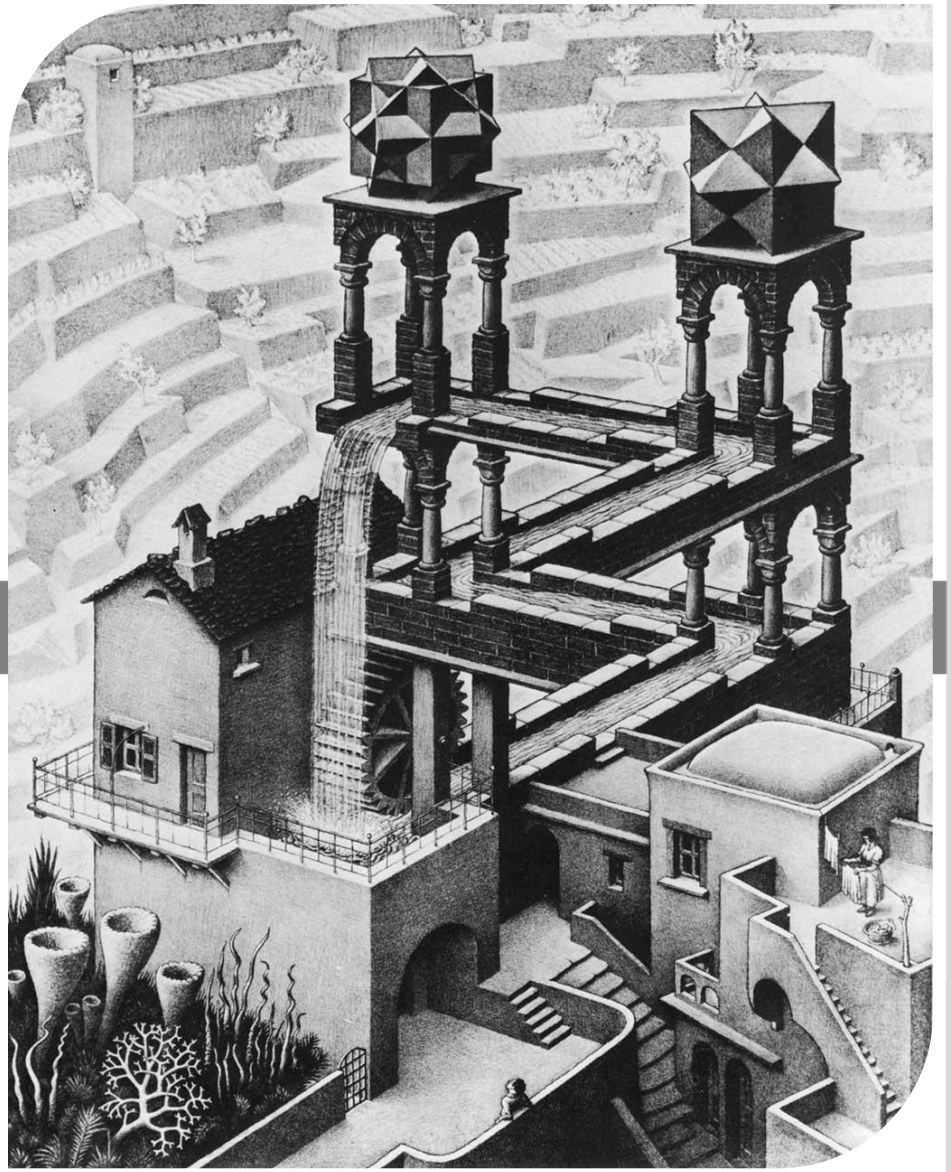
Karlsruher Institut für Technologie

Tritium Loops

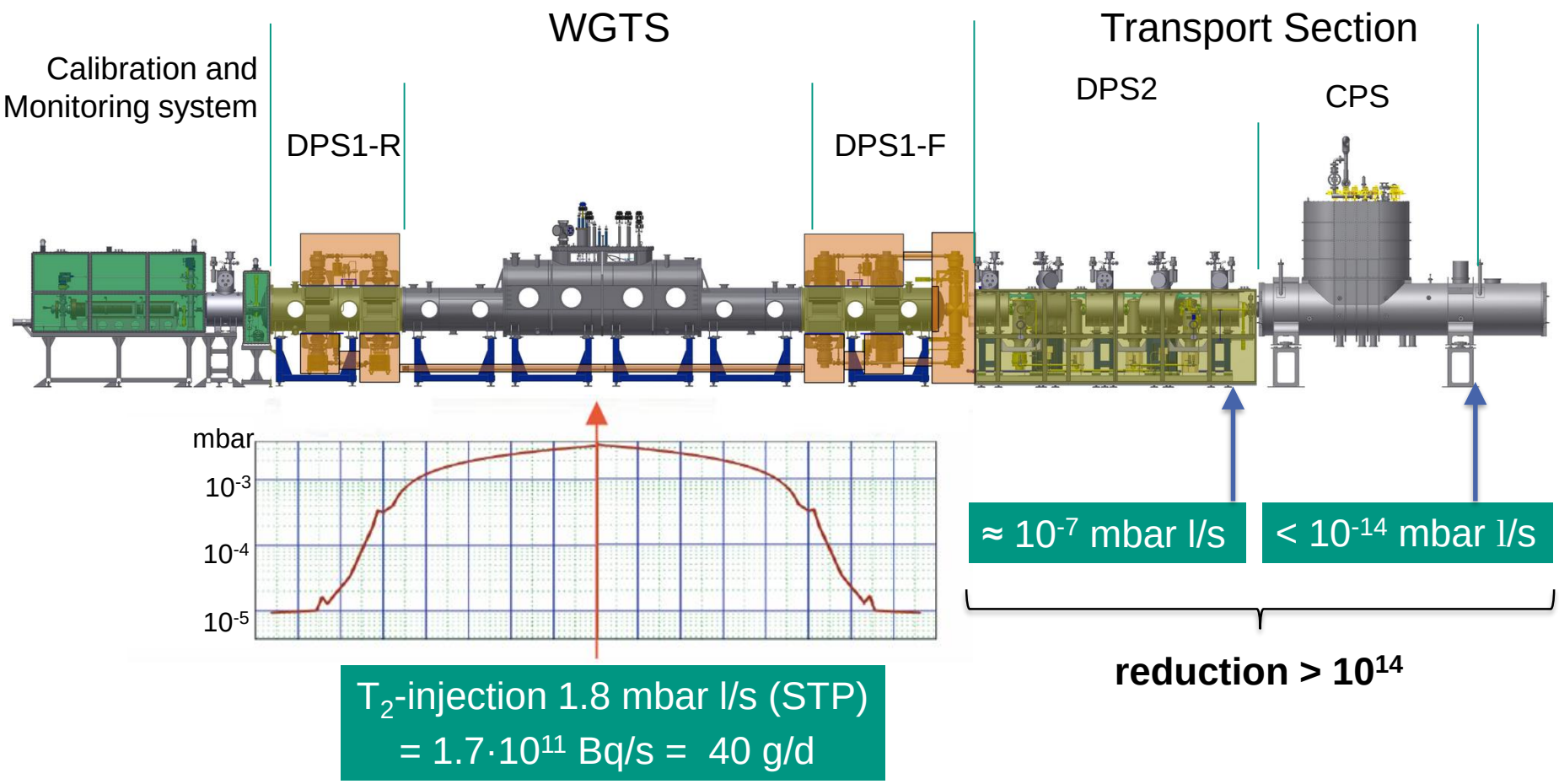
34. KATRIN Collaboration Meeting

Florian Priester, Tritium Laboratory Karlsruhe (TLK), ITEP



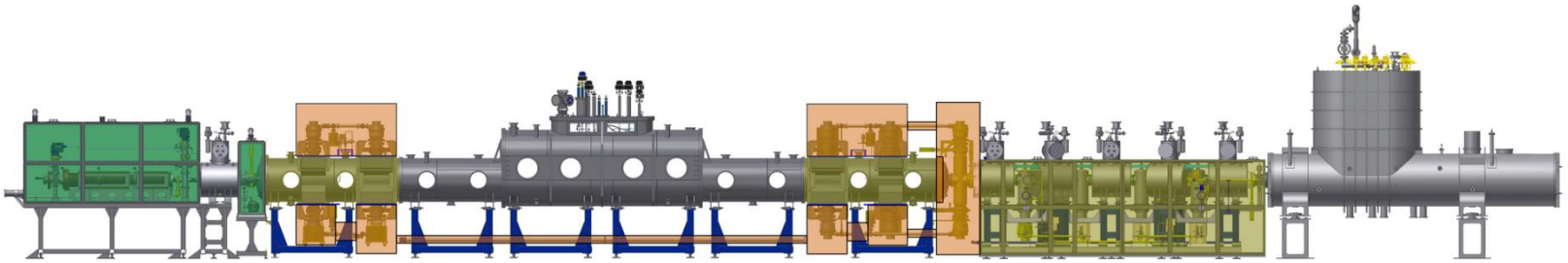
Wasserfall, © M. C. Escher, 1961

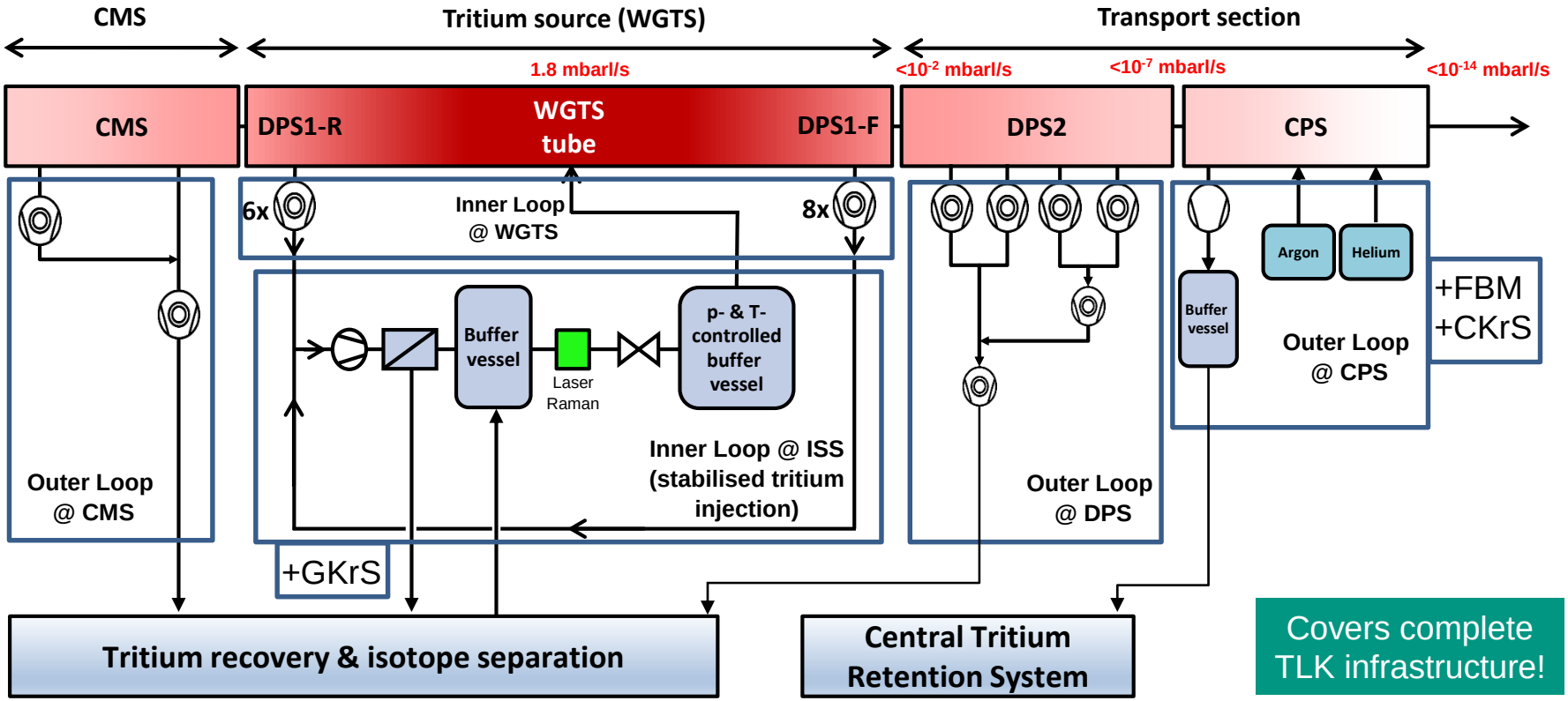
Overview: Source & Transport System



➡ **processing-system: “tritium loops”**

Overview of Loop System





Covers complete TLK infrastructure!

