

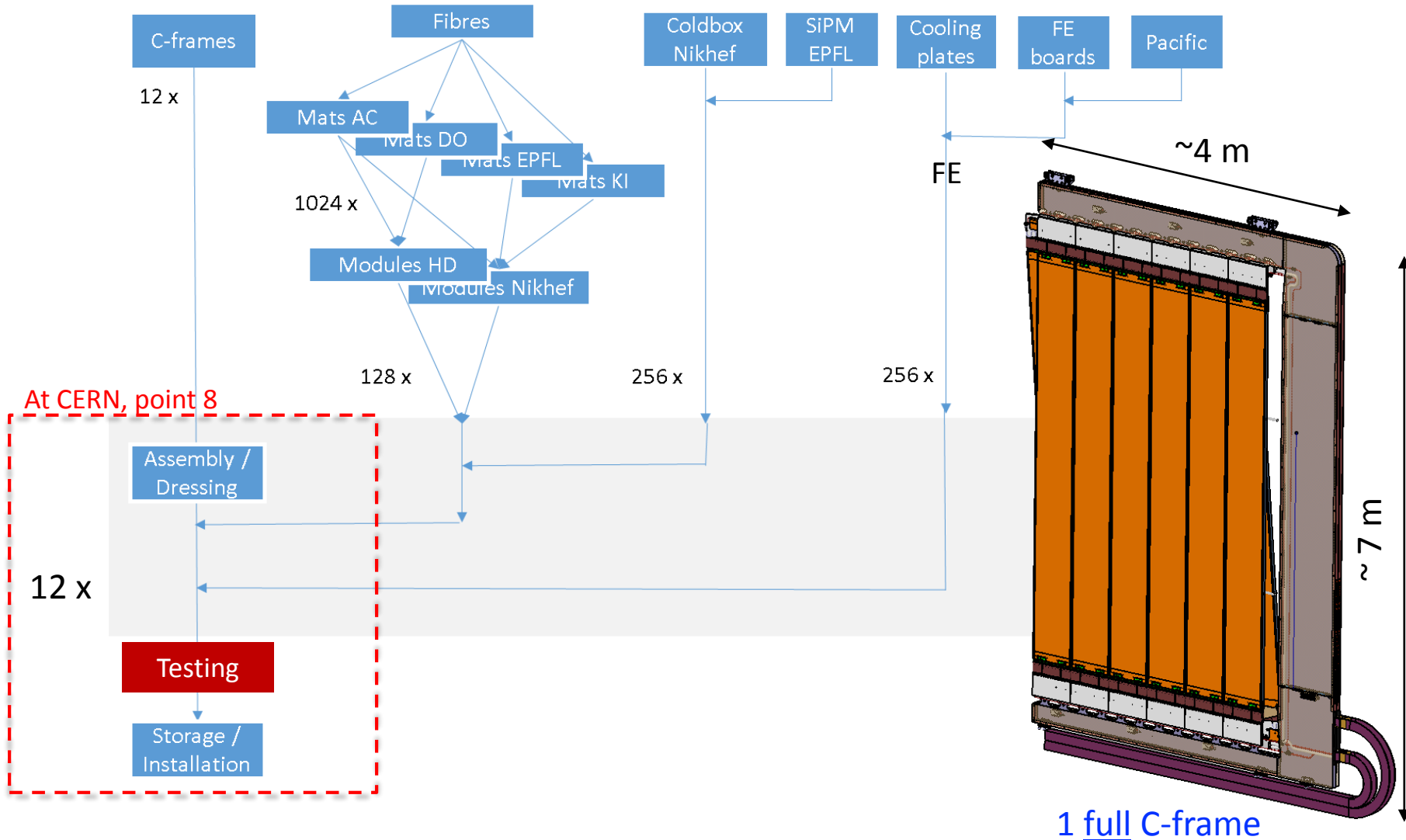


Electronics needs for SciFi testing and commissioning

C. Joram for the LHCb SciFi team

