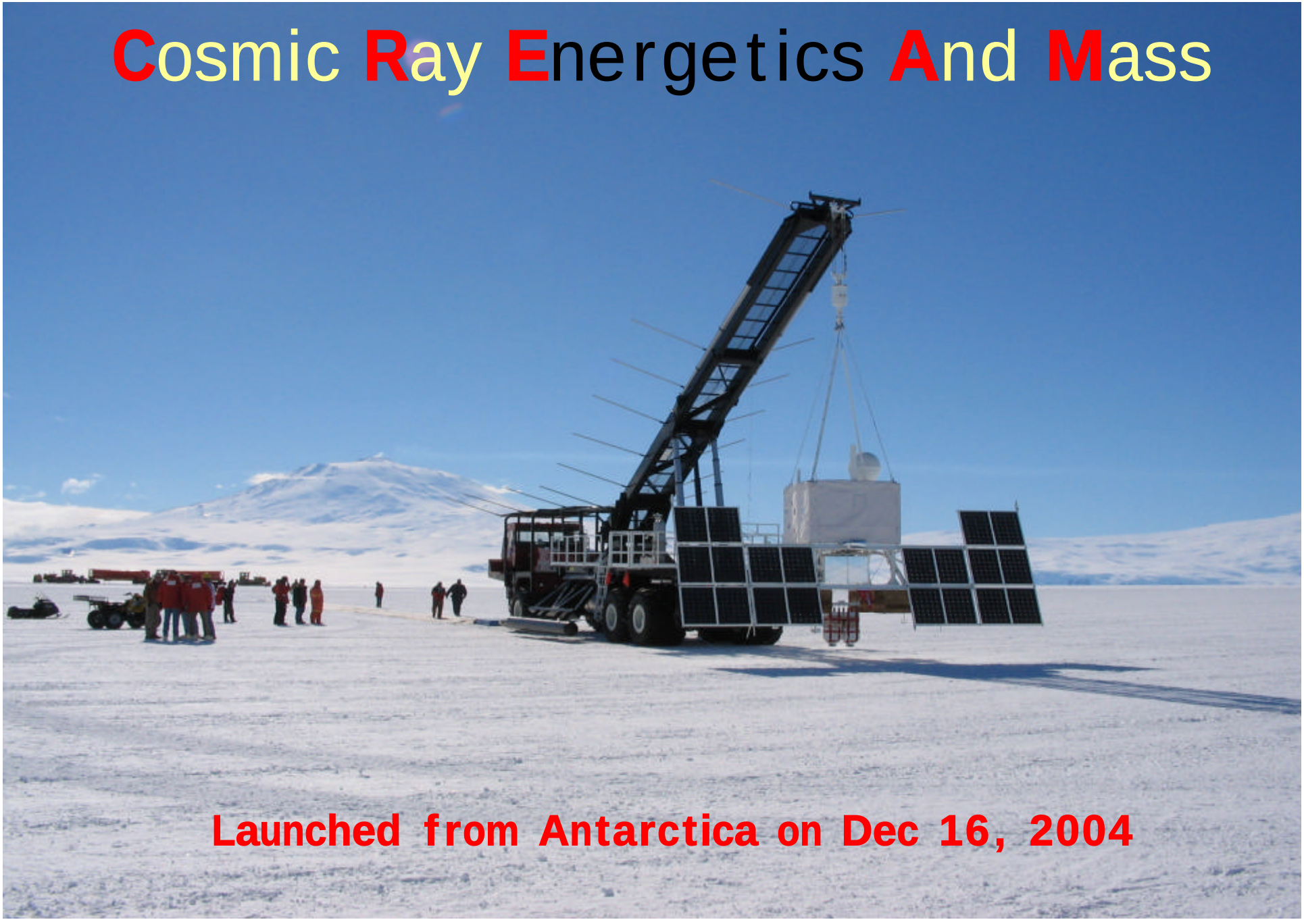
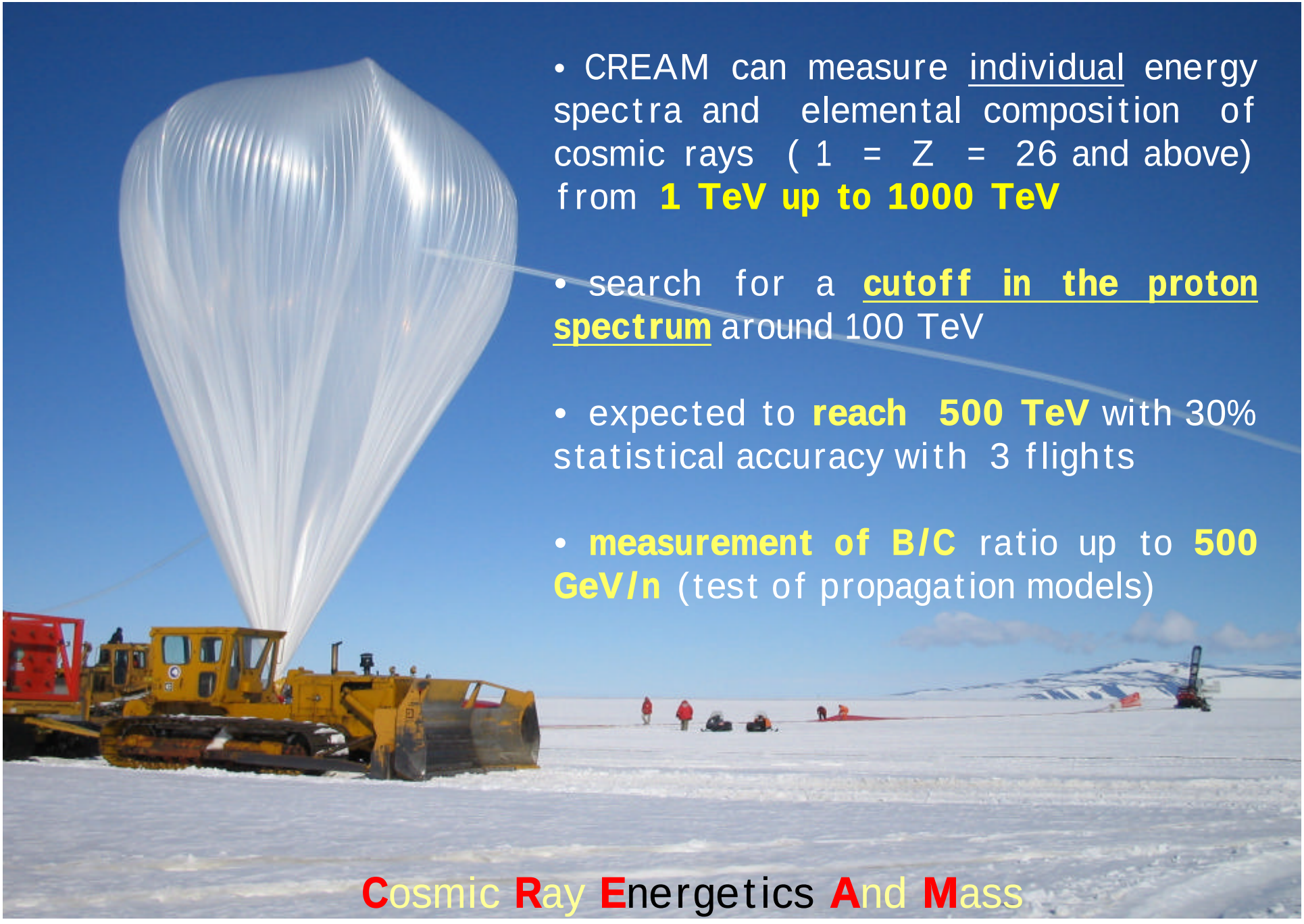
Cosmic Ray Energetics And Mass