What happened since last collaboration meeting?

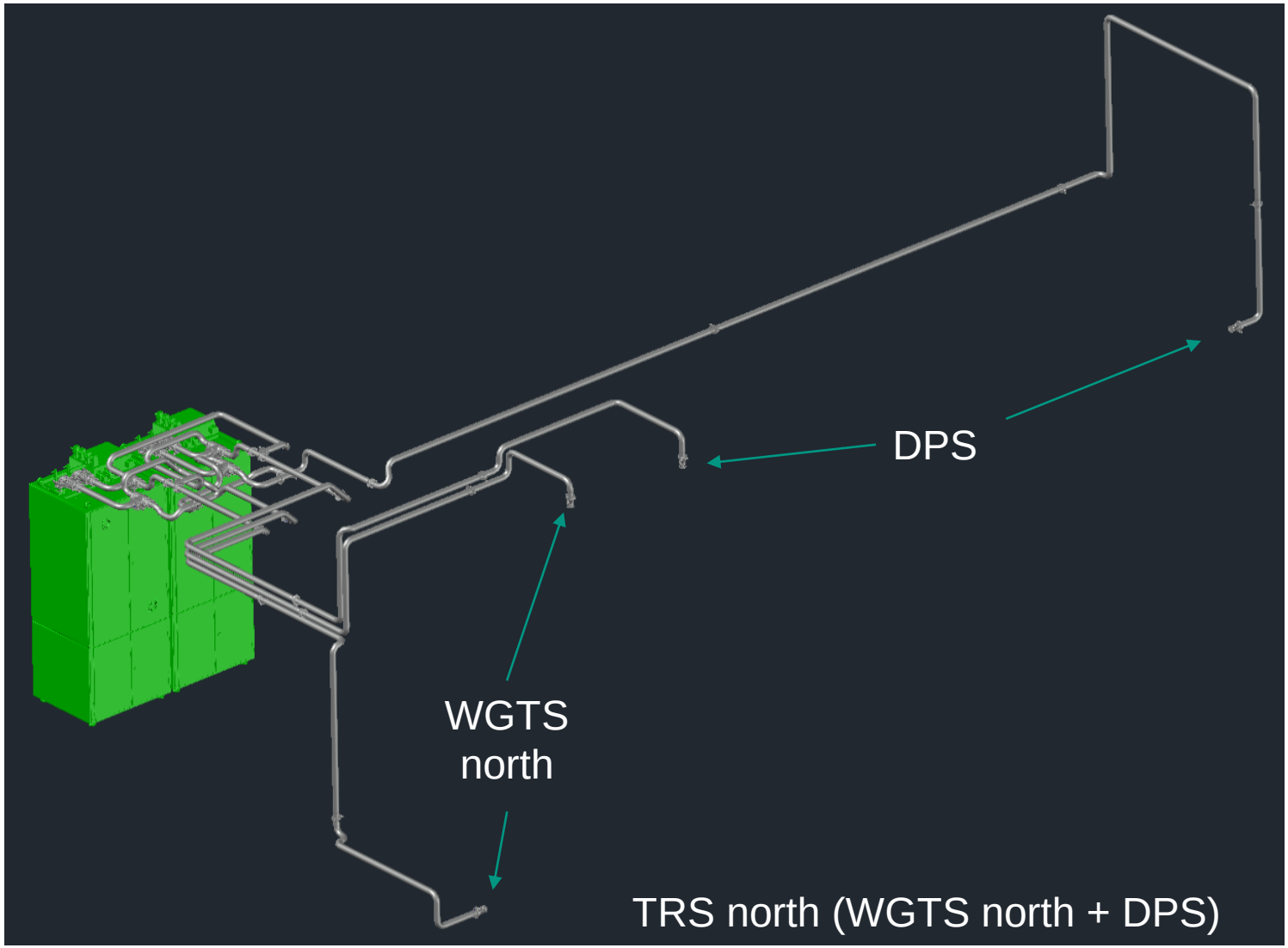
2ND CONTAINMENT SUPPLY SYSTEMS, PIPING, CABLING

Status at CM 33…

- Cooling water installation incomplete
  - No pipework
- No pressurised air
- Cabling incomplete
- Not connected to PCS7 system
- Vast majority of magnetic shielding not installed
- No leak tests
- No 2nd containment infrastructure
- T_2-transfer line incomplete

…and how it looks right now:

TRS north system design



TRS connection of DPS&WGTS (north)

