



Topology

EVM Master main element of the topology

- Synchronized by the GPS and the master oscillator.
- In charge of the distribution of:
 - Reference frequency
 - Event trigger
 - Timestamp
 - Upstream events propagation

Injector

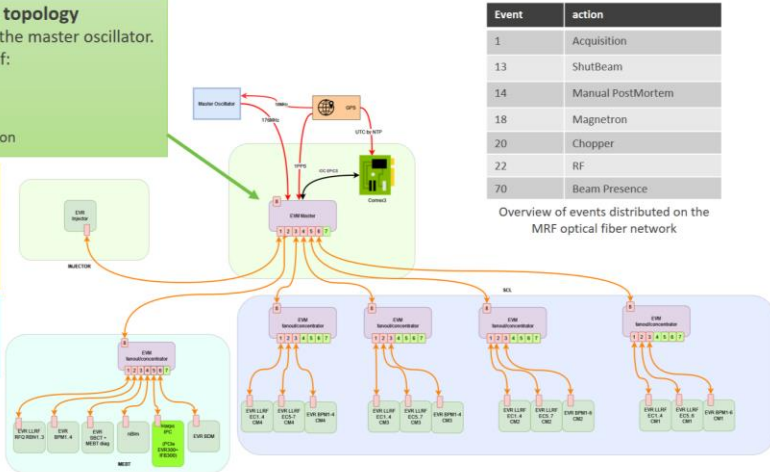
As close as possible of the main EVM to avoid propagation time and get shut beam as soon as possible.

MEBT / SCL

Possibility to operate them independently

Glossary

EVM : Event Master
EVR : Event Receiver
MEBT : Medium Energy Beam Transport
SCL : Super Conducting Linac
LLRF : Low Level RF
RF : Radio Frequency
RFQ : Radio Frequency Quadrupole
MRF : Micro Research Finland



Event	action
1	Acquisition
13	ShutBeam
14	Manual PostMortem
18	Magnetron
20	Chopper
22	RF
70	Beam Presence

Overview of events distributed on the MRF optical fiber network

Hardware platform

- ### Industrial PC
- IFB300SAM
 - IPC Kontron
 - PCIe-EVR300DCS

- ### MTCA.4
- NAT R2 crate + MCH PHYS80
 - MCH-COMEXe3
 - MTCA-EVR-300U
 - MTCA-EVM-300

- ### Universal Modules
- TTL 5V output
 - TTL input
 - Optical fiber



Operation Mode

RF conditioning Mode :

- RFQ, rebunchers and cryomodule cavities have to be conditioned.
- Each subEVM is able to produce events necessary for its own cavities.

Pilot Beam, mode to operate beam in the accelerator

- Operator configures the following sequence and MRF sequence is executed in a loop
- subEVM just used as fan-out/concentrator

Trigger event	20 (chopper)	22 (RF)	70 (beam presence)
Timestamp	0	480	500
Mask	1	0	1

Stop Beam / Start Beam

- During changing the beam destination, RFQ has to be left ON so sequencer is still ON.
- Mask (StopBeam) or Unmask (StartBeam) some events in the sequencer
 - Inputs of EVG (through EVRU) can Mask some event in the sequencer (Development to add this functionality in the mrloc2 EPICS Driver)

EVR Backplane

MTCA.4 backplane bus trigger examples

Through backplane EVRs and LLRF can manage here up to 4 cavities

EVR will manage up to 3 BPMs

Machine Protection System

Part of the MPS is delegated to MRF cards.

Critical defect example :

- EVR 1 detects rising edge (critical defect) on In0, then propagates upstream events 13 on the network.
- Internal EVRU of the EVM detects event 13, send signal on the internal EVG of the EVM
- EVG detects rising edge on inputs then propagate downstream event 13
- Depending on the EVR, event 13 will shut some signals or trig some Postmortem analysis

EVM Master main element of the topology

- Synchronized by the GPS and the master oscillator.
- In charge of the distribution of:
 - Reference frequency
 - Event trigger
 - Timestamp
 - Upstream events propagation