Launched from Antarctica on Dec 16, 2004



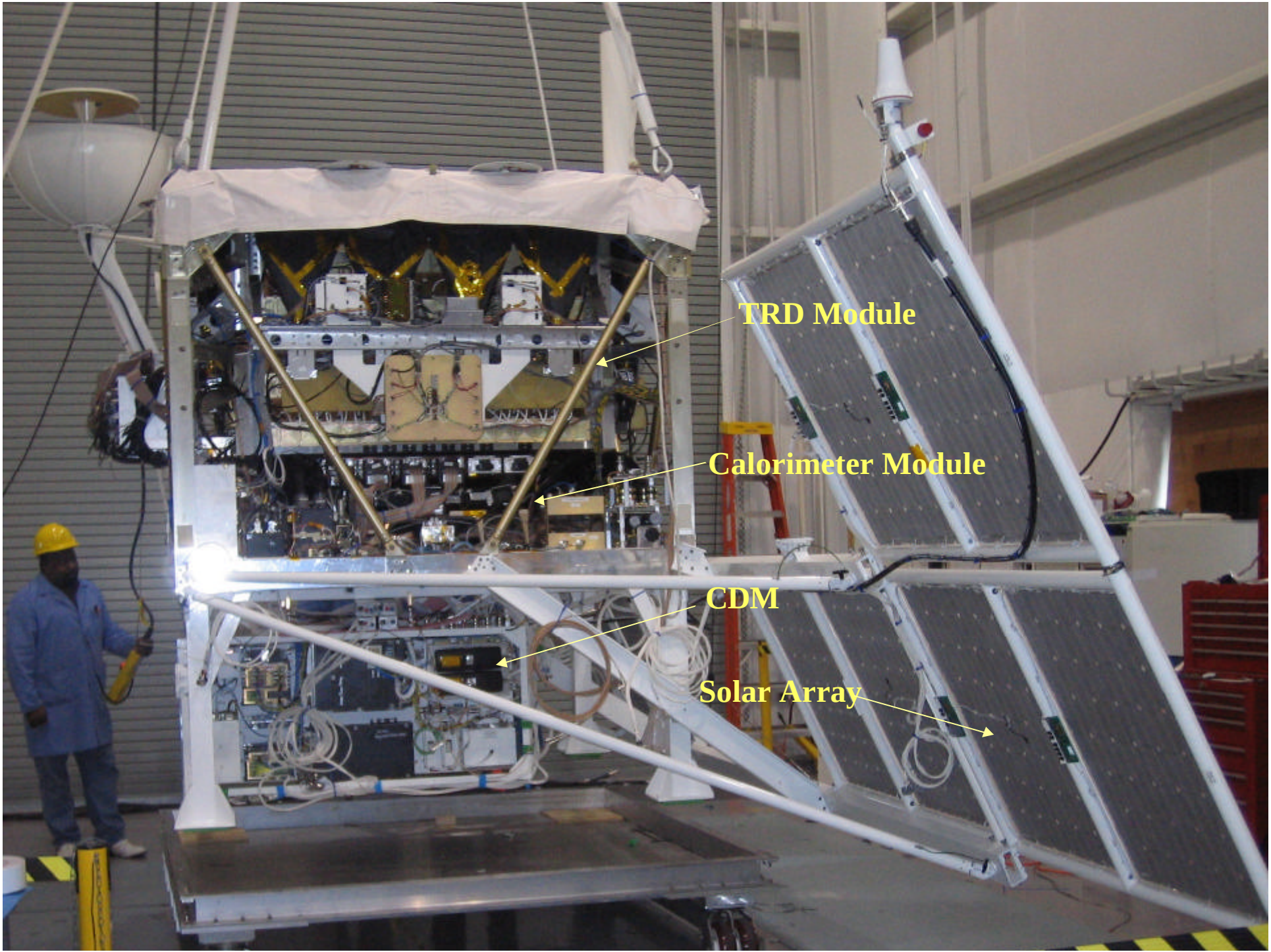
- CREAM can measure individual energy spectra and elemental composition of cosmic rays (1 = Z = 26 and above) from **1 TeV up to 1000 TeV**

- search for a **cutoff in the proton spectrum** around 100 TeV

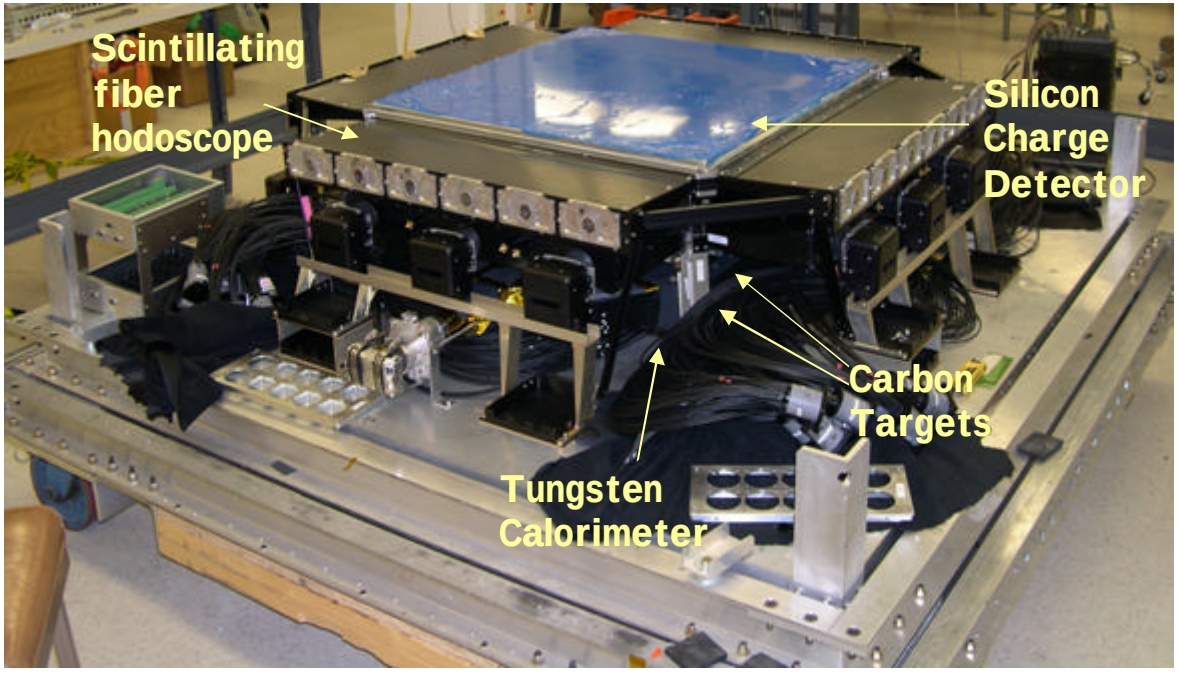
- expected to **reach 500 TeV** with 30% statistical accuracy with 3 flights

- **measurement of B/C** ratio up to **500 GeV/n** (test of propagation models)

Cosmic **R**ay **E**nergetics **A**nd **M**ass

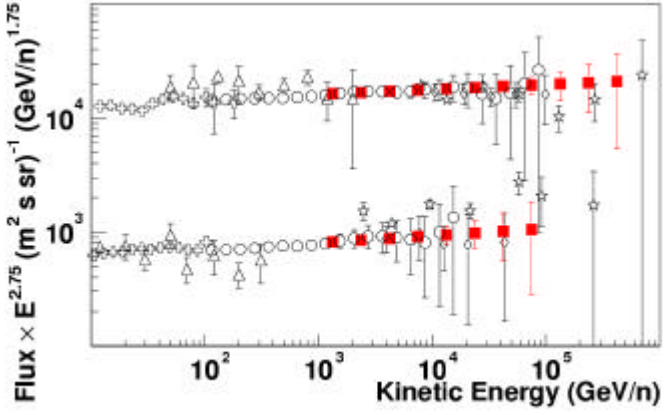

TRD Module
Calorimeter Module
CDM
Solar Array

Exploring Supernova Acceleration Limit



Calorimeter Module

- The **Silicon Charge Detector (SCD)** provides particle charge identification
- The 20-layer **tungsten-scintillating fiber calorimeter** provides its own event trigger and x,y,z tracking coordinates
- The **scintillating fiber hodoscope** provides x,y tracking coordinates at fixed z above the calorimeter