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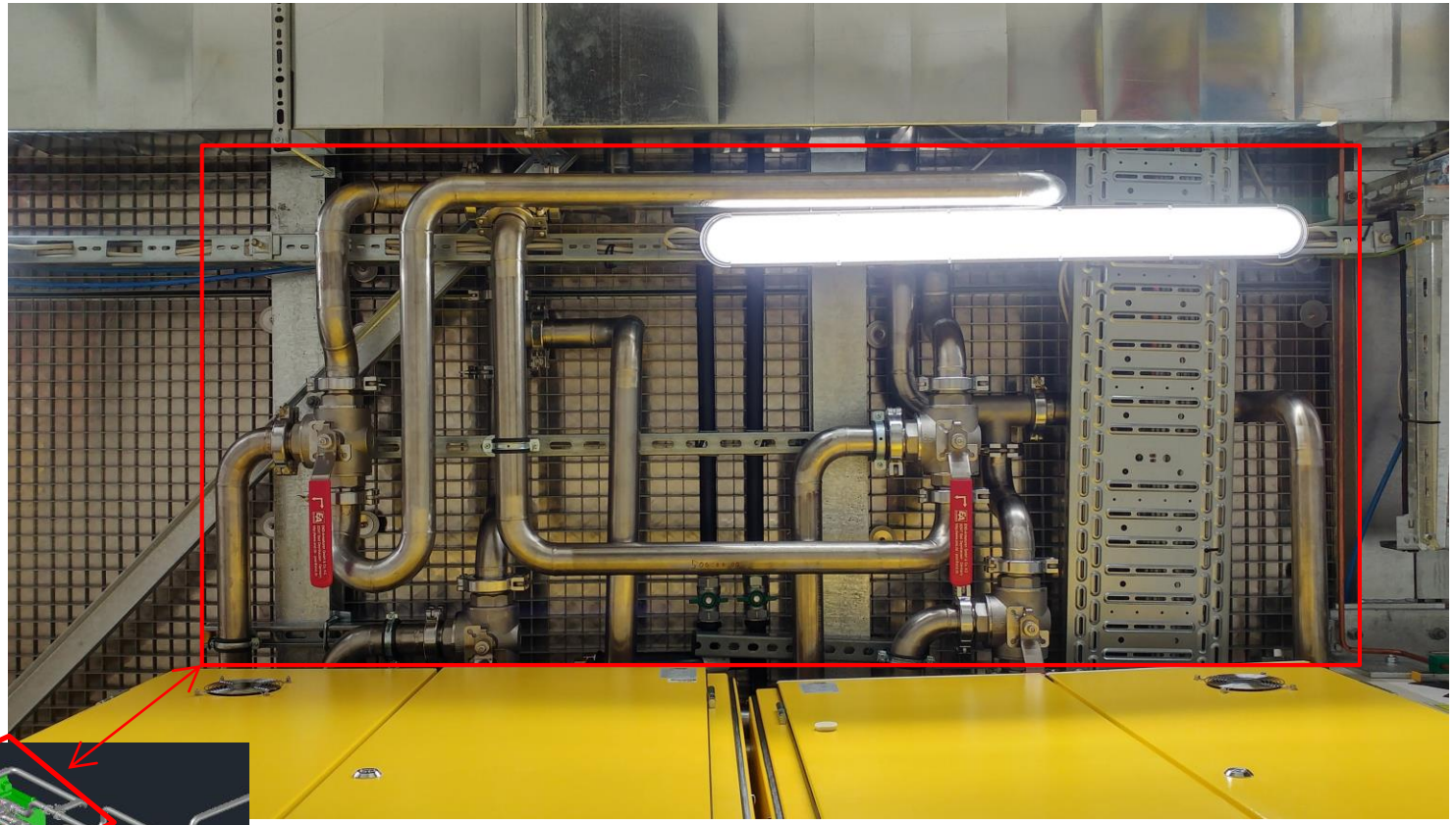
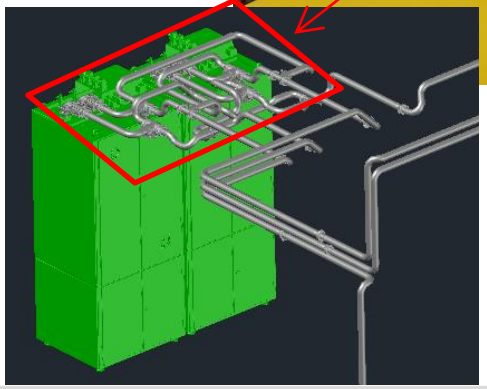
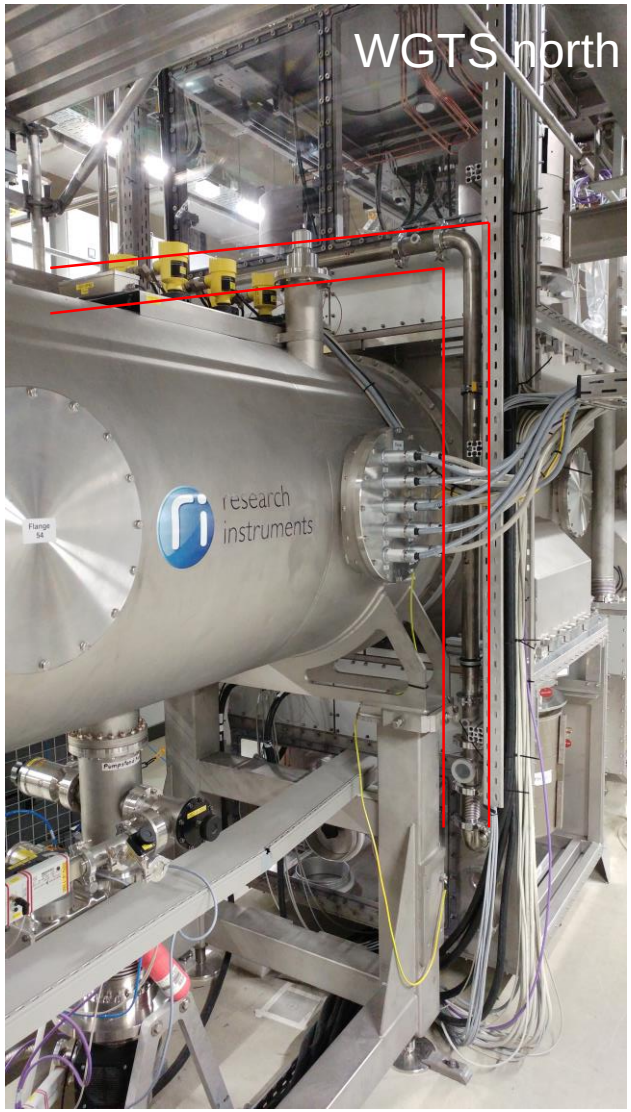




