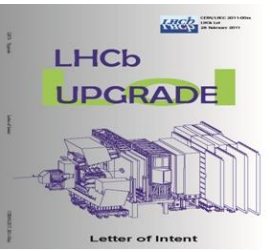
Front-End architecture

- Upgrade architecture
  - What is unchanged ?
- ECAL HCAL Front-end Crate
- FEB and CROC architecture
- Link between Front-end, readout and TFC crate
- Data format
- New development for Tests Board
- Summary

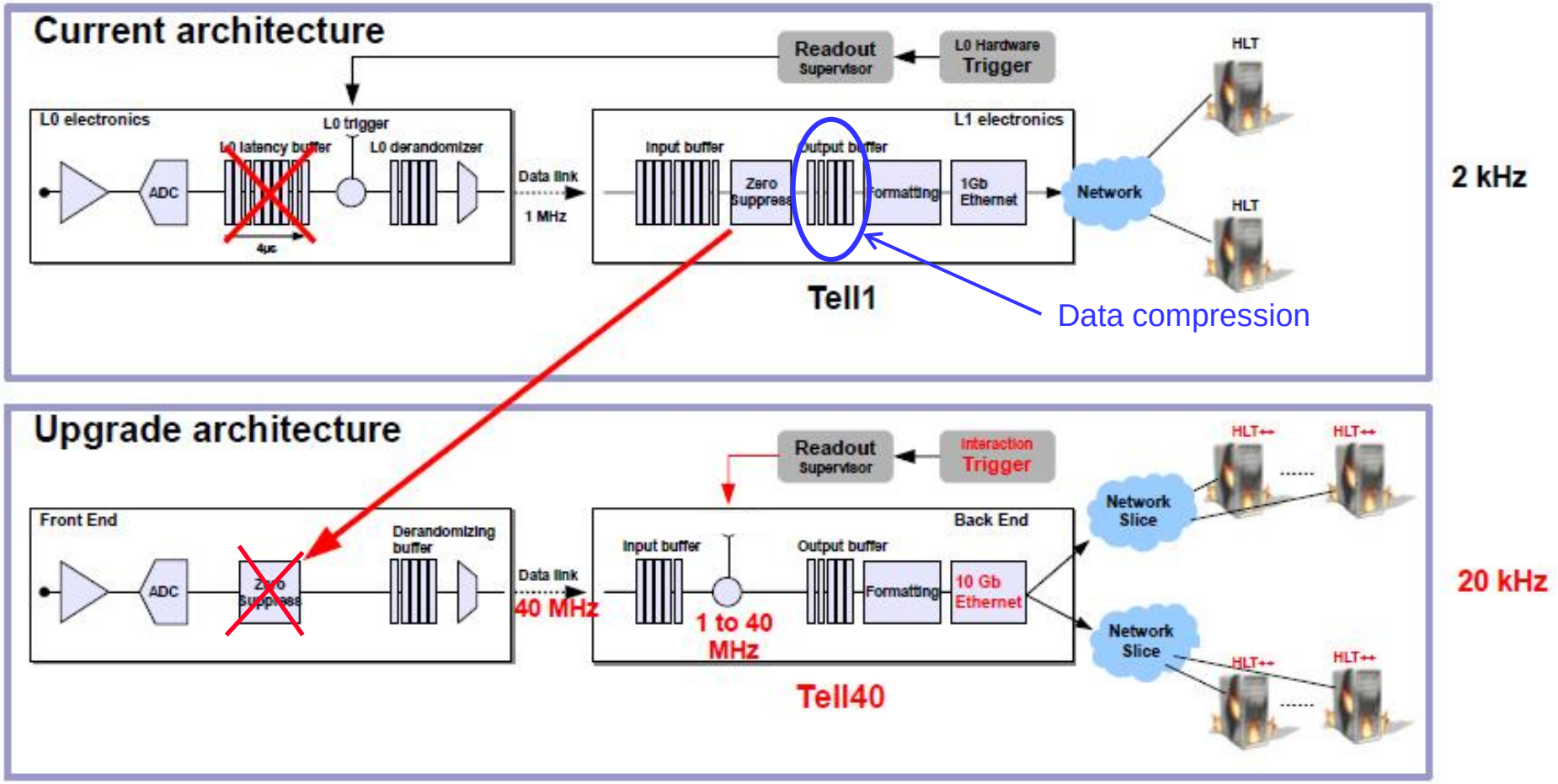


Calorimeter upgrade architecture

- **What is (un)changed ?**
  - **On the detector side**
    - Most of the module are kept (some modules in the inner region replaced)
    - PMT : a reduce gain is applied on the gain to keep them alive
    - Cockcroft-Walton bases (and PS), signal cables, etc … are kept
    - Remove the SPD, PRS and lead absorber
  - **On the balcony**
    - Keep the crates, backplanes, power supplies, …
