FLASH2020+

Progress Review

FL1 Electron Beamline (Installation)

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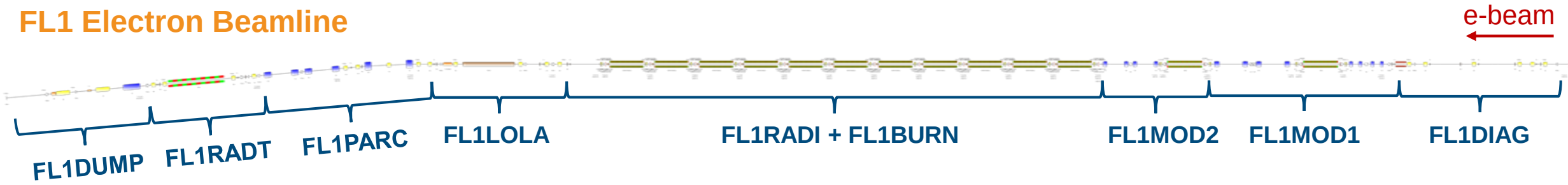
18 October 2024

HELMHOLTZ RESEARCH FOR GRAND CHALLENGES

DESY.

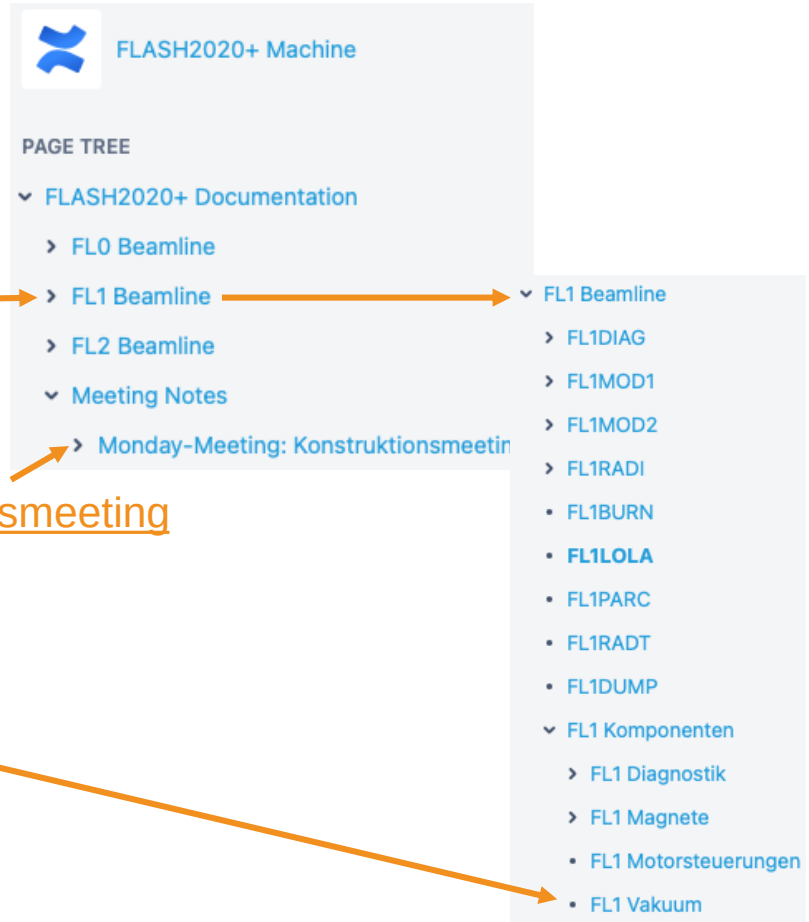
Introduction / Reminder

FL1 Electron Beamline



FL1 Electron Beamline is divided into **sections** according to their **functionality**.

