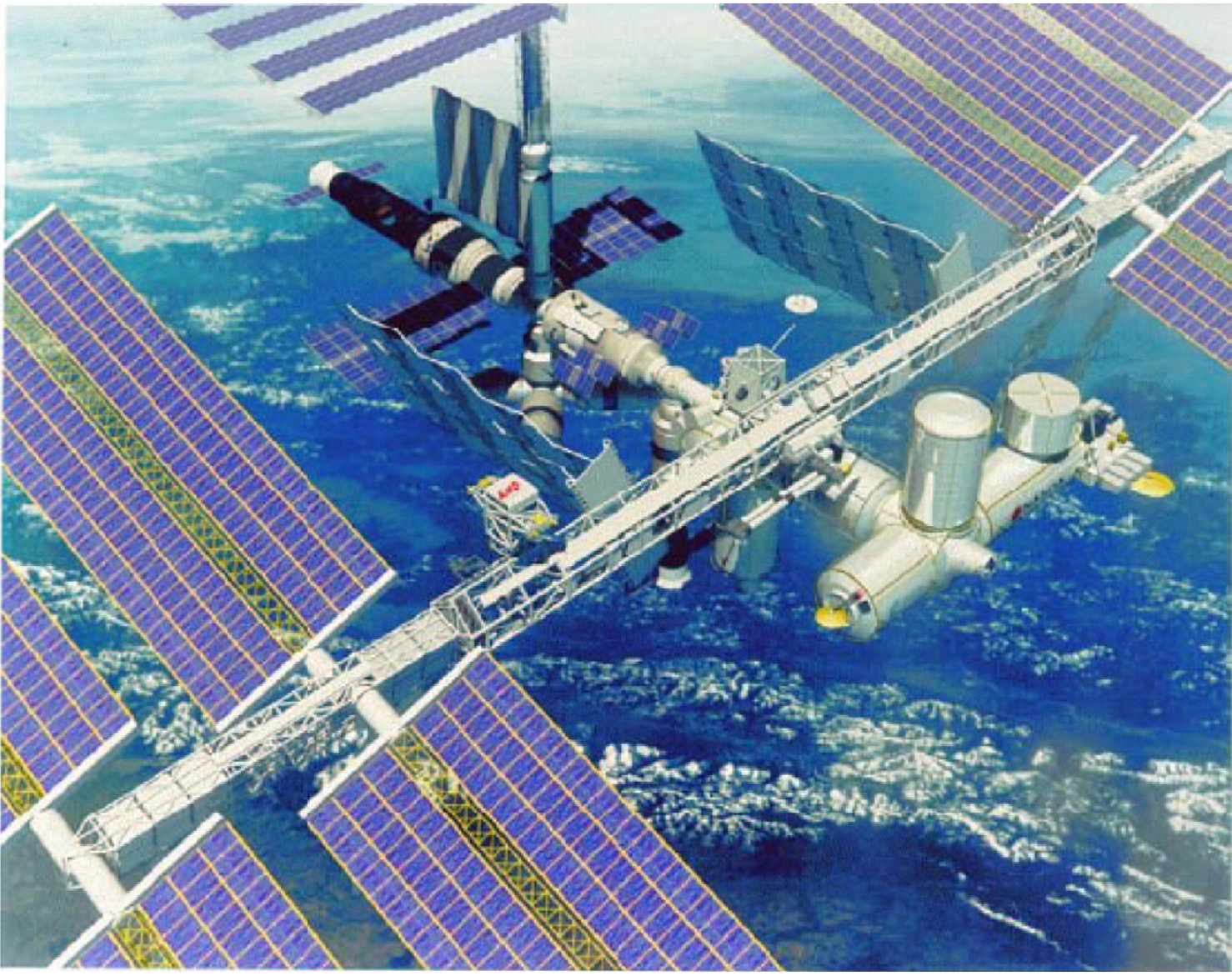
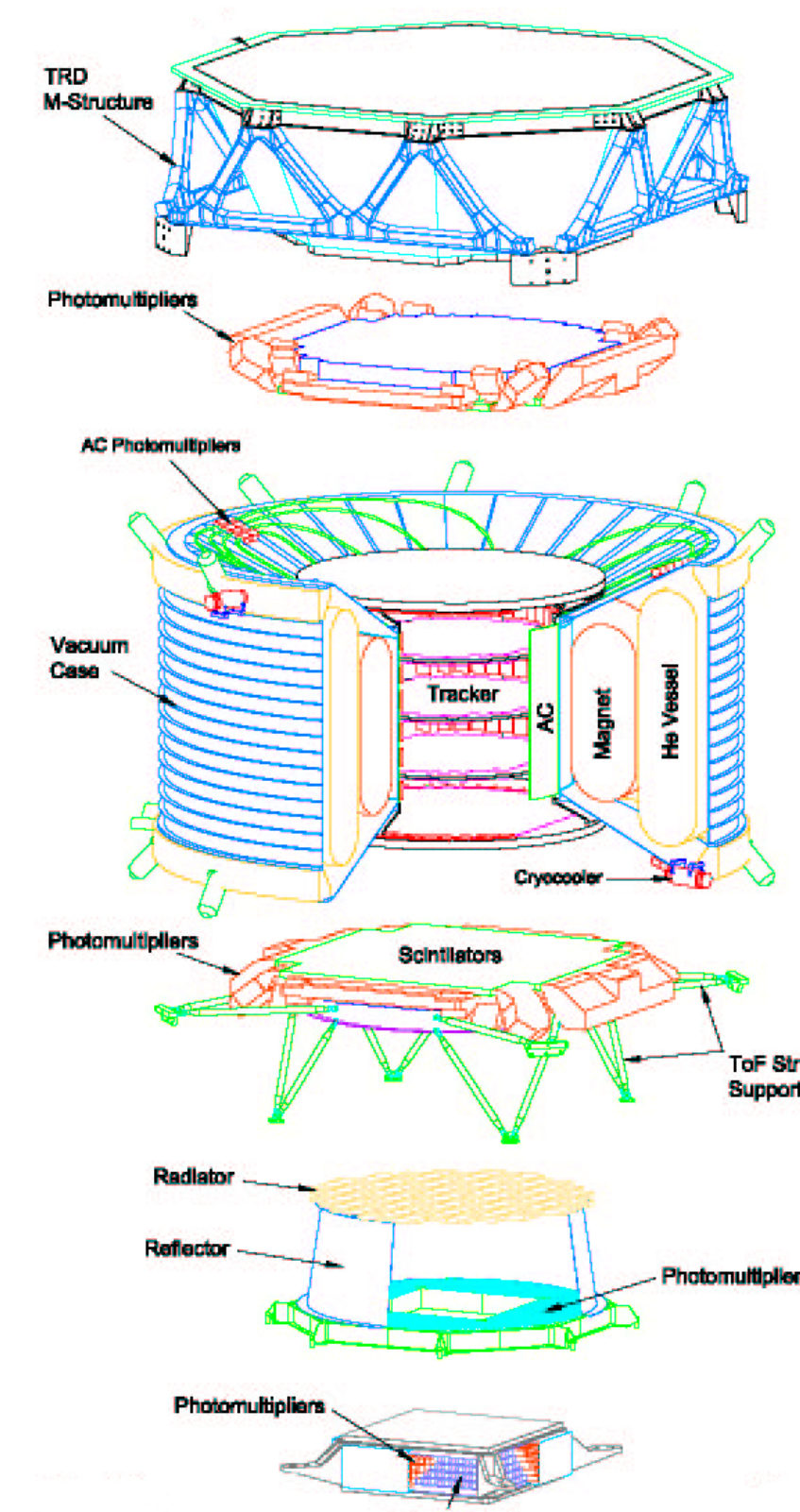