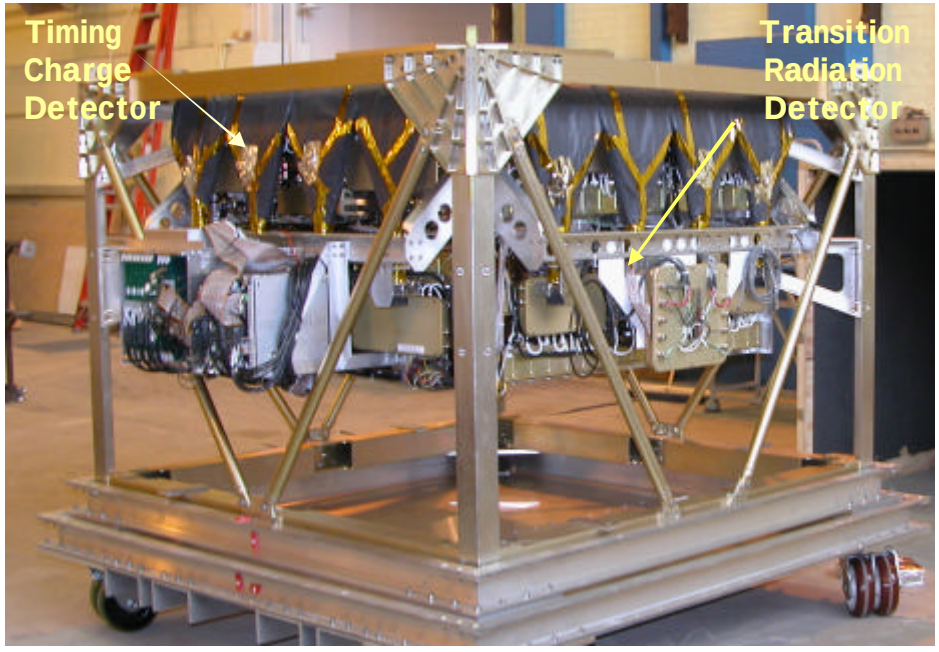


Comparison of Calorimeter data (red squares) for protons (upper) and Helium (lower) with prior data

Calorimeter Science Objectives

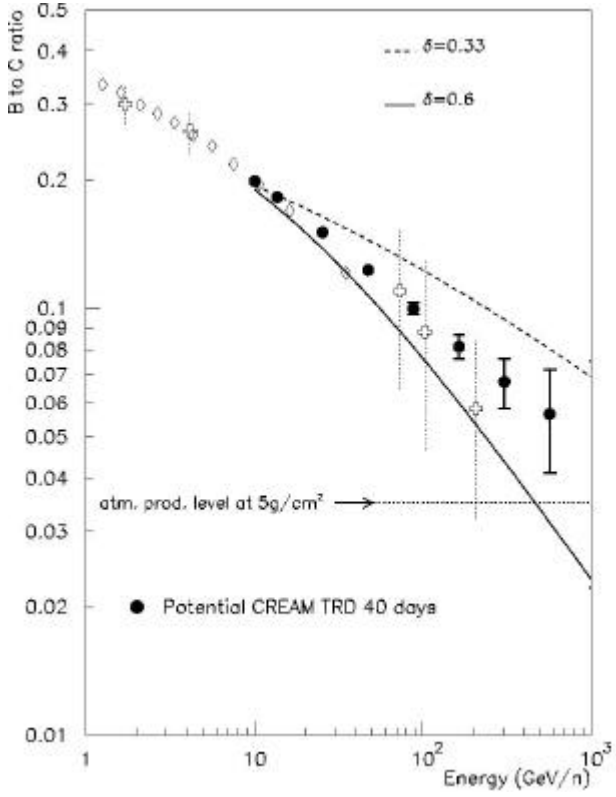
- The Figure (left) shows **p** and **He** spectra measurements with the Calorimeter as **expected from a 40-day flight**
- Simultaneous measurements of Z > 3 particles provides inflight cross calibration of Calorimeter and TRD

What is the history of cosmic rays in the Galaxy ?



TRD Module

- The **Timing Charge Detector (TCD)** provides event trigger and particle charge identification. The TCD has 2 layers of 4 paddles each.
- The **Transition Radiation Detector (TRD)** has 2 modules separated by a Cherenkov threshold counter



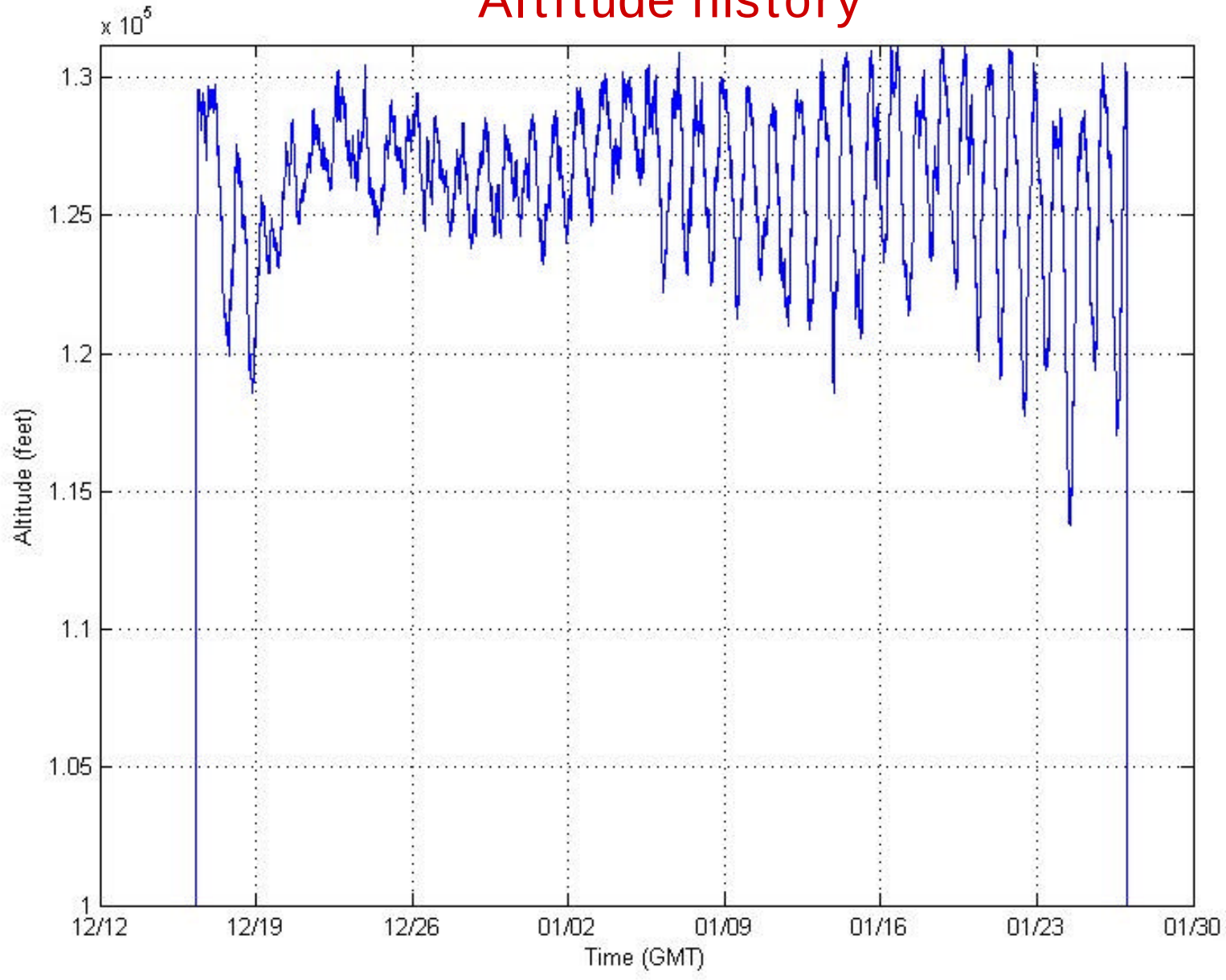
TRD Science Objectives

- The above figure compares TRD data expected from a 40-day flight (black circles) with prior data
- The TRD is expected to provide the first **B/C ratio** in this energy range in more than a decade