    - Replace the Front-end electronics (GBT 40 MHz readout)
      - Make it compliant with the crates, power supplies, …
    - Migrate L0 Calo electronics to LLT
  - **Counting room**
    - TELL1 ⇨TELL40
    - Slow control : SPECS ⇨ GBT

Calorimeter upgrade architecture

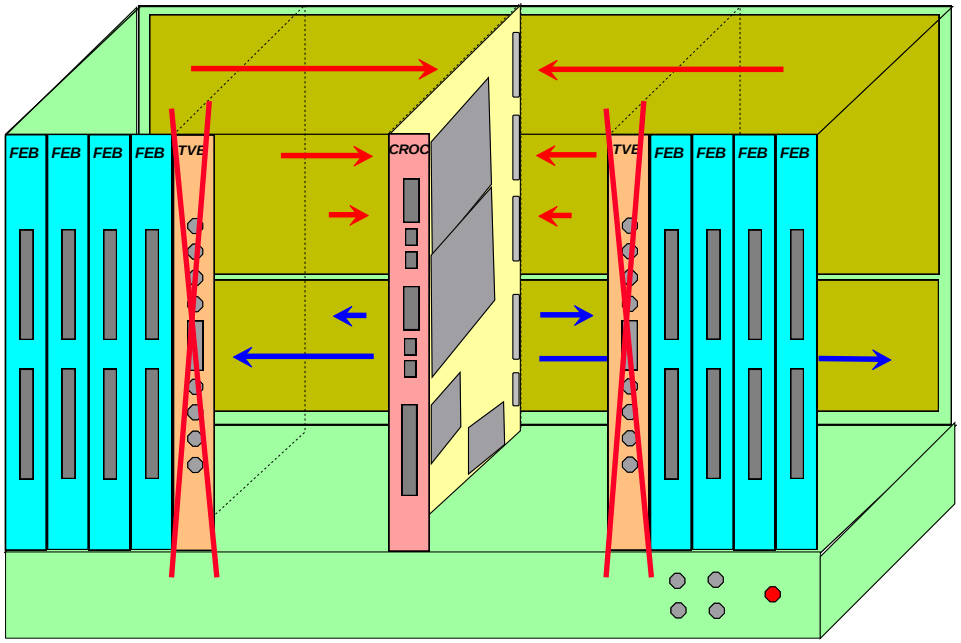
- **What is changed ?**
  - **Current architecture**
    - Data compression in the TELL1 board
    - L0 latency buffer
  - **Upgrade architecture**
    - No zero suppression
    - Used 112 bit width of the GBT



ECAL-HCAL Front-end crate

- **Front-end crate**
  - **Same backplane**
    - **3U ⇨ power supply, clock distribution, …**
    - **6U ⇨ links between boards inside the same crate**
  - **New Front-end Board**
  - **New CROC board**
  - **Remove TVB**