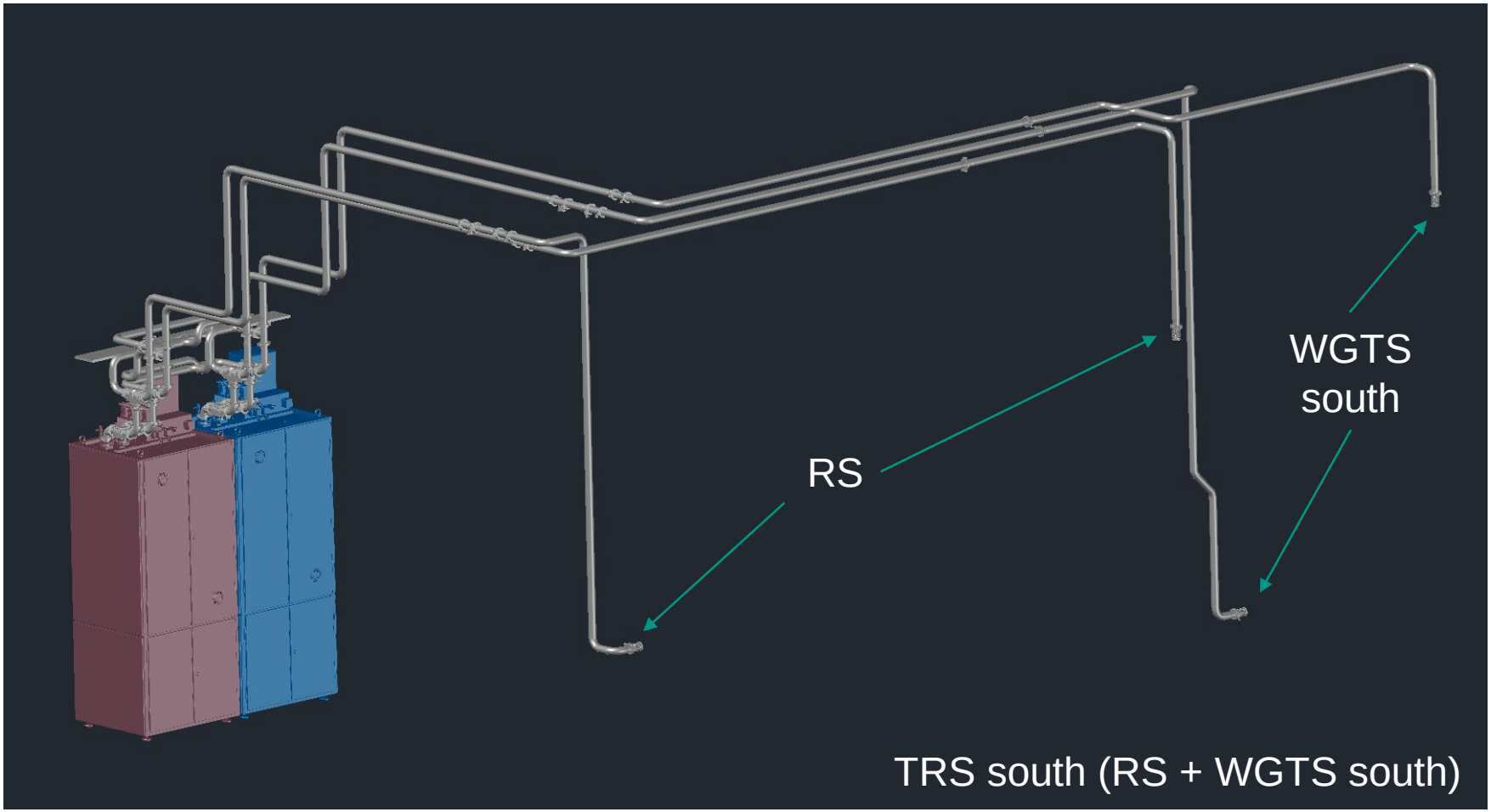
TRS systems north

TRS connection summary

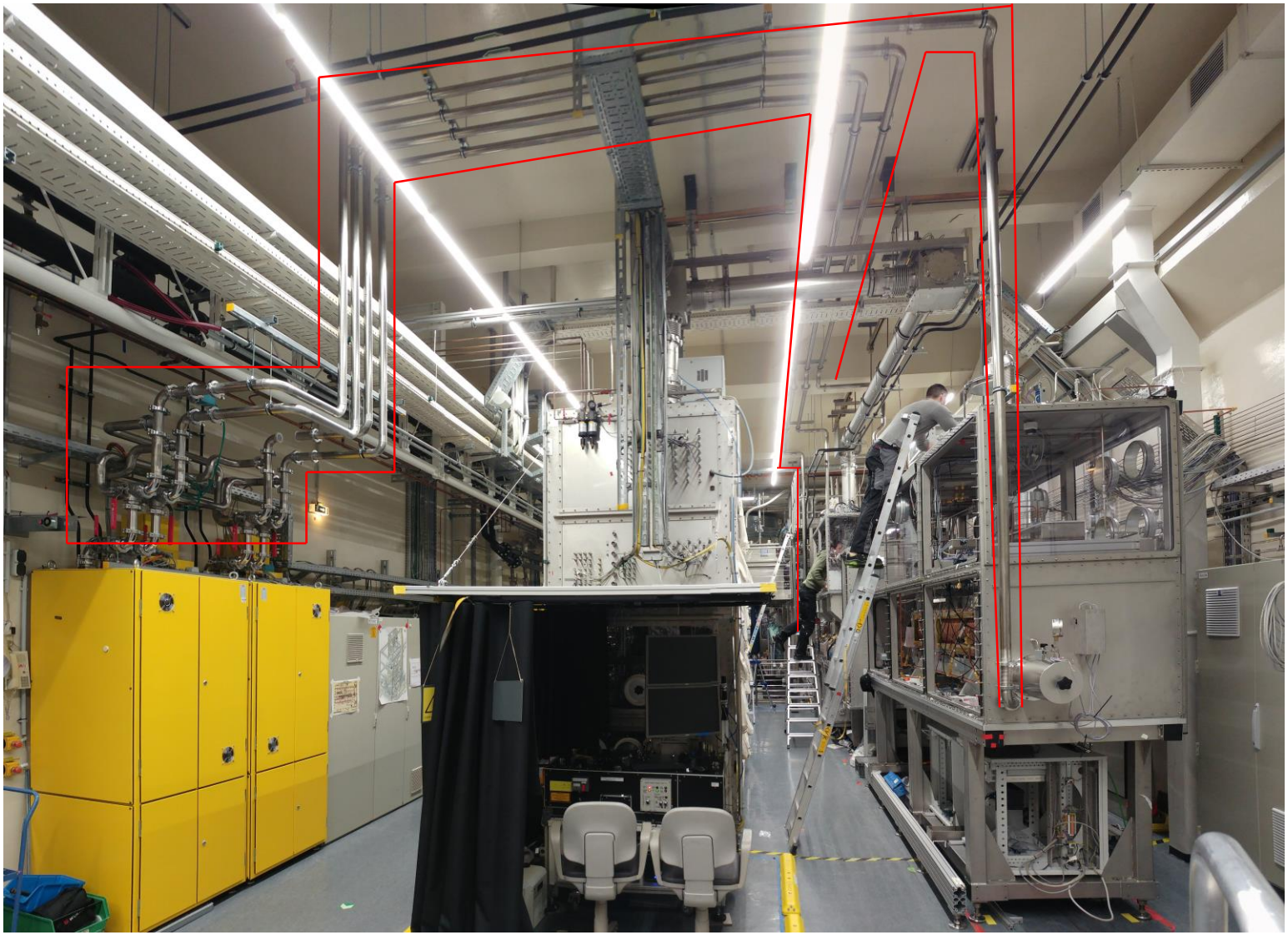


- TRS piping finished
  - adjustments necessary
- Manufacturing started of pipework for
  - CPS waste gas (“ZTS”)
  - Pressure control in 2nd containment (“UDH”)

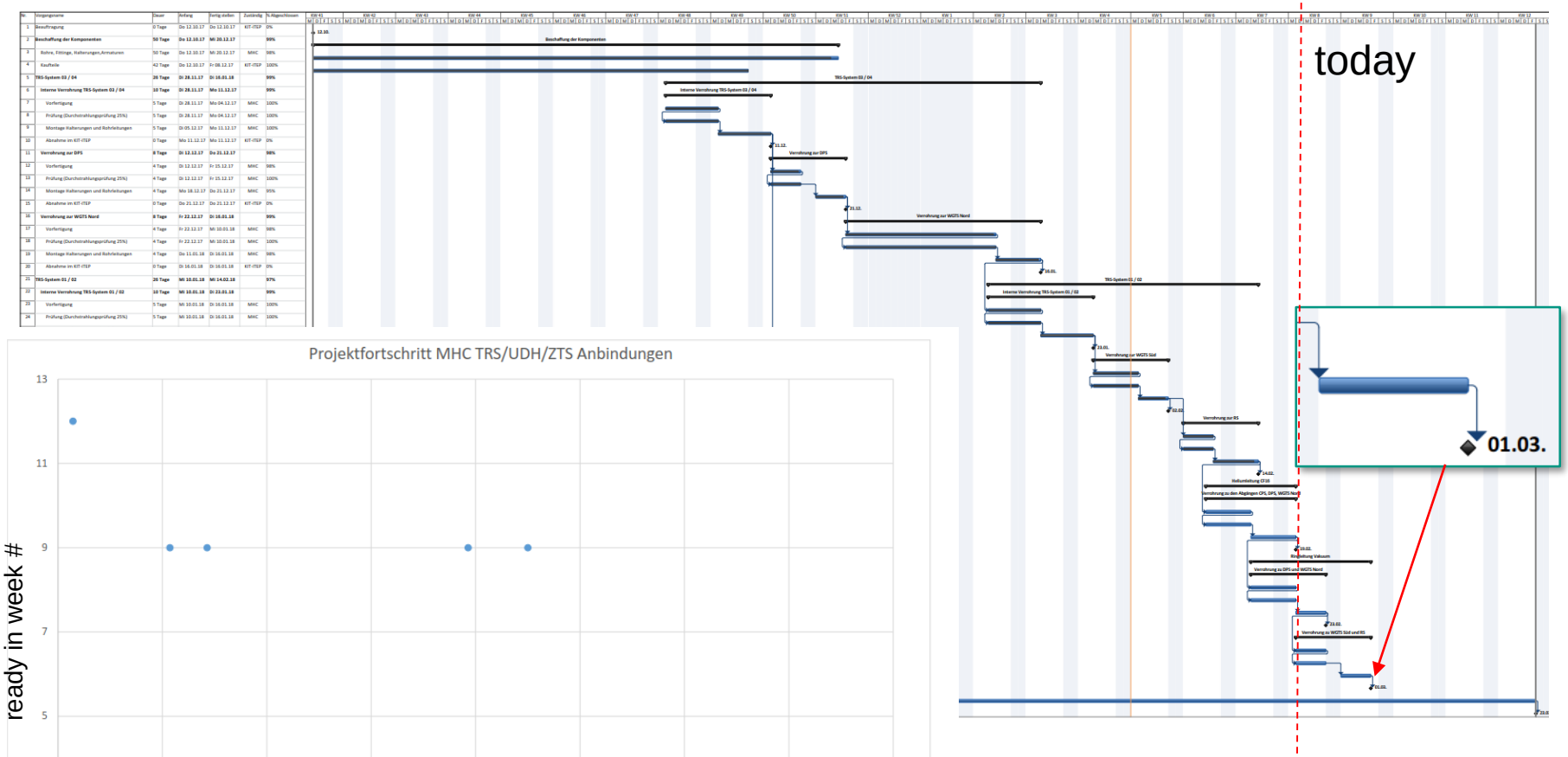
TRS south system design



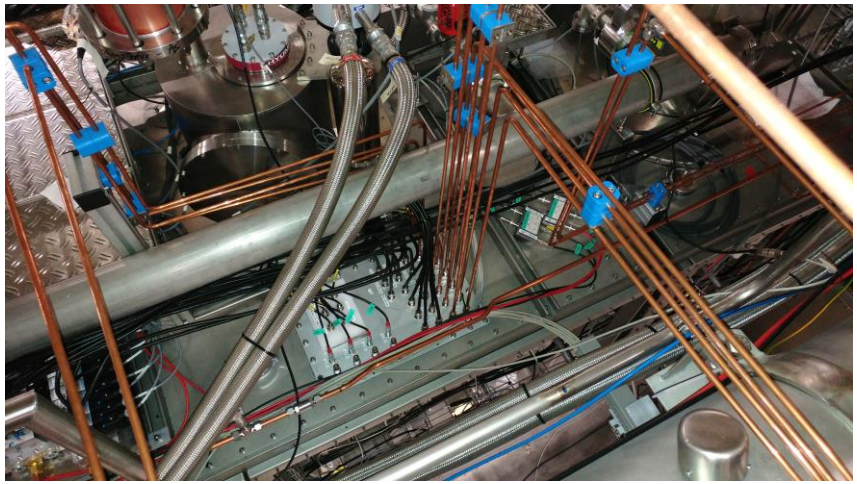
TRS connection of RS&WGTS (south)