AMS02 on ISS



- * Mean altitude 400 km
- * in orbit for 3 years
- * acceptance 0.5 m²sr

AMS02 Exploded View



TRD Particle ID & 3D tracking
20 layers fleece + Xe/CO₂
5248 channels 6mm straw-tubes
 $p^+ \text{Rej} > 100$ from 10-300 GeV

TOF 1,2 Trigger $\sigma_t \approx 125$ ps
Anticoincidence (Veto) counter

Silicon strip tracker (2·10⁵ Ch)
with internal laser alignment
6 m² in 3 double + 2 single xy layers
1σ charge separation up to 1TV

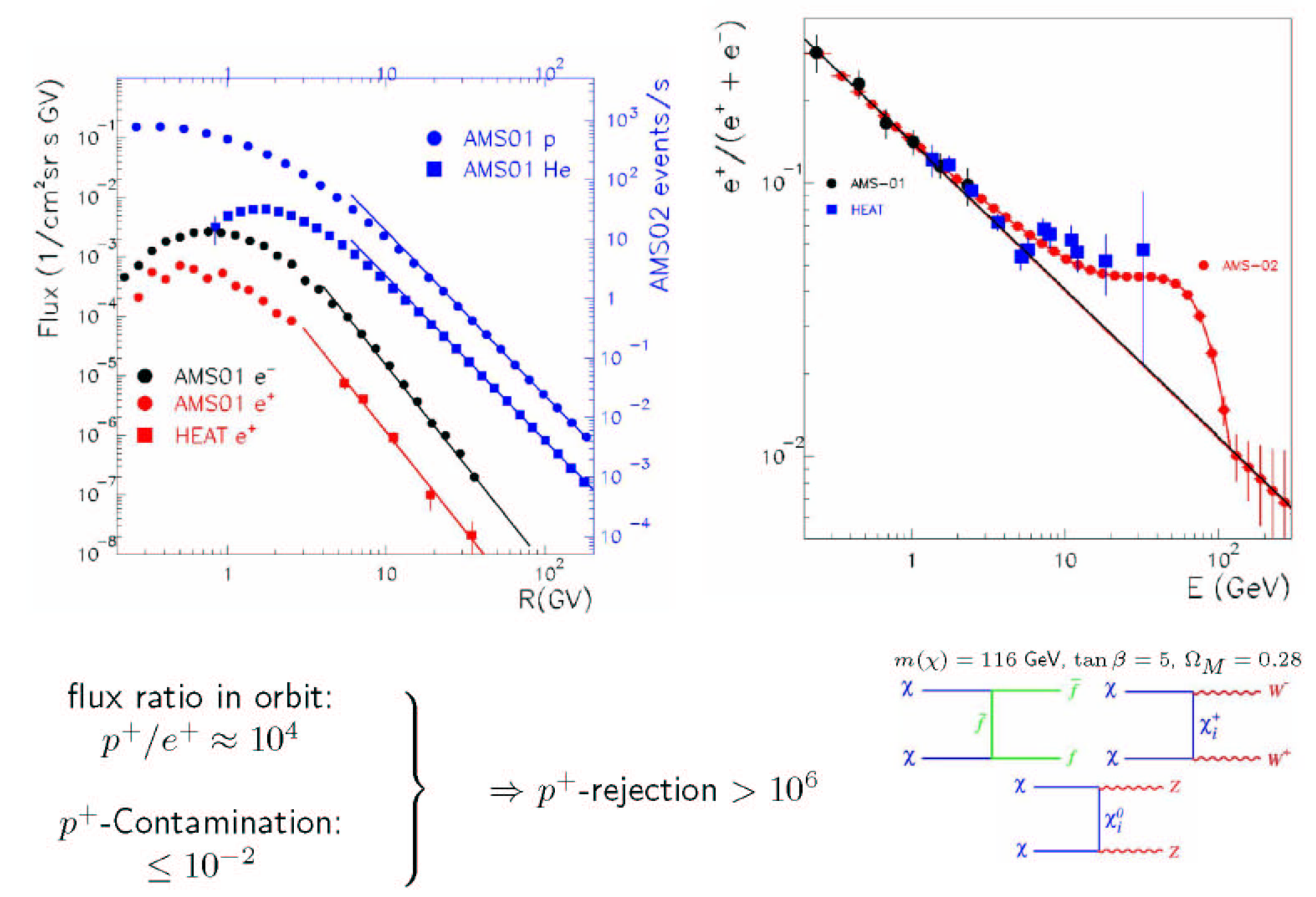
Superconducting Magnet (ETH)
B = 0.9T V = 0.6m³

TOF 3,4 1.3m distance to TOF 1,2
 $p^+ / e^+ > 3\sigma$ below 2 GeV

PFIRICH AGL(+NaF) Radiator
for A<27 and Z<28
separation > 3σ from 1-12 GeV

ECAL 3D sampling lead/scint.-fibre
 $p^+ \text{Rej} > 10^4$ from 10-300 GeV
with p-E matching and shower-shape

