MAUVE
LHCb UT & Velo CO_2 cooling system
Open points

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P. Tropea, on behalf of the DT cooling team

CERN
EP-DT
Detector Technologies

Open points

1. Detector requirement update
2. Operation modes & agreements between subdetectors
3. On site activities
4. M&O & spare part purchases

Detector requirement update

Reminder: so far, data used for design have been those collected at the meeting of October 13th, 201, as reported at the PRR

Have those numbers changed?

In particular: total flow & DP

Update of P&ID:
need detector input!

EDMS 1556956

Operational parameters for detector

data from LHCb cooling meeting on October 13th, 2016
https://indico.cern.ch/event/568964/

		UT 1/2	Velo 1/2	Main lines
Flow	g/s	28.8	15.6	89
By-pass flow @ detector	g/s	0	0.4	0.8
Flow used * calculations	g/s	28.8	16	89.6
Power	W	2500	1040	7080

Flow always in by-pass at the detector level

Total flow in main lines = sum of both detector max needs (including local by-pass)

For each detector max flow & max power are considered
0.9 g/s for UT staves – 5 kW
0.6 g/s for each Velo module – 2 kW

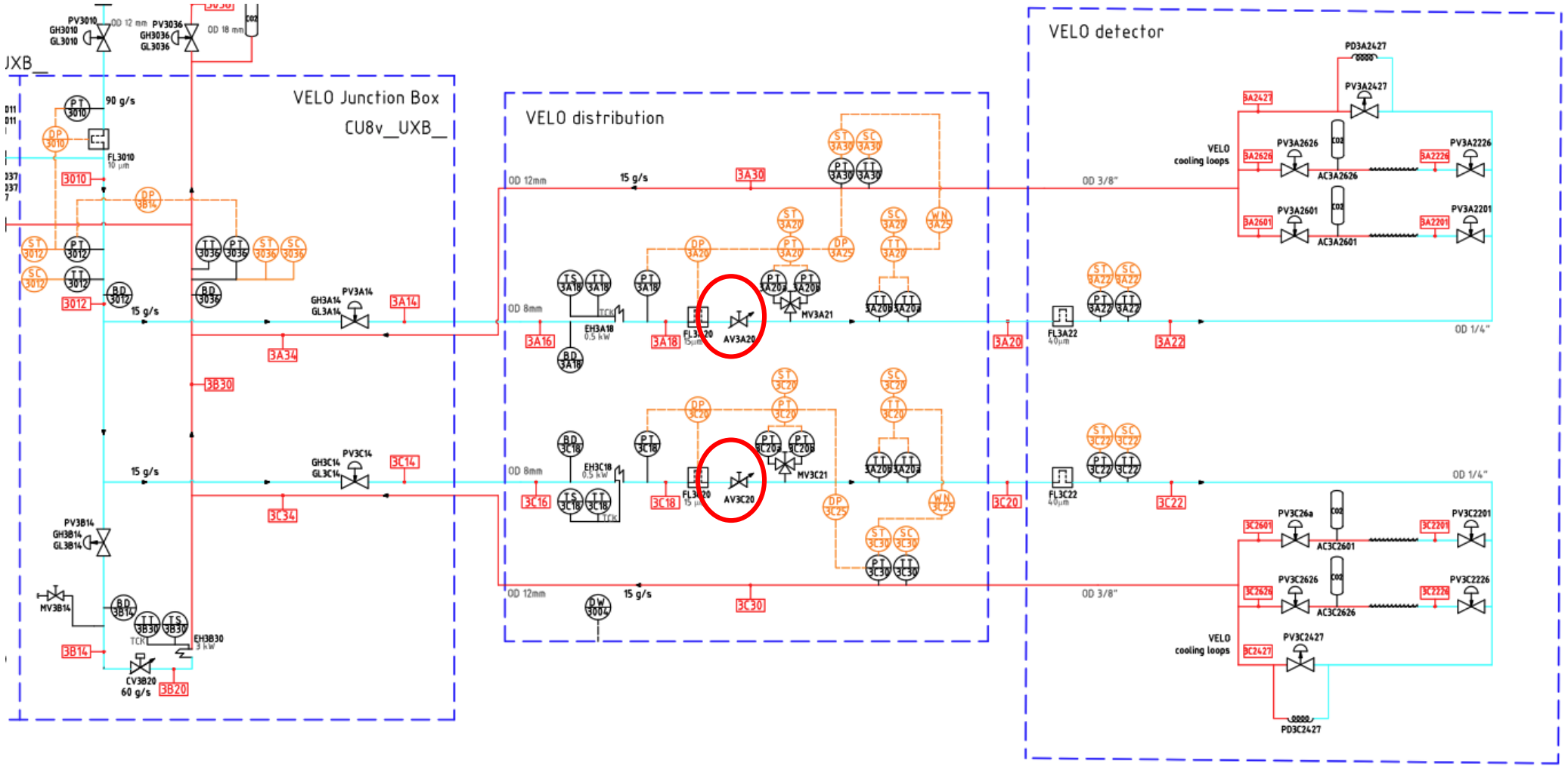
Design data for operating T:
- CO2 evaporation T @ accumulator = -35 C

Note on operation T:
- Each plant can be operated in the range -35 C / +15 C
- A COMMON temperature set point shall be defined for backup operation: need input on this

Design pressure for the system:
- 130 bar
- Testing @ 186 bar needed for the full hydraulic (detector included)

EDMS docs with detector requirements:
UT: https://edms.cern.ch/document/1487284/1
Velo: https://edms.cern.ch/document/1556963/1
Are they updated? Can they be released?