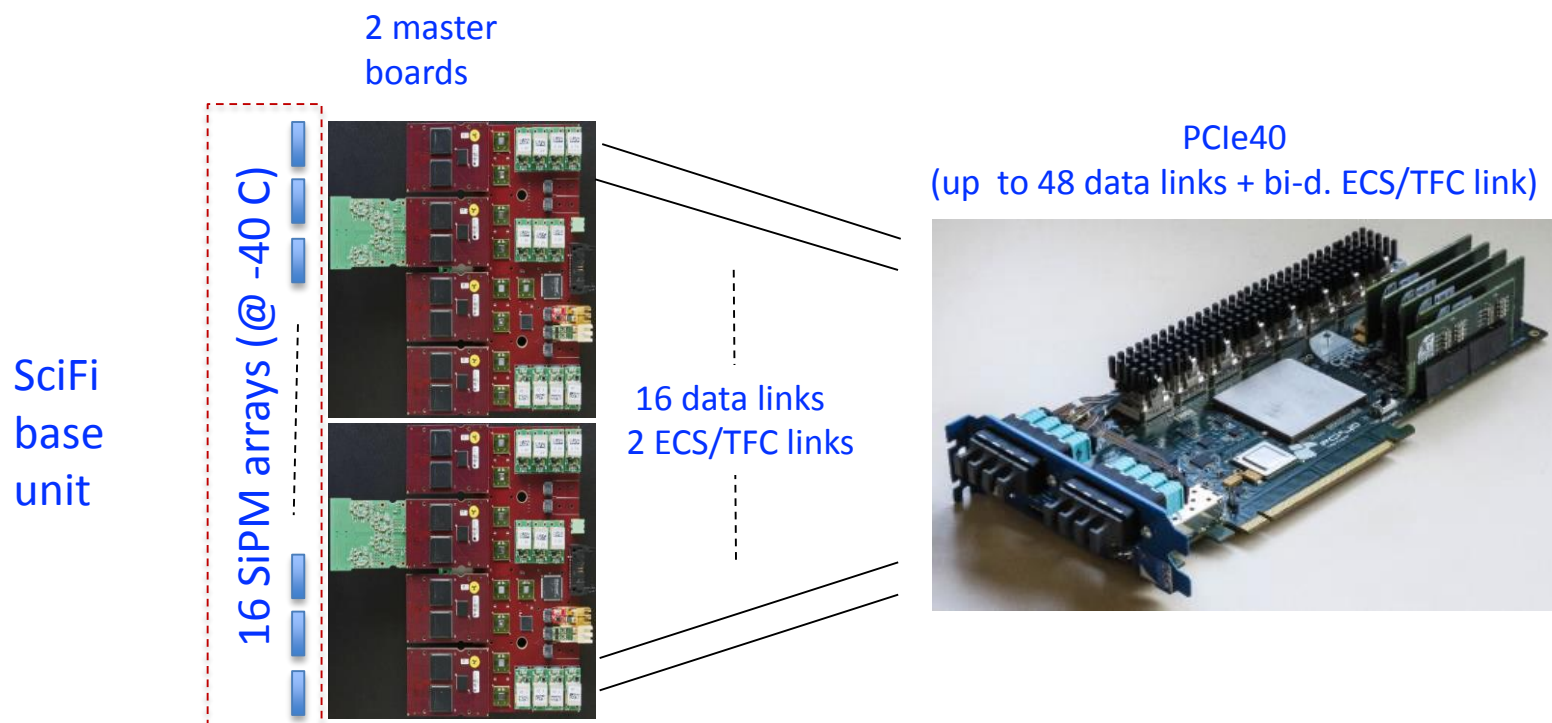
LHCb Electronics Meeting
13.04.2017

Simplified work flow: production and integration (numbers w/o spares)



