MPP meeting 19/7/2013:

The new BETS on MSI, TDI and TCDQ

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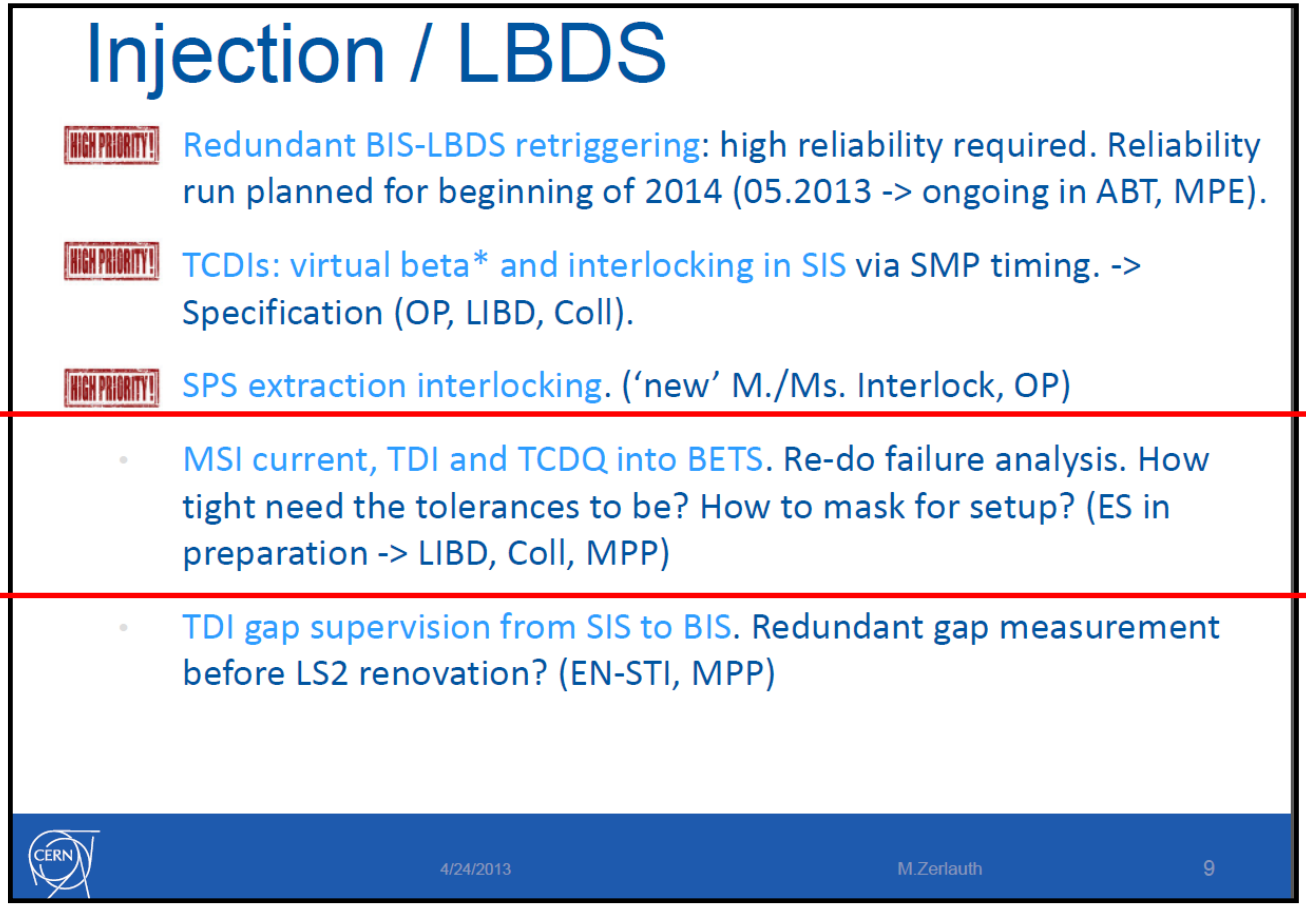
- Markus reporting on the MPP Workshop in Annecy which took place in March 2013:



BETS on the Injection Septum MSI

- BETS interlock on absolute MSI current
- Interlock to be connected to maskable LHC Injection BIS input
  - Takes into account the Set-up Beam Flag which moves to unsafe if the NEXT injection from the SPS would make the circulating beam unsafe
  - Same entry to the BIS as the BETS for the TDI presented below
  - The LHC Injection BIS will stop the SPS extraction within a few microseconds
- Proposed tolerances: 7 μrad angle = 1 σ oscillation = 5e-4 tolerance on the MSI current (~0.5A)
  - Stability of the MSI current to be checked
- MSI power converter possibly upgraded from mugef to LHC FGC
  - Standard interface for BETS acquisition card
  - Can then ramp down MSI when energy is ramped up

BETS on the Injection Absorber TDI

- BETS interlock on the gap between the jaws.
- Two channels per TDI: one upstream, one downstream
- The threshold function inhibits all injection above and under 450 GeV
- To be connected to maskable input at the LHC Injection BIS, same input as for the MSI BETS interlock will be used
- Proposed tolerance is ± 1 σ on the gap at 450 GeV
  - About +/- 0.6 mm
- Issues
  - No redundant position measurement available
  - Difficult to get present gap measurement with good resolution delivered to the BETS
  - Alessandro's interference project….

BETS on the Dump Absorber TCDQ

- The TCDQ is single sided, interlock on the absolute position
- Two channels per beam: Interlock on upstream and downstream positions
- TCDQ BETS interlock will be connected to an additional maskable channel of the LHC ring BIS
  - Note: the present BETS on the LBDS is connected directly to the TSDS and will remain unchanged

BETS input signals

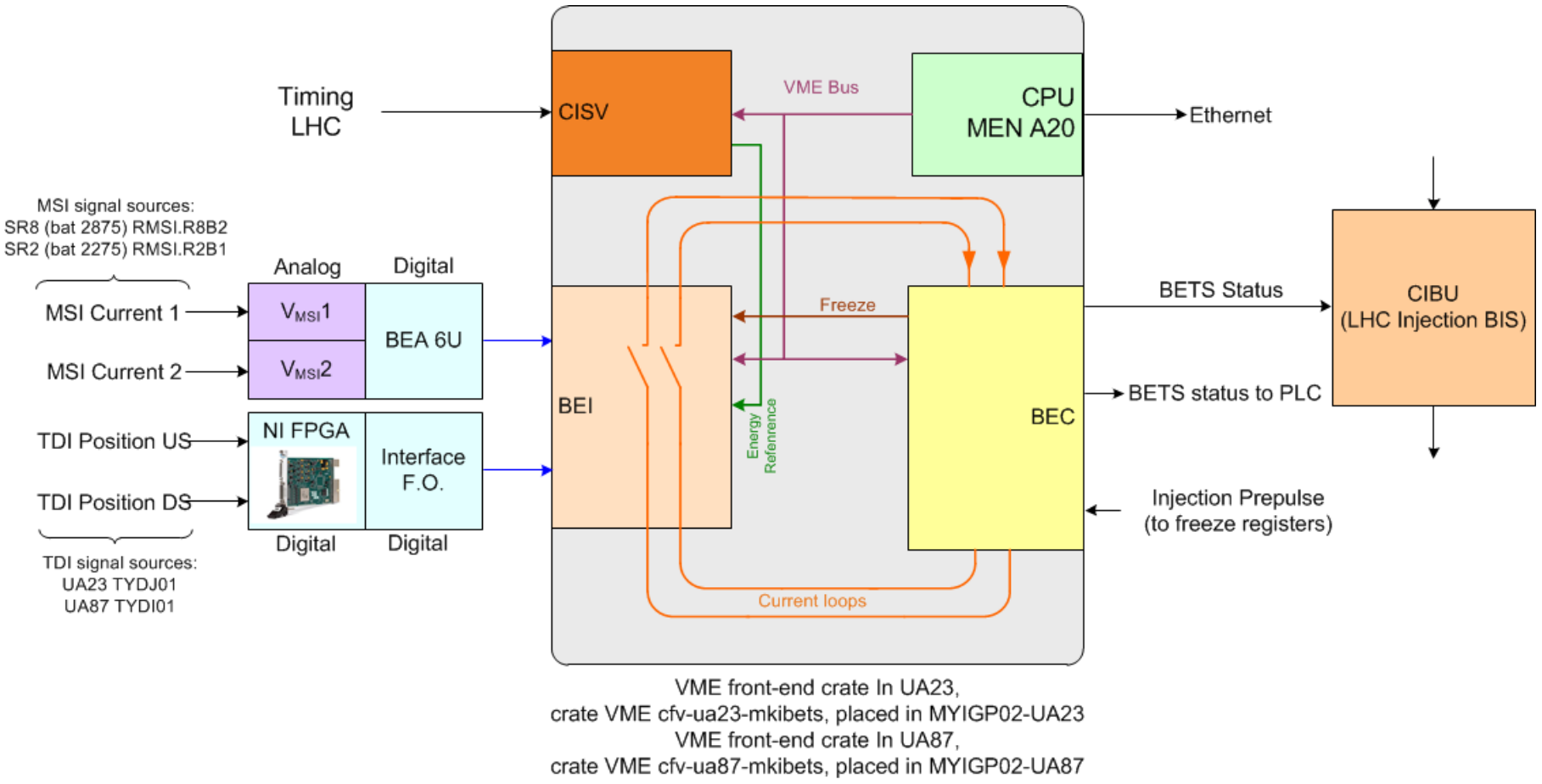
- MSI
  - 2x 0-10V proportional to MSI current
    (main and feedback current measurements)
  - 2x DCCT OK signals for status of the power converter
- TDI – redundant measurement – slides Alessandro
  - Manchester encoded frames to be sent directly to BEI
    The encoded frame contains Upstream and Downstream jaws spacing. Status of the measurements can be added in the frame.
  - Use of NI FlexRIO FPGA customizable boards?