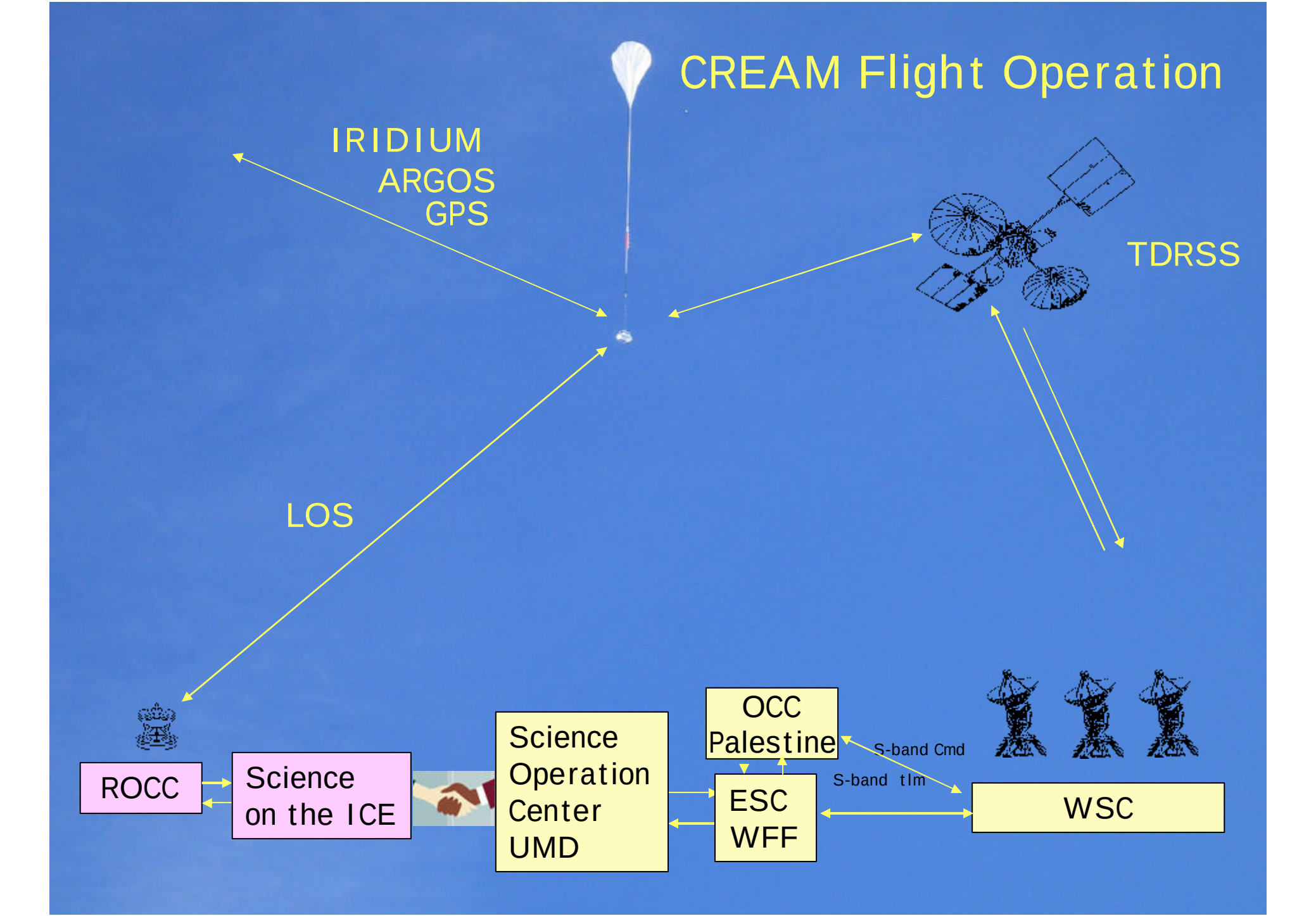
Launch operations

Dec 16, 2004

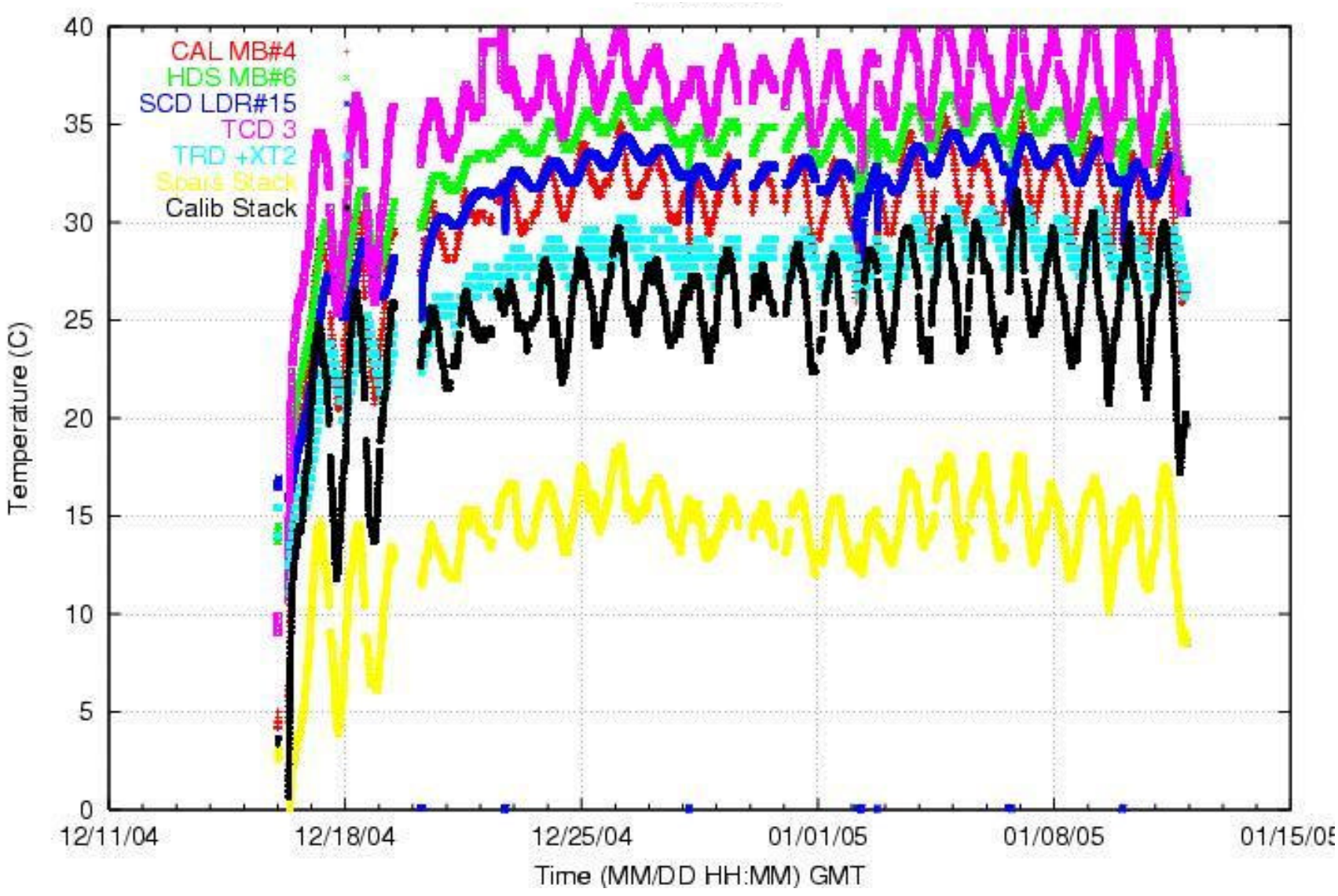
Altitude history

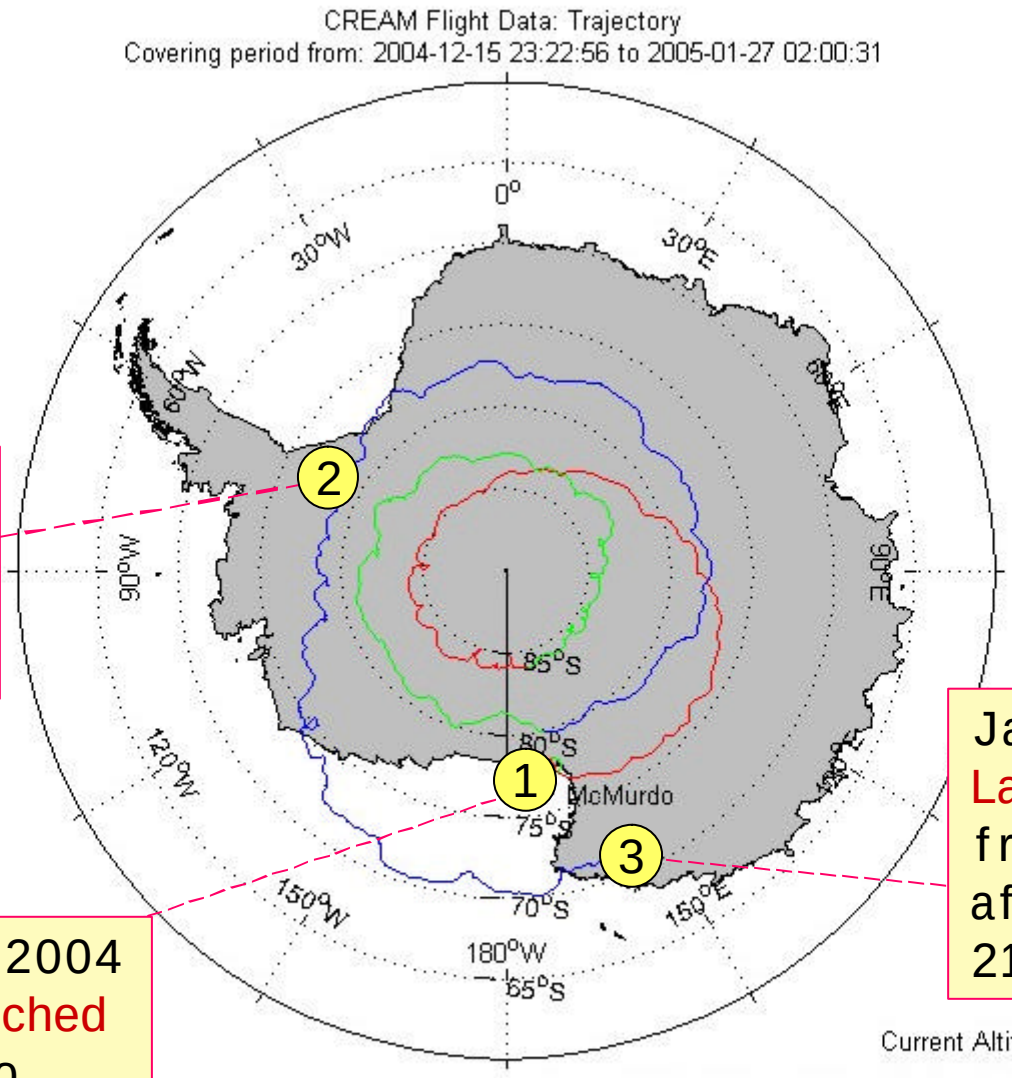