Injector

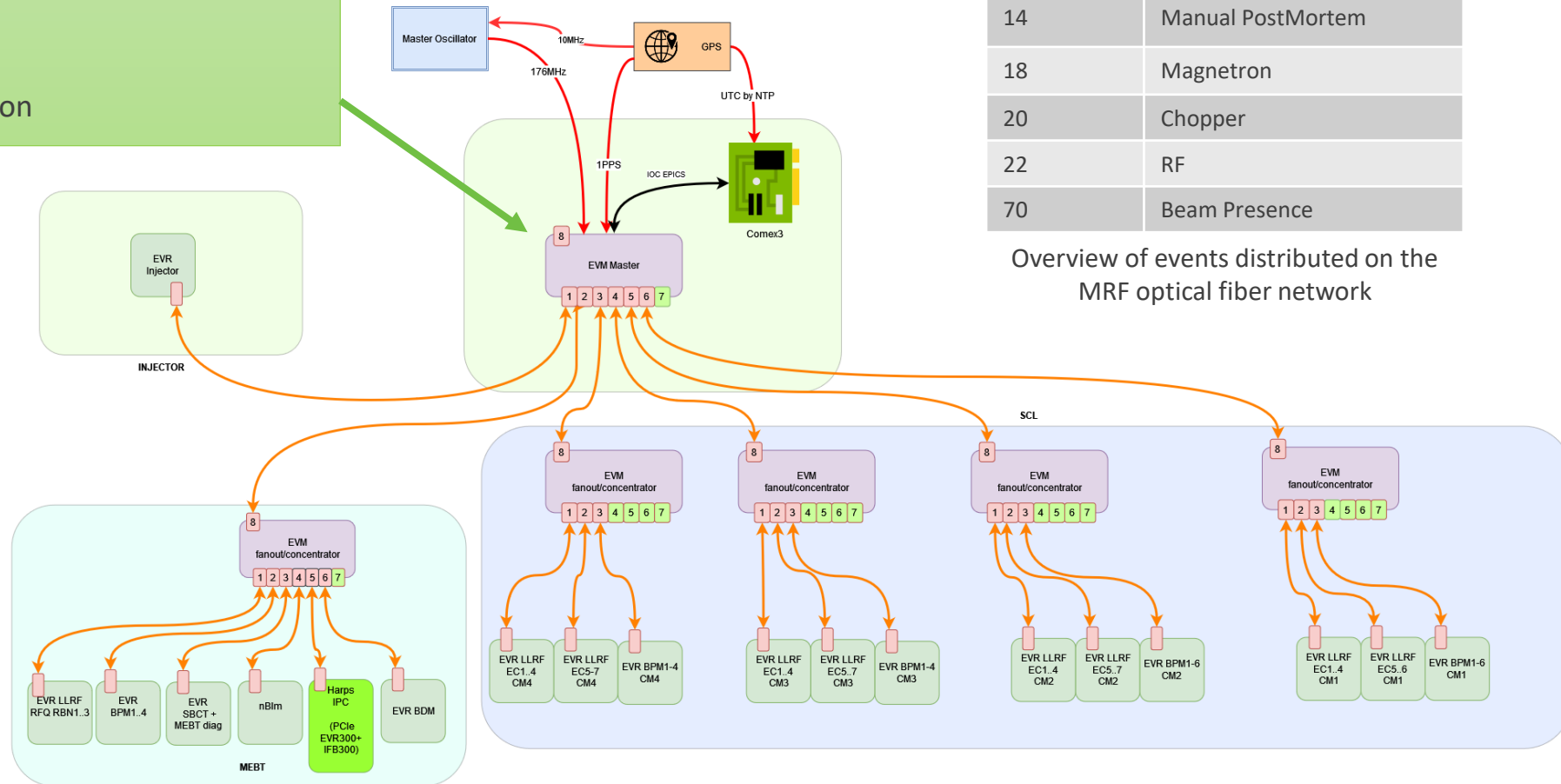
As close as possible of the main EVM to avoid propagation time and get shut beam as soon as possible.