- TCDQ
  - 2x 0-10V signals from new redundant potentiometers on TCDQ upstream and downstream.
  - A 10 V reference for the TCDQ potentiometers is provided by the BETS itself.

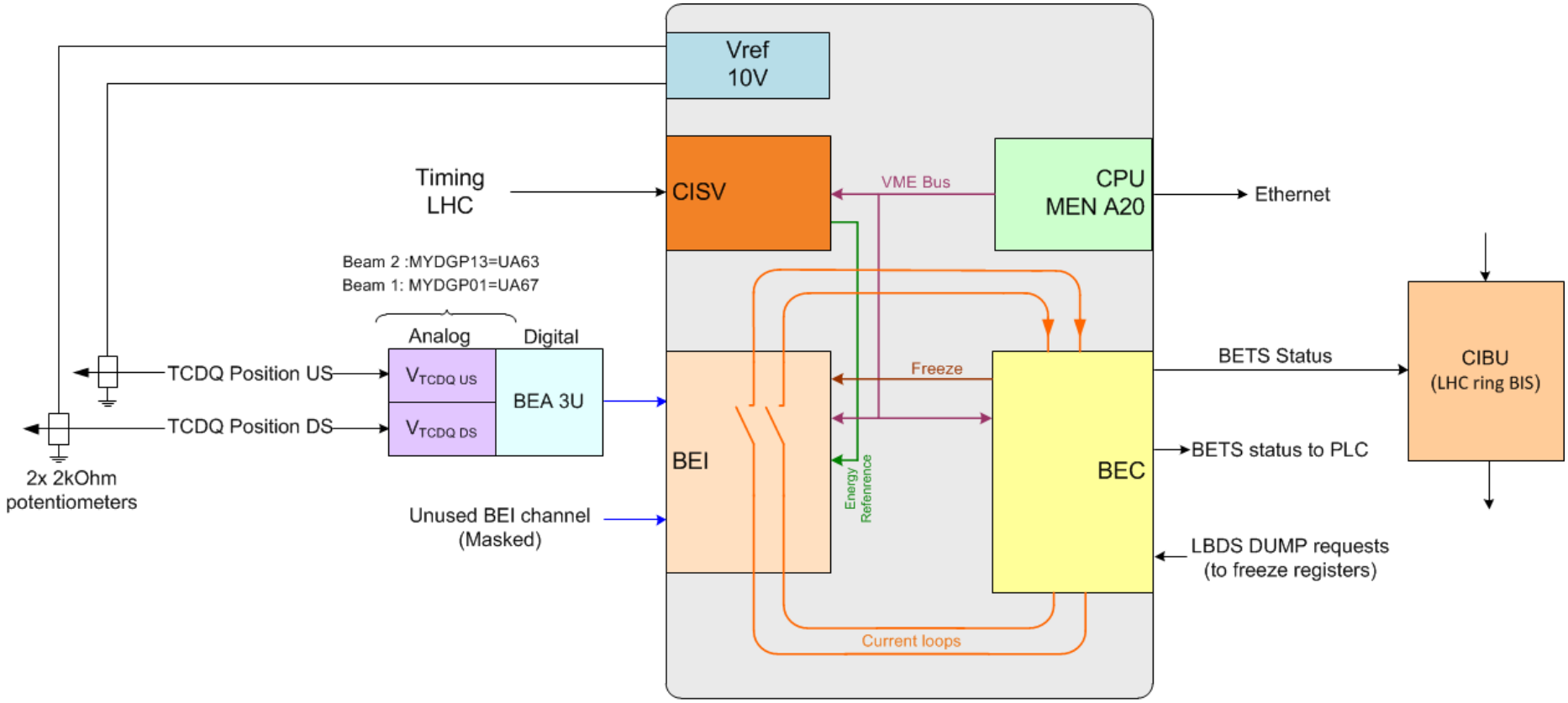
BETS cables and connections

- MSI and TDI
  - MSI and TDI BETS in a single VME crate
    - Additional VME crate to be installed by BE/CO (request done)
  - Connected to LHC injection BIS via standard CIBU (new channels)
    - CIBU crate installation is pending
  - Fiber optics installation request already sent to EN/EL
    - TDI: not a problem as the length is ~20m away from MKI control racks location
    - MSI: possible problem as EPCs are in surface buildings (SR2 & SR8)
- TCDQ
  - BETS installed in a VME crate.
    - Additional VME crate to be installed by BE/CO (request done)
  - Connected to LHC ring BIS via standard CIBU (new channel)
    - Cables to be pulled (can be done by TE/ABT ~30m)
  - Fiber optics installation can be done by TE/ABT (~4m patch)

