



CLIC-ACM

Acquisition and Control System



B. Bielawski, F. Locci, S. Magnoni, CERN Beams Department/Controls Group, Geneva, Switzerland

What is the CLIC-ACM?

The **ACM (Acquisition and Control Module)** is a device providing timing, data acquisition and control signals to the **TBM (Two Beam Module)**.

It must be an expandable system for hosting cards interfacing directly with TBM subsystems, must have redundant power supplies and optical communication interfaces to communicate with the **Front End Computers (FECs)**.

CLIC Overview 1

Summary:

- 2 main beam linacs (1.5 TeV),
- 24 sectors per linac,
- 440 TBMs and ACMs per sector,
- 21000+ TBMs and ACMs in total,
- 50 Hz repetition rate.

The **alcoves (radiation free zones)** are places at the end of each sector (878 m apart) in the drive beam turnarounds. The **FECs installed in each alcove** will control the two nearest halves of the adjacent sectors.

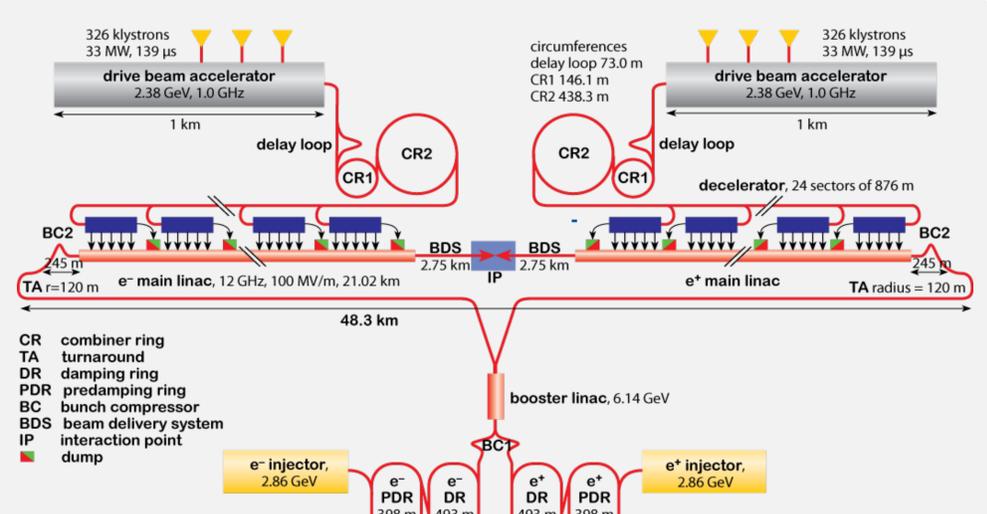


Figure 1. CLIC Overview

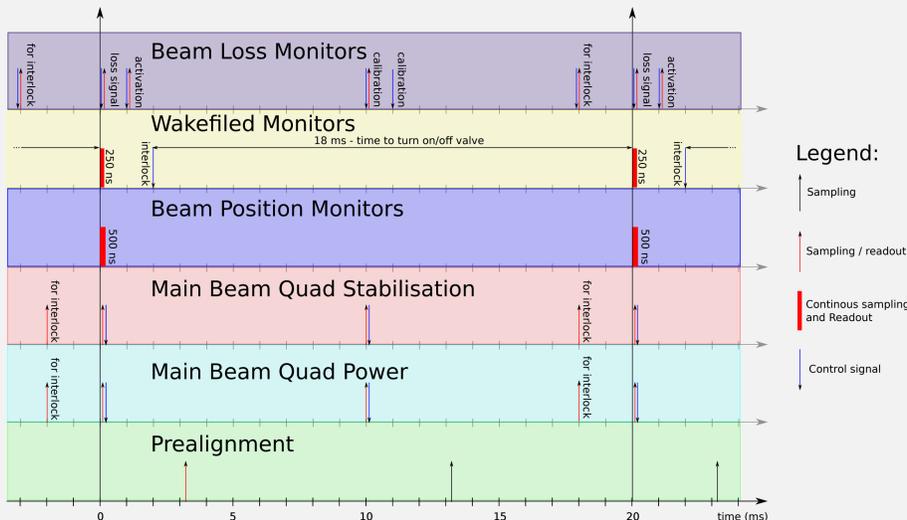


Figure 2. Timing diagram for acquisition channels

2 Requirements and Constrains

There are multiple requirements and constrains for the CLIC ACM:

- power budget: **50 W / ACM**,
- limited space,
- radiation (**100–1000 Gy per year**).

Currently over 300 channels have been requested:

- 28 Fast ADC (200 MS/s, 14 b),
- 55 Slow ADC (10 kS/s+, 16 b)
- 110 Raw DIO, 18 Serial IO (RS232/485),
- 24 Slow DAC (10 kS/s+, 16 b)
- Total: **301 channels, 500+ including spare channels**

Some of the channels are considered critical and the results from these channels must be available every cycle!

Proposed solution 3

Use of the **GBTX chip** for data, triggering and timing transfer:

- **3.2 Gb/s** (40 channels, 80 Mb/s per ch),
- **build in switch**,
- **radiation resistant** 130 nm technology,
- **clock recovery**.