- **Documentation** in Confluence Space "**FLASH2020+ Machine**"
  - FL1 beamline **sections** (shutdown 2024/2025 = "STAGE_0"):
    - https://confluence.desy.de/display/FLM/FL1+Beamline
    - Lattice List, Overview Drawing, Vacuum String, MBOM
  - Overall **mechanical design** by ZM: **Konstruktionsmeeting** Mondays at 14:00
    - https://confluence.desy.de/display/FLM/Monday-Meeting%3A+Konstruktionsmeeting
  - Hand-over of **vacuum parts** from ZM to MVS
    - https://confluence.desy.de/display/FLM/FL1+Vakuum
- **Note**: No information on installation Schedule
  - See Confluence Space FLASH2020+ Project



Status Overview – Progress Review 08/03/24

Status of Sections

FL1 START: z = 146,7610004 m

08 March 2024

CADNAME	X	Y	Z	DG Assembly	Section Review	Lattice released	Vacuum parts (ZM3 to MVS)
FL1DIAG	0,000000	0,000000	0,000000	D10000000523348	22 Jan 2024	22 Feb 2024	
FL1MOD1	0,000000	0,000000	12,389219	D10000000523351			
FL1MOD2	0,000000	0,000000	25,289219	D10000000523352			
FL1RADI	0,000000	0,000000	33,389217	D10000000524071			
FL1BURN	0,000000	0,000000	69,354218	D10000000523353	08 Jan 2024	22 Feb 2024	08 Feb 2024
FL1LOLA	0,000000	0,000000	72,569221	D10000000523354			07 Mar 2024
FL1PARC	0,000000	0,000000	82,469215	D10000000523355	05 Feb 2024	23 Feb 2024	
FL1RADT	0,828233	0,000000	93,838875	D10000000523356	19 Feb 2024		22 Feb 2024
FL1DUMP	1,516764	0,000000	101,708817	D10000000523357			

Status Overview – Progress Review 31/05/24

Status of Sections

31 May 2024

FL1 START: z = 146,7610004 m

CADNAME	X	Y	Z	DG Assembly	Section Review	Lattice released	Vacuum parts (ZM3 to MVS)	Vacuum parts RFI
FL1DIAG	0,000000	0,000000	0,000000	D10000000523348	22 Jan 2024	22 Feb 2024	02 May 2024	13 May 2024
FL1MOD1	0,000000	0,000000	12,389219	D10000000523351				
FL1MOD2	0,000000	0,000000	25,289219	D10000000523352				
FL1RADI	0,000000	0,000000	33,389217	D10000000524071				
FL1BURN	0,000000	0,000000	69,354218	D10000000523353	08 Jan 2024	22 Feb 2024	08 Feb 2024	20 Mar 2024
FL1LOLA	0,000000	0,000000	72,569221	D10000000523354	08 Apr 2024		07 Mar 2024	08 Apr 2024
FL1PARC	0,000000	0,000000	82,469215	D10000000523355	05 Feb 2024	23 Feb 2024	14 Mar 2024	
FL1RADT	0,828233	0,000000	93,838875	D10000000523356	19 Feb 2024		22 Feb 2024	11 Mar 2024
FL1DUMP	1,516764	0,000000	101,708817	D10000000523357				

Status Overview – Progress Review 18/10/24

Status of Sections

18 October 2024

FL1 START: z = 146,7610004 m

CADNAME	X	Y	Z	DG Assembly	Section Review	Lattice released	Vacuum parts (ZM3 to MVS)	Vacuum parts RFI
FL1DIAG	0,000000	0,000000	0,000000	D10000000523348	22 Jan 2024	22 Feb 2024	02 May 2024	13 May 2024
FL1MOD1	0,000000	0,000000	12,389219	D10000000523351	23 Sep 2024		X	
FL1MOD2	0,000000	0,000000	25,289219	D10000000523352	23 Sep 2024		X	
FL1RADI	0,000000	0,000000	33,389217	D10000000524071	09 Sep 2024	08 Oct 2024	26 Sep 2024	08 Oct 2024
FL1BURN	0,000000	0,000000	69,354218	D10000000523353	08 Jan 2024	22 Feb 2024	08 Feb 2024	20 Mar 2024
FL1LOLA	0,000000	0,000000	72,569221	D10000000523354	08 Apr 2024	08 Oct 2024	07 Mar 2024	08 Apr 2024
FL1PARC	0,000000	0,000000	82,469215	D10000000523355	05 Feb 2024	31 Jul 2024	14 Mar 2024	X
FL1RADT	0,828233	0,000000	93,838875	D10000000523356	19 Feb 2024	25 Jul 2024	22 Feb 2024	11 Mar 2024
FL1DUMP	1,516764	0,000000	101,708817	D10000000523357				