Cosmic Particle Spectroscopy → Dark Matter Search

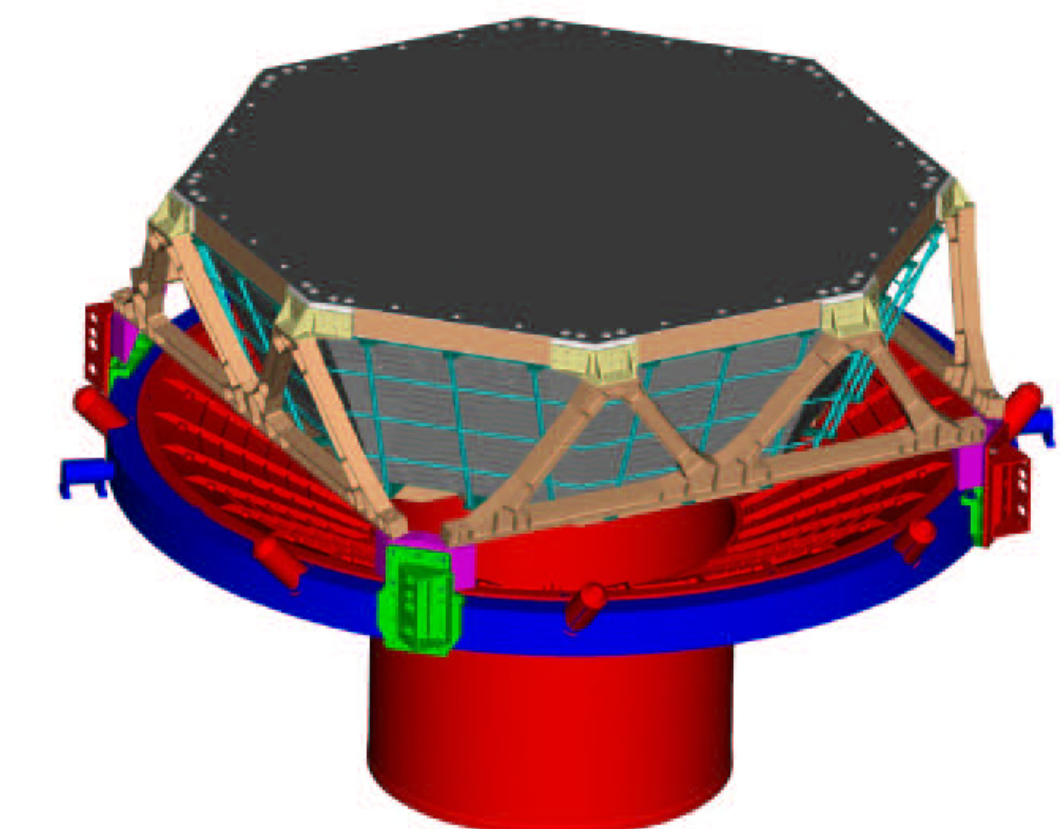


AMS02 TRD Principle

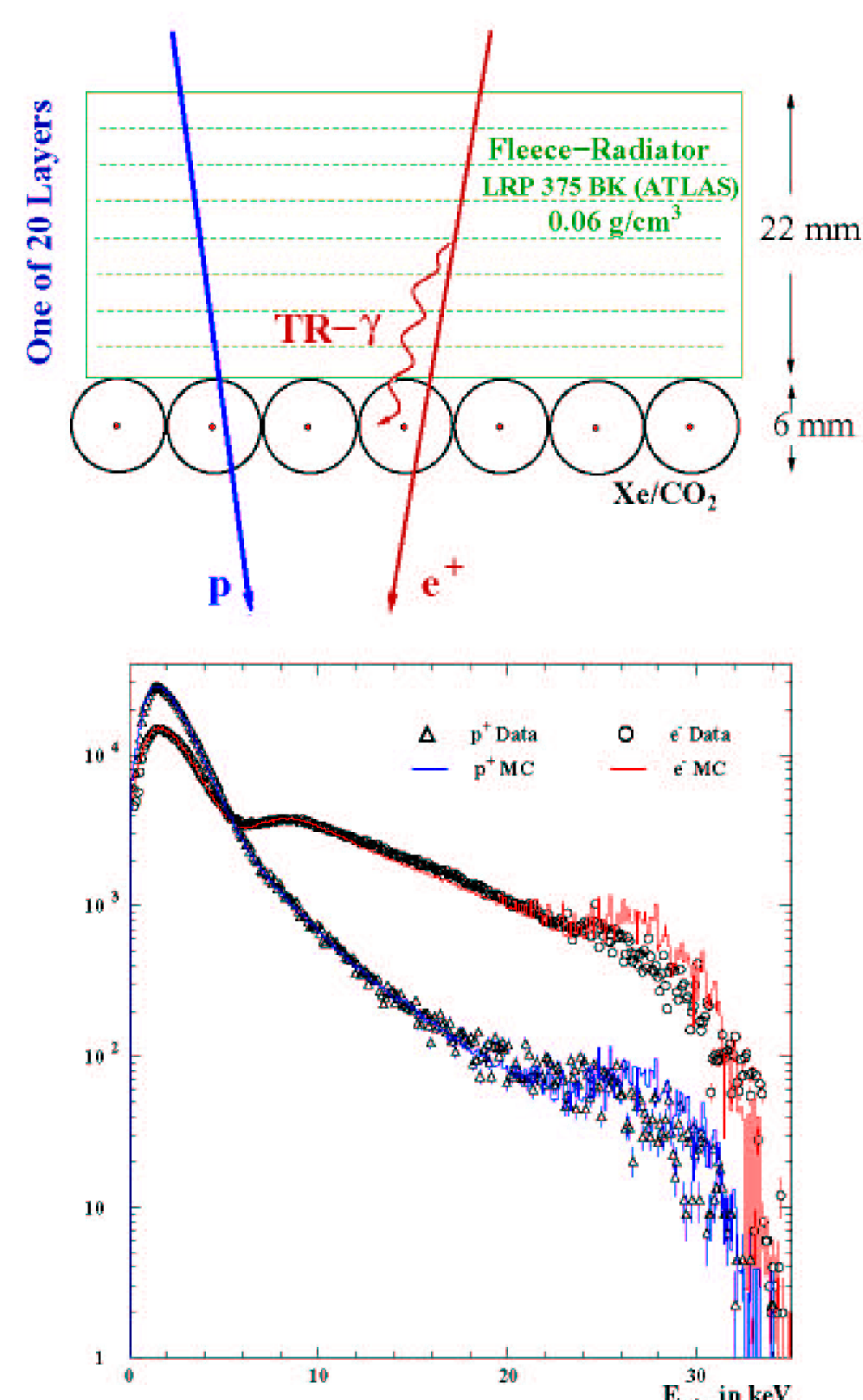
p^+ -rejection $> 10^2$ (10 - 300 GeV)

Chosen Configuration for 60 cm height:

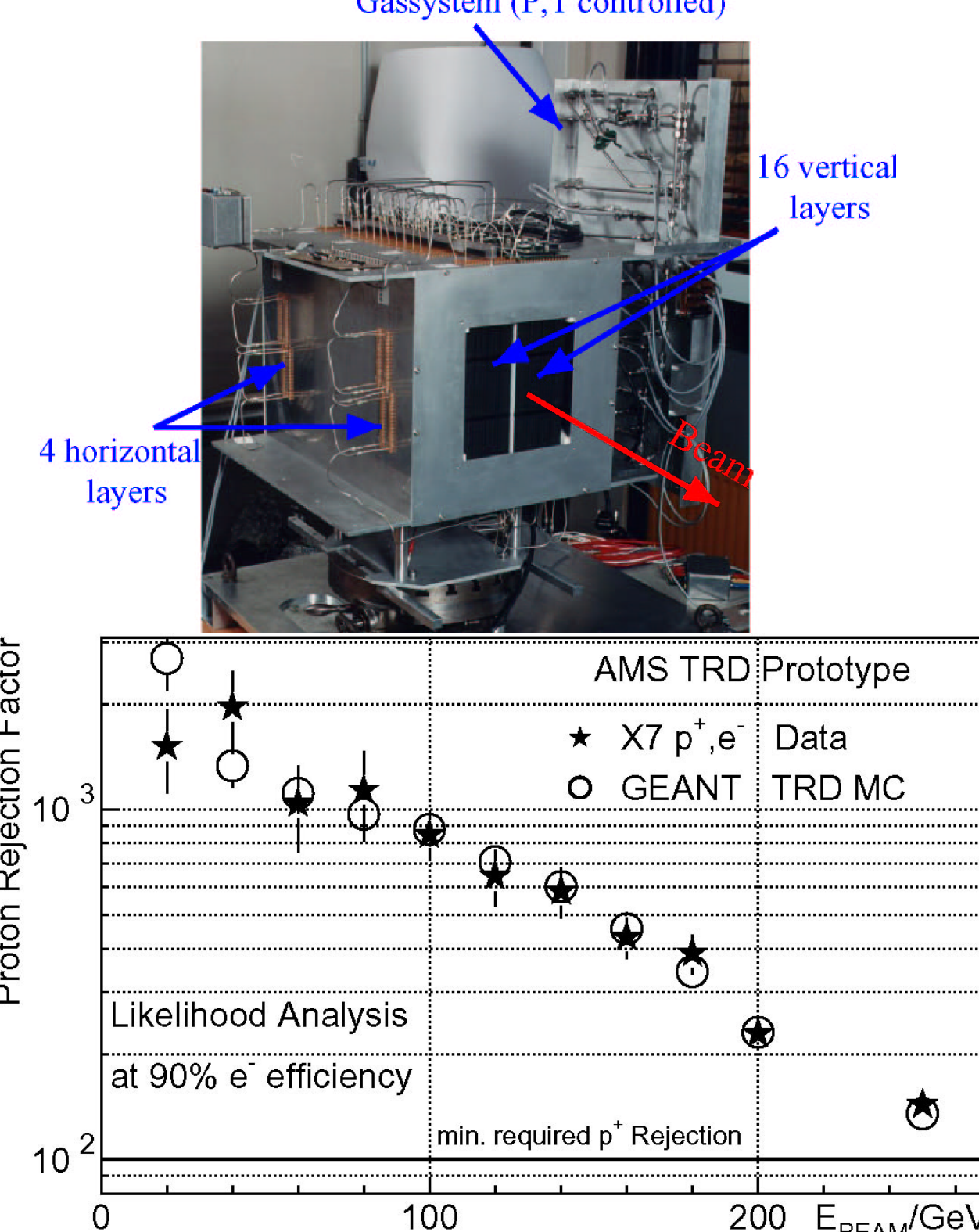
- 20 Layers each existing of
- 22 mm fleece
- Ø 6 mm straw tubes (Xe/CO₂ (80/20))