Manual regulation valves in local boxes 1



Manual regulation valves in local boxes - 2

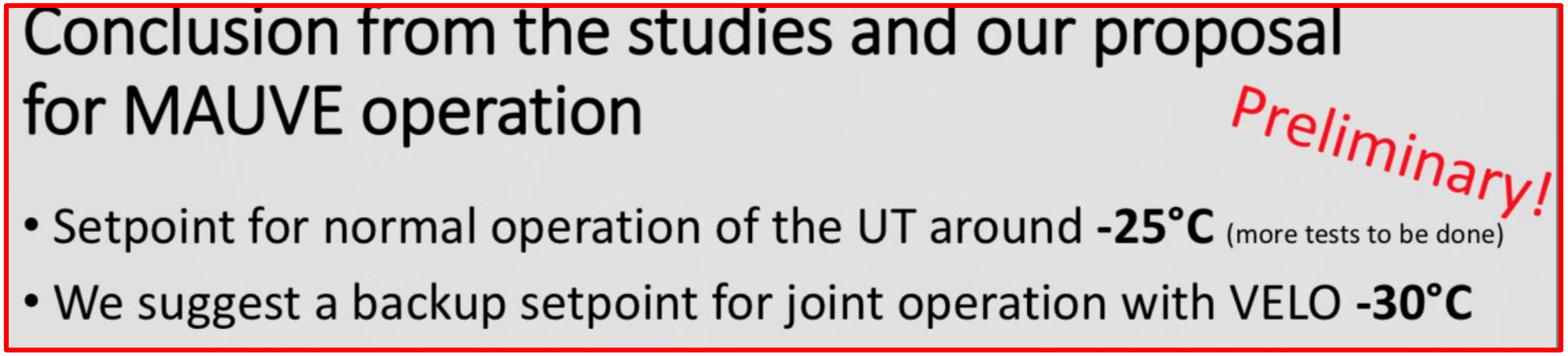
- used to balance flow in A and C sides of the same detector
- Used to guarantee same DP for Velo and UT during common operation

In order to select them (and allow 3D design, purchase, construction….all very urgent):

- DP and nominal flow for parallel loop of both UT and VELO shall be known (with a precision of 1 bar)
- The same data are needed to prove stable functioning of parallel loops

Operation conditions – need agreement

1) Common operational T : can we approve what proposed by MB last year?



2) Speed for cooling 1 C/min?

3) Common low and high T operation limits when running on common plant: -30/+15?

On site activities

- Cabling to LB
- Cabling to DSS & VSS
- Connection of transfer lines from JB to LB
- Local boxes production (need drawings to estimate if DT workshop can take over + BC)

M&O agreement

M&O WP has been circulated beginning of 2019.

In formal approval on EDMS https://edms.cern.ch/document/2059529/1

ATLAS, CMS, LHCb involvement, with equal share of costs (but ATLAS and CMS contribute, on top, with dedicated resources for the stand-by duty team) . In agreement with the 3 experiments, FSU work for INSTALLATION has been charged to that cost centre.

	Budget 2019-2021			
		CMS	ATLAS	LHCb
Codes	Item	kCHF/year	kCHF/year	kCHF/year
AU	Car	1,5	1,5	1,5
CT	Controls	2	2	2
FL	Fluids (CO2, oil, Freon)	1	1	1
FP	Fittings, pipes, spares	4	4	4
FSU	FSU unit EP-DT	30	30	30
PM	Pump maintenance	20	20	20
RE	Repairs	1	1	1
SC	Calibration & replacement of sensors	0,5	0,5	0,5
	Total	60	60	60

URGENT: need signature & 60 kCHF for 2019, cost for 2020 will be charged early next year.

IN ADDITION:
53 kCHF of spare parts already purchased and need reimbursement

Spare – advance on M&O cost for 2019

Main chapter	Detail	Unit price [kCHF]	Total QTY	CONSTRUCTION COST Oct 18	SPARE COST Oct 18	DIFF TO NOV 17
Hardware						
Primary						
	Main chiller	~~40.00~~	~~1~~	10.50	2.54	10.50
	Backup chiller	10.00	1	13.85	6.00	-0.15
Hydraulics						
	Main components	100.00	2	263.16	32.02	31.16
	Pipework & structure	44.00	2	86.64	2.96	2.64
	Instrumentation	17.00	2	33.21	2.47	-0.79
Controls						
	Control HW	40.00	1	80.13	7.49	20.13
	Cables & pneumatic pipes	10.00	1			
Manpower						
	PH-DT Assembly Services	0.05	2	76.01		16.01
	PH-DT Cabling & programming	20.00	1	36.34		16.34
	QualificationServices	0.05	2	15.25		-4.75
	Design	3.30	6	5.00		-15.00
		Total 2 CO2 plants		*620.10*	*53.48*	*76.10*

Summary of relevant document x MAUVE plants

EDMS repository

Management

- WP for MAUVE plants construction https://edms.cern.ch/document/1575817

Operation modes

- Mauve P&ID plan & document https://edms.cern.ch/document/1556956
- Process description https://edms.cern.ch/document/2022099/1 (Under approval - L. Davoine)
- Mauve Functional Analysis https://edms.cern.ch/document/1562732: can be developed once Process approved
- Filtering policy https://edms.cern.ch/document/2003471/1 (under approval – J. Daguin)

Technical docs

- Drawings https://edms.cern.ch/document/1703238/1
- Accumulator https://edms.cern.ch/document/1836202/1
- Cold box https://edms.cern.ch/document/1867798/1
- Backup chiller https://edms.cern.ch/document/1810421/1
- Main chiller WP https://edms.cern.ch/document/1870688/1.1