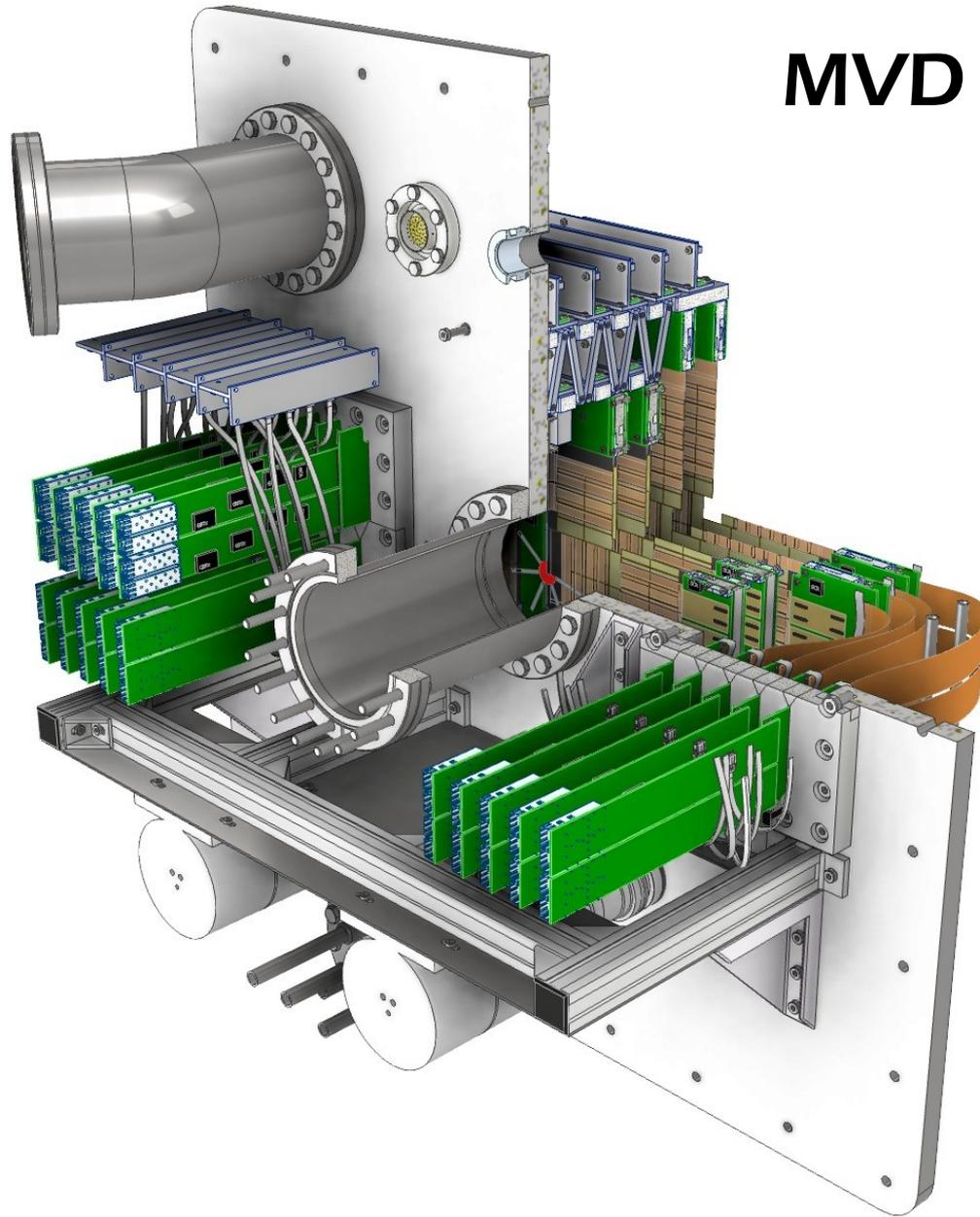


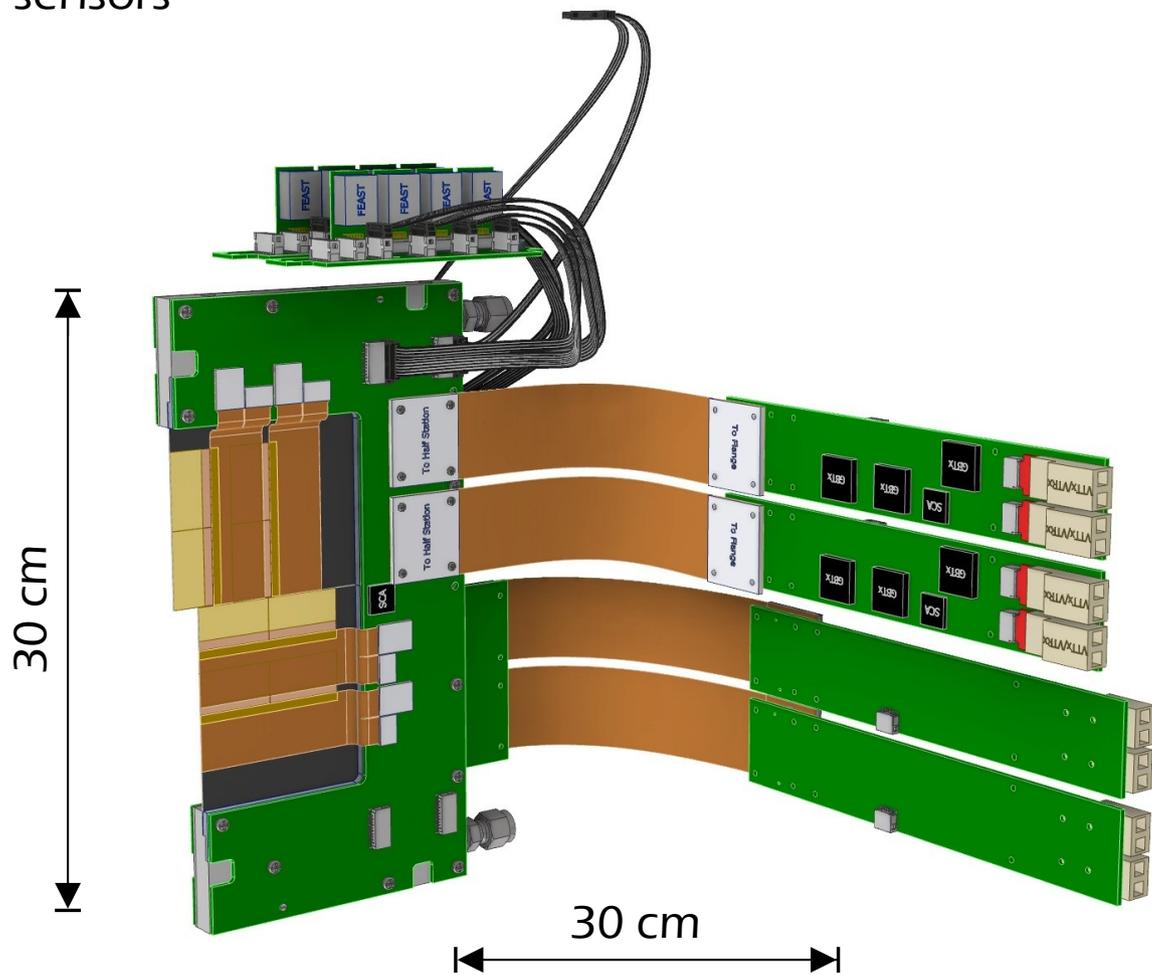
Mimosis @ MVD

MVD - full system



Station 1 (right half) full setup

Station 0 & 1: 2x2 sensors



Stations 2 & 3 have 4x4 sensors. All cables and PCB are about 10 cm longer