FL1MOD1/2 : the most complex sections with many new components + SEED1/2 laser beamlines

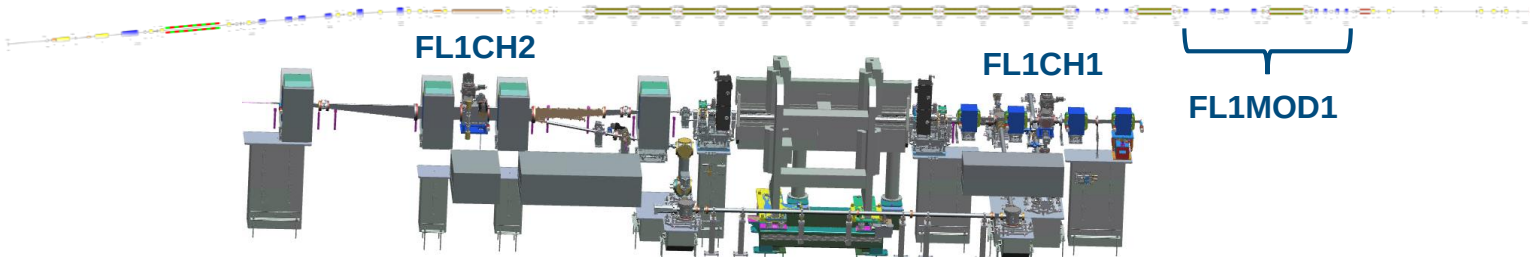
X Mainly the chicane chambers (CH1, Ch2, CH3, DBA) are still in production (see next slides)

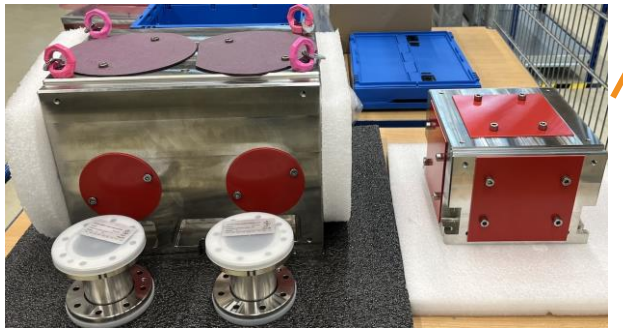
FL1DUMP lowest priority, only the DUMP dipole chamber in production (ZM), no copper coating

FL1MOD1

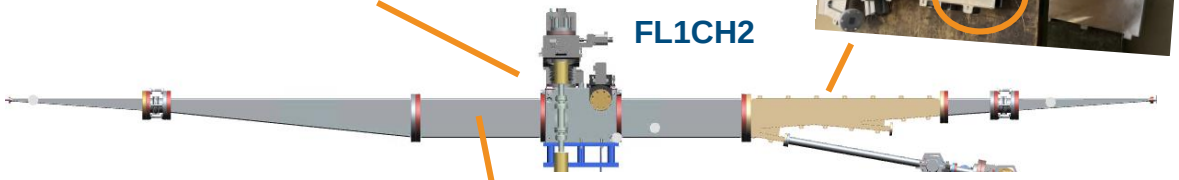
Status of Components

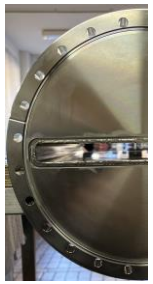
- Chicane Dipole Magnets
  - FL1CH1 (TDK): In fabrication: delivery date Jan/Feb 25, magn./transfer measuement
  - FL1CH2 (TDI): In fabrication: delivery end Jan 25, magn./transfer measuement
- Chicane Vacuum Chambers
  - FL1CH1: 2 mm (sheet width) chambers: next step: welding of 8 flanges
  - FL1CH2:
    - Chamber for laser beam line: vacuum leak (re-brazing)
    - 2 mm (sheet width) chambers: next step: welding of 4 flanges
    - 4 mm (sheet width) chambers: last step: copper plating
    - Mirror chambers LEIKA1 / LAUKA1-LEIKA2 : delivered ✓
      - Next steps: transfer measurement, clean room assembly
      - Movers: CO_2 cleaning of bellow at MSL (J. Ziegler)
- Two Intersections (Type ISMA/B)
  - Pre-assembled, transfer measurement and RFI ✓
  - (1 bellow has vacuum leak => resoldering at MKS)
- Supports
  - Mechanical design of supports on-going
    (many constraints due to high density of parts)
- Undulator (planar U84) ✓
  - see presentation by K. Goetze
- SEED laser beamline:
  - see presentation by T. Lang