SciFi in numbers

- SciFi = 128 fibre modules \rightarrow 256 Front-ends (FE)
- 1 FE = 16 SiPM arrays = 16 data links + 2 \times 2 (bidirectional) ECS/TFC links
- 1 FE = 100 W power
- 1 full C-frame = 5 + 5 or 6 + 6 modules (vertical + stereo) = 20 or 24 FE = 3 kW
- 1 full C-frame = 320 or 384 SiPM arrays / data links, 80 or 96 ECS/TFC links



Need 1:

Reception of Cold Boxes at point 8

- Cold boxes (loaded with 16 SiPMs) will be (re-)mounted on fibre modules (2 CB per module)
- Tests shall verify: functional SiPMs, good optical alignment, light tightness, gas tightness.
- Use of a fully analog SPIROC readout system. Detection of light from light injection system.
- “Standard” central support needed (mechanical infrastructure, cabling, power supplies, desktop+internet+disks, etc.)

>5 m



Need 2: C-Frame Tests

Assumptions

C-frames will be fully tested before installation:

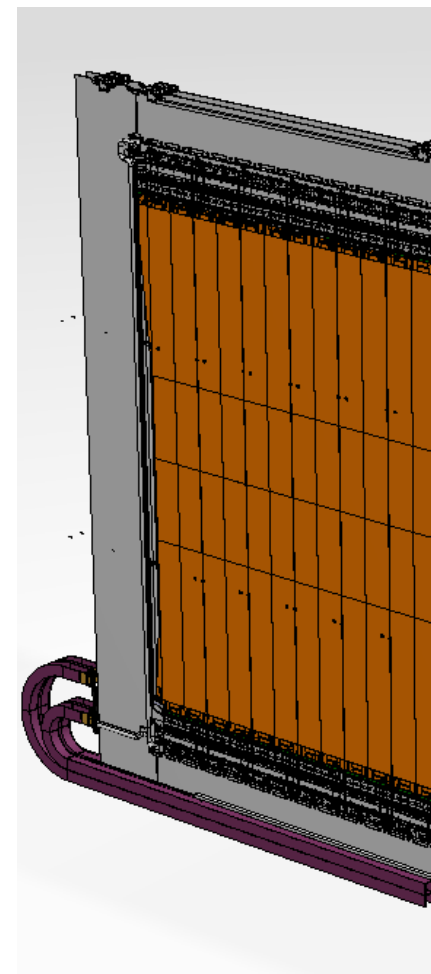
- SiPMs cooling to -40°C (Novec system)
- SiPM biased (“HV”)
- Water cooling of electronics
- Test of full front-end electronics

Thermally (Novec), the 12 Cold Boxes at the top (or bottom) form one circuit. → test all together.

