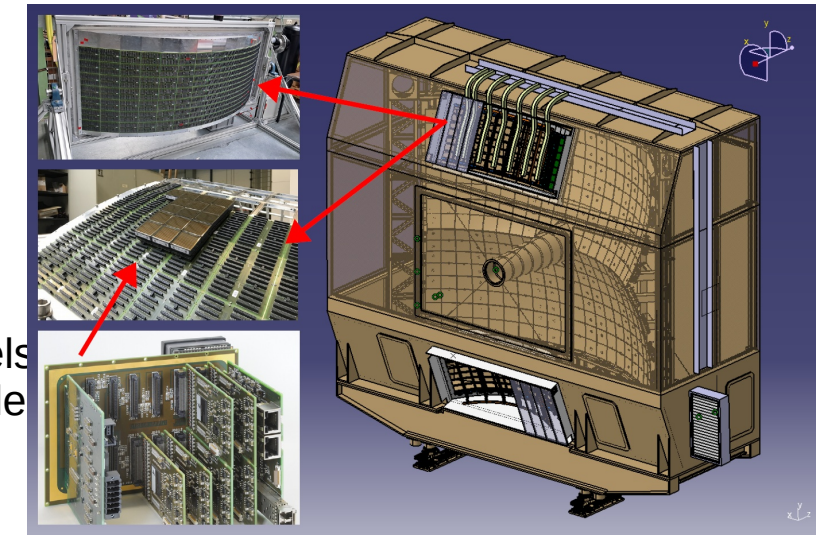
# DOGMA readout for CBM RICH

# *Overview RICH system*



**2 Cherenkov Photon cameras:**

- ~500 MaPMTs per camera, 64 pixel / MAPMT
- 2x 30k = 60k readout channels in total

**Electronic readout: frontend:**

- organized in modules of 6 MAPMTs each, 384 channels
- **DIRICH readout chain**, 12 DIRICH per readout module
- Data Concentrator module for link aggregation:
  single SFP (2.4 Gb/s) per module (per 12 DIRICH)
  (currently the bottle neck, need faster uplink…)

**Electronic readout: backend:**

- Common CRI-based CBM readout chain
- RICH : CRI1 – Felix FLX 712 V2 (BNL 711 V2)
- Up to 47 SFP input per CRI1
- dedicated TRBnet firmware entity
  for DIRICH readout + TFC sync

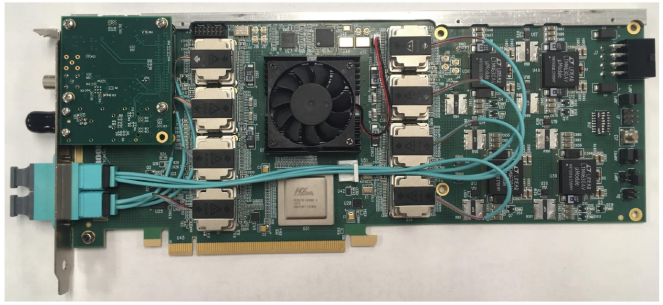


Figure 1: The FLX-712 card with fibres assembled.

CBM RICH readout module for 6 MAPMTs :
- backplane PCB
- 12 DIRICH TDC modules
- 1 Data Concentrator module
- 1 Power Module

# *Current readout and requirements*

**Current TRBnet based RICH readout scheme:**

- TRBnet interface for CRI 1 has been developed, running in mCBM
- quasi-free DIRICH readout using regular readout trigger (few kHz) to DIRICHes
- Synchronization between CBM TFC and TRBnet readout on CRI
- (Sub)-Timeslice building on CRI

- **problem: radiation hardness:**
  in case of radiation induced failure of endpoints, full DAQ has to be restarted (as currently observed in mCBM)

  → **would be resolved if we migrate to DOGMA-based readout**

**Requirements for DOGMA readout:**

- Leading edge timing precision / synchronization better 100ps
- Integration of DOGMA readout into CBM TFC (Timing Fast Control) Interface