MVD Components

Power Boards with
CERN FEAST DCDC

Mimosis sensors

GBT-SCA for sensor
control & monitoring

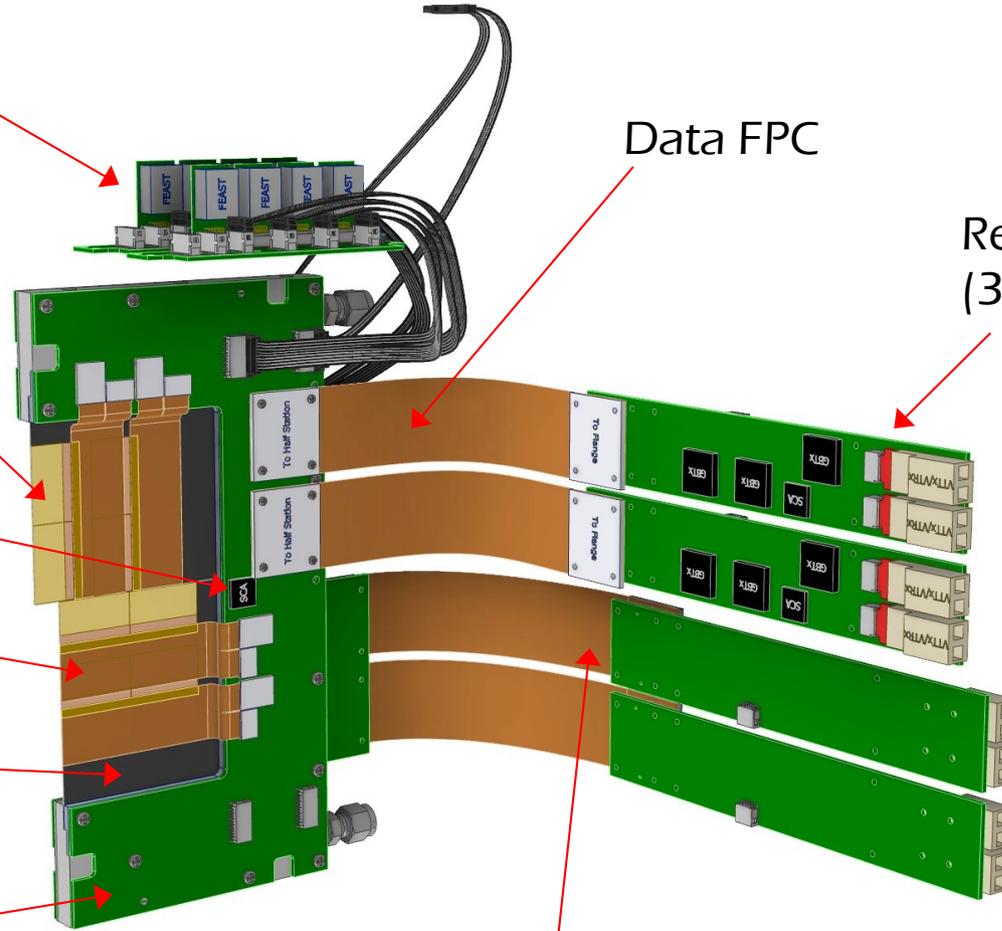
Sensor FPC

Carrier (TPG)

Front-end board
(on heatsink)