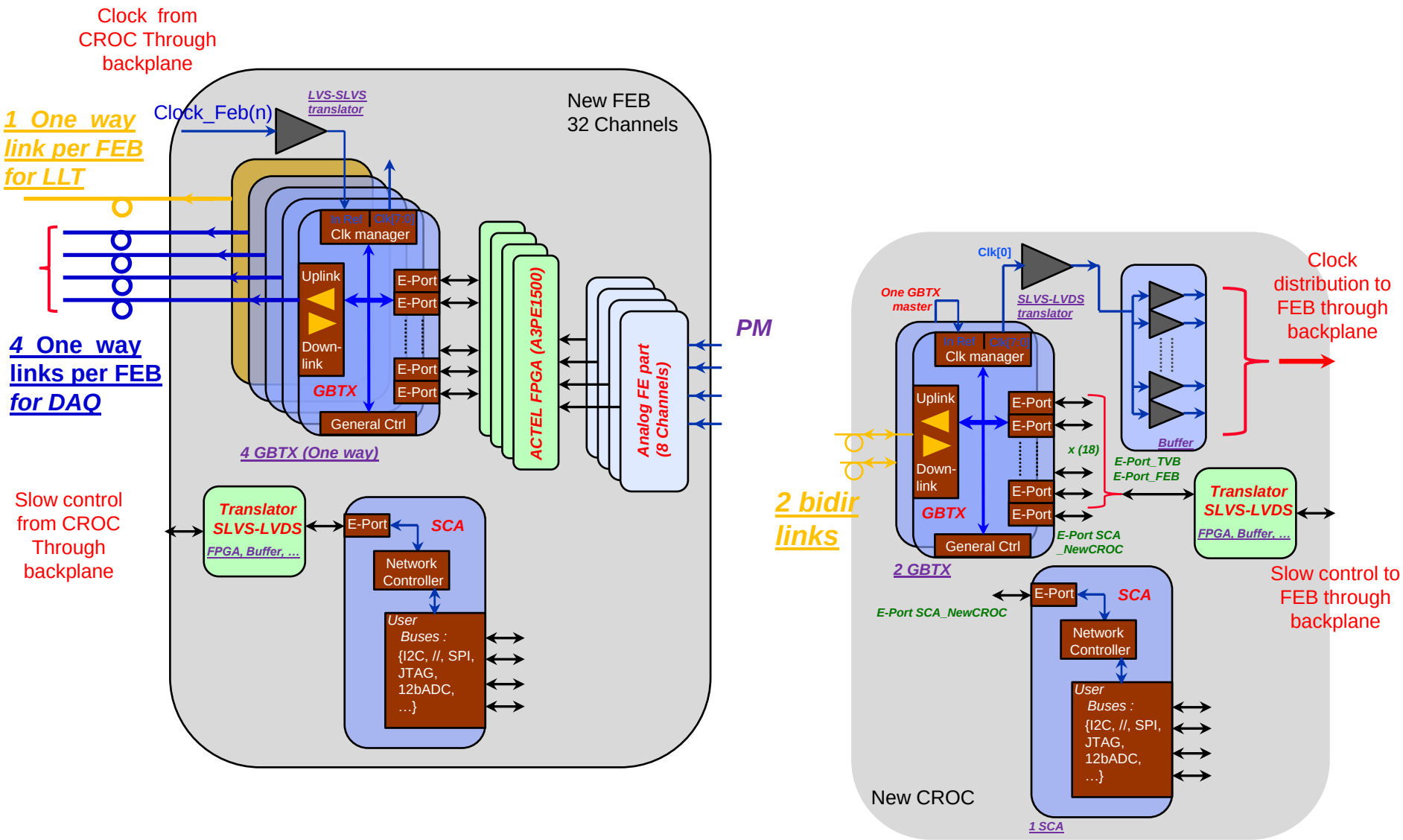
    Add an extra LLT fiber on the FEB



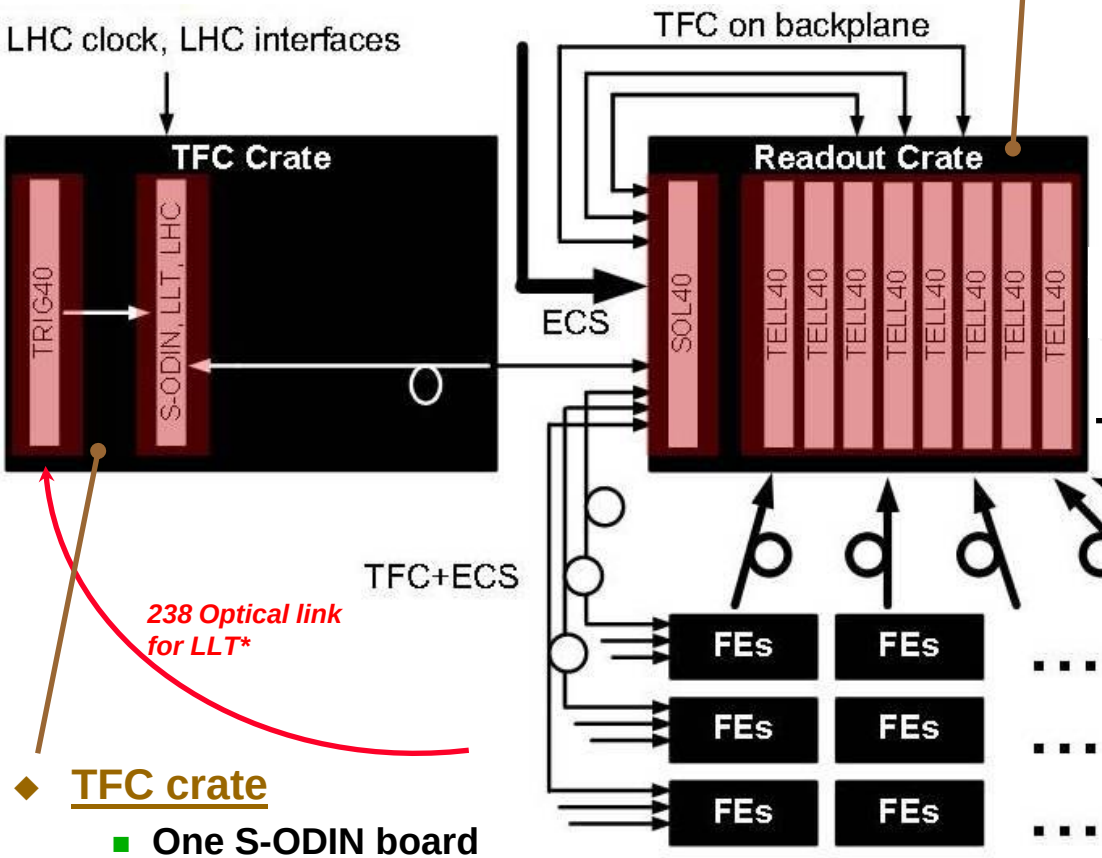
- **FEB and GBT**
  - **On the new Calorimeter FEB**
    - **4 GBTX chip (one way) for Data**
    - **1 GBTX chip (one way) for LLT**
    - **1 SCA chip (FEB Ctrl/Cmd)**

- **CROC and GBT**
  - **On new CROC board**
    - **2 GBTX (one master) chip with bidirectional optical fiber (right side and left side of FE crate)**
    - **1 SCA chip (CROC Ctrl/Cmd)**

Front-end Board and CROC Board architecture



Links Calo front-end crate ATCA40



◆ **Readout Crate**

- **TELL 40 board**

TELL40 = (x1)ATCA40 (mother)+ (x4)AMC40

- **AMC40**
  - **24 IN (GBT)**
  - **12 OUT**
- **SOL 40 (one per crate) same hardware TELL40**

Distribution ECS et TFC

  - **24 IN (GBT)**
  - **12 OUT**

◆ **Calo front-end crate**

- **188 ECAL FEB and 50 HCAL FEB**
  - **4 GBTX chip (one way) for Data**
  - **1 GBTX chip (one way) for LLT**

