

# MCH electronics upgrade

- TDR

- Consequences of luminosity increase

- Rates, dead time : => change FEE + R/O electronics
    - From “Trigger” to “continuous” read-out
    - Constrains: keep same detectors, same FEE connectors, same running conditions for gas and HV => good resolution, same cooling (power consumption)

- FEE upgrade (*short*)

- Common with TPC
    - MCH specificities
    - FEE boards : 20000 ...

- Data flow / Data transmission

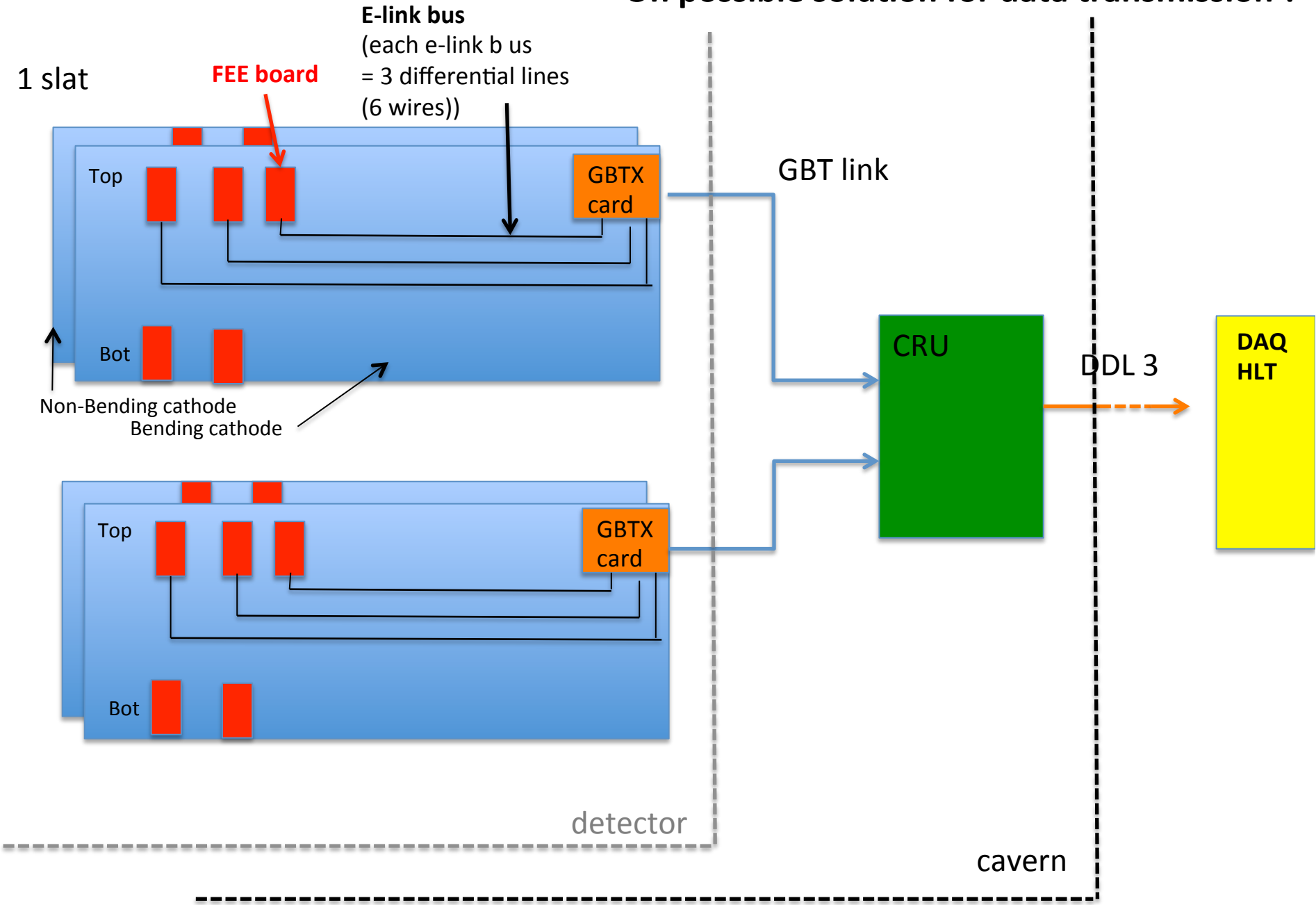
- Short reminder on present segmentation
    - Data flow
    - Possible data transmission solution: FEE – elink---→ GBTX board -----→ CRU ---- ddI3--→ DAQ

- Common Read-out Unit (CRU) (*short*)

- “as much as possible” common to other detectors
    - MCH specificities

- Budget, cost sharing, Institutes involved, schedule

# On possible solution for data transmission ?



# MCH Link: “possible” scenario

- **Solution 1 :**
- **4 buses / slat : Bending Top / Bending Bot; Non-bending Top / NB Bot**
- Max 36 FEE on 1 bus
  - 1 FEE = 7 (10% occ of 64 channels) x 64 (bits) x  $10^5$  (100 kHz) = 40 Mb/s (e-link : OK)
  - 36 FEE :  $40 \times 36 = 1.6$  Gb/s ( GBTX : OK)
- Need :
  - FEE output : e-link
  - RCU with optical link GBT input
  - 4 GBTX board /slat
    - St3 :  $\frac{1}{2}$  CH = 9 slats => 36 GBTX/(1/2CH)
    - St4 :  $\frac{1}{2}$  CH = 13 slats => 52 GBTX/(1/2CH)
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    - St1 :  $12+12=24$ /quad => 48/(1/2 CH) ?
    - St2 :  $12+12=24$ /quad => 48/(1/2 CH) idem St1 ?
      - **Total = 560 + 384 = 944 GBTX**
  - **!!! Implementation !!! (bus/slat BT, slat BB, NBT,NBB)**
  - **ROU :**
    - **With 1 ROU = 10 input (GBT)**
    - St3 : 4 CRU/(1/2 CH) => St3 : 16
    - St4 : 6 CRU/(1/2 CH) => St4 : 24
    - St5 : 6 CRU/(1/2 CH) => St5 : 24
    - St1 : 5 CRU/(1/2 CH) => St1 : 20
    - St2 : 5 CRU/(1/2 CH) => St2 : 20
      - **Total = 104 ROU Boards**
- “possible”: possible on paper but feasibility has to be demonstrated (place, location....)

# Issues ?

- FEE Chip
  - Sao Paolo, Saclay ...: other labs interested ? .... How to proceed ?
  - Rough estimation of cost ?
  - Cost sharing ?
  - MCH FEE boards: Orsay
- CRU
  - Technical points:
    - Different types ?
    - Size of CRU board ? ; crates (mechanics + power) ?
    - Transmission to DAQ: ddl3 ?
  - Rough cost of one CRU ? => who pays: MCH pays for MCH CRU boards ?
  - Labs interested ? (Kolkata ?)
- Links
  - Different types of links (related to CRU):
    - ITS: custom bus
    - TPC: FEE -----e-link---> CRU ?
    - Other detectors ?
  - MCH: Cagliari