



Nuclear Reaction Measurements using CARME at CRYRING

(CRYRING Array for Reaction MEasurements)

Jordan Marsh

Supervisors: Dr Carlo Bruno, Prof Phil Woods



Science and Technology Facilities Council



CARME@CRYRING

CARME is a new array for charged particle detection mounted at CRYRING@FAIR. Storage rings offer the opportunity to study nuclear reactions at astrophysically relevant energies with CRYRING unique due to its ability for low energy beam storage

Storage rings measurement advantages:

- Electron cooled, high purity radioactive isotope beams
- Ultra-thin, windowless, gas-jet targets
- Beam Recirculation

This allows for charged particle spectroscopy and negligible target straggling affects. XHV pressures of $\sim 10^{-12}$ mbar required for circulation of the beam around the ring

CARME

Reaction products are detected by Double-sided Silicon Strip Detectors (DSSD's) which move under vacuum to protect against un-cooled beam

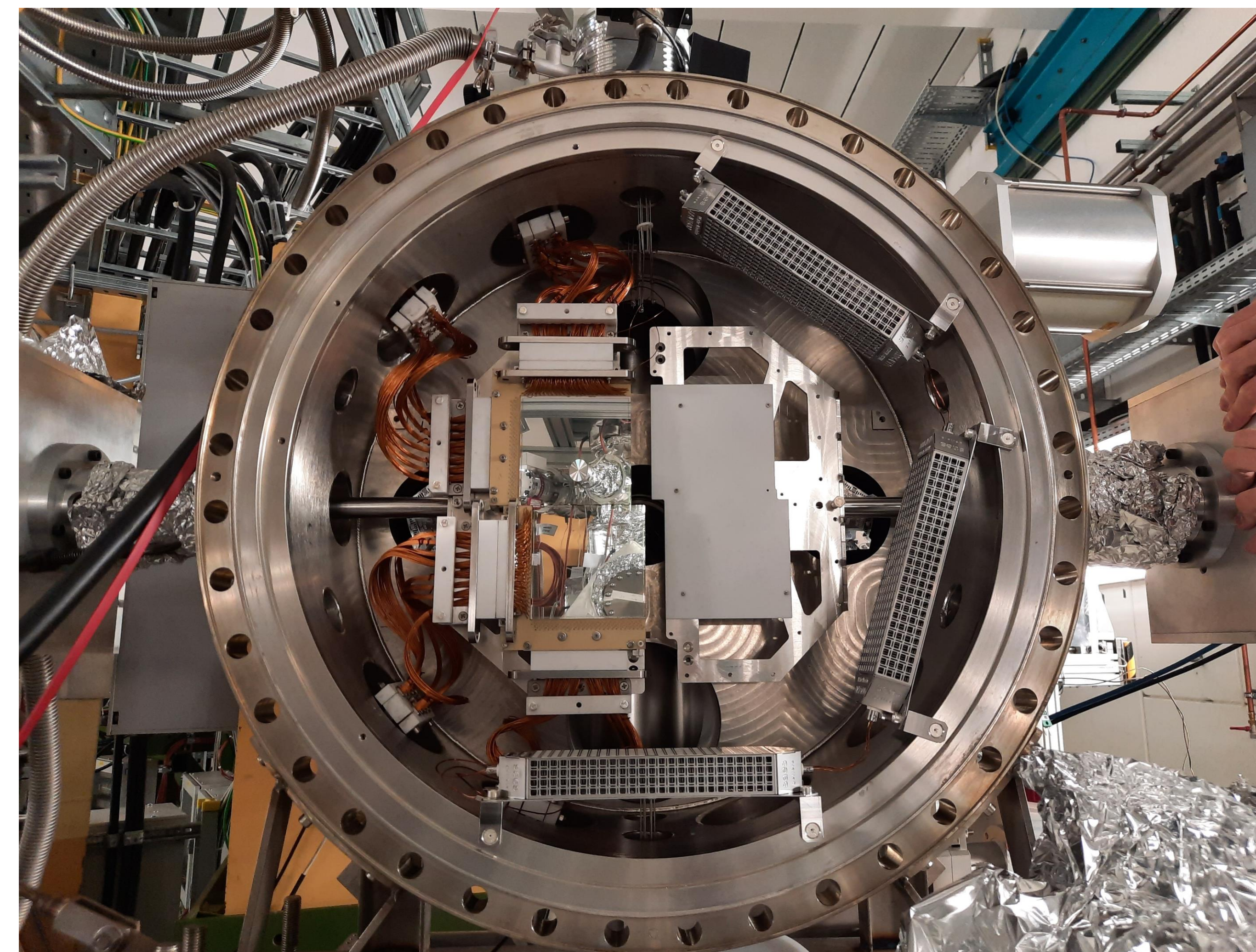


Fig 2: Internal components installed in the moving detector chamber section of CARME