BETS MSI and TDI overview



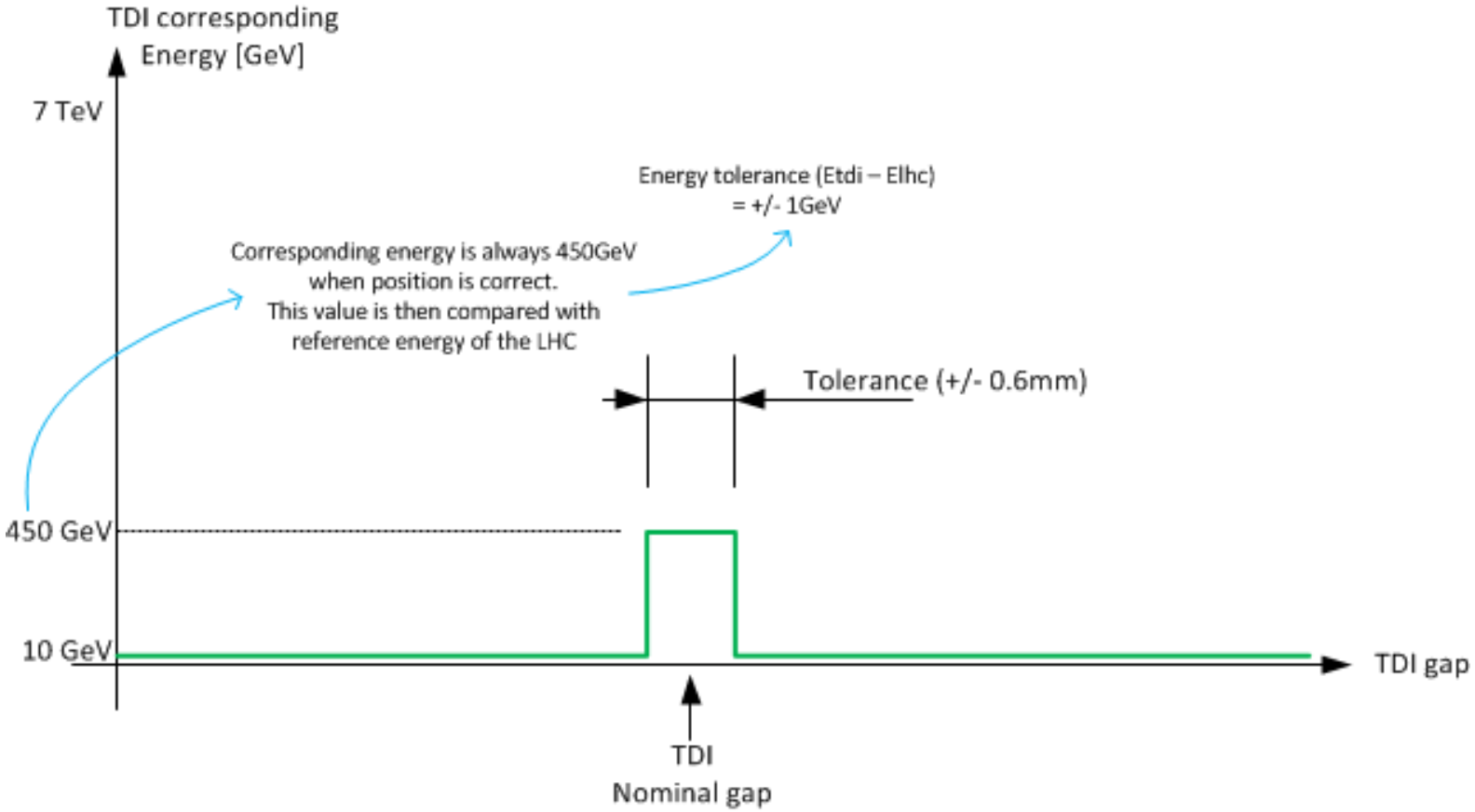
BETS TCDQ overview



VME front-end crate In UA63,
crate VME cfv-ua63-tcdqbets, placed in MYDGP08-UA63
VME front-end crate In UA67,
crate VME cfv-ua87-tcdqbets, placed in MYDGP06-UA67

BETS BEI transfer function for TDI

- Change of transfer function to be done locally in the tunnel
- Transfer function to be checked by MCS
- Arming sequence for BETS on TDI not needed (standalone)



