hydrogen dominated
- UHV pressure level:  $p \approx 10^{-10}$  mbar

### Background with High Voltage



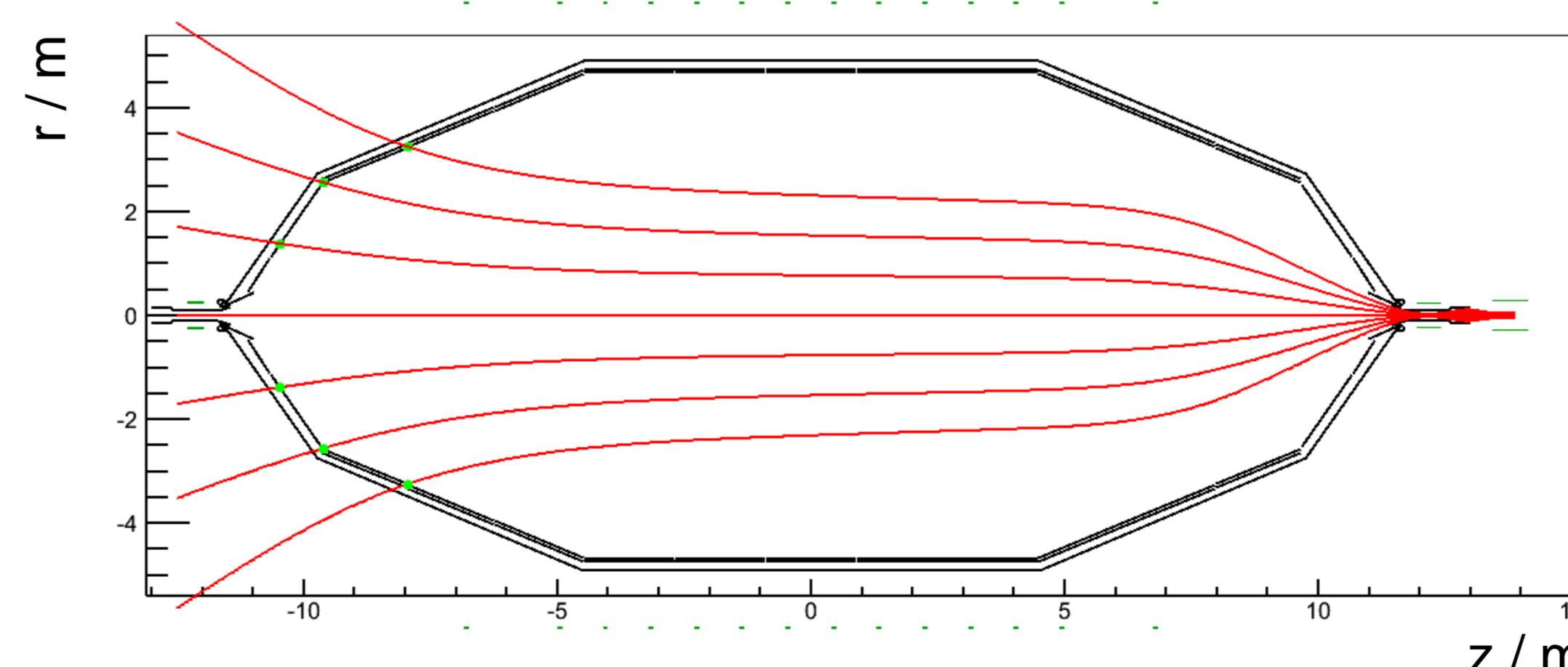
- First background data at HV:
  - no Penning traps
  - lowest initial background ever observed at a MAC-E filter