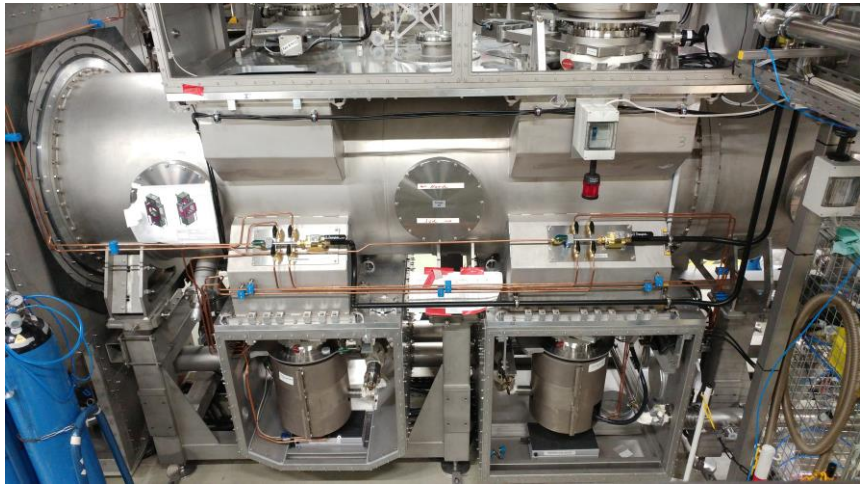


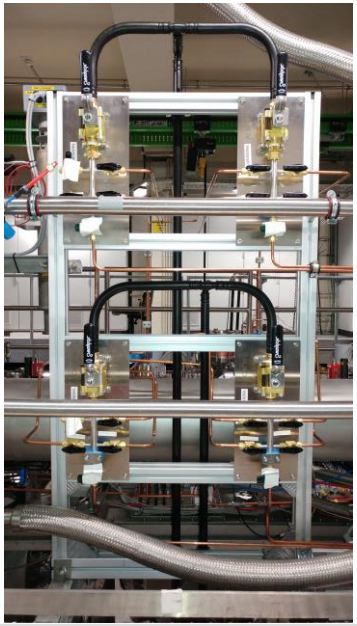
Schedule for 2nd containment connections



Water cooling system



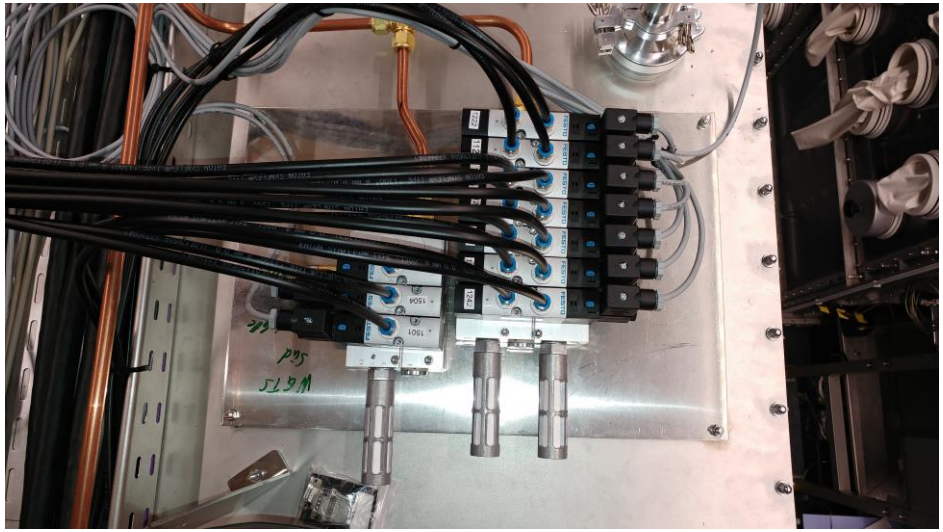




- ≈ 100 manual valves
- ≈ 500 meters copper pipe
- 2 feedthroughs for each water cooled device
- Little available space inbox: manufacturing time consuming

Everything connected and operational

Pressurised air system



- ≈ 35 pneumatic valves connected, each with own pilot valve
- ≈ 50 feedthroughs installed
- ≈ 600 meters hose installed

Other 2nd containment supply systems

IC‘s of WGTS (north) and DPS

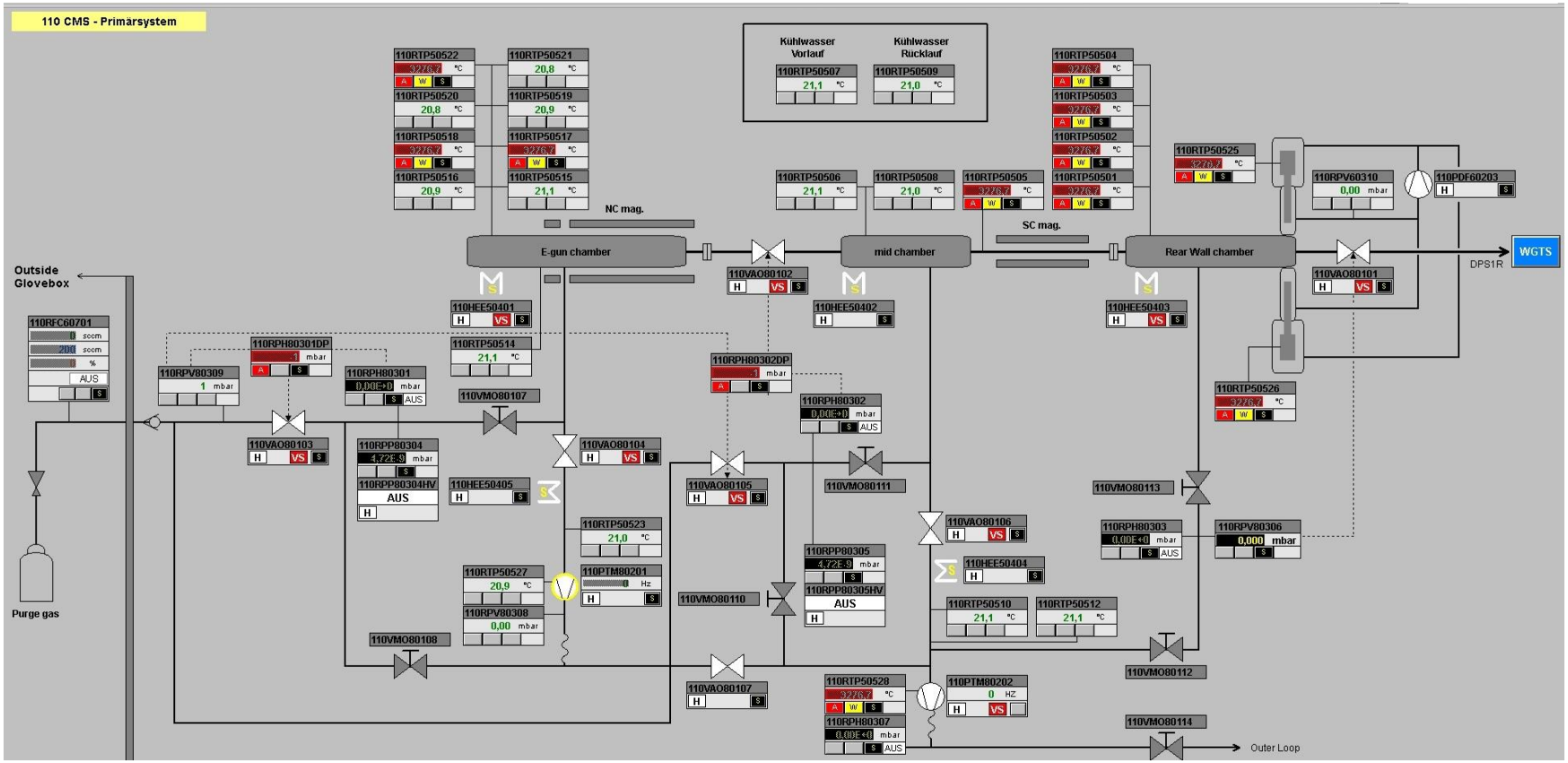
- All seven ionisation chambers delivered by end of December 2017
  - Installation (piping) and integration into TLK bus system started
- Installation of 2nd containment air locks and pumps (six air locks) started
- Instrumentation of all 2nd containments installed
  - Pressure sensors, automatic and safety valves, H_20 sensor, in-box smoke detector and light

What happened since last collaboration meeting?