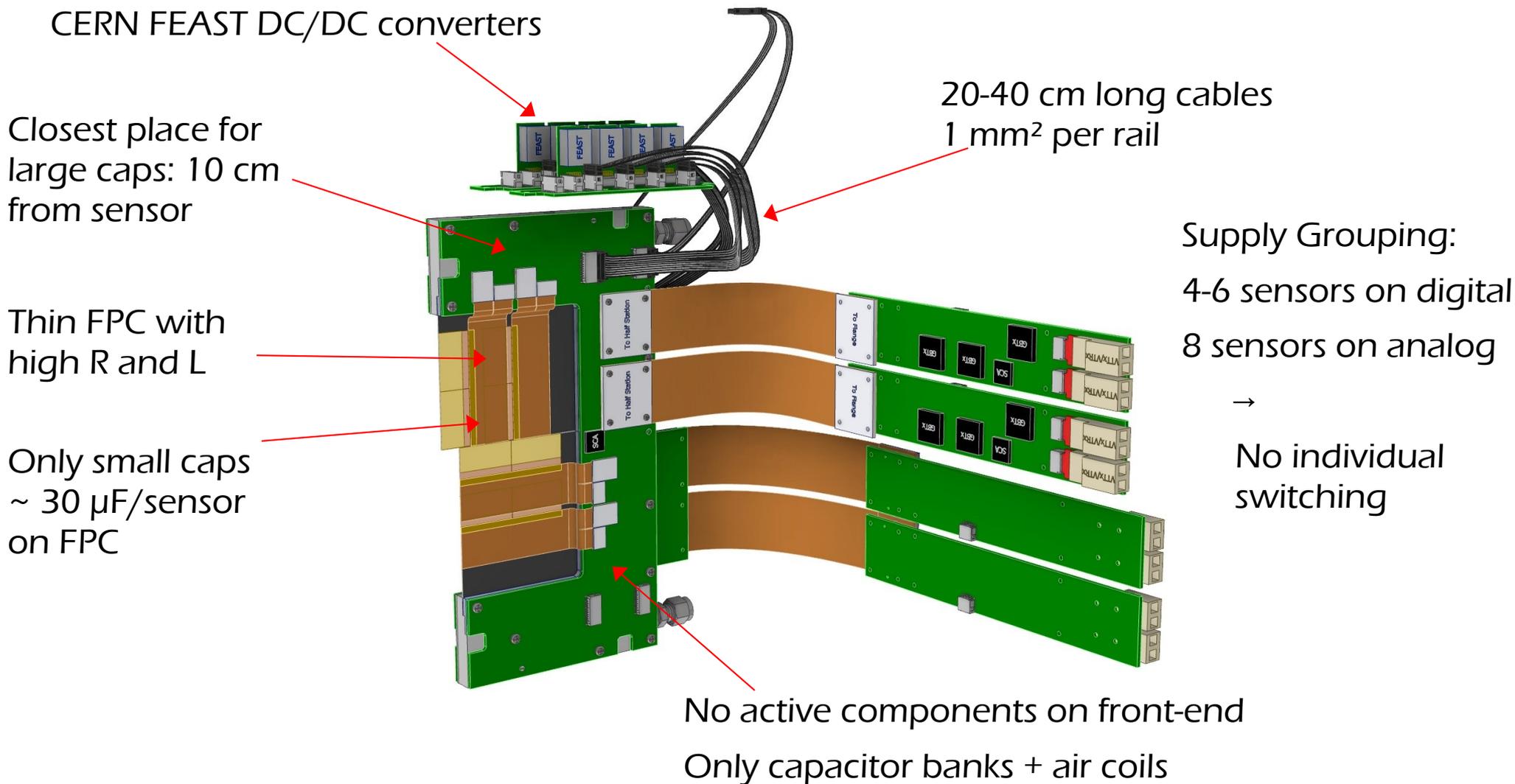
Data FPC

Read-out boards
(3 GBTx / VTRx / VTTX)
common CBM
hardware

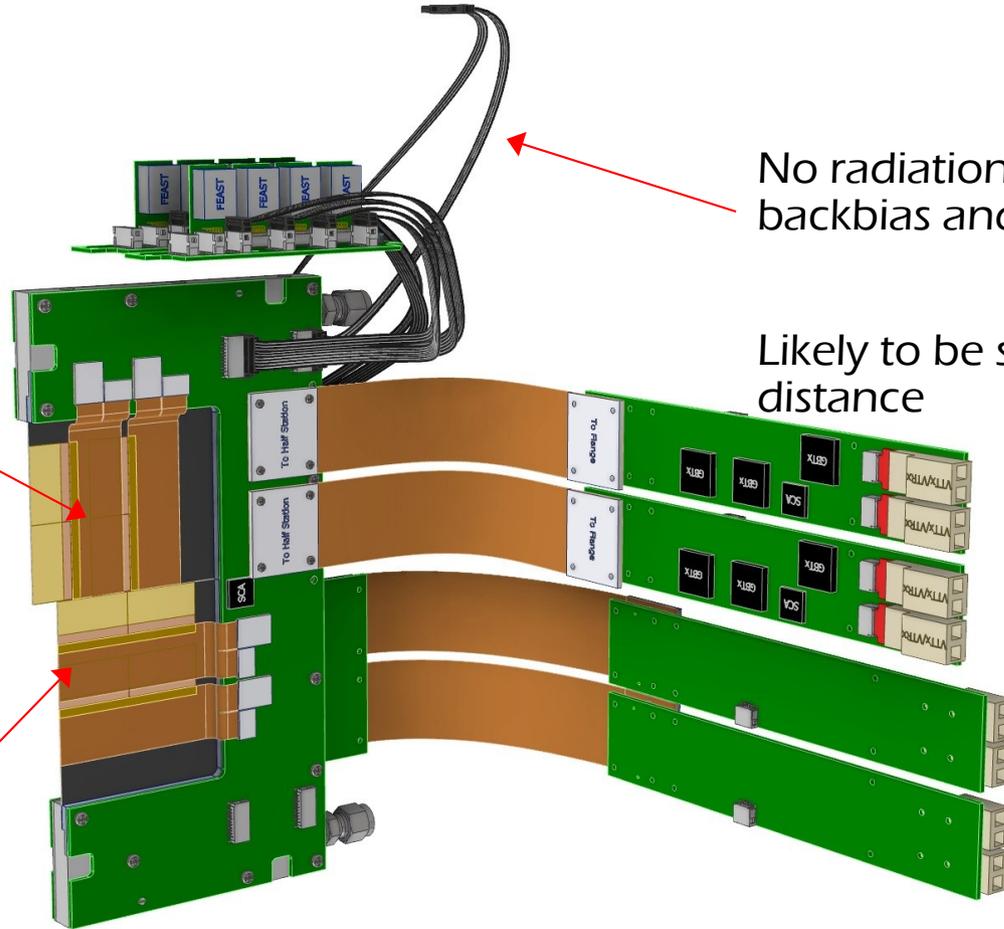


Position of vacuum feed-
through (not shown)