Radiator + Straws + Xe/CO ₂	168 kg
Octagon + Support + Shielding	207 kg
Gas System	50 kg
Electronics	53 kg
TRD Total	478 kg

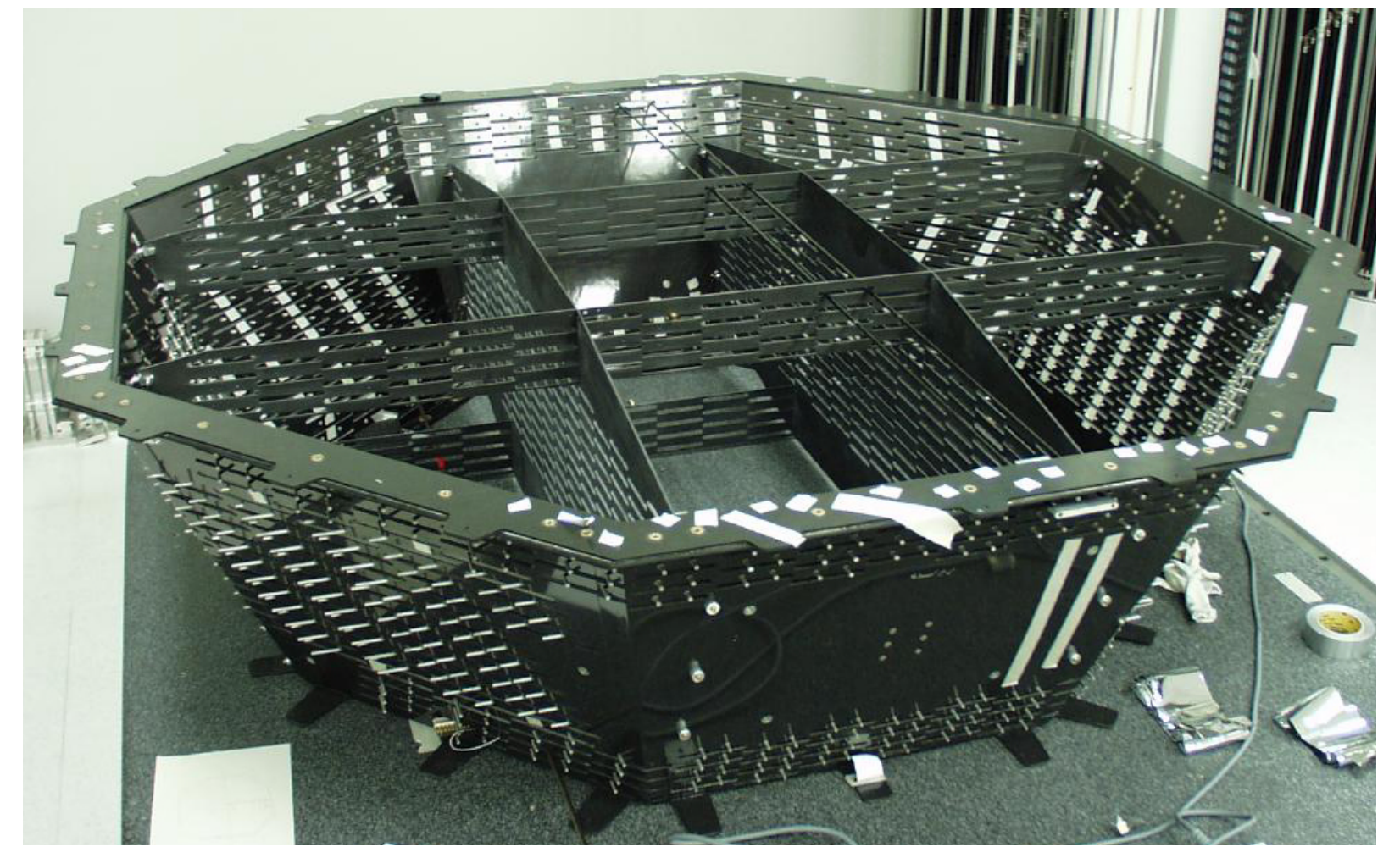


20 Layer Prototype, Beam Test @CERN



TRD Support Structure

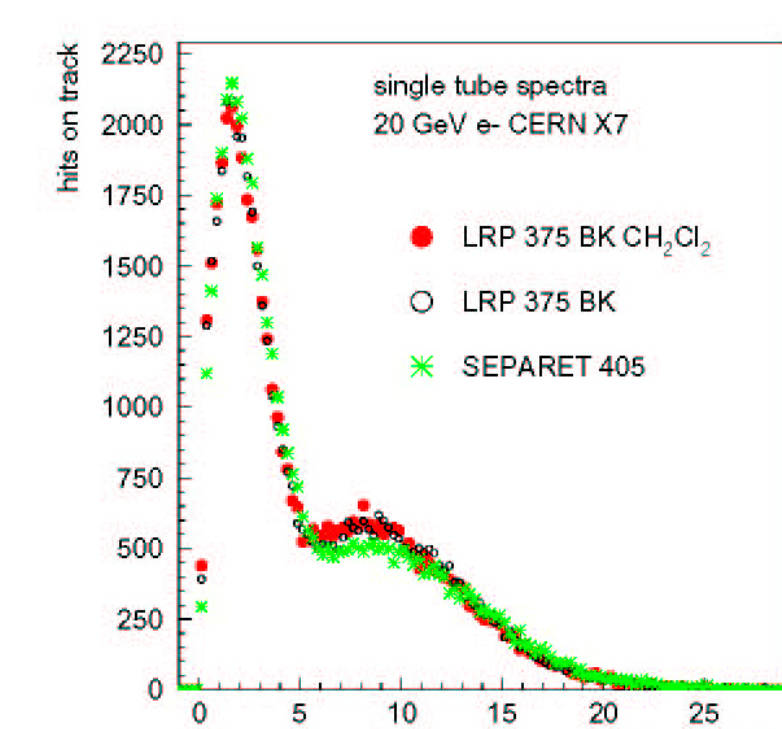
Octagon and Bulkheads support 328 Modules (5248 Straws, L= 86 to 201 cm) with 100 μm mechanical accuracy



Upper/Lower 4 layers measure in bending plane
Middle 12 layers measure in perpendicular plane