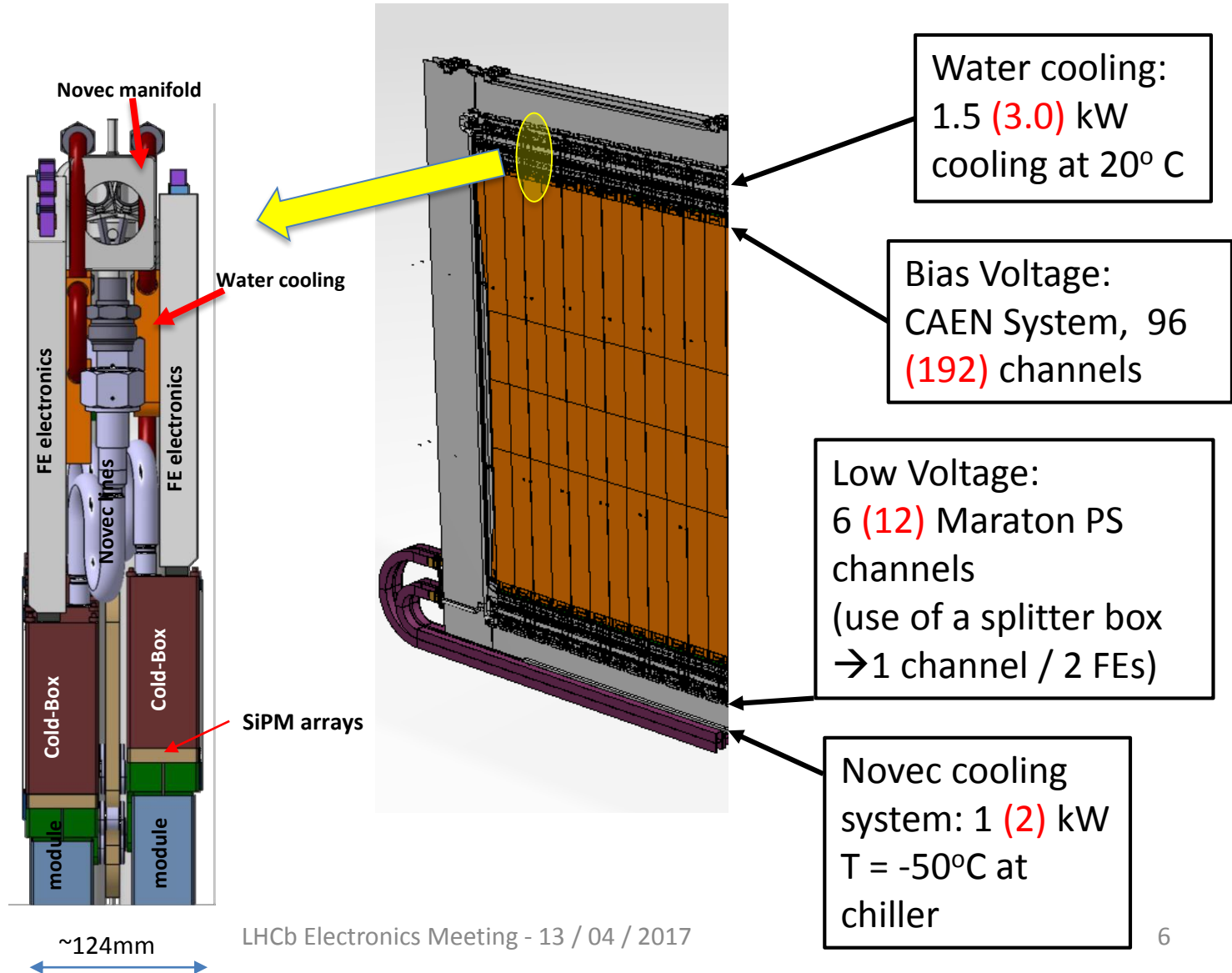
Minimum configuration: 2 upper/lower half layers

Preferred configuration: full C-frame

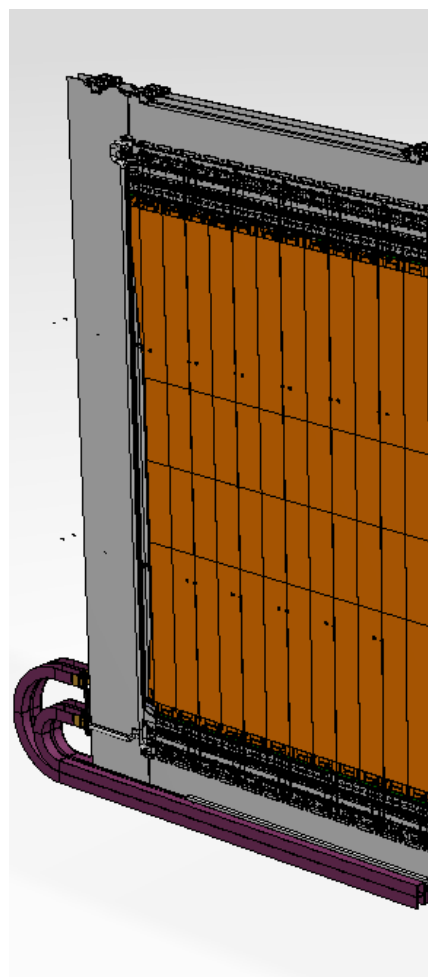
- 6 modules (25000 channels) (12 modules, 50000 chan)
- 12 (24) FE w/ 192 (384) data links
and 48 (96) control links
- LV power supplies: 1.8 kW (3.6 kW)
- Water cooling: 1.5 kW (3.0 kW)