COMMISSIONING OF LOOP SYSTEMS

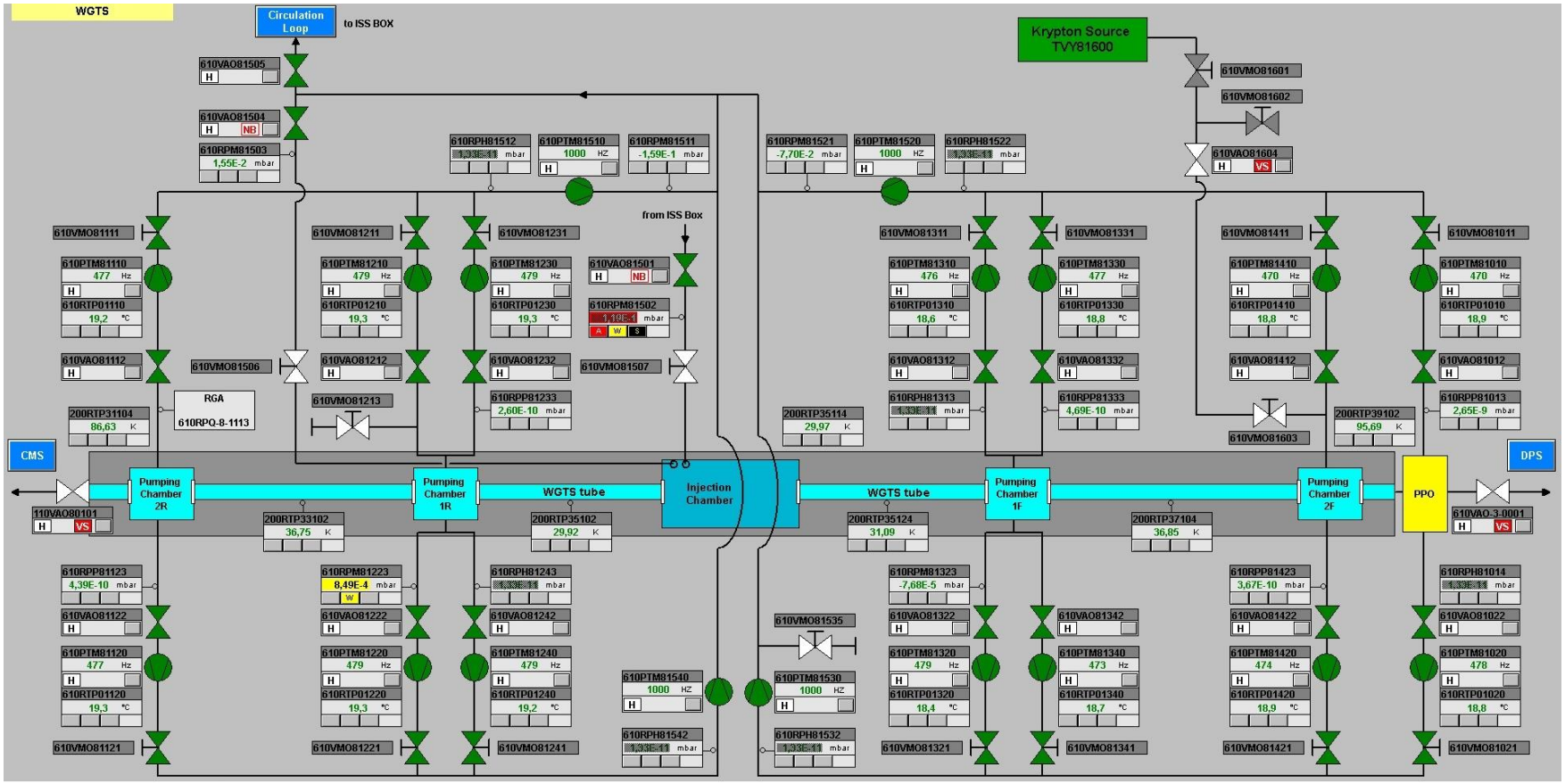
Commissioning of RS

- Electrical safety: 90%
- Electrical commissioning: 0%
- Interlocks: 0%
- Leak testing: <20%
- 2nd containment: >80%



Commissioning of WGTS

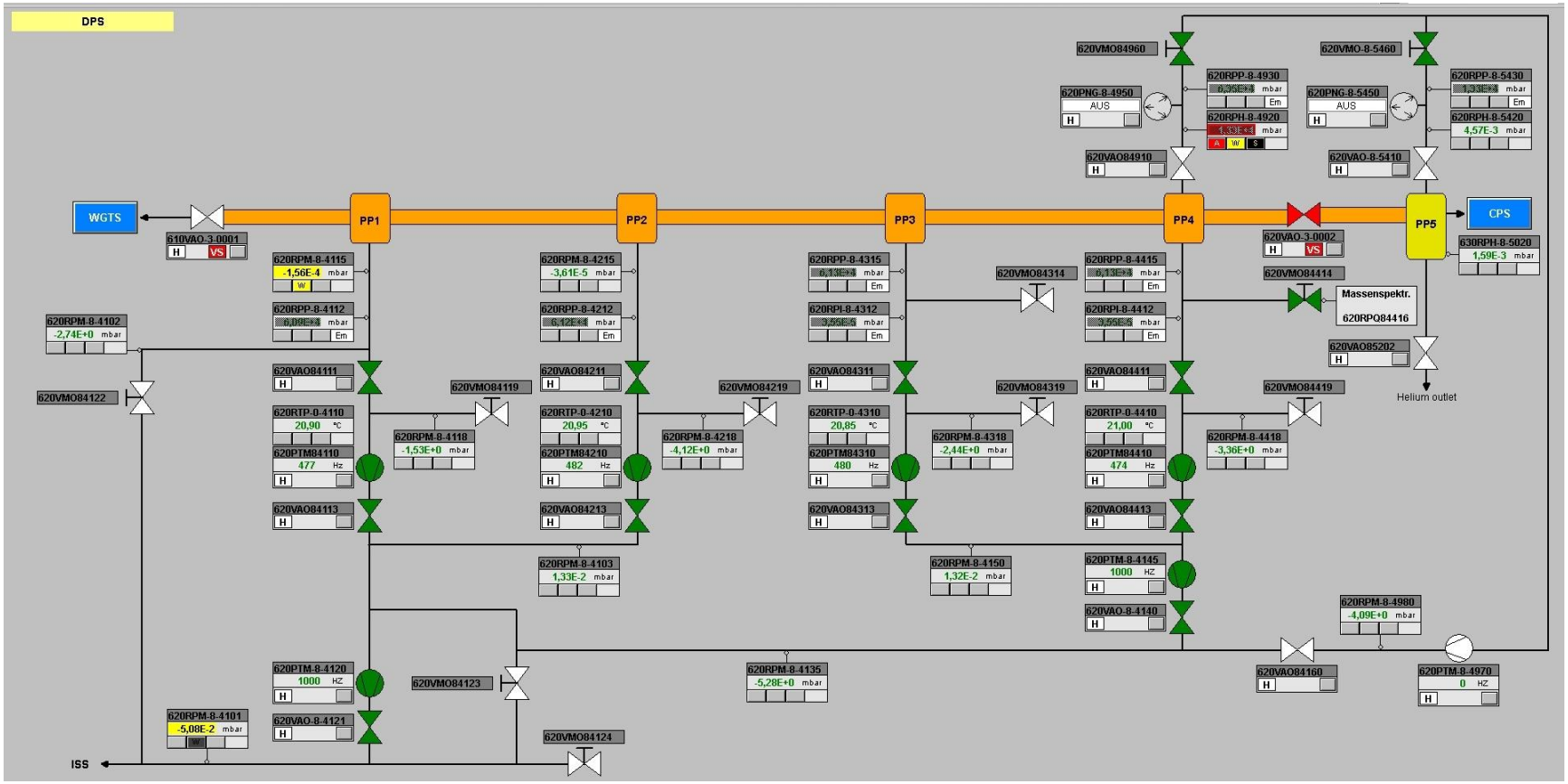
- Electrical safety: 100%
- Electrical commissioning: 100%
- Interlocks: <20%
- Leak testing: 75%
- 2nd containment: >80%