◆ **TFC crate**

- **One S-ODIN board**
- **TRIG40 board**
  - **24 IN (GBT!)**
  - **12 OUT**

**** For the optical link for LLT see Cyril 's Talk February 1st, 2013***

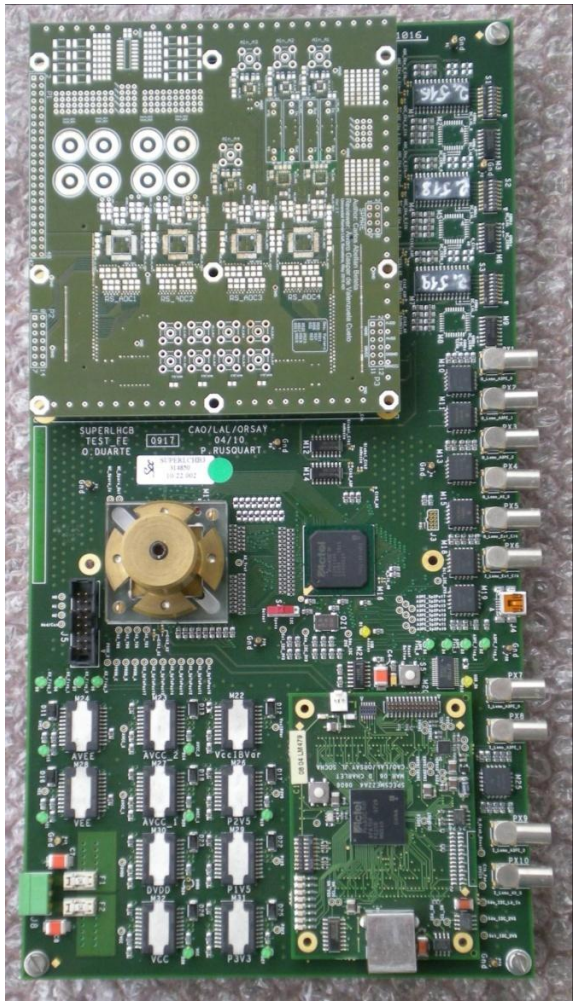
Data format

- **Trigger data format proposal : (1 link - 80 bits)**
  - 5b ⇨ local address
  - 16b ⇨ data for trigger(8b Max ET, 8b Sum ET)
  - 12b ⇨ BXID
  - 6b ⇨ Calo Hit (number of channel under threshold)
  - 5b ⇨ Crate Id, under discussion (see Patrick's talk)
  - 4b ⇨ FEB Id, under discussion (see Patrick's talk)
  - 1b ⇨ Status
  - 49 / 80 bits used

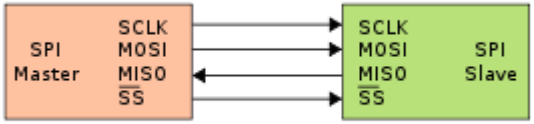
- **Data format proposal (4 links - 112 bits)**
  - (8x12=96b) ⇨ data
  - 5b ⇨ Crate Id
  - 4b ⇨ FEB Id
  - 7b ⇨ Lsb of BXID

One 112 bit word for each bunch crossing, No compression, continuous data flow

New and last development for test board ?



- **SPI**



- **We need 4 spares wire between A3PE FFPGA and analog mezzanine**
  - **Spare_A3P_To_Analog_Mezza[3:0] used to clock 20 MHZ**
  - **Used parallel bus implementation wire to SPI**

    (Add_ParBus[7:0], N_Rd_ParBus, N_Wr_ParBus, N_OE_ParBus)