$^{14}\text{N}+d$ Beamtime

CARME has been installed at CRYRING and completed its commissioning beamtime of $^{14}\text{N} + d$ with a deuteron beam on a nitrogen target. Beam energies of 1.5 MeV/u and 5.5 MeV/u, and multiple detector positions were tested during the commissioning beamtime.

Several peaks from nuclear reactions can be seen above Rutherford scattering peak

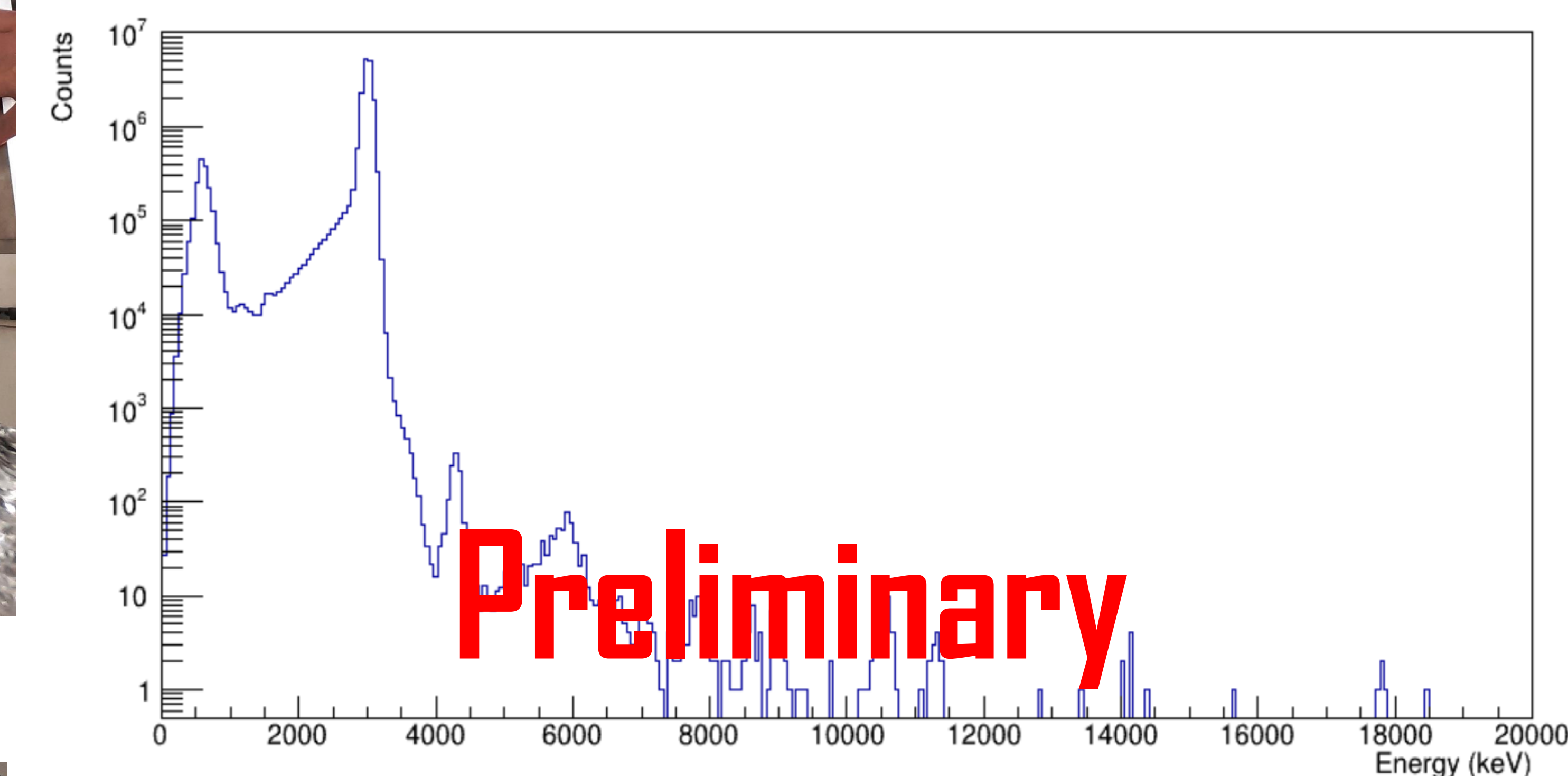


Fig 4: Energy histogram from 0-20 MeV for 1.5 MeV/u run.