C-Frame Tests: Infrastructure



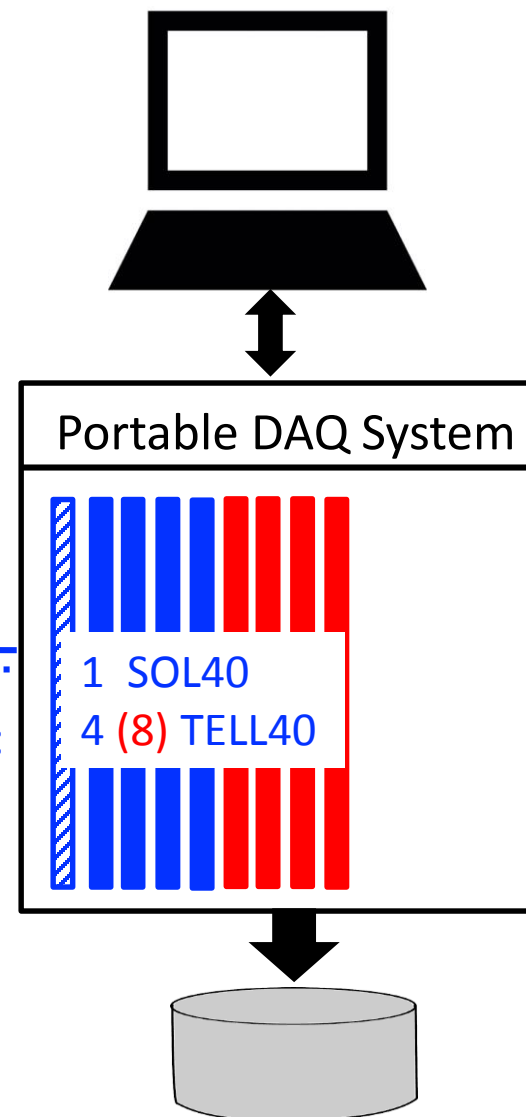
C-Frame Tests: DAQ System



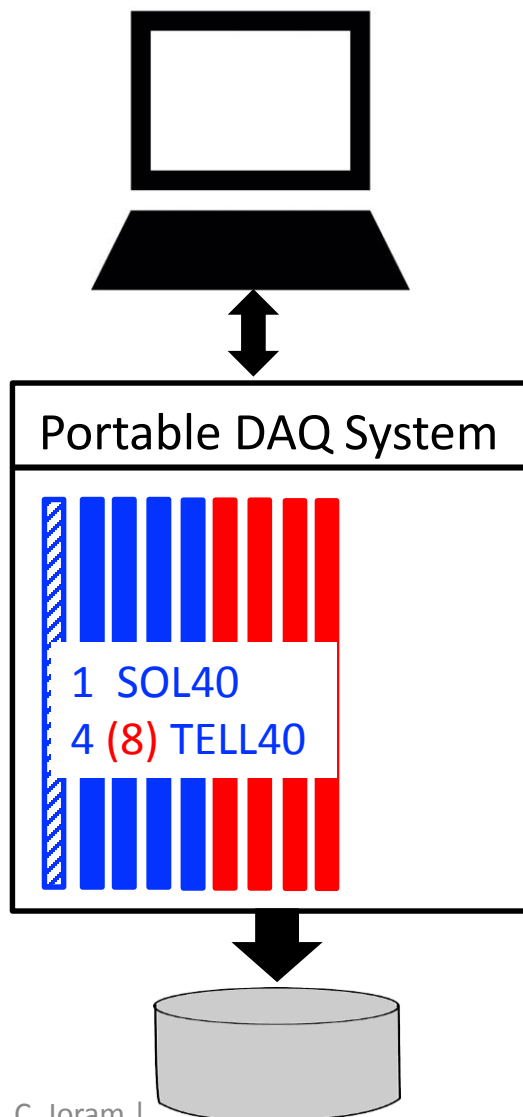
Minimum (preferred) configuration:

Optical data links:
16 (32) MPO connections

Control links (bidirect.):
2 (4) MPO connections



Portable Mini-DAQ System



1 SOL40,
4 (8) TELL40

Necessary Software:

- Fast and slow-control
- Event building
- Event handling and event storage

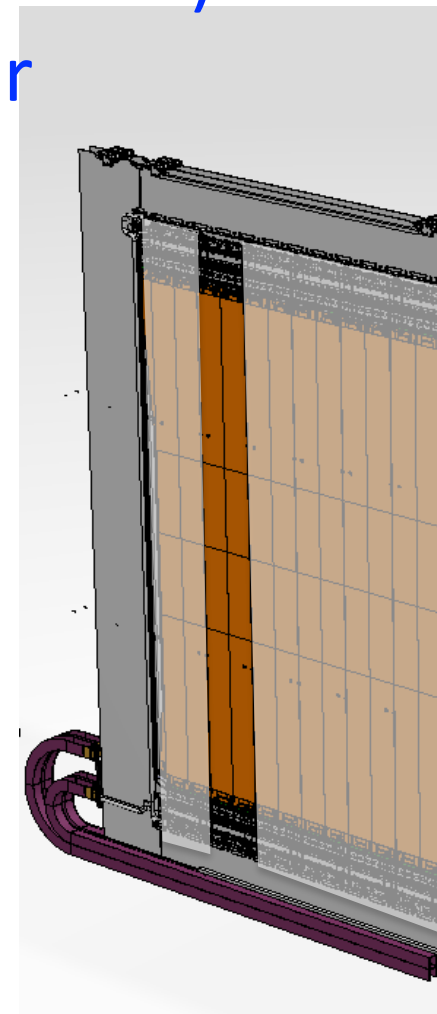
In addition we need the support by the DAQ team to operate this large system (~1/12th of final system)!

Need 3:

1 FE Tester (2048 PACIFIC channels) to test, debug and repair

- FE tester developed by SciFi group
- Perform diagnosis and re-test after repair
- Assumes a miniDAQ-based readout and control
- $T_{\text{SiPM}} = \text{ambient}$. FEE cooled by water at 15°C.

Readout / control by MiniDAQ1/2



LHCb SciFi: Estimates of infrastructure needs for detector testing during integration

SPIROC based RO system for 1 ROB (16 SiPM) for reception control

1

central support	Location	Start date	LV power supply		HV power supply		LV cabling		PCIe40		Optical fibres			Cooling			Total el. Power
			type	# chan	type	number	type	number	TELL40	SOL40	number	length	connectors	coolant	power	T _{op}	
no	SX8 (clean box)	4/2018	lab	some	CAEN	32	stan-dard	some	0	0	/	/	/	none	none	ambient	marginal

PACIFIC based RO system for 1 full C-frane (24 FE) for commissioning and testing

2

central support	Location	Start date	LV power supply		HV power supply		LV cabling		PCIe40		Optical fibres			Cooling			Total el. Power
			type	# chan	type	# chan	type	number	TELL40	SOL40	number (data/control)	length	connectors	coolant	power	T _{op}	
yes	3852	4/2018	Maraton	12	CAEN	192	35mm2	12	8	1	384/96	20 m	MPO	Novec	1 kW	-40 at SiPM	
														H2O	3 kW	ambient	3 kW

PACIFIC based RO system for 1 FE (16 SiPM) for debugging and repair

3

central support	Location	Start date	LV power supply		HV power supply		LV cabling		PCIe40		Optical fibres			Cooling			Total el. Power
			type	# chan	type	# chan	type	number	TELL40	SOL40	number (data/control)	length	connectors	coolant	power	T _{op}	
yes	3852	4/2018	Maraton	1	CAEN	8	35mm2	1	1	1	16/4	20 m	MPO	H2O	100 W	ambient	100 W