MEBT / SCL

Possibility to operate them independently

Glossary

EVM : Event Master
 EVR : Event Receiver
 MEBT : Medium Energy Beam Transport
 SCL : Super Conducting Linac
 LLRF : Low Level RF
 RF : Radio Frequency
 RFQ : Radio Frequency Quadrupole
 MRF : Micro Research Finland



Event	action
1	Acquisition
13	ShutBeam
14	Manual PostMortem
18	Magnetron
20	Chopper
22	RF
70	Beam Presence

Overview of events distributed on the MRF optical fiber network

Industrial PC

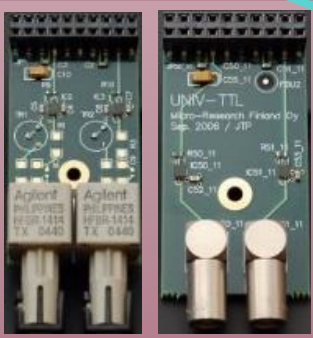
- IFB300SAM
- IPC Kontron
- PCIe-EVR300DCS

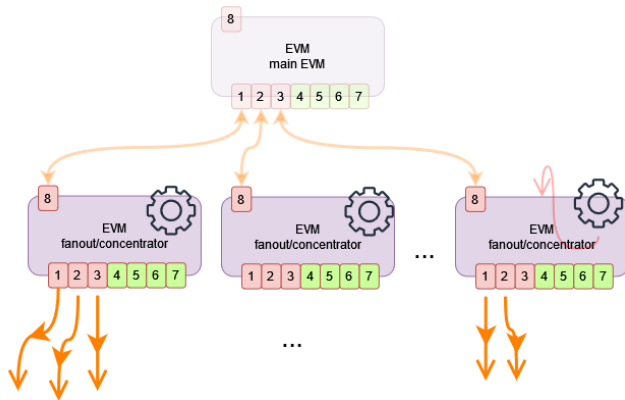
MTCA.4

- NAT R2 crate + MCH PHYS80
- + MCH-COMEXe3
- MTCA-EVR-300U
- MTCA-EVM-300

Universal Modules

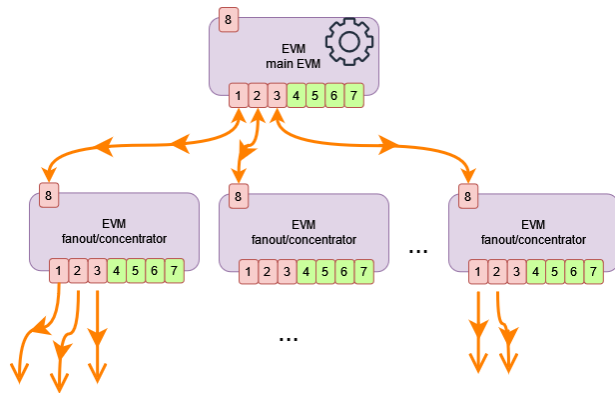
- TTL 5V output
- TTL input
- Optical fiber





► RF conditioning Mode :

- RFQ, rebunchers and cryomodule cavities have to be conditioned.
- Each subEVM is able to produce events necessary for its own cavities.



► Pilot Beam, mode to operate beam in the accelerator

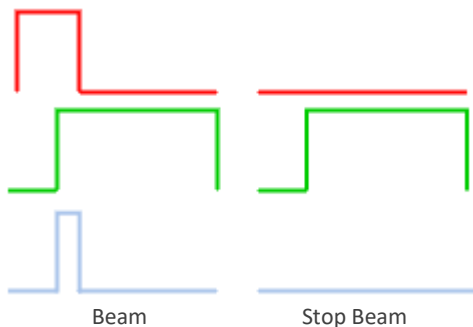
- Operator configures the following sequence and MRF sequence is executed in a loop
- subEVM just used as fan-out/concentrator

Trigger event	20 (chopper)	22 (RF)	70 (beam presence)
Timestamp	0	480	500
Mask	1	0	1