- **Re-used block developed at LAL (Christophe, Jihane)**

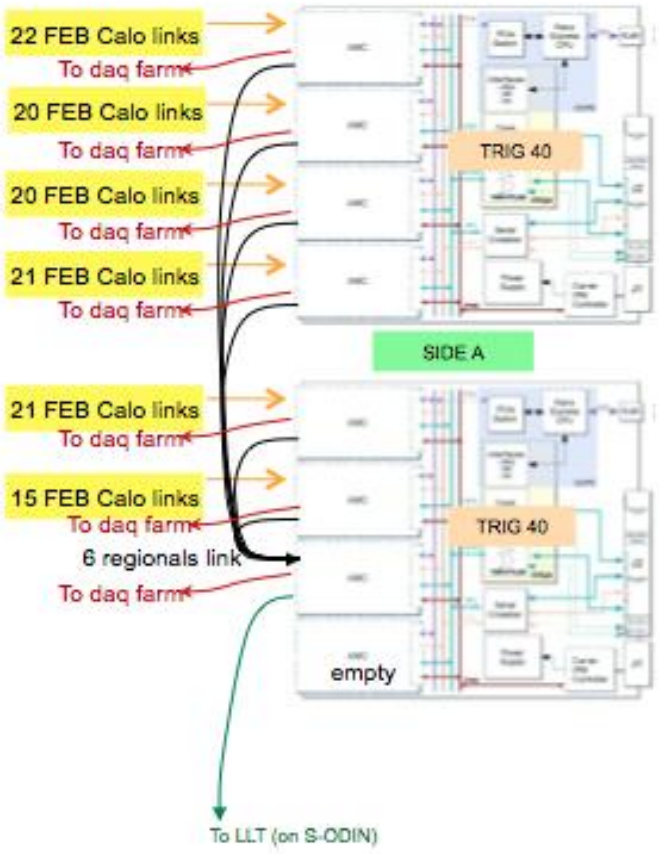
Summary

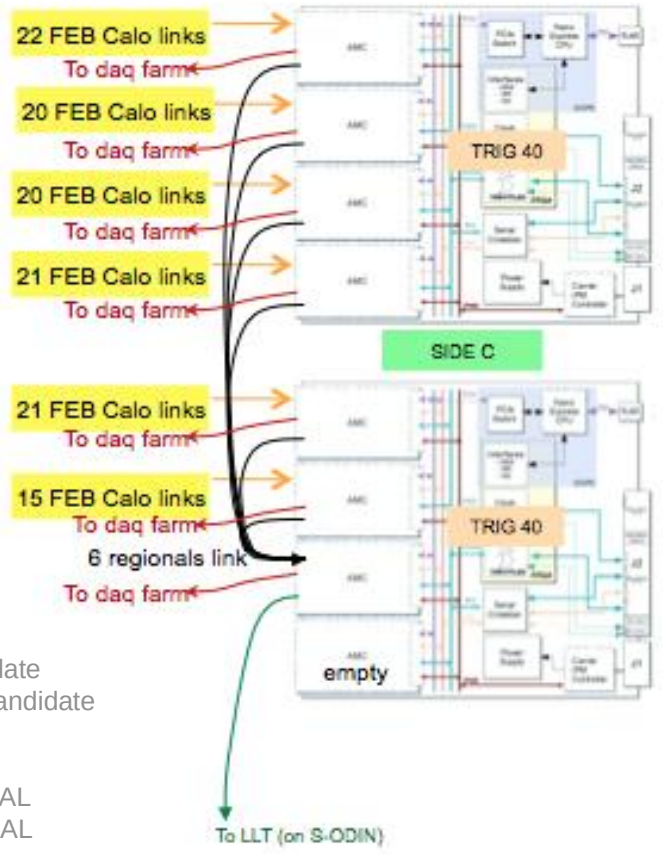
- **Upgrade architecture with New FEB, New CROC board and without TVB.**
- **Re-used old Front-end crate and old 6U and 3U backplane.**
- **On each FEB, 4 GBTX chip (one way) for data, 1 GBTX chip (one way) for LLT.**
- **Used Actel FPGA family reprogrammable (A3PE family) for new and new CROC board.**
- **Prototype new feb and new Croc current 2014 (GBT available ?)**

Spare

LLT Calo

- **Implementation on the TRIG40 side**





Output (per side):

- Hadron candidate
- « Electron » candidate
- SumET HCAL
- SumET ECAL
- Multiplicity ECAL
- Multiplicity HCAL

Cyril Drancourt Slide