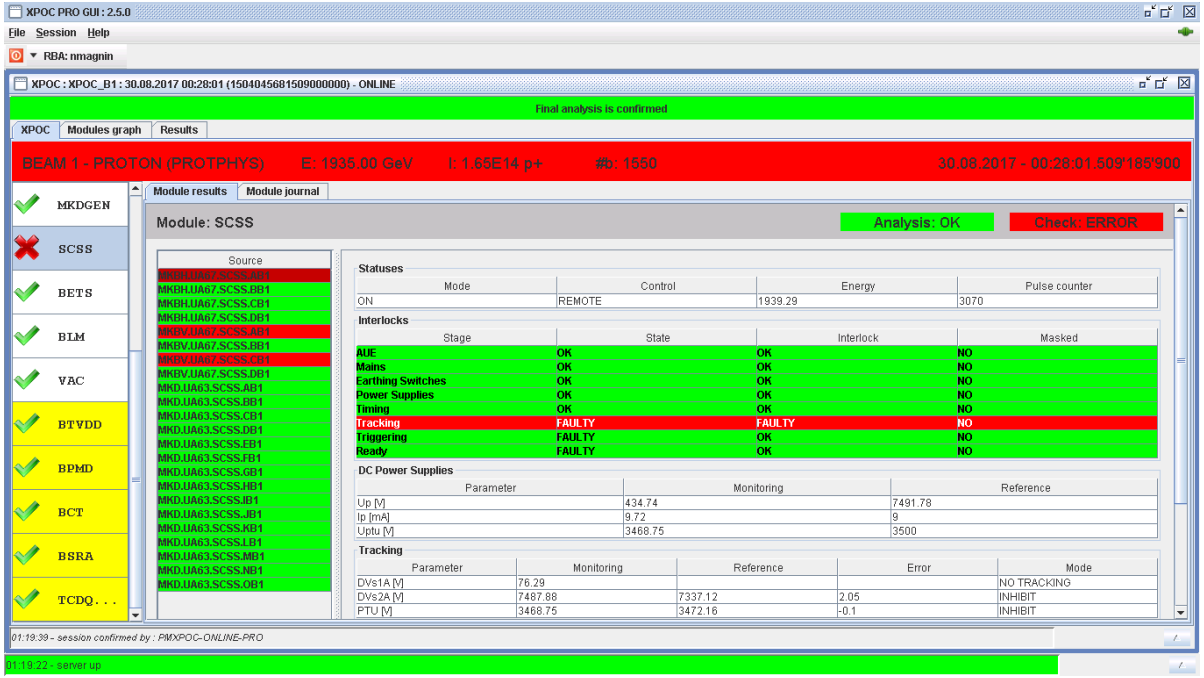

CERN

Beam dump due to BEM problem

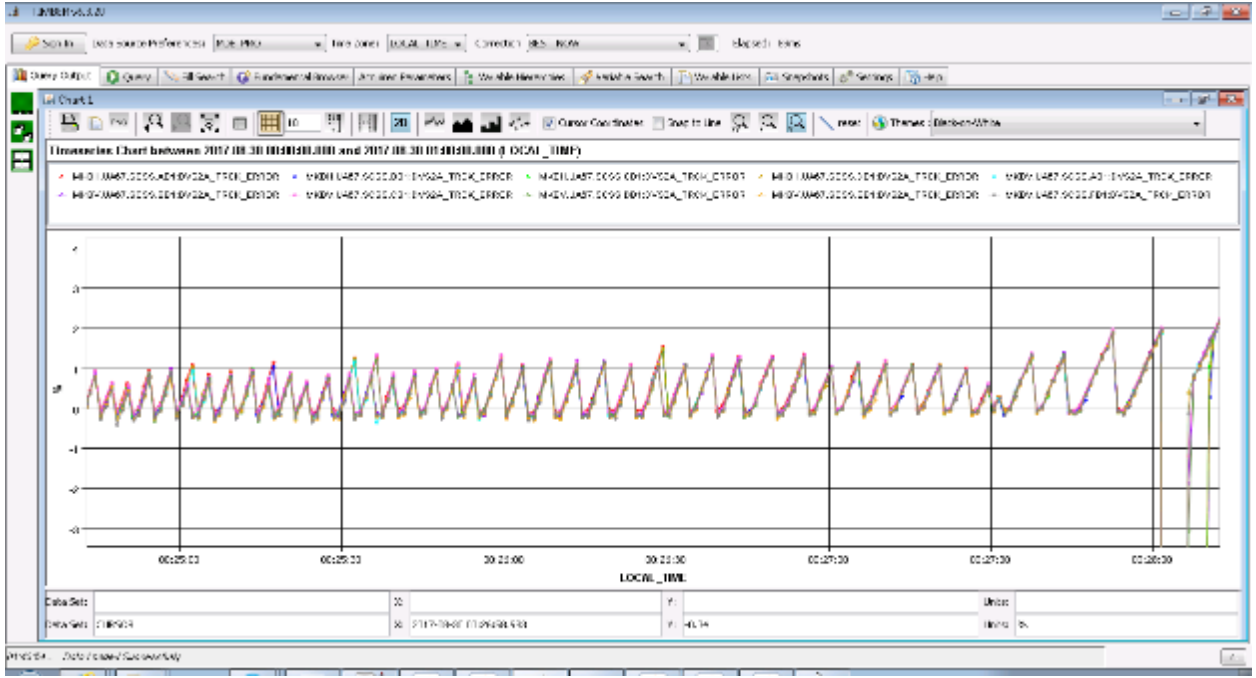
N.Magnin - MPP 01.09.2017

Dump due to LBDS



- XPOC error: 3 MKB tracking error on SCSS
- XPOC&IPOC MKD/MKB waveform analysis is OK
- TSU dumped on SCSS request
- No BETS tracking error