Redundant acquisition of the critical signals in multiple ACMs to reduce the machine downtime due to a missed beam permit.

Double Star topology for increased reliability:

- **easier** to maintain than **Ring with 16 ACMs**,
- **only 25% more expensive** than Ring with 16 ACMs,
- can work with the GBT.

Crate placement still to be decided.

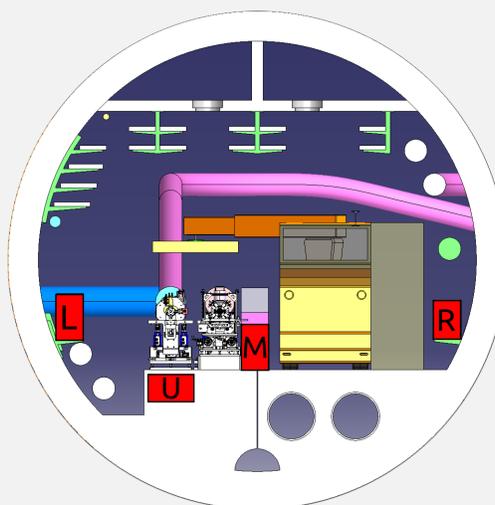


Figure 3. CLIC's tunnel cross section

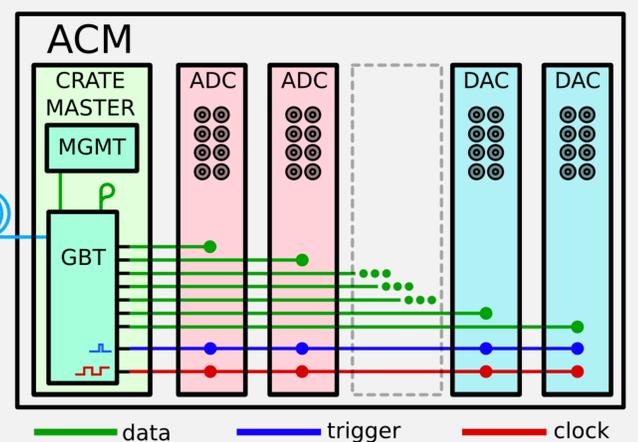


Figure 4. Concept of ACM using GBT

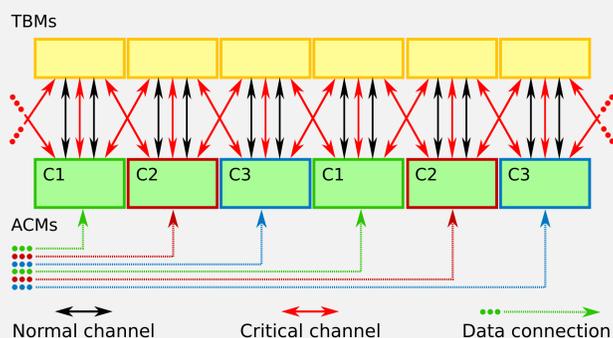


Figure 5. Redundant acquisition of critical signals

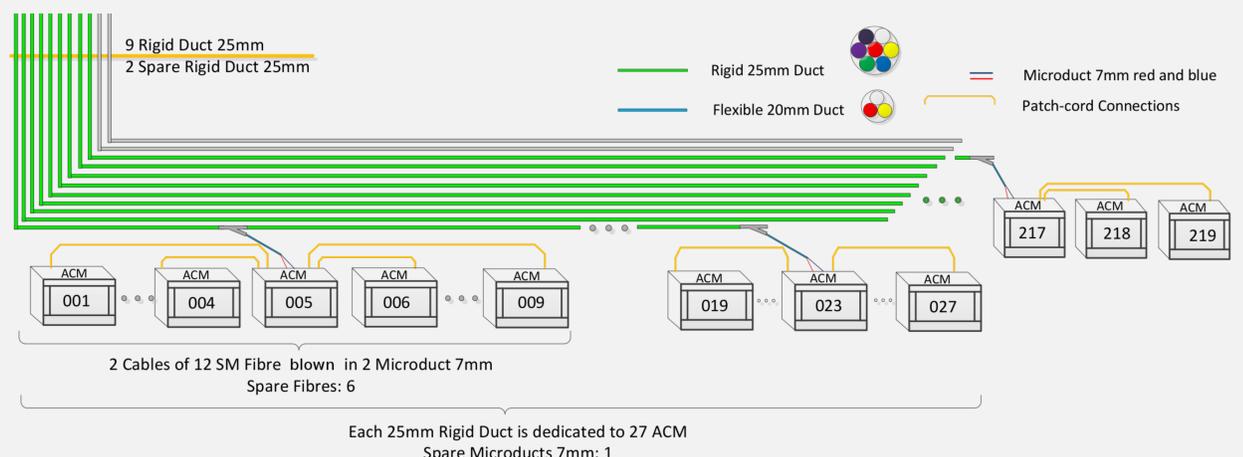


Figure 6. Detail of distribution of fibres in the Dual Star topology in a half of the sector

Figure authors:

Figure 1. - CLIC CDR

Figure 3. - A. Samochkine, CERN BE-RF-PM

Figure 6. - Simao Machado, CERN EN-EL-CF