CREAM Flight Operation



Thermal history





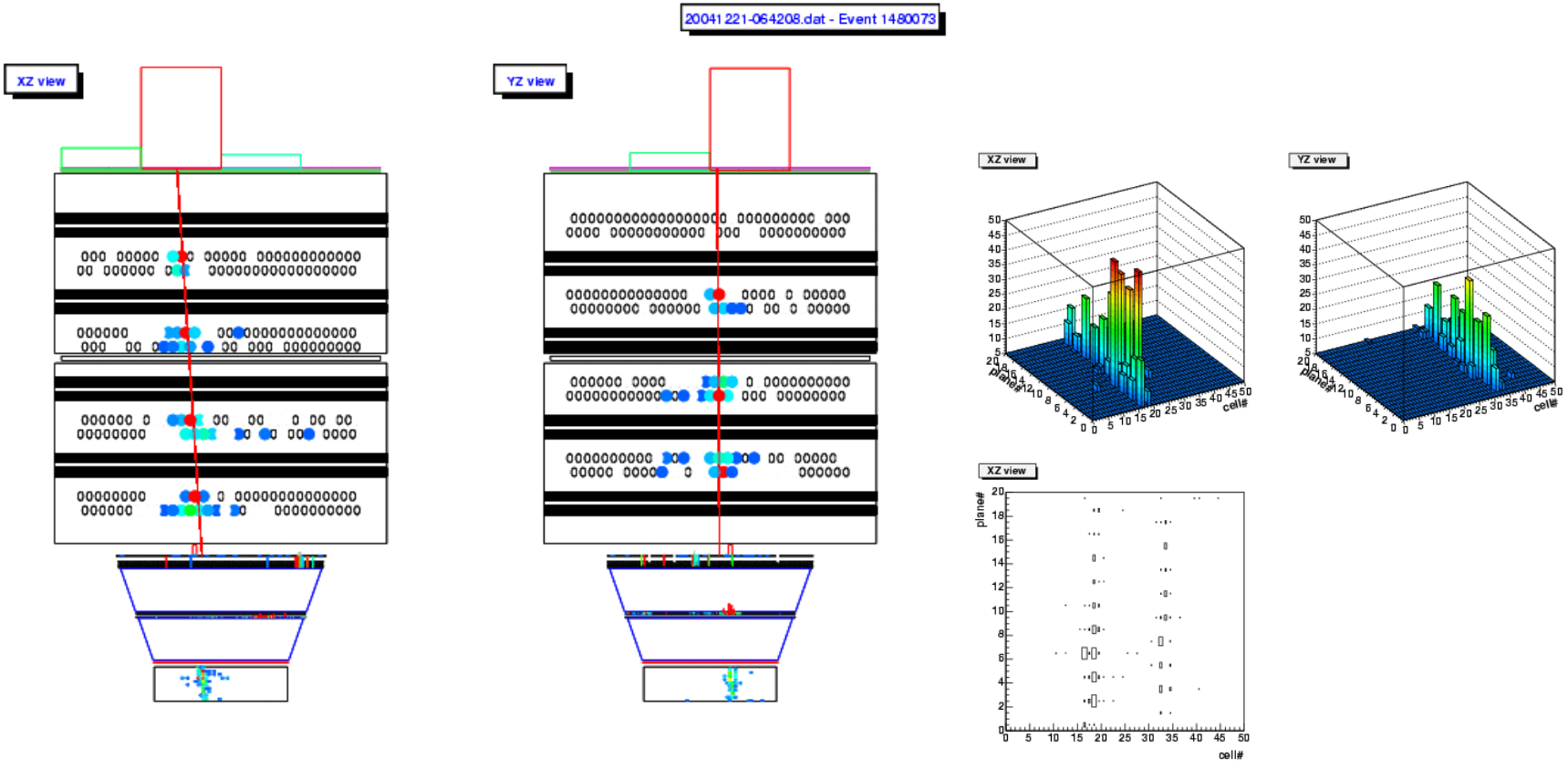
January 16, 2005
Break the record
of 31 days and 20 hrs