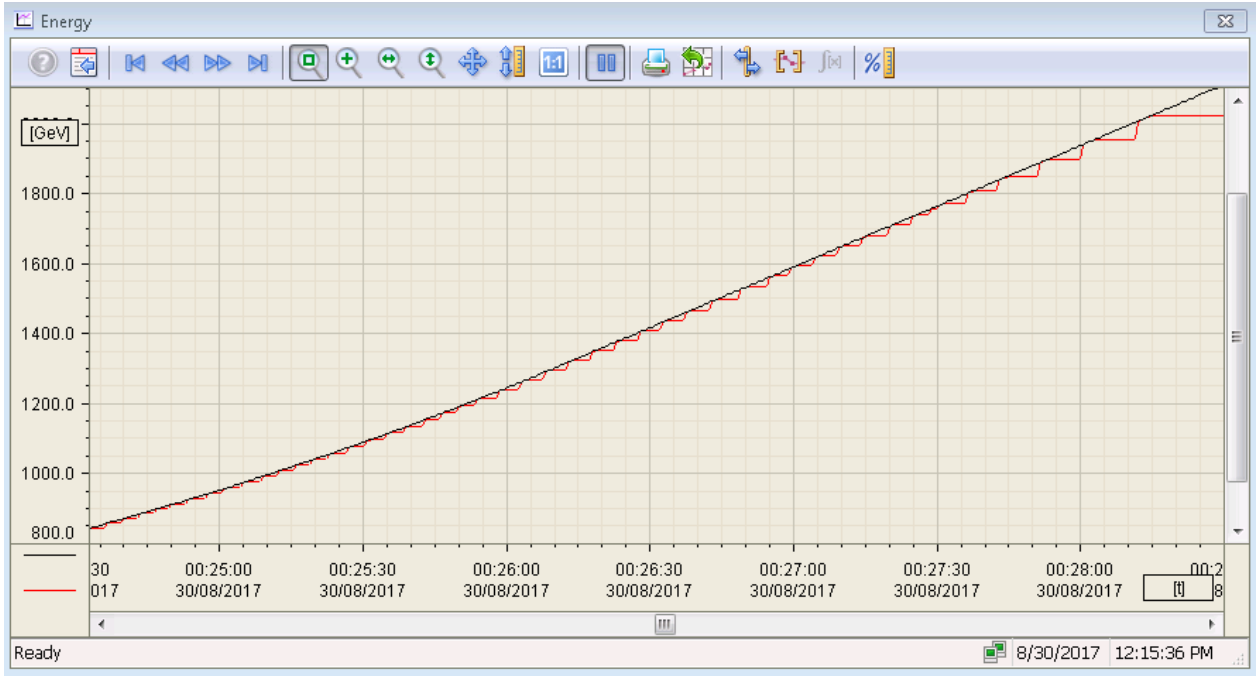
SCSS tracking error



ALL MKD and MKB generator showed big ‘saw shape’ tracking error during ramp

Dump after 2% error:
3 MKB gen interlocked

SCSS energy Reference/Interlock



Reference energy OK

Interlock energy 'frozen' for increasing time up to minutes !

⇒ Communication problem with the **BEM-Interlock** card

BEM-Interlock problem scenario

- BEM Reference send the energy to SCSS
  - ⇒ SCSS set voltage to HV generators

- BEM Interlock send the energy to SCSS:
  - ⇒ SCSS check voltage on HV generators (V/E tracking tables)

BEM **Interlock** energy ‘frozen’ during ramp:

⇒ HV Generators voltage is correct wrt beam energy

⇒ SCSS detects a tracking error on all generators => Dump request.

This problem already occurred once in 2012 operation.

BEM-Reference problem scenario

- BEM Reference send the energy to SCSS
  - ⇒ SCSS set voltage to HV generators

- BEM Interlock send the energy to SCSS:
  - ⇒ SCSS check voltage on HV generators (V/E tracking tables)

BEM **Reference** energy ‘frozen’ during ramp:

⇒ HV Generators voltage is **NOT** correct wrt beam energy

⇒ **BETS** detects a tracking error on all generators => Dump request.

This problem never occurred in operation.

BEM Diagnosis problem

- BEM cards have an ‘AnyBus error’ interlock, which was not visible.
  - ⇒ BEM card send energy to SCSS through AnyBus card
  - ⇒ SCSS receives the energy and send it back to BEM
  - ⇒ BEM card receives the energy from SCSS and check wrt to sent value.

- This interlock did not work !
- Problem understood after investigation:
  - The BEM card only check the receive value wrt to sent value WHEN A VALUE IS RECEIVED FROM SCSS.
  - In this case the AnyBus card was frozen, no data received => no check, no interlock !

Summary

- Dump due to AnyBus communication problem between BEM-Interlock and SCSS
- Thin is a know failure mode, taken into account in design
- System protections worked properly
- Beam dumped synchronously, clean dump
- AnyBus communication diagnosis problem identified.
  - Could be fixed with a new firmware deployed during YETS.
  - Validation during reliability run with local BIS loops.