Tritium Laboratory Karlsruhe

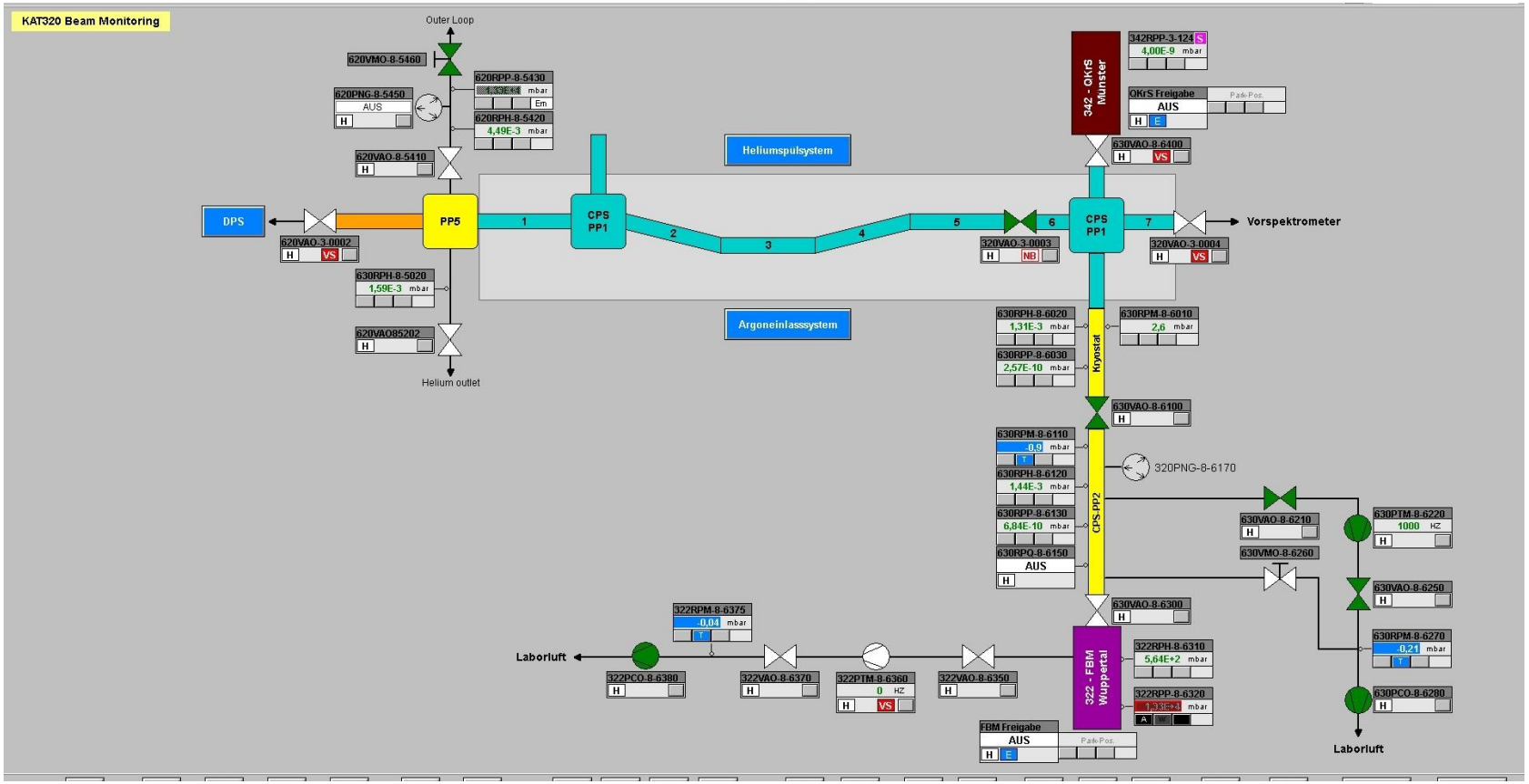
Commissioning of DPS

- Electrical safety: 90%
- Electrical commissioning: 90%
- Interlocks: >90%
- Leak testing: 100%
- 2nd containment: >80%



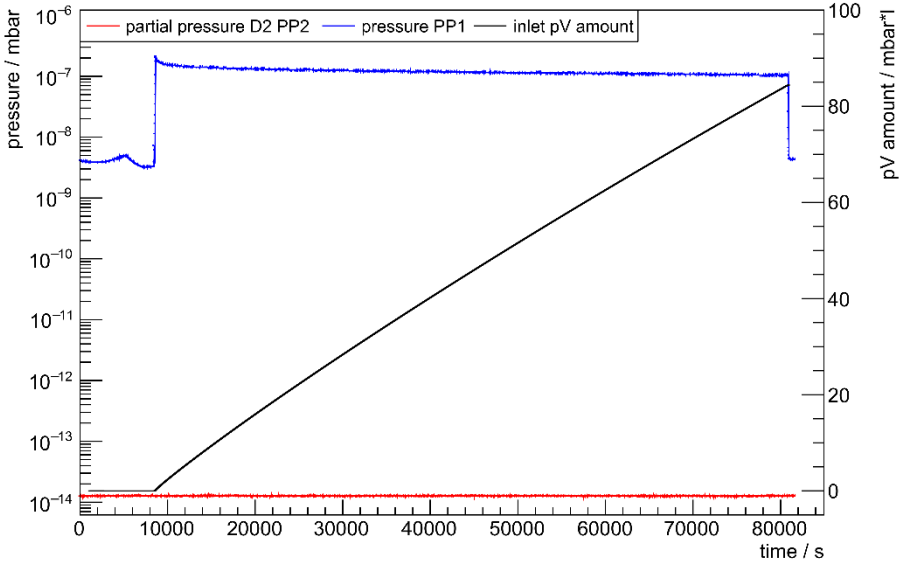
Commissioning of CPS

- Electrical safety: 100%
- Electrical commissioning: 100%
- Interlocks: 50-60%
- Leak testing: 100%
- Fume hood: >80%



CPS argon frost and retention measurement

- First preparation of argon frost layer on 13th December, 2017
- Up to now 3 successful repetitions
- 2nd February, 2018: first helium purging



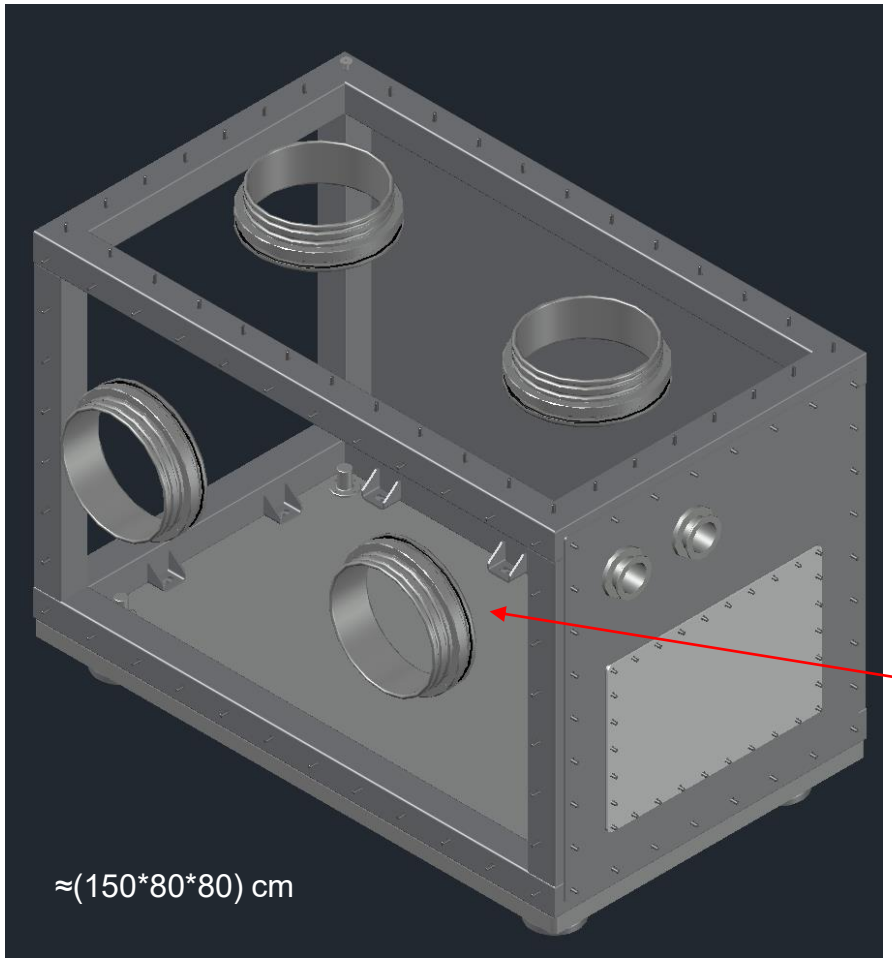
- Tests with deuterium show good performance of the cryo pump
- Extrapolated retention > 10^7
- Injected deuterium pV amount is equivalent to 5 KATRIN lifecycles (first measurement)

See talk by Carsten Röttele for more details

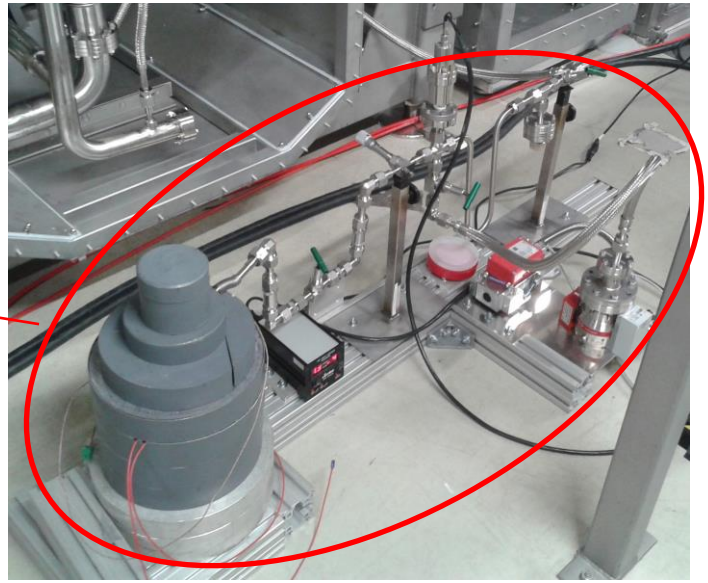
What happened since last collaboration meeting?