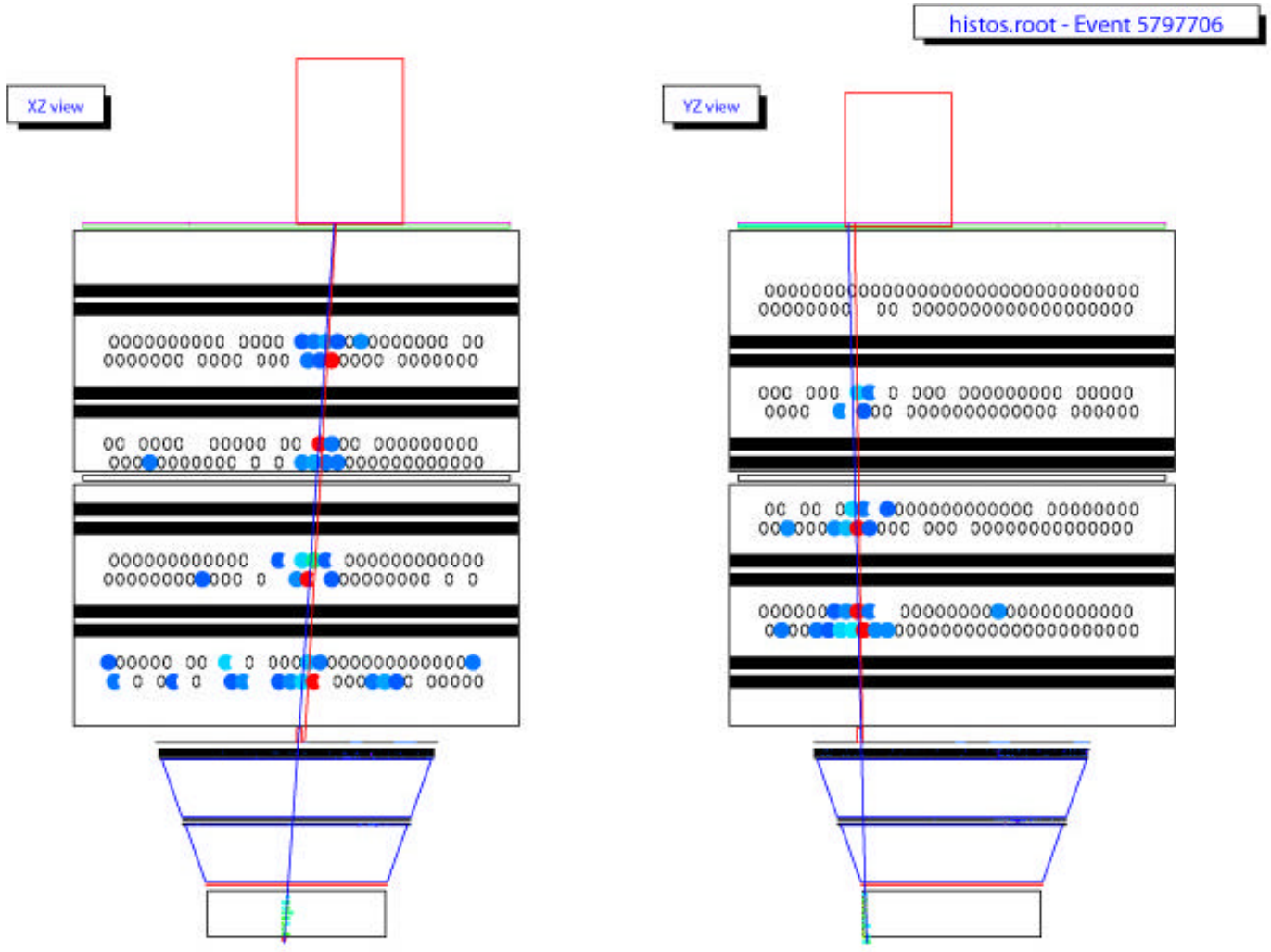
December 16, 2004
CREAM is launched
from McMurdo