- **hardware:**
  - **new DIRICH Concentrator module**, providing
    Ethernet hub for aggregation of 12 individual DIRICH data links
    min. 10GB/s Ethernet output link (better two links)
    DOGMA link, fanout to individual DIRICH modules

  - **DOGMA link fanout** for DOGMA link distribution
    ~2x 100 = 200 individual links needed, 1 per module with 6 PMTs each

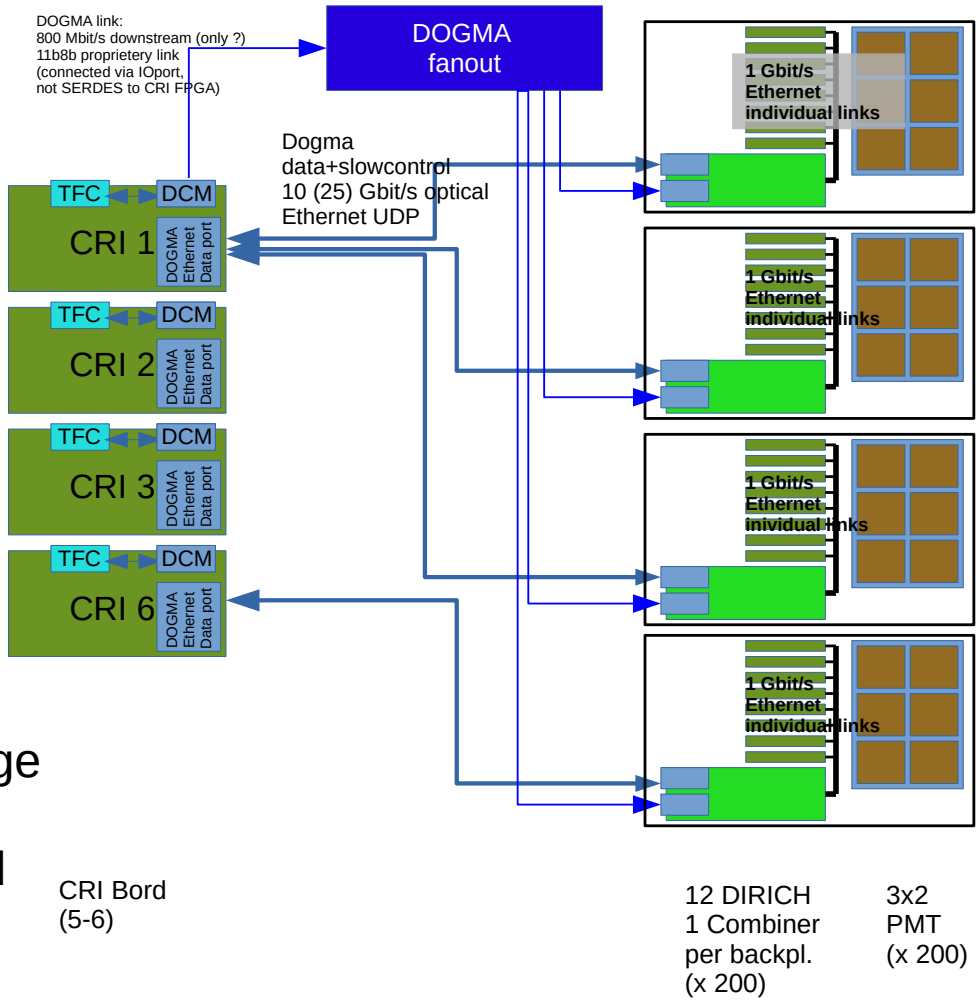
# *status of implementation*

- just started to look into DOGMA for RICH
- **first idea:**
  - DOGMA Ethernet links implemented on CBM CRI board
  - DOGMA DCM on one of the CRIs

- **alternative: “soft-CRI” ??**
  - fast Ethernet cards in FLES InputNodes (eg 4x100 Gb/s Ethernet per InputNode ?)

  - fast switches close to InputNodes (eg 48x 10Gb/s SFP → 8x 100 Gb/s)

  - single CRI for DOGMA DCM ???




- **available man-power**
  - currently one person with FPGA knowledge

- **CRI test system being set up in Wuppertal**
  - one / two CRI