THERE IS SOME MORE…

Gaseous Kr source

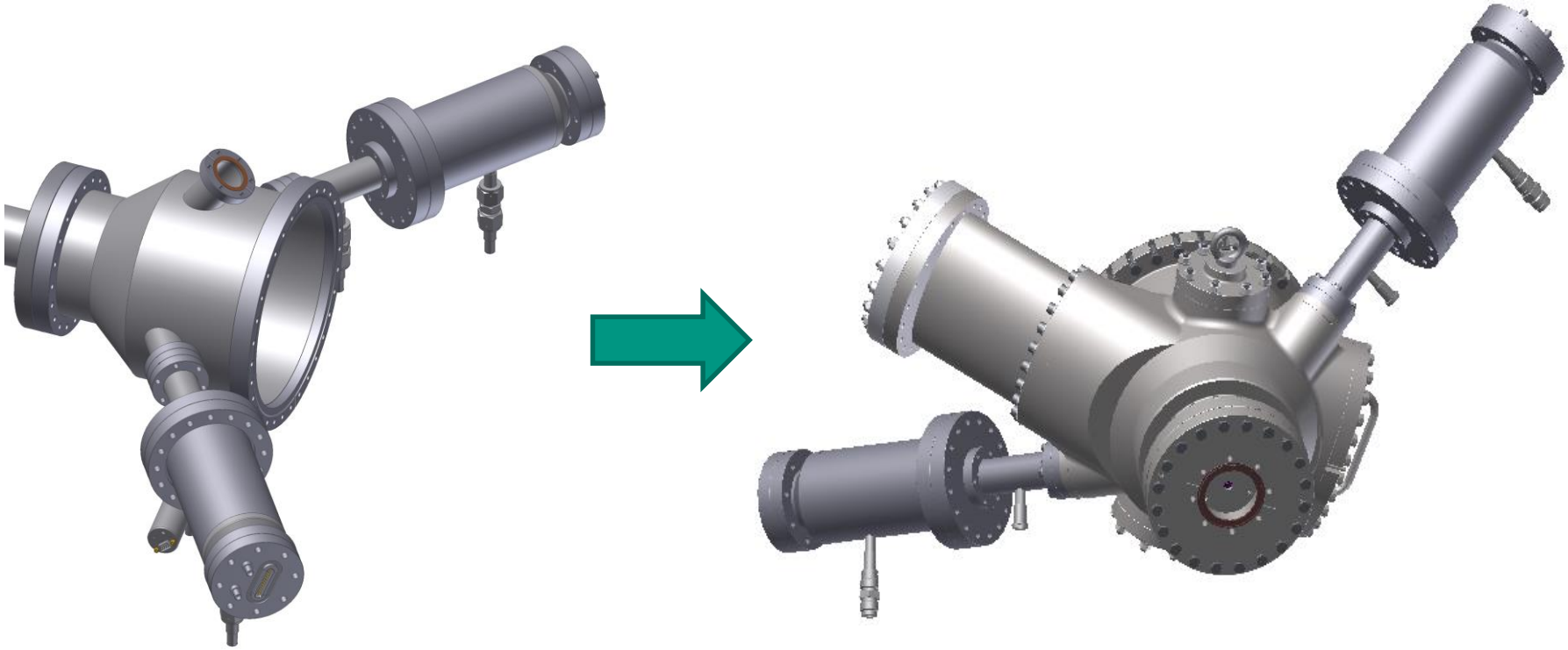


- Additional box for the gKr generator
- Delivery in March 2018
- Will be attached to WGTS (north) 2nd containment on the east side



Rearsection

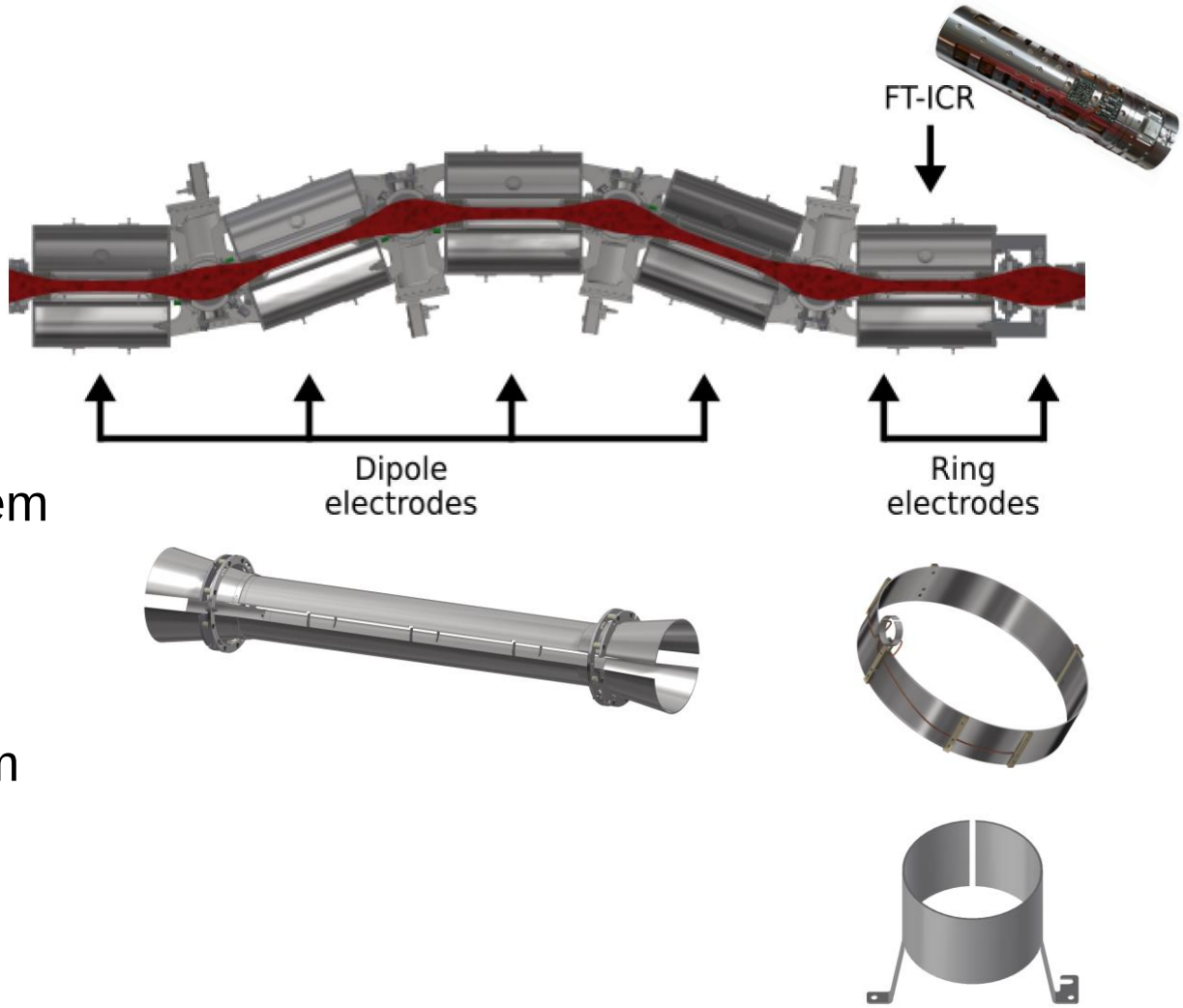
- Exchange of RW vessel and UV illumination system



See talk by Klaus Schlösser for more details

Radiation safety: Ion suppression

- Design finalised
- In vacuum parts installed
- Wiring done
- Remote read-out and control by PCS7 system (currently set up).
- System will handle all safety relevant control (getting interlocks from Loop PCS7)



See talk by Manuel Klein for more details

Thanks to the whole TLK-team, the STS-team and all others involved!!!