January 27, 2005
Landing 417 miles
from McMurdo
after 41 days and
21 hrs

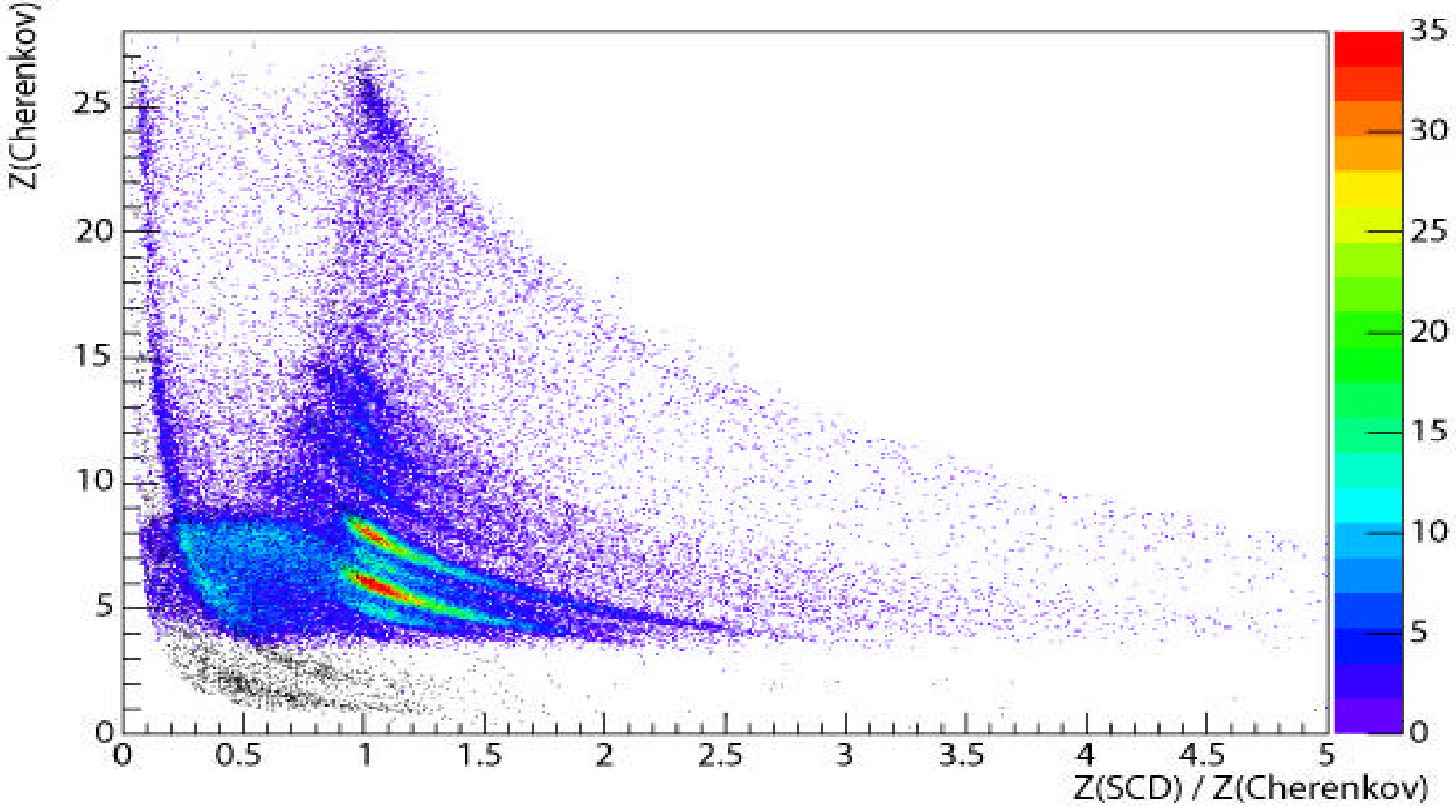
Instrument functions well

An example event: ~10 TeV Fe

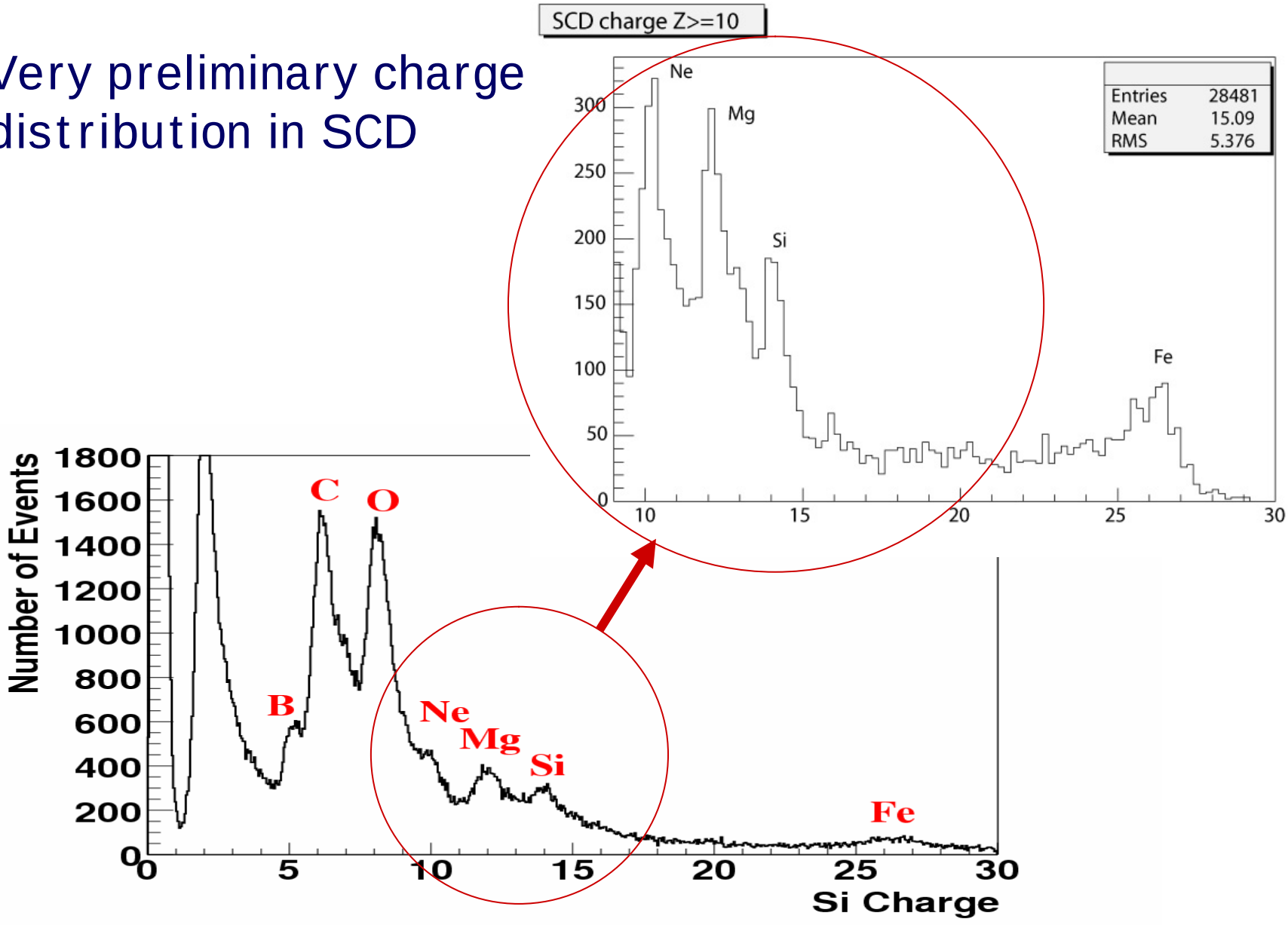



histos.root - Event 5797706
XZ view
YZ view

Preliminary charge correlation in the Cherenkov and SCD

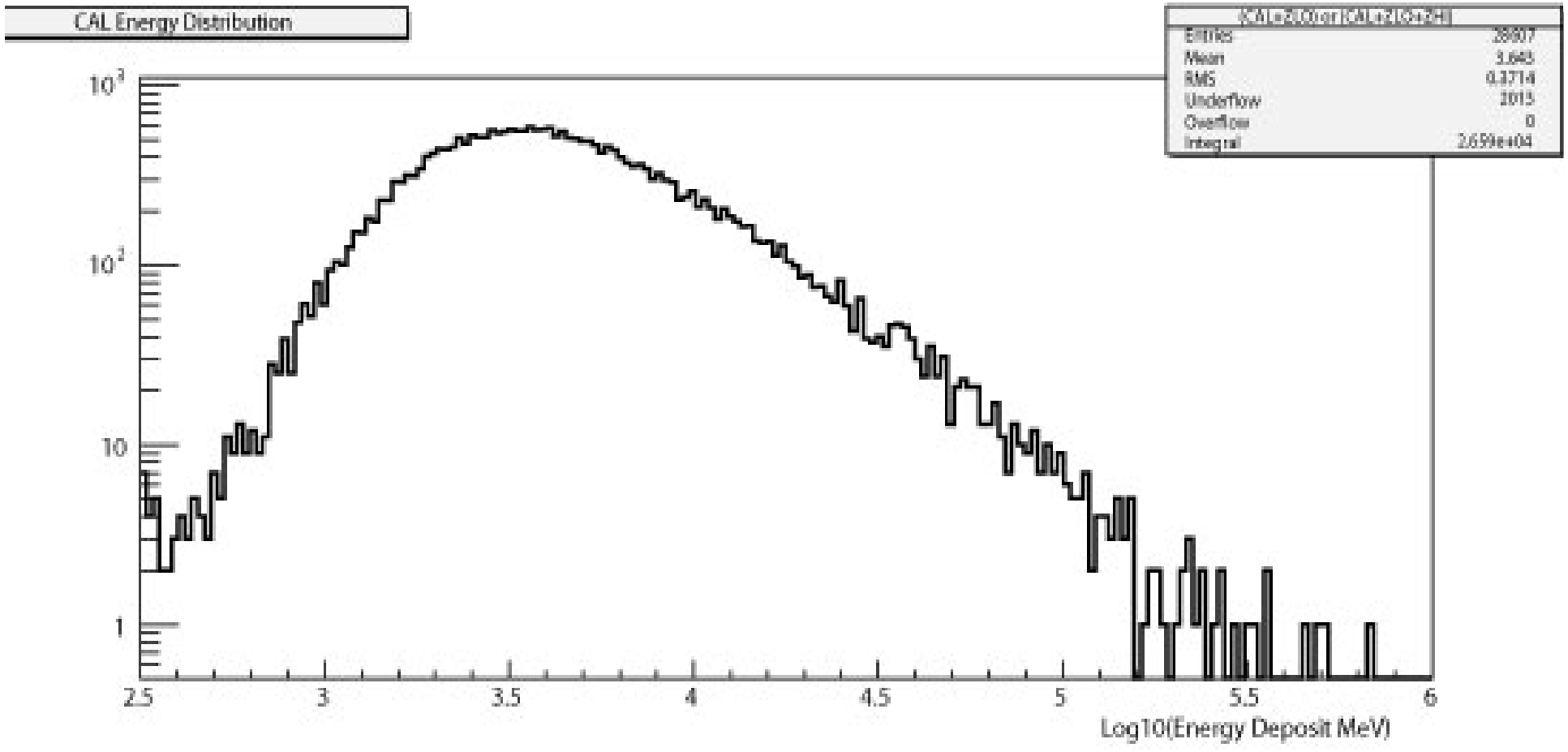