Operational Challenges: Power



Operational Challenges: Biasing & Control



No radiation hard regulators for backbias and HVreset voltages

Likely to be supplied from 20 meter distance

Width of FPC limited – number of control lines needs to be small

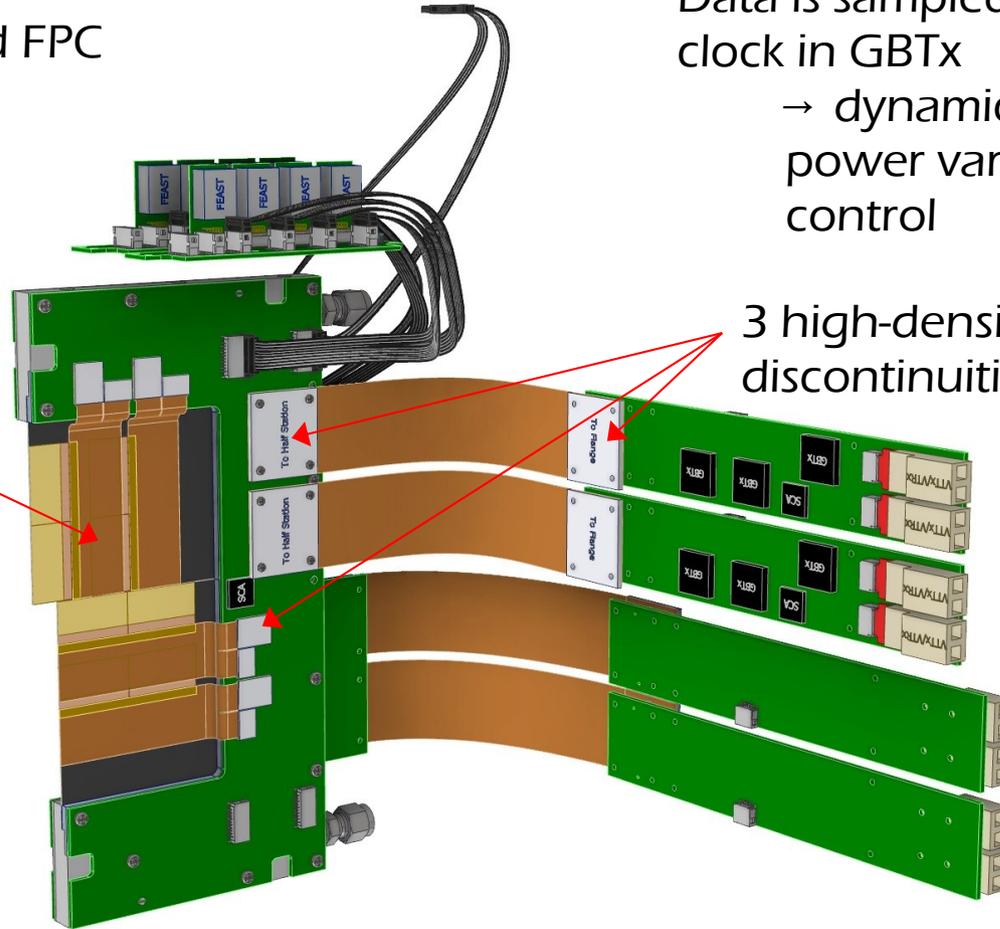
Biasing voltages subject to GND shifts due to dynamic power consumption