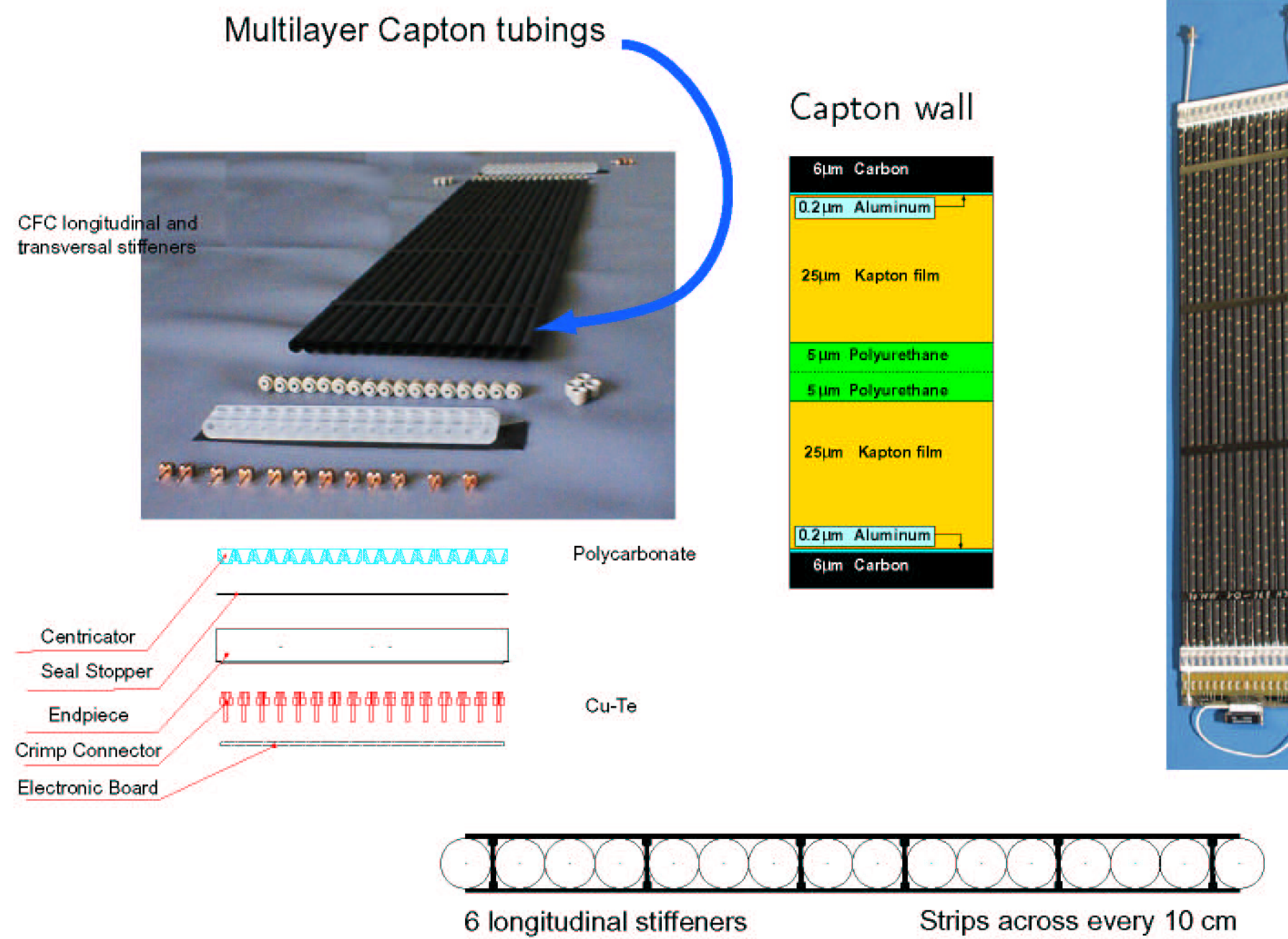
TRD Radiator

Vliesmaterial LRP 375 BK
Firma Freudenberg
• 10 μm Polypropylene/ethylen
• $\rho = 0.06 \frac{g}{cm^3}$
→ 4000 Matten (2 km Vlies)