### Status of Inner Electrode



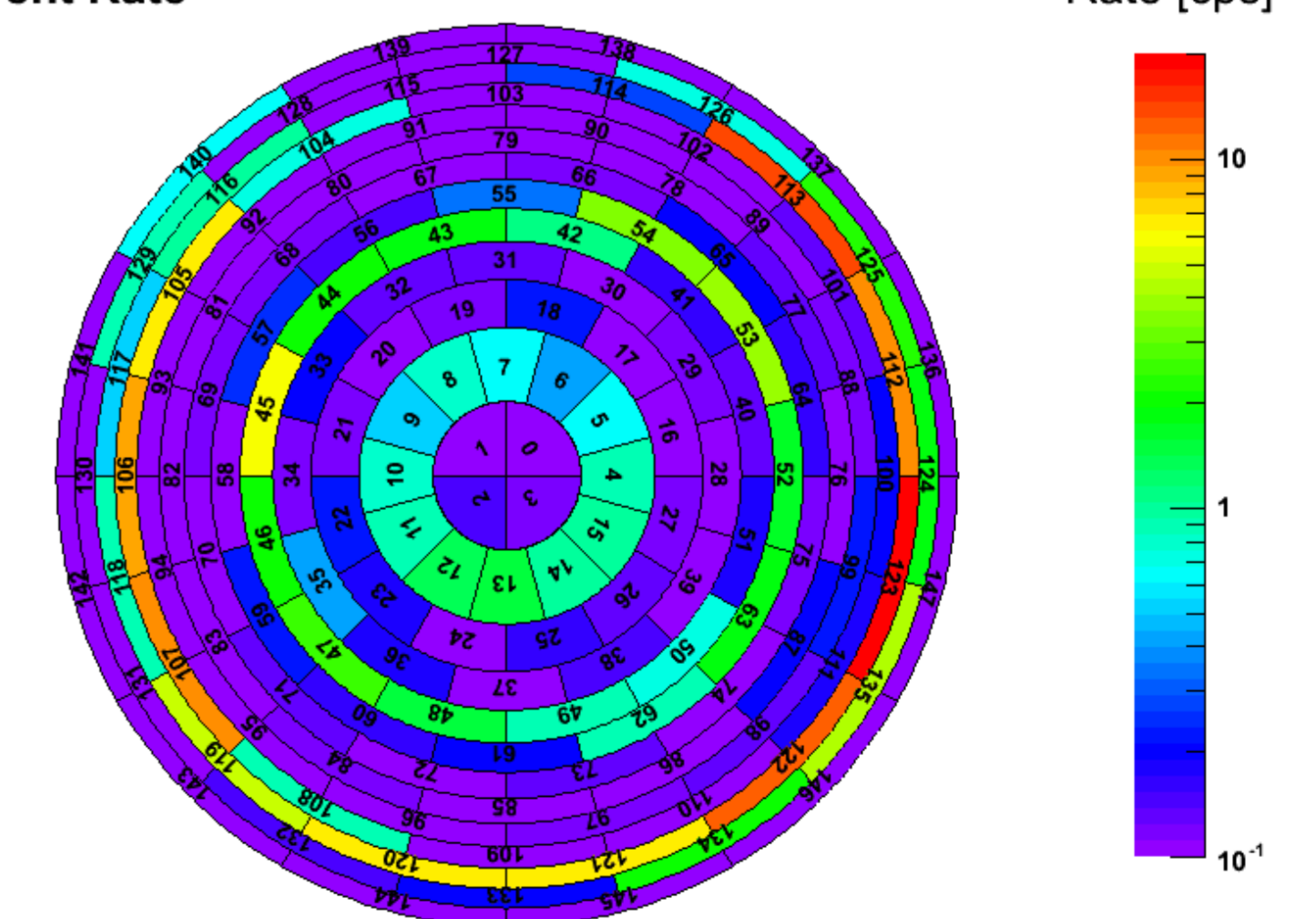
- 23 000 wires inside vessel
- Short circuits during baking:
  - repair of central part finished

### First Light Measurements



- Asymmetric magnetic guiding field
- Direct investigation of inner electrode structures and tank wall
- Mapping of Inner Electrode structure onto detector

#### Event Rate



- First spectrometer electrons arrive at the detector – first light
- Agreement of measurements and simulations deepen understanding of transport mechanisms