Operational Challenges: Data Integrity

320 Mbit/s SLVS
up to 90 cm PCB and FPC

First ~ 12 cm on
single-layer, thin FPC

PLL fall-back solution
requires 320 MHz
clock input

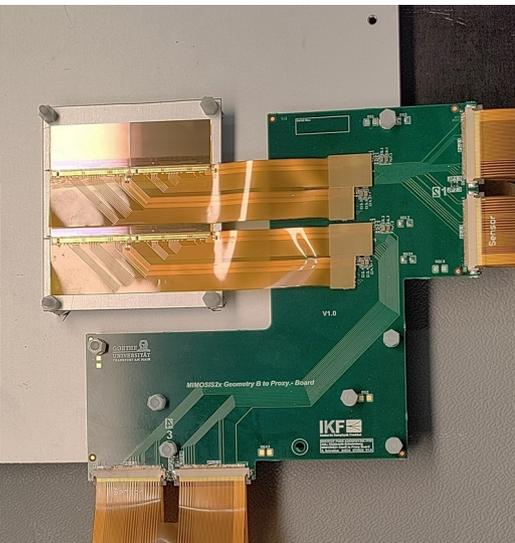
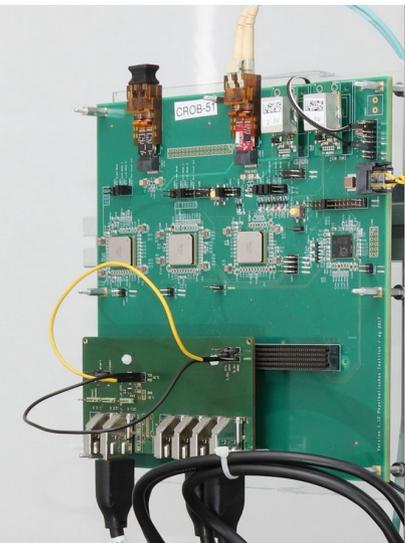
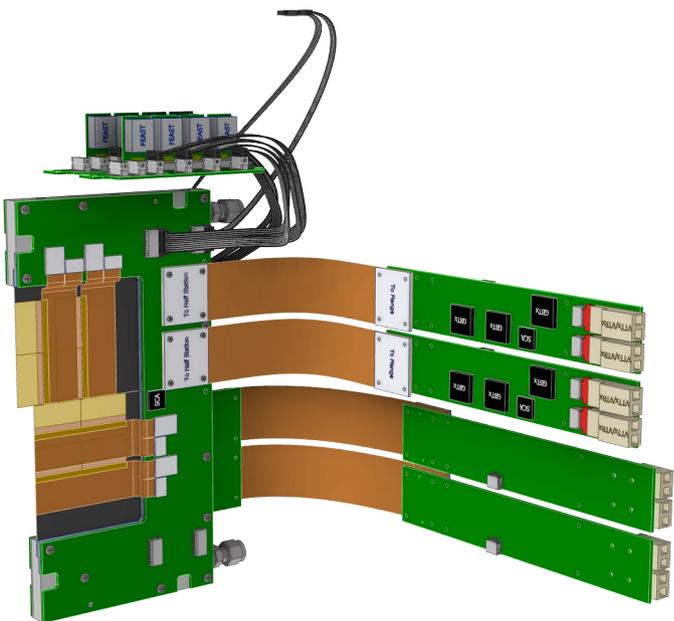
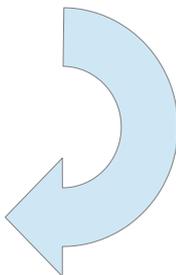
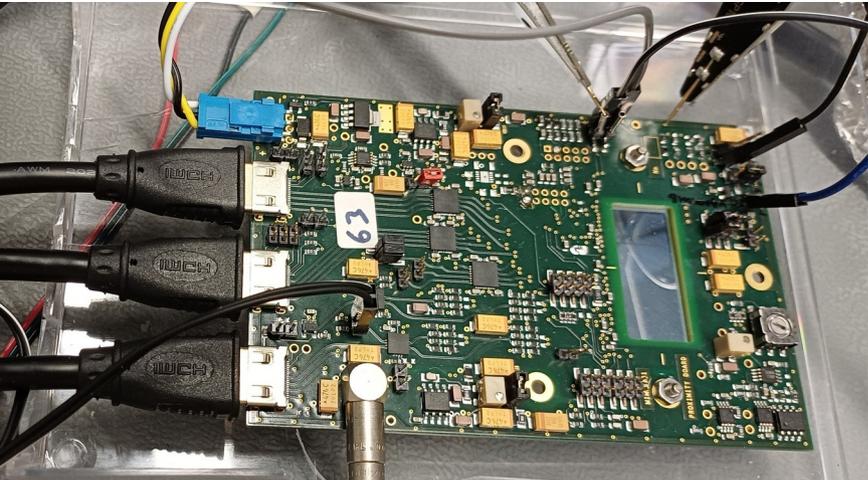


Data is sampled with phase-adjusted
clock in GBTx
→ dynamic phase shifts due to
power variations must be under
control

3 high-density connectors /
discontinuities in data path

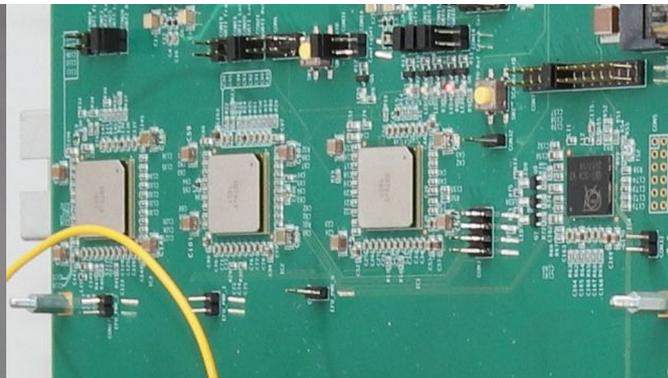
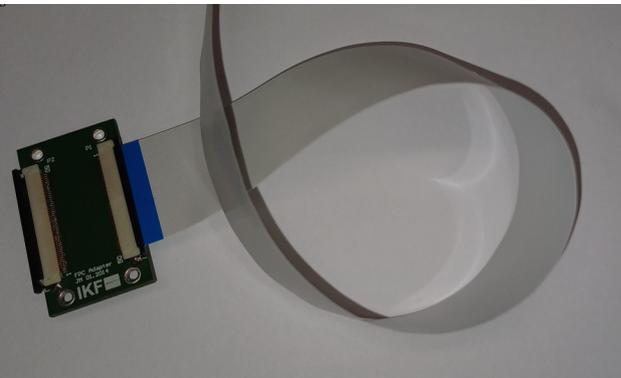
SLVS: common mode 200 mV
GND: 40 mV shift along FPC

Evolving towards realistic setup



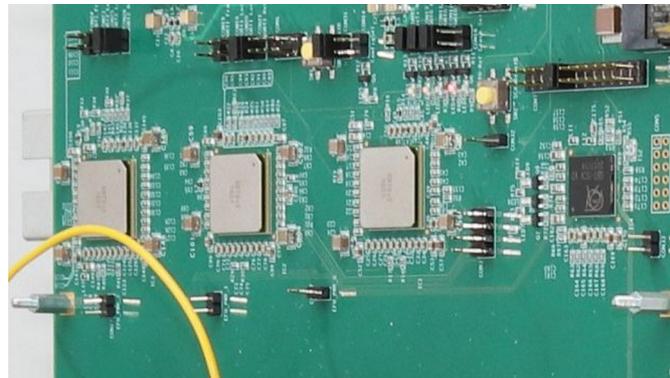
Basic tests: Data

Aspect	Test	Result
Long Data Cables	Read-out over 1m industrial flex (non-differential, non-optimized)	Digital signal quality worse, but still with a lot of margin
		I2C starts to have issues at 50 cm, but not required for final system
Compatibility to GBTx	Beam campaign with mCBM	Data successfully received and forwarded
	Data transport included LVDS repeaters	No test with direct SLVS to GBTx