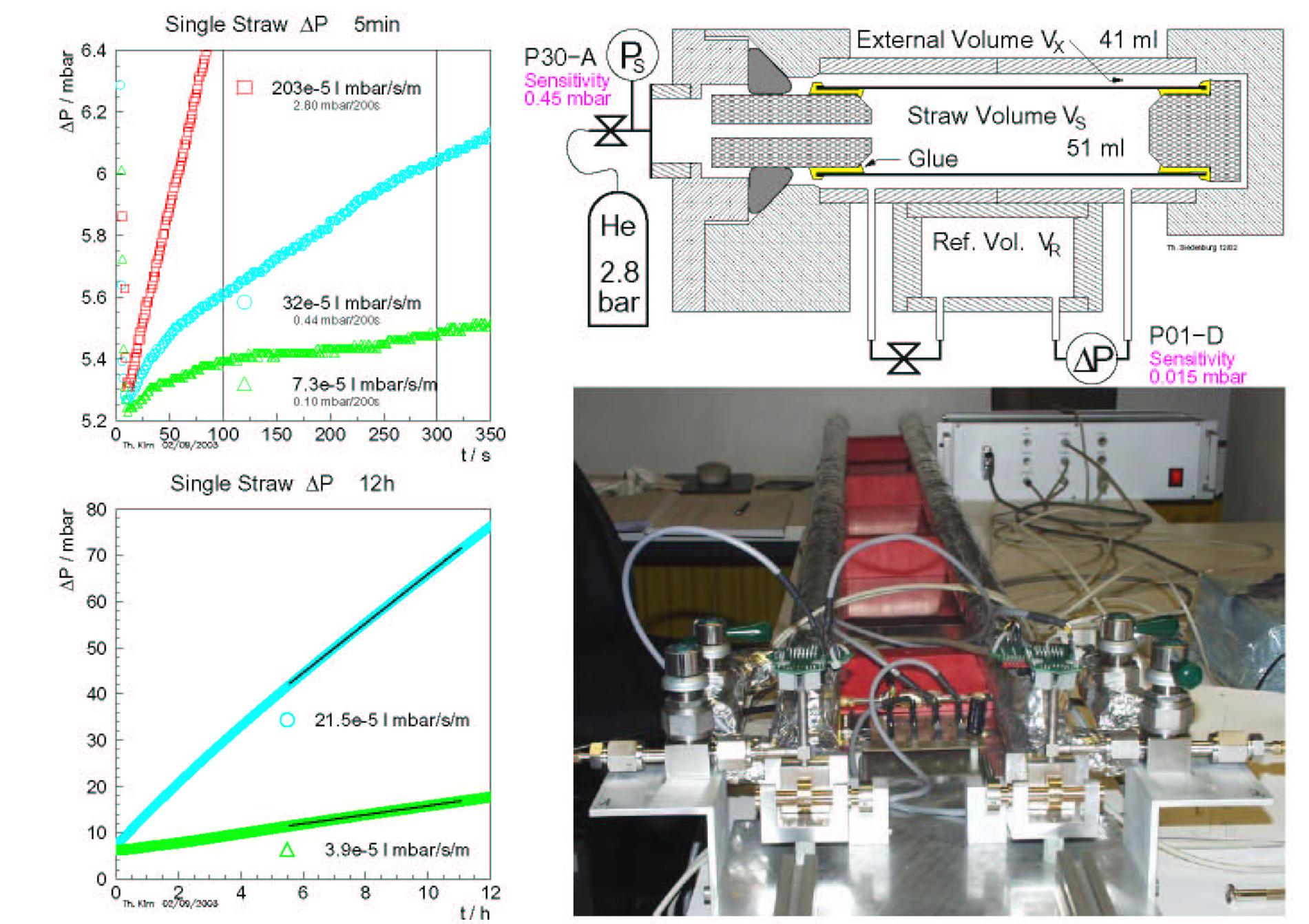


Soxhlett Extraction → $\frac{dM}{dt} < 10^{-12} \frac{g}{cm^2}$

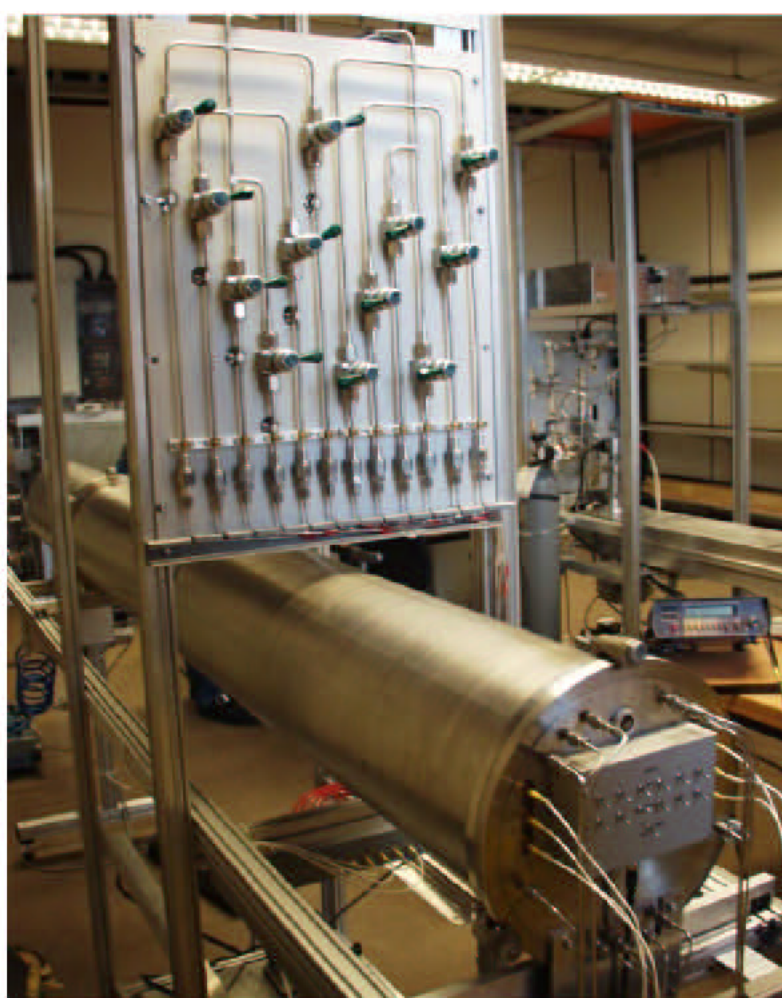
TRD Straw Modules



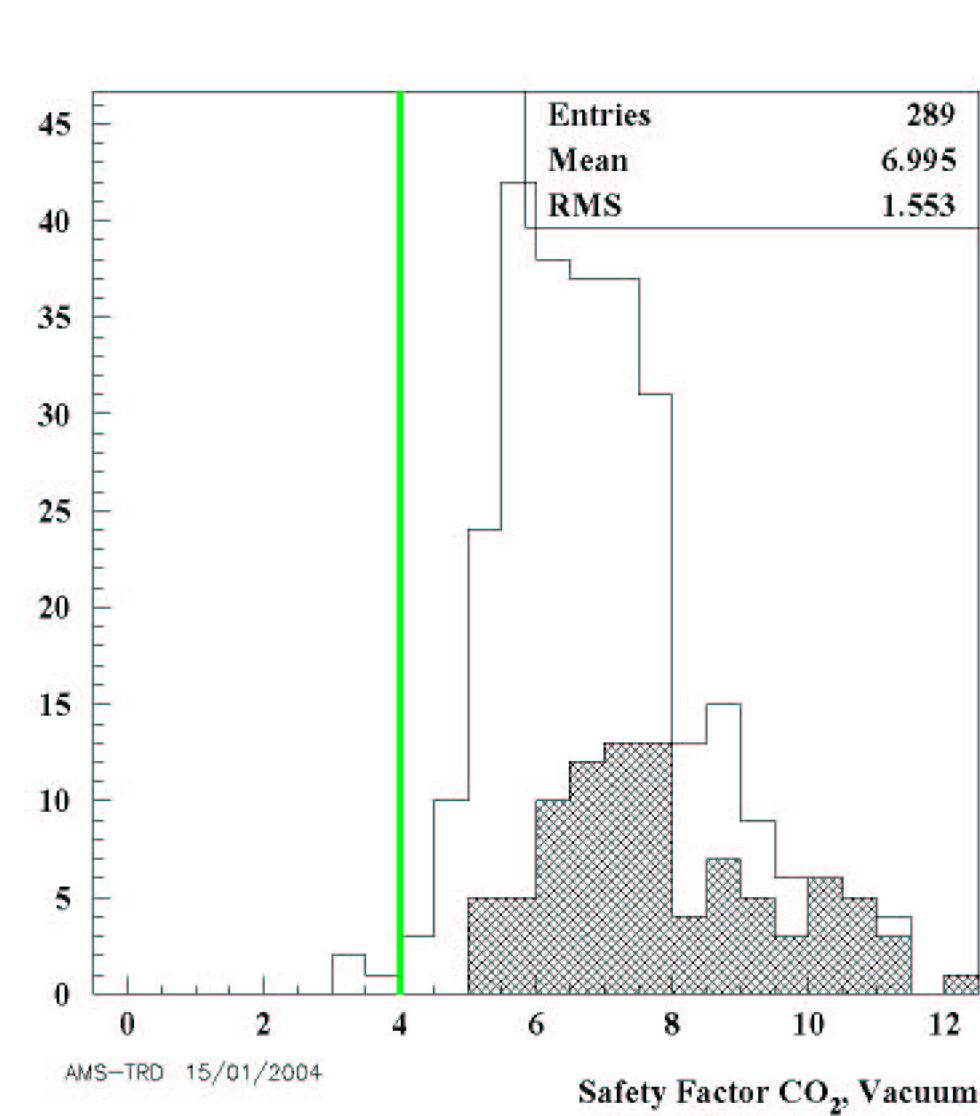
TRD Single Straw Test