Very preliminary charge distribution in SCD



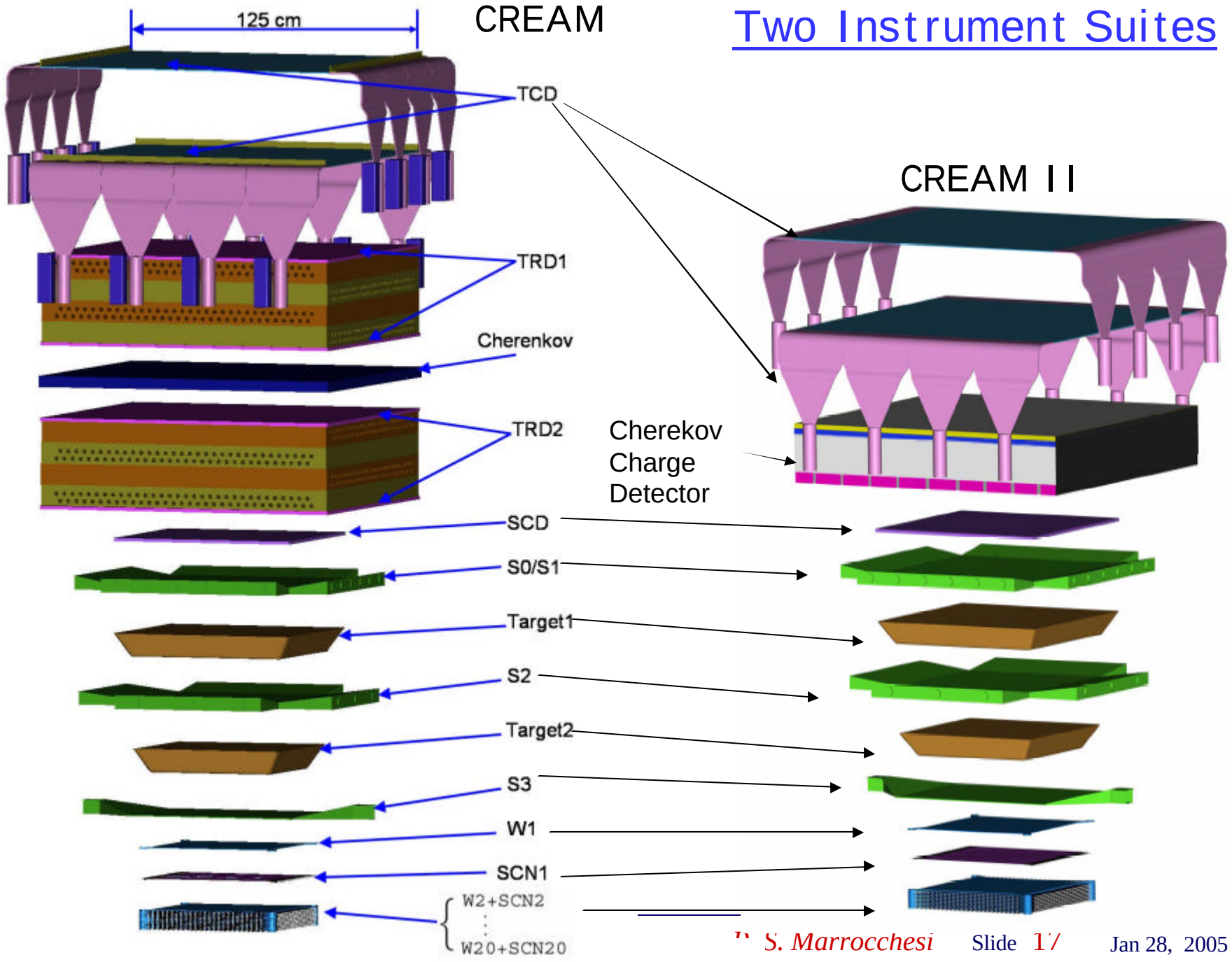
Very preliminary : energy deposit in the calorimeter

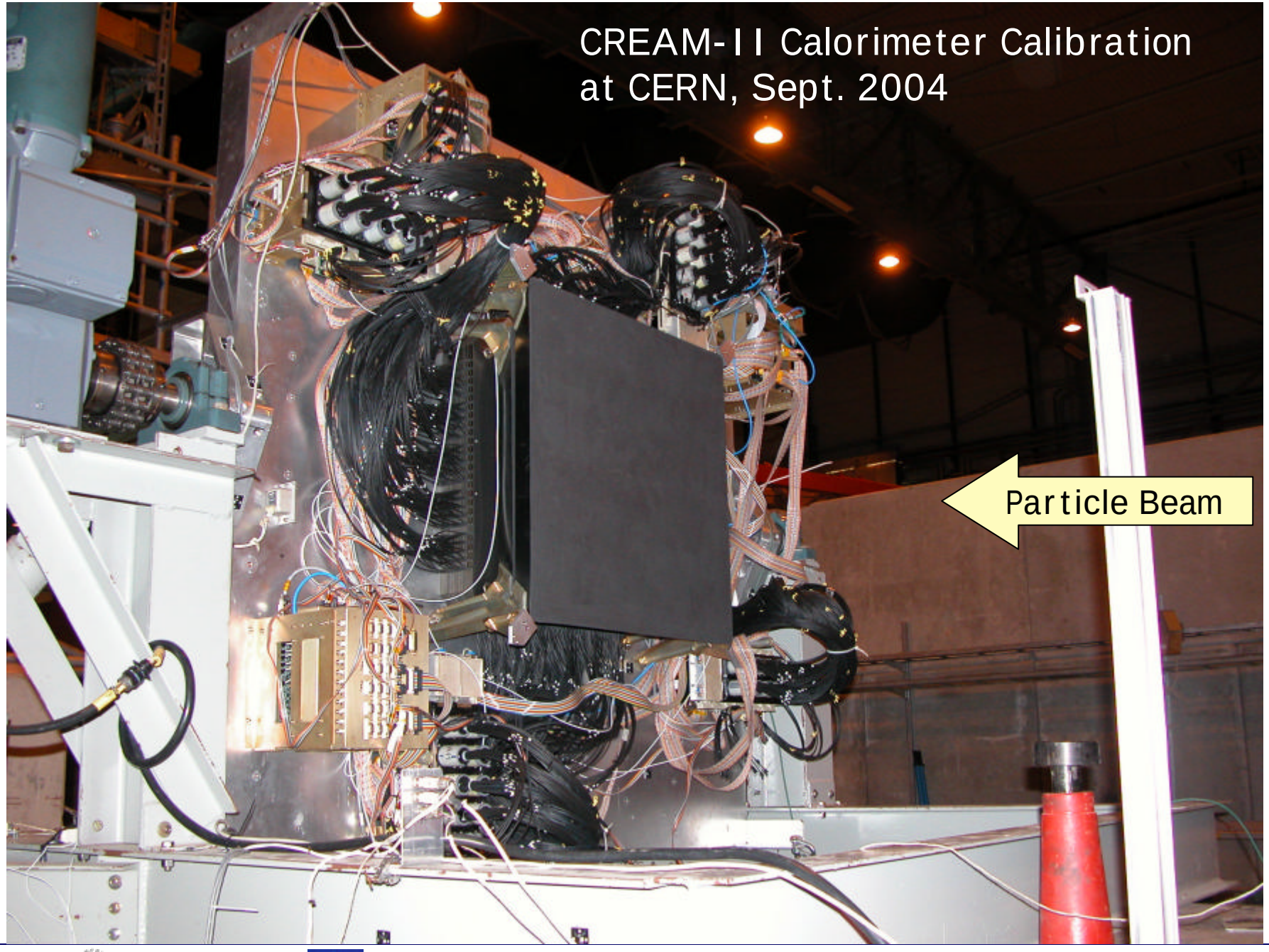
(CAL + ZLO) .OR. (CAL + ZLO + ZHI) triggers




Recovery operations

Two Instrument Suites




CREAM-II Calorimeter Calibration
at CERN, Sept. 2004
Particle Beam