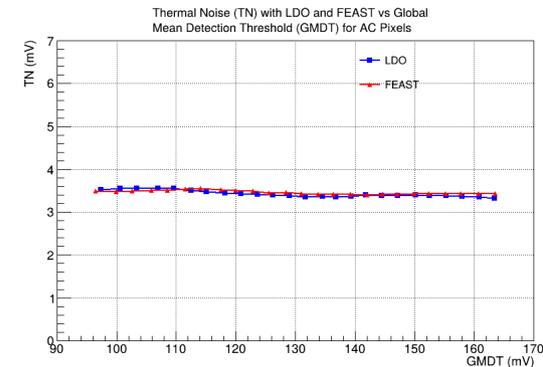
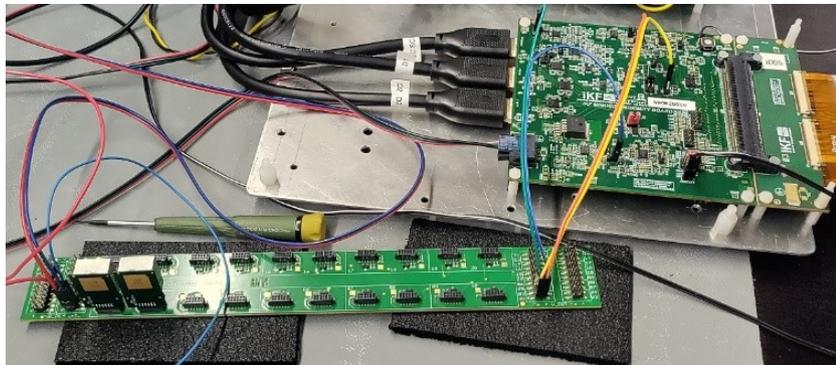
Basic tests: Control & Monitoring

Aspect	Test	Result
Compatibility to GBT-SCA	I2C control via GBT-SCA	Successfully used in mCBM test run Monitoring via ADC t.b.d., but no issues expected
Initialization without external Start / Sync / Reset signals	Try operation without these signals connected	Operation possible M2.1 needs external fail-save circuitry → changes in M3
Control during run	Test I2C operations during data taking	M2.1 exhibits failures due to high I/O current → changes in M3



Basic tests: Power

Aspect	Test	Result
Influence of DC/DC	Powering of sensors using FEAST MP instead of on-board LDOs	No influence on noise seen
Single Supply Failure	Power sensor with one power / bias rail missing	No destructive effects seen Back bias must stay connected → include diode to keep < +0.3V
Biasing vs. voltage drop	Evaluate influence of dynamic GND shift on analog functions	Operation within foreseen margins ok
Data vs. voltage drop	Evaluate influence of dynamic load on digital data	Large shifts in timing (4ps/mV) → changes in M3





Some additional, detailed views

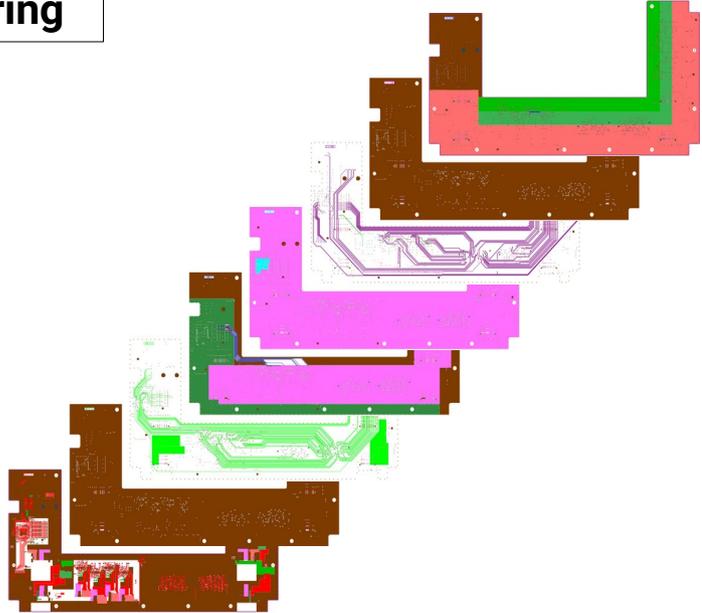
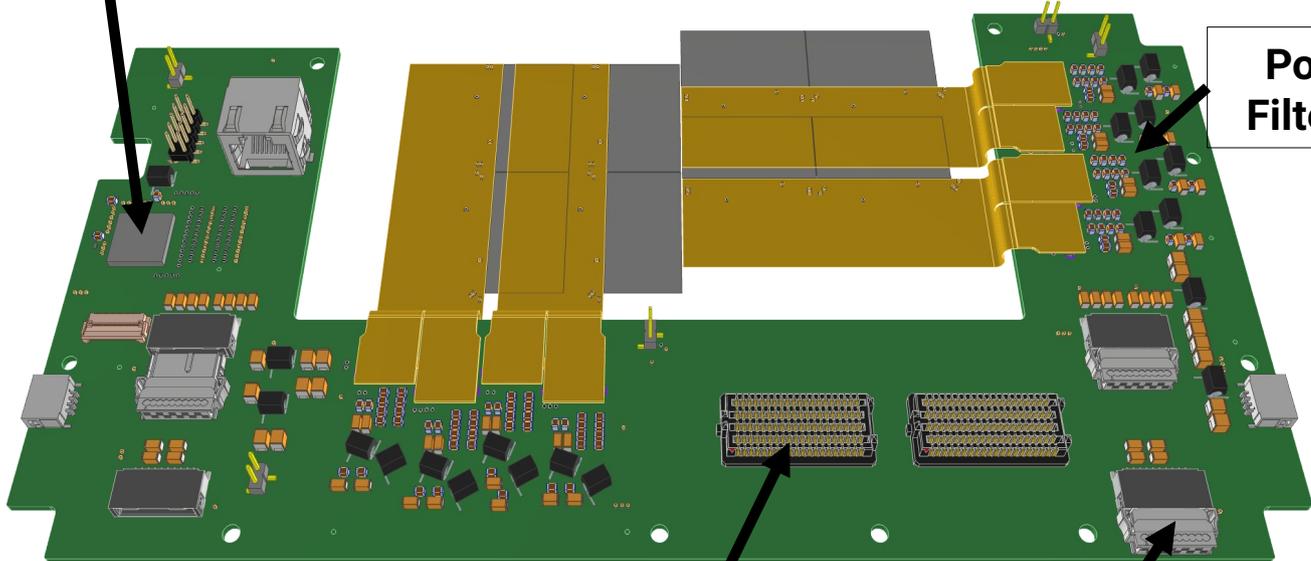
Front End Board