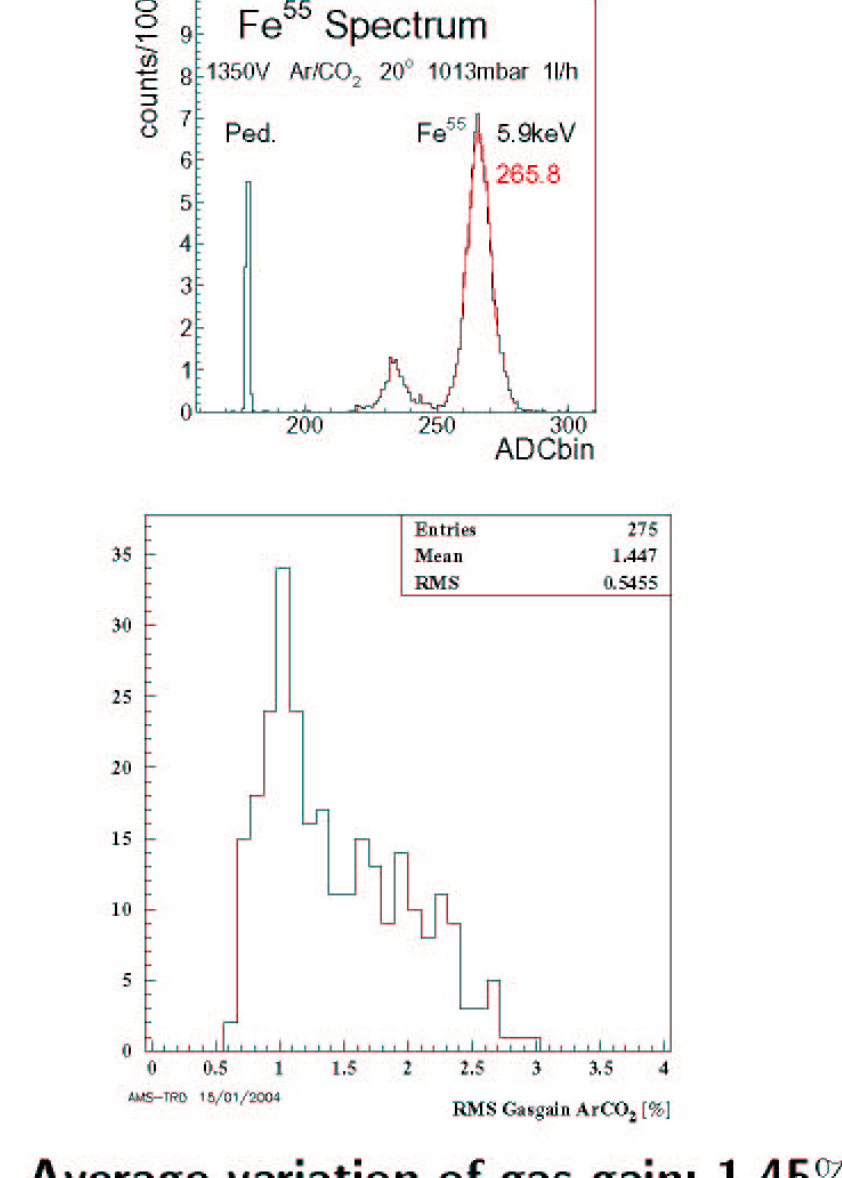
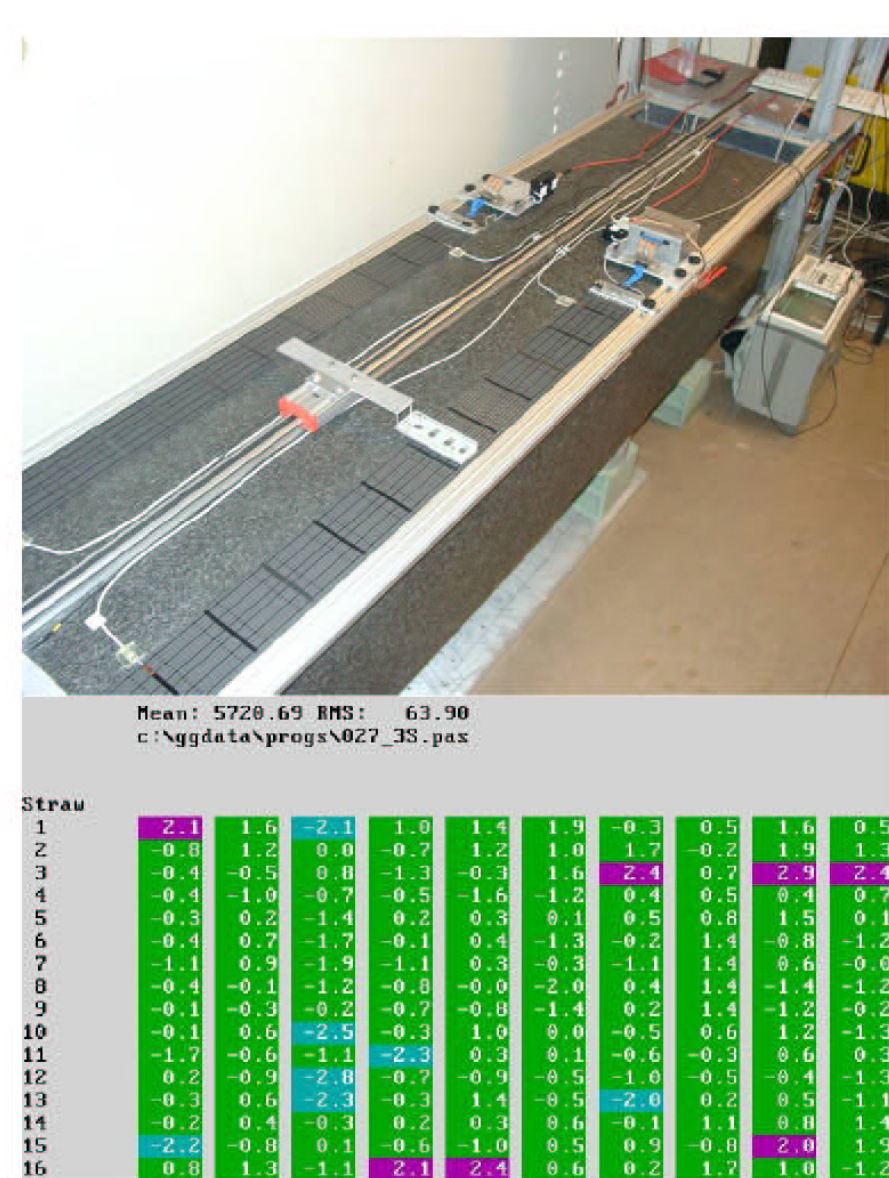
Straw Modules: Gastightness



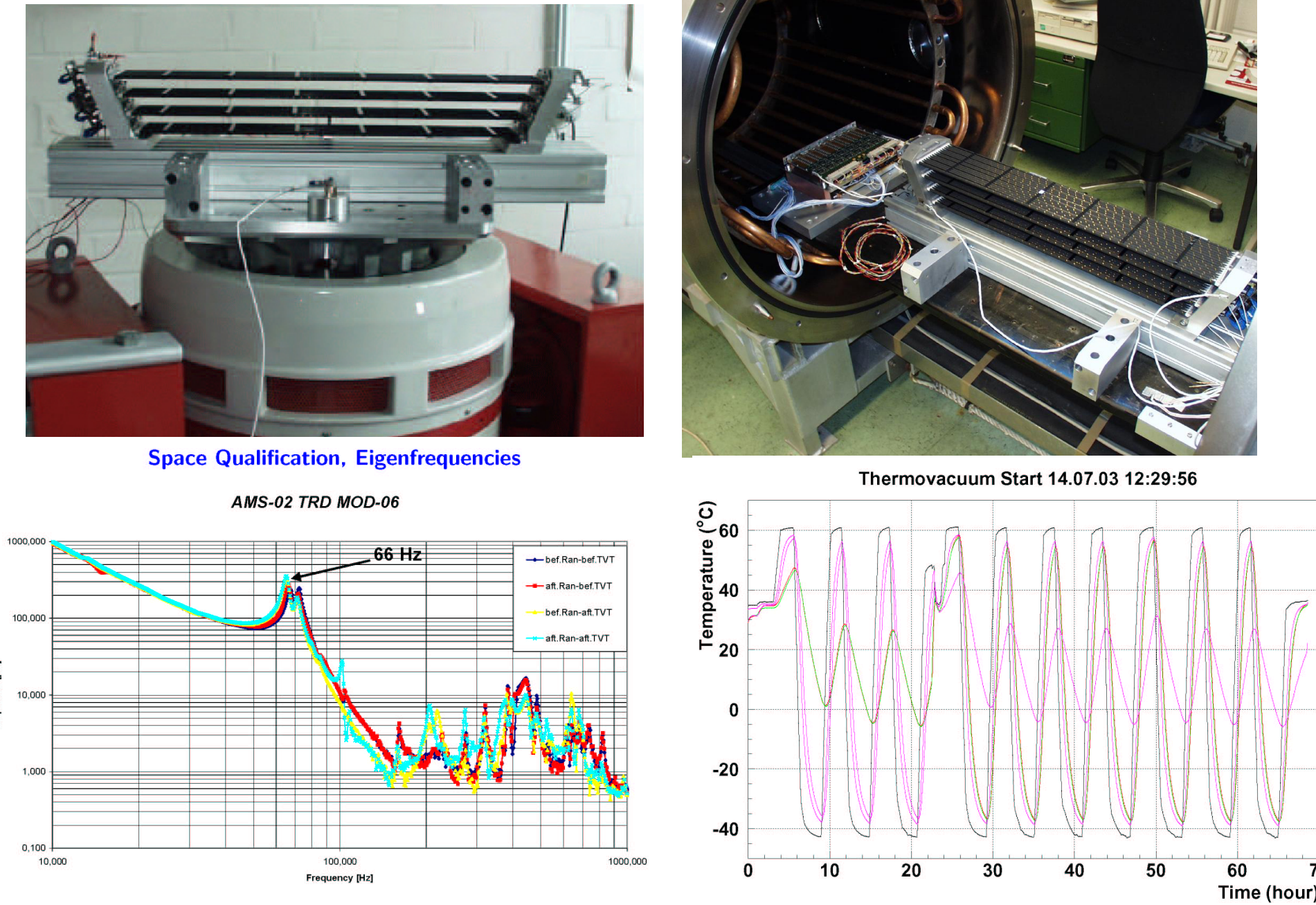
289 Straw Modules:
Safety Factor for TRD: ~ 7
7 × 3y ~ 21 years operation on ISS