Chopper

RF Gate

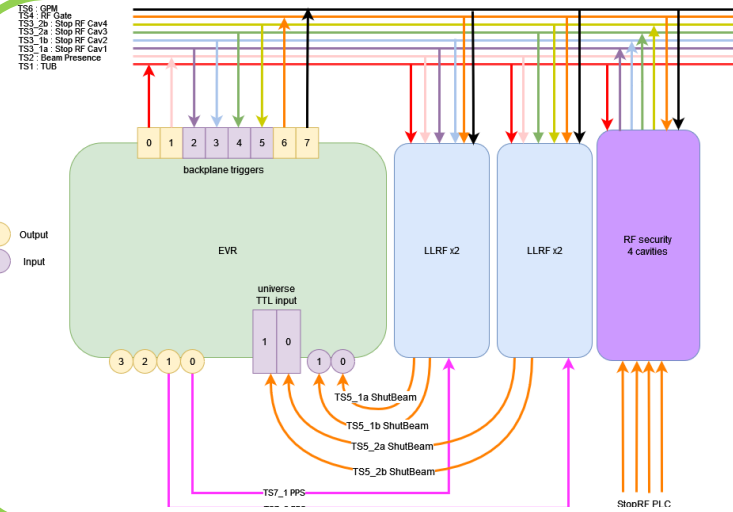
Beam presence



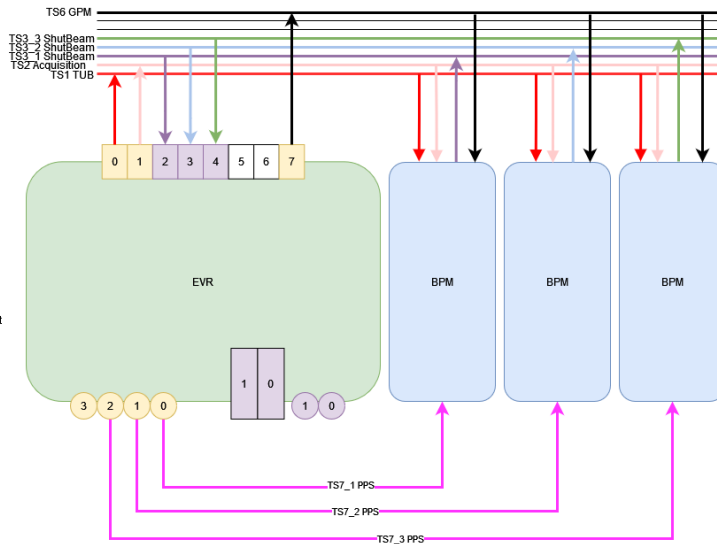
► Stop Beam / Start Beam

- During changing the beam destination, RFQ has to be left ON so sequencer is still ON.
- Mask (StopBeam) or Unmask (StartBeam) some events in the sequencer
 - Inputs of EVG (through EVRU) can Mask some event in the sequencer (Development to add this functionality in the mrfioc2 EPICS Driver)

MTCA.4 backplane bus trigger examples

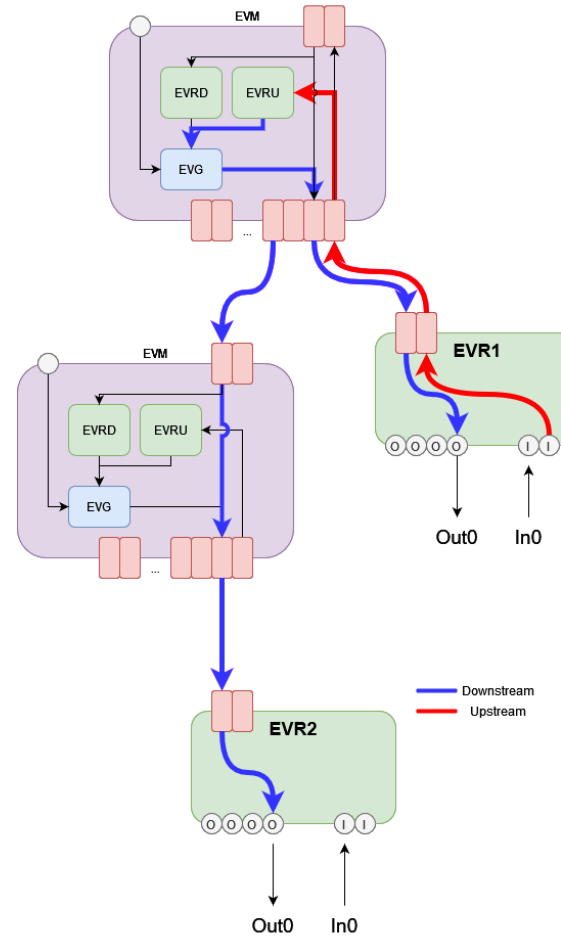


Through backplane EVRs and LLRF can manage here up to 4 cavities



EVR will manage up to 3 BPMs

Part of the MPS is delegated to MRF cards.



Critical defect example :

- EVR 1 detects rising edge (critical defect) on In0, then propagates upstream events 13 on the network.
- Internal EVRU of the EVM detects event 13, send signal on the internal EVG of the EVM
- EVG detects rising edge on inputs then propagate downstream event 13
- Depending on the EVR, event 13 will shut some signals or trig some Postmortem analysis