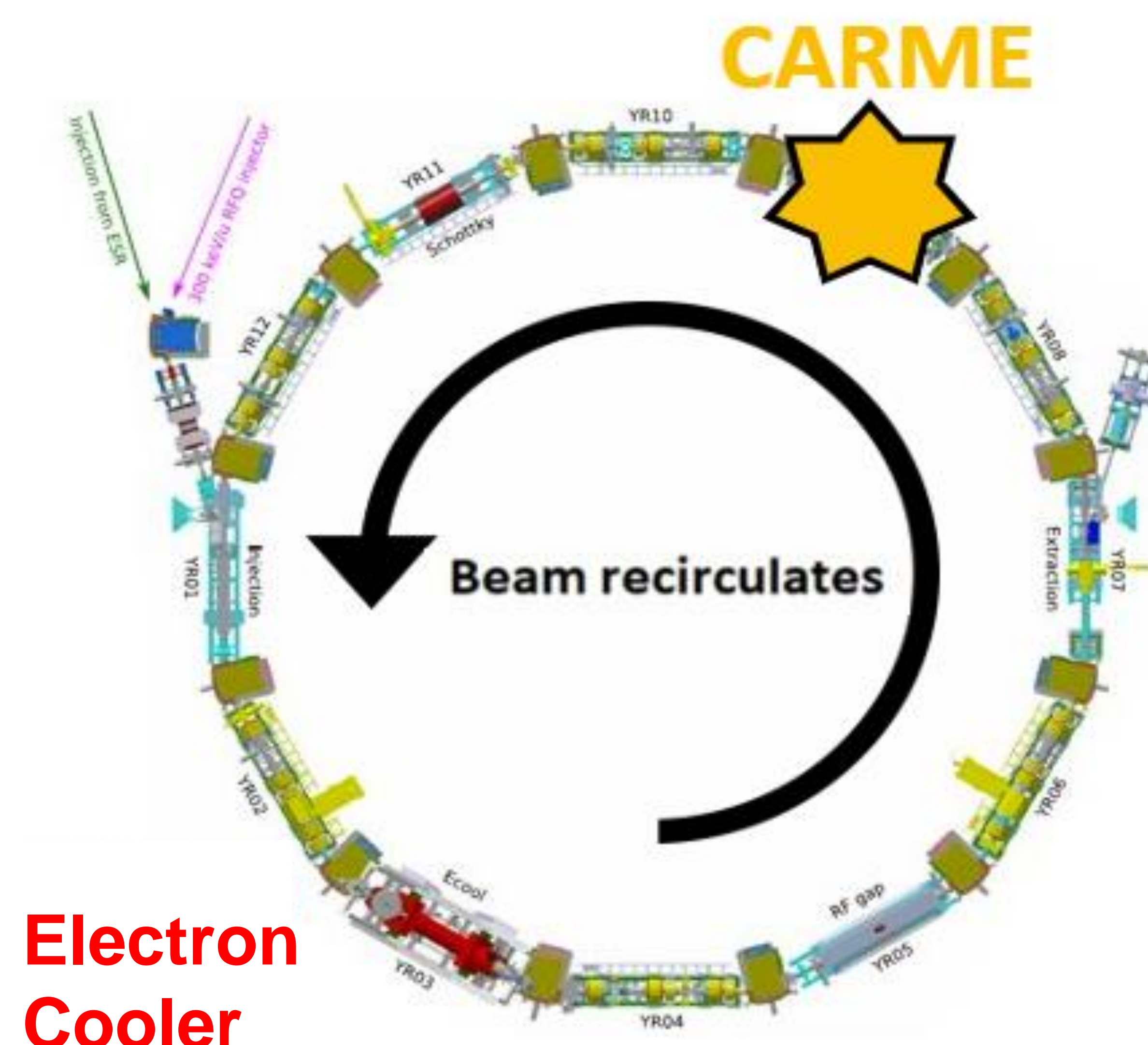


Fig 1: Structure of storage ring at CRYRING GSI

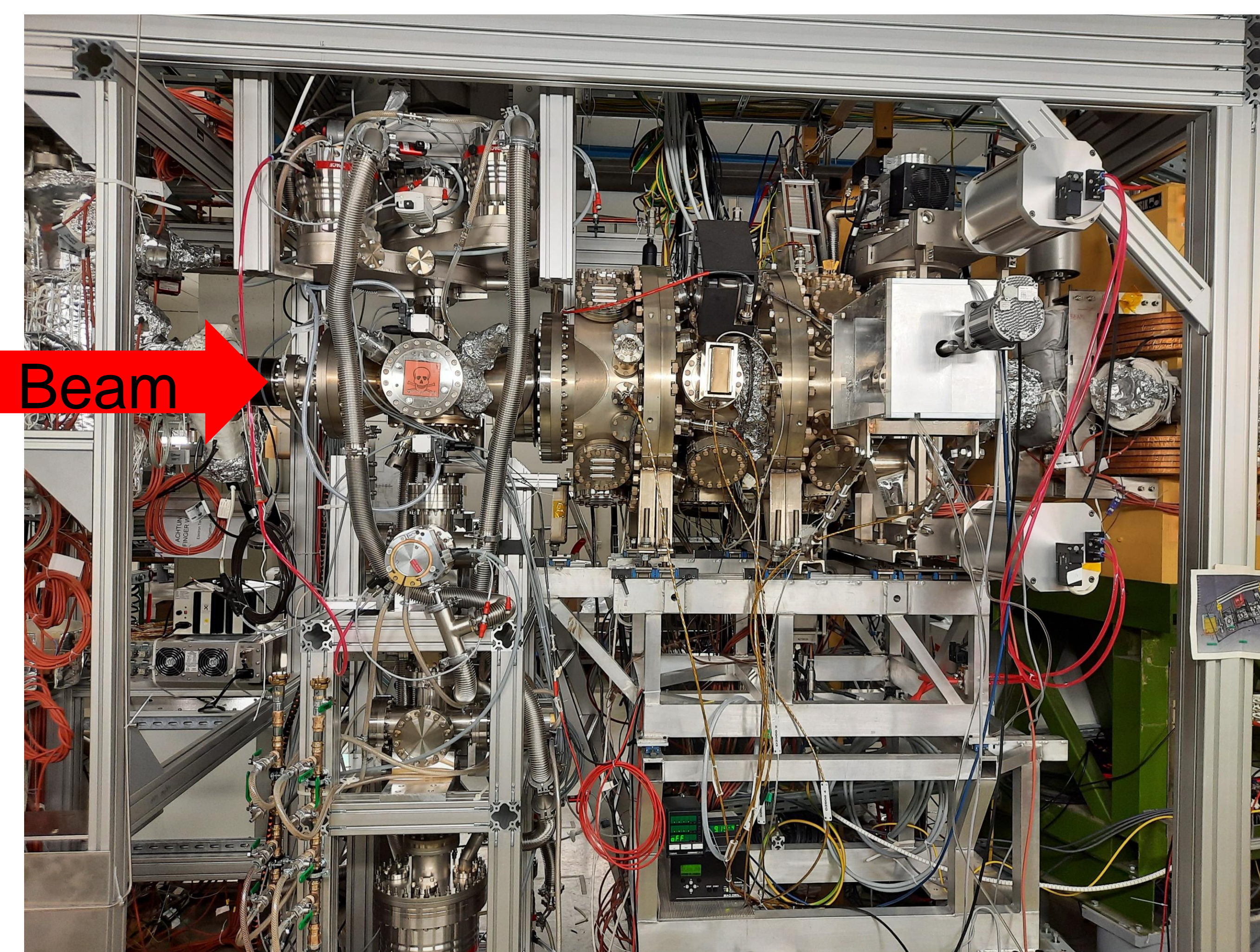