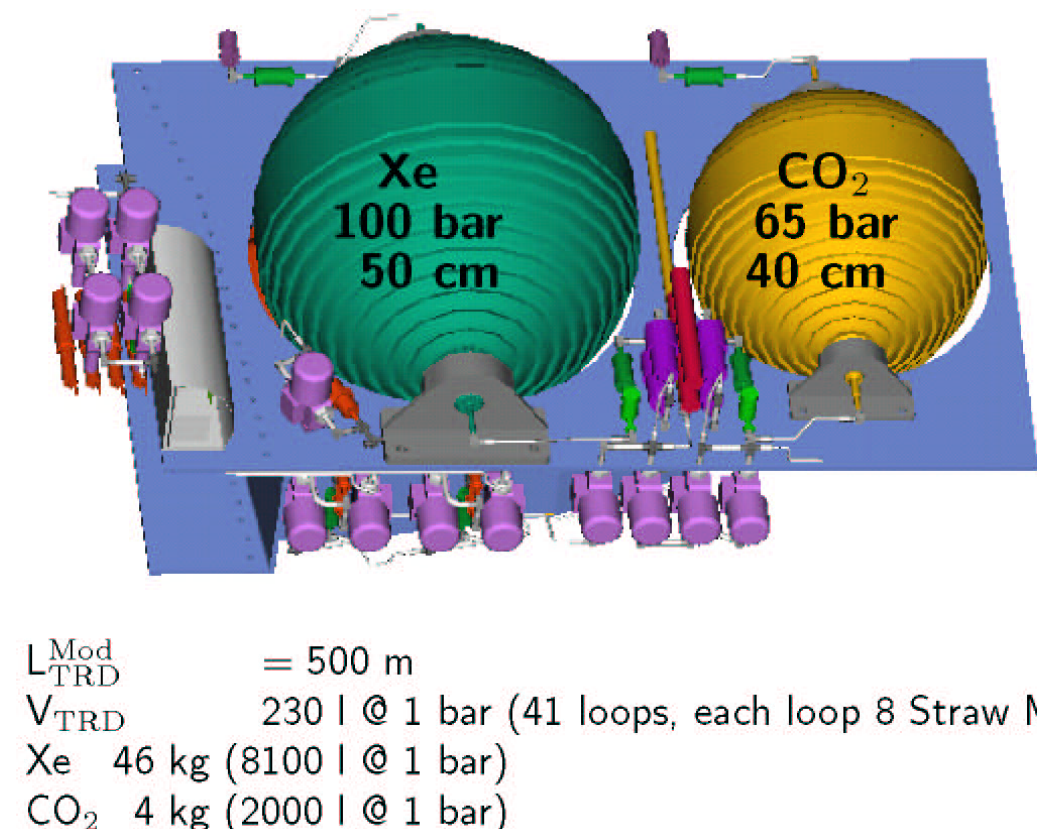
Straw Modules: Gas Gain



Space Qualification: Vibration+ Thermovacuum Test

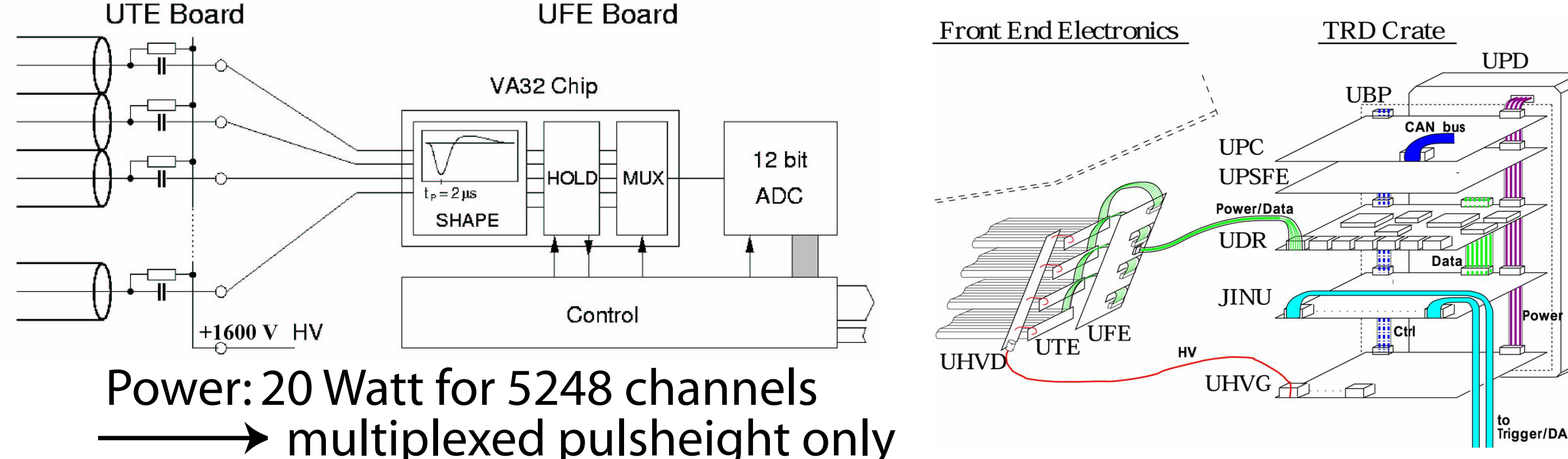


TRD Gassystem



L_{Mod} = 500 m
V_{TRD} = 230 l @ 1 bar (41 loops, each loop 8 Straw Modules in Series)
Xe 46 kg (8100 l @ 1 bar)
CO₂ 4 kg (2000 l @ 1 bar)

TRD Frontend Electronics TRD DAQ



Power: 20 Watt for 5248 channels
→ multiplexed pulsheight only

Noise before and after space qualification