Slow Control,
Monitoring
(GBT-SCA)

Power
Filtering

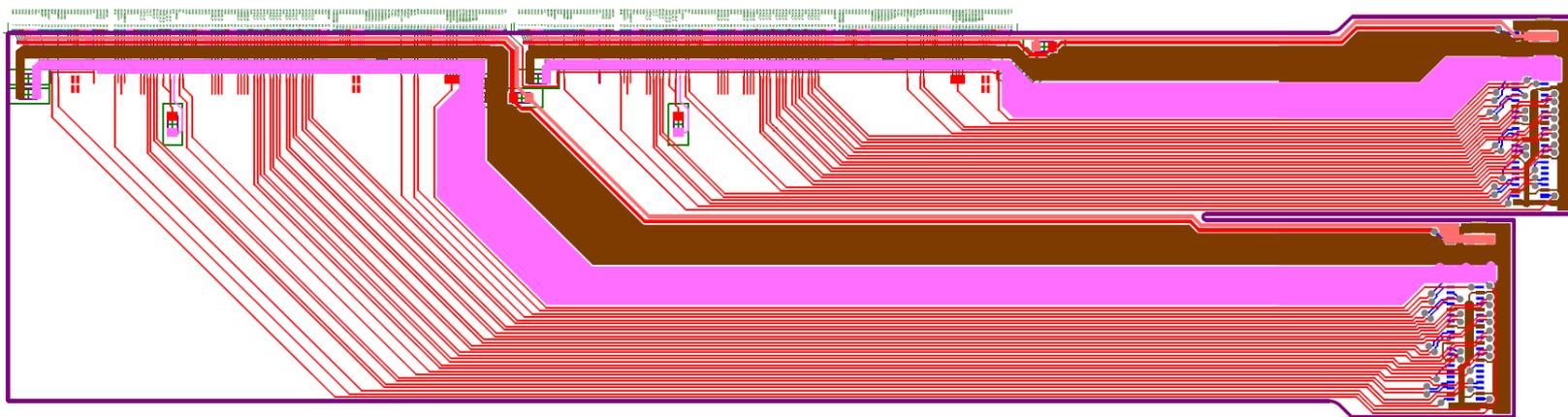
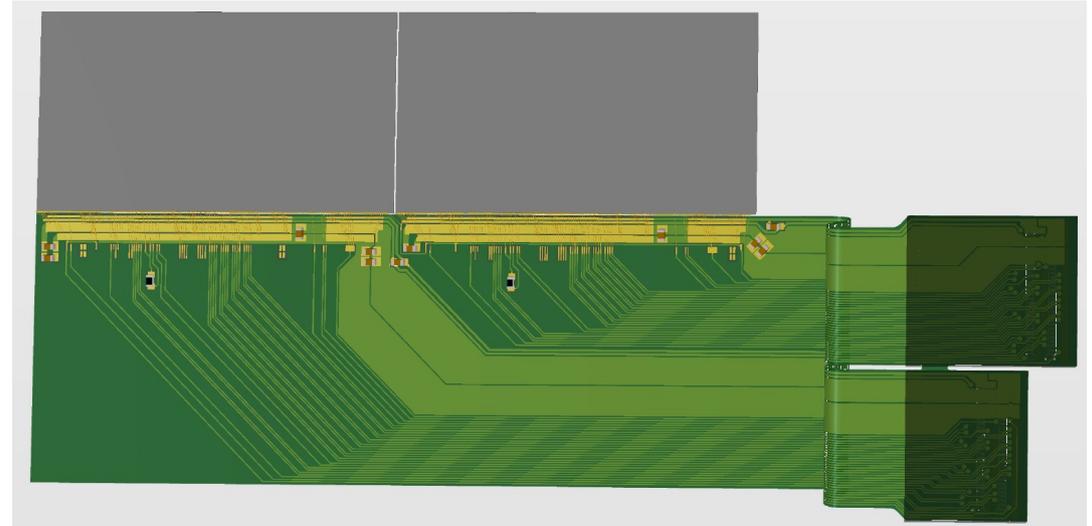
Data,
Clock