Fig 3: CARME chamber (right) and interaction chamber (left) installed at CRYRING

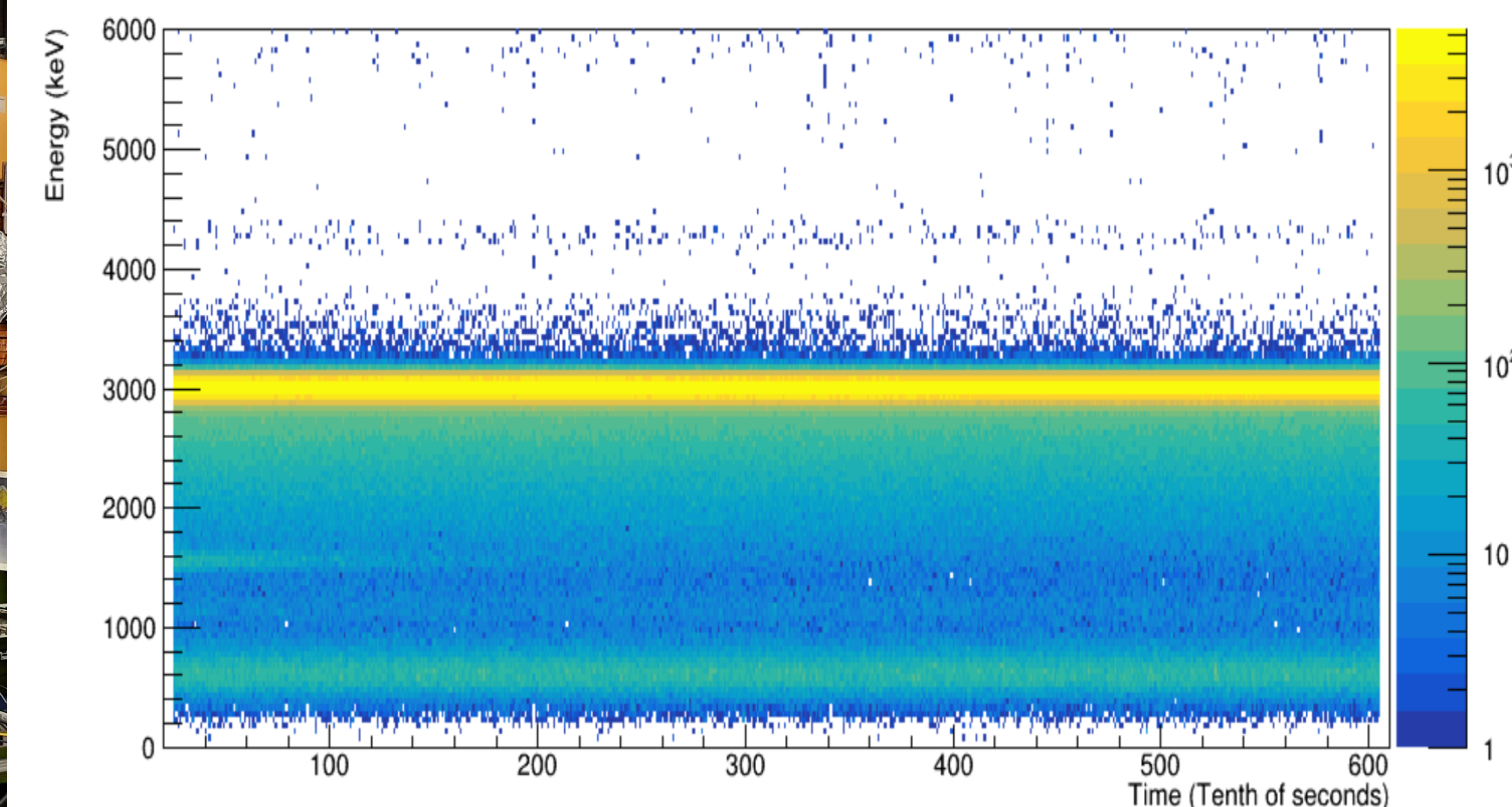


Fig 5: Energy vs Time Histogram for a 1.5 MeV/u run in the period where DSSD's are static