BETS BEI transfer function for MSI

- Change of transfer function to be done locally in the tunnel
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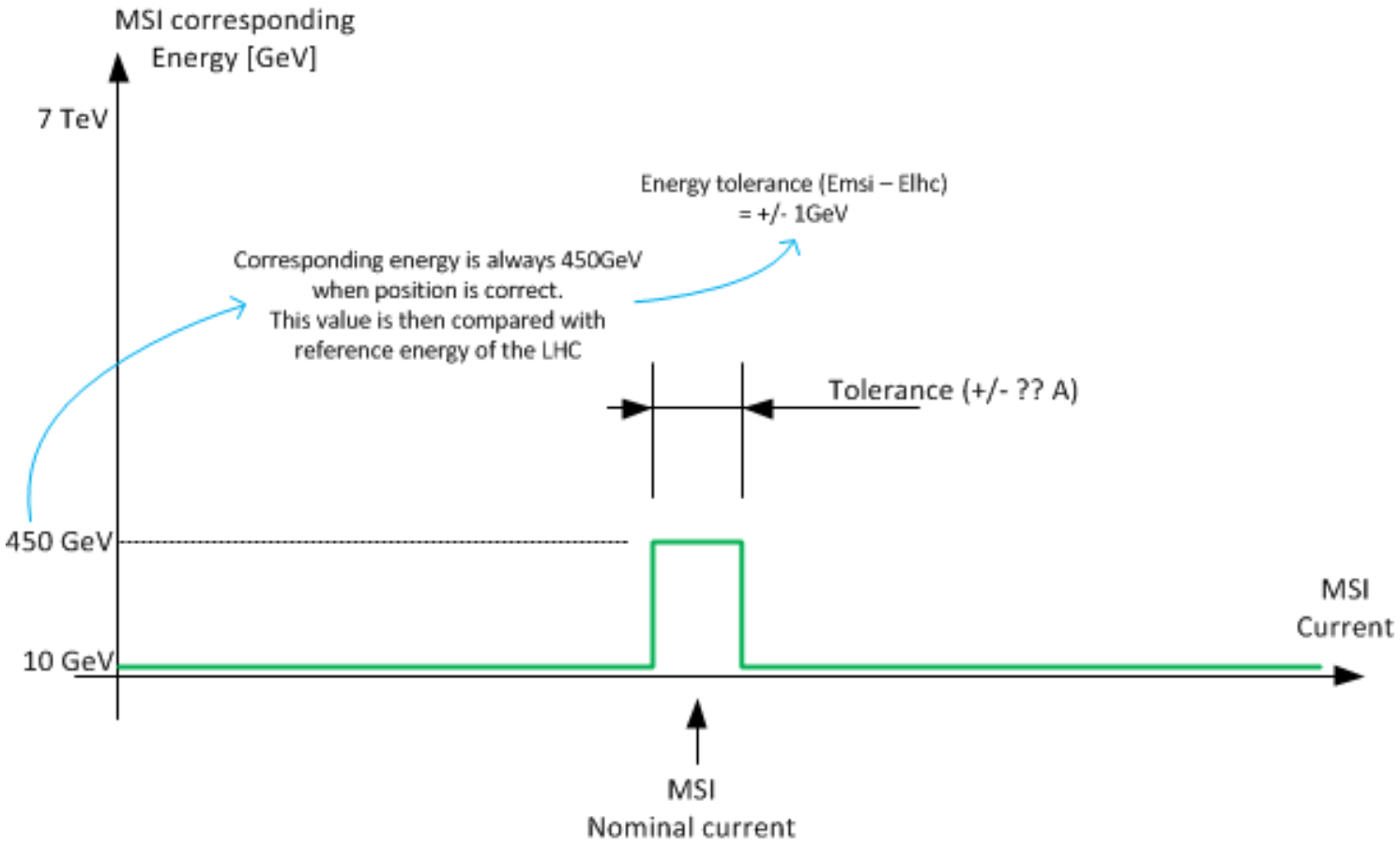
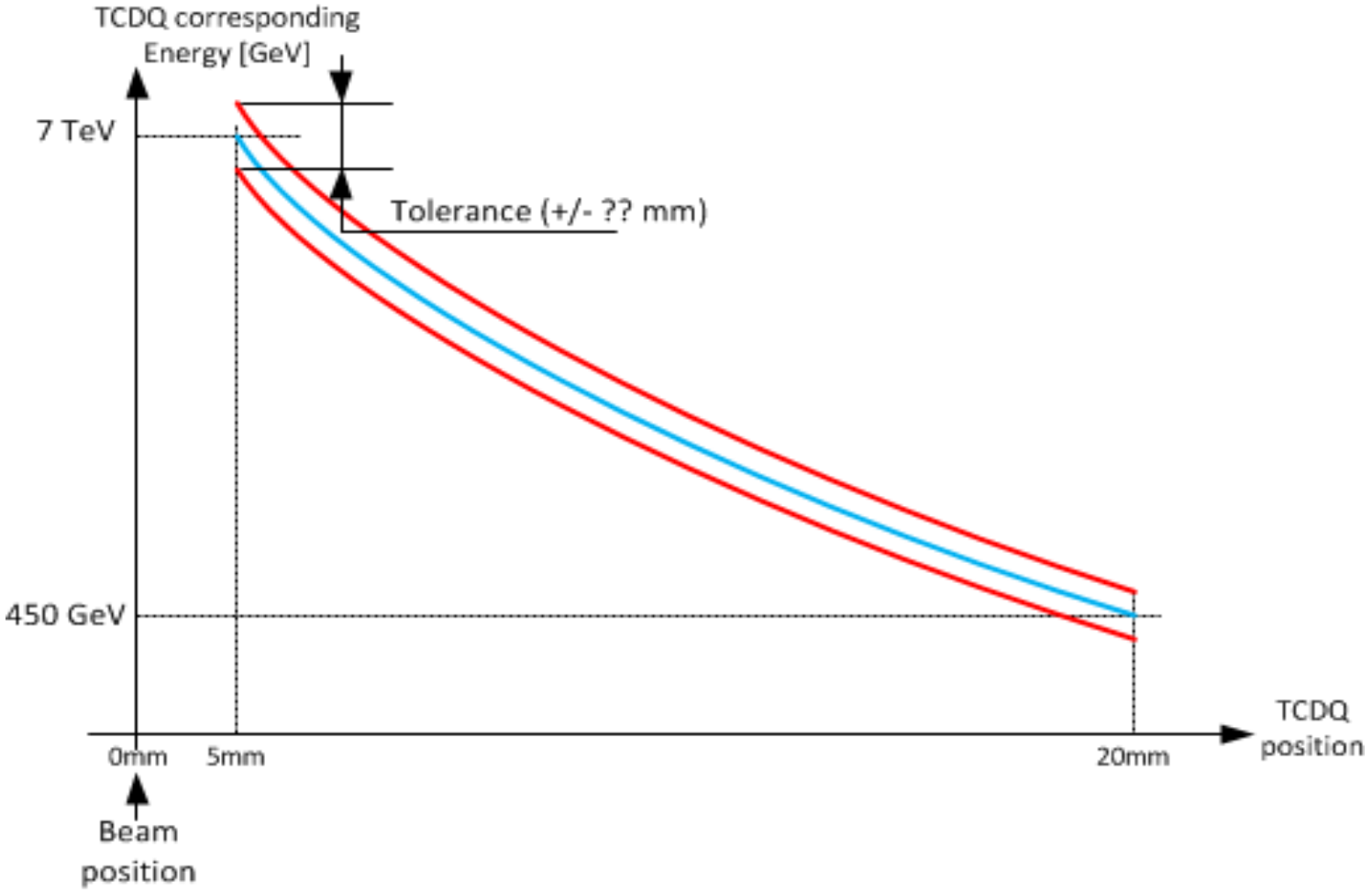


BETS BEI transfer function for TCDQ

- Change of transfer function to be done locally in the tunnel
- Transfer function to be placed in MCS
- BETS on TCDQ needed during the arming sequence of the LBDS



Conclusions

- What is critical ?
  - Fiber optics demands from MSI power converters to BETS not yet confirmed.
  - Status of cabling for additional BIS channels
    - 2 to LHC injection BIS
    - 2 to LHC ring BIS
- What input is missing / decisions outstanding
  - MSI power converter on LHC FGC or not
  - TDI position measurement to be confirmed and financed
  - Functional specification:
    - BETS tolerances and transfer functions
    - Commissioning procedures, etc…