Power
Input

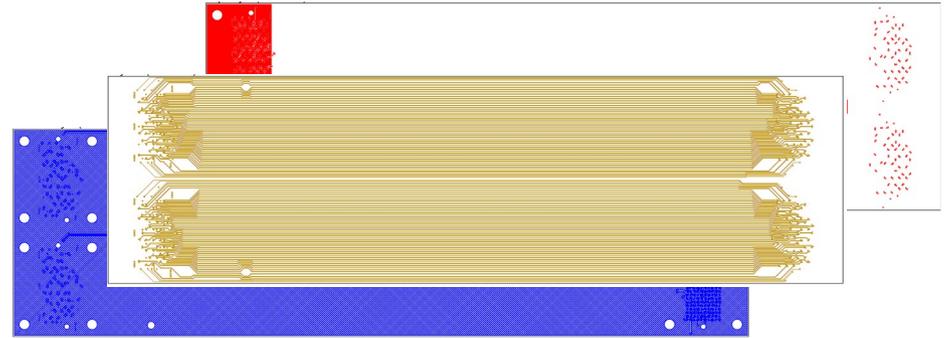
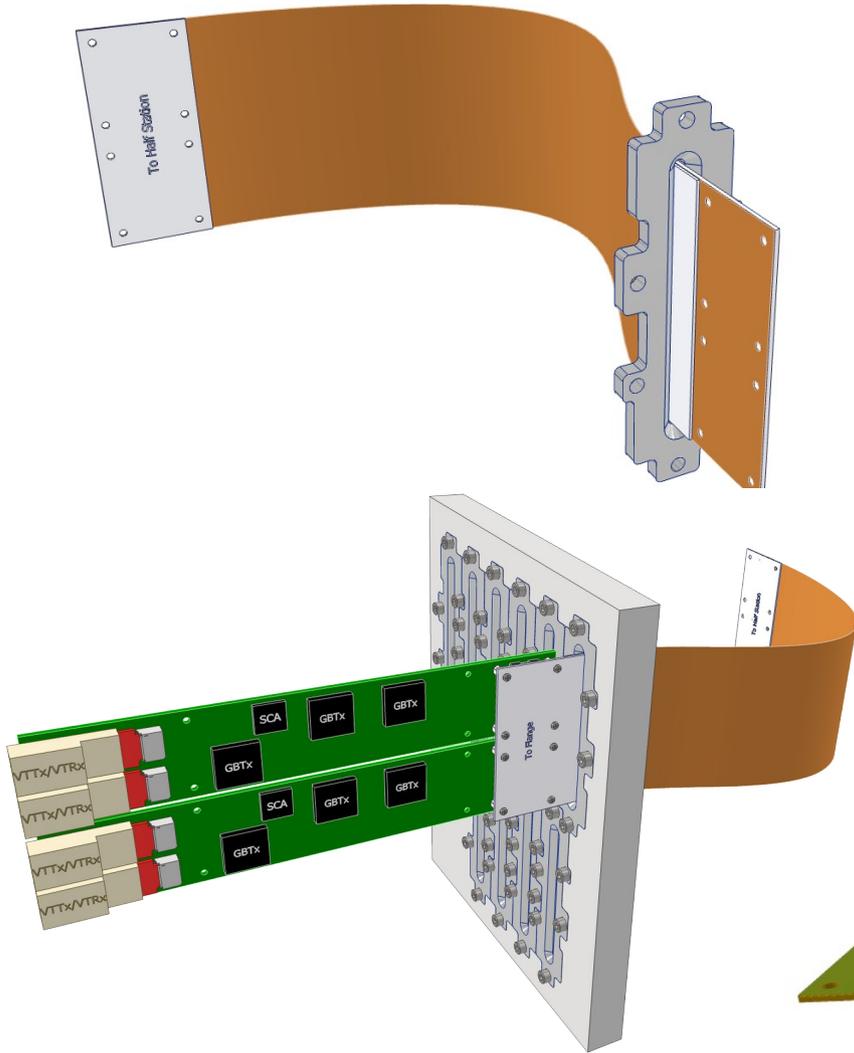


Sensor FPC

- Close-to-final design
- Currently 18 μm copper, planned 9-12 μm
- Few capacitors close to sensors
- Large stations require FPC with +6 cm length



Data Cable / Feed-through

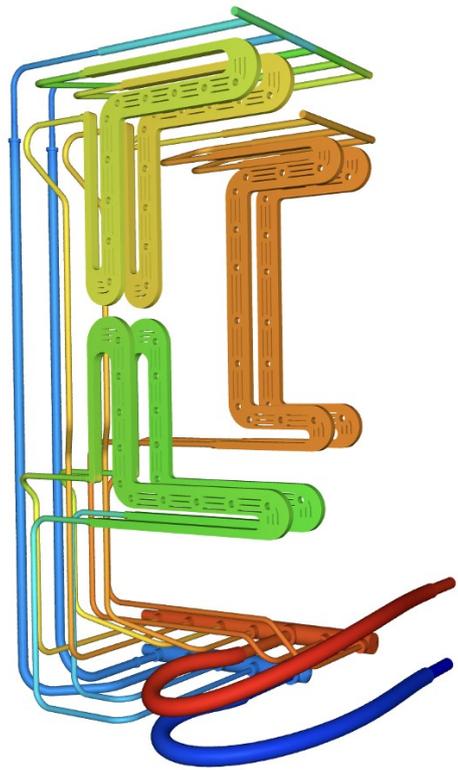
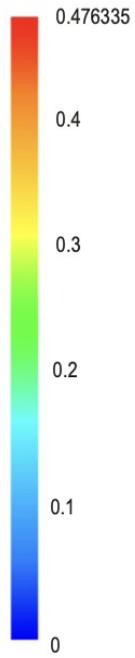


- 2.5 layer FPC
- 25 – 35 cm length
- Stiffener glued into vacuum flange



Heatsink (TPG & alum.)

Static Pressure - bar



Passive, conductive cooling

Active, liquid cooling