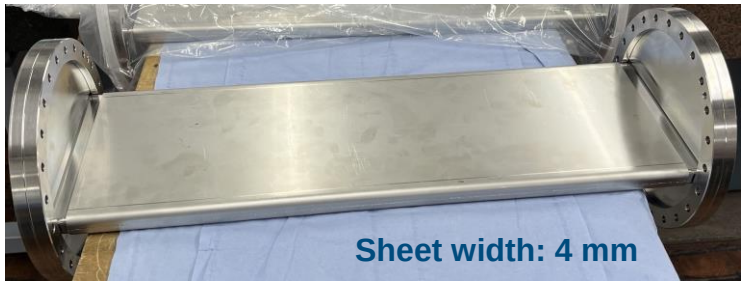




vacuum leak:
re-brazing of flange

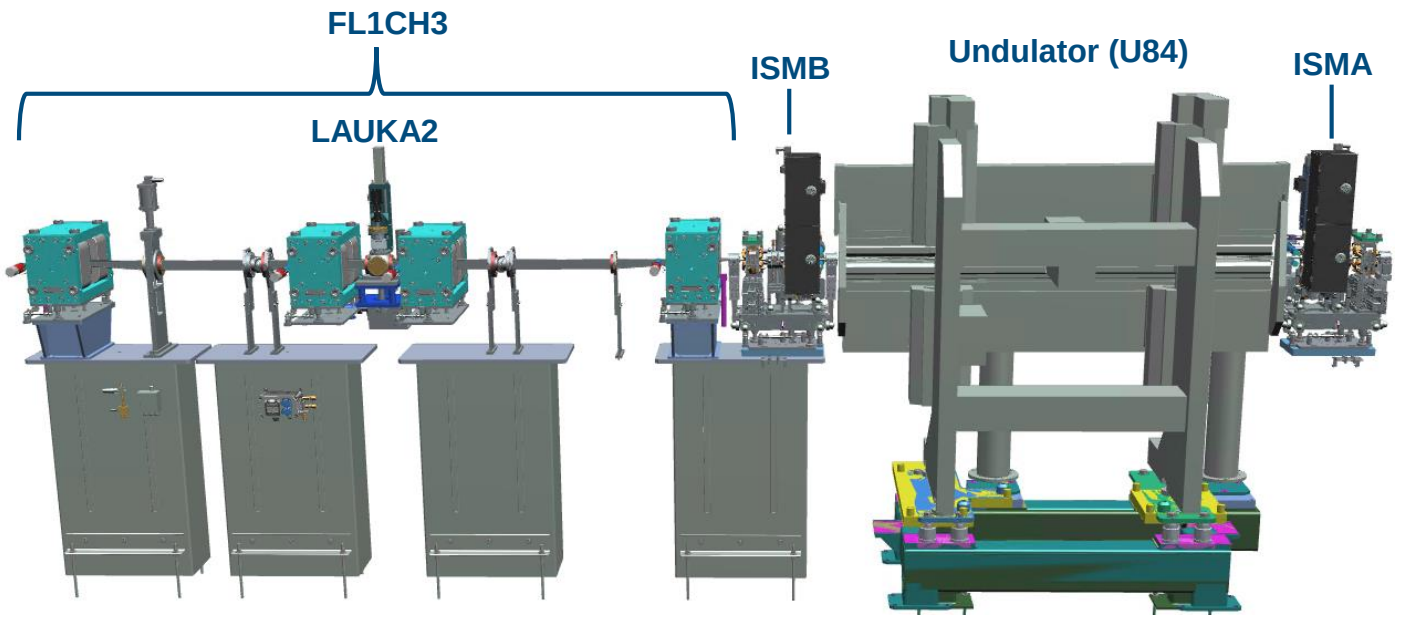






FL1MOD2

Link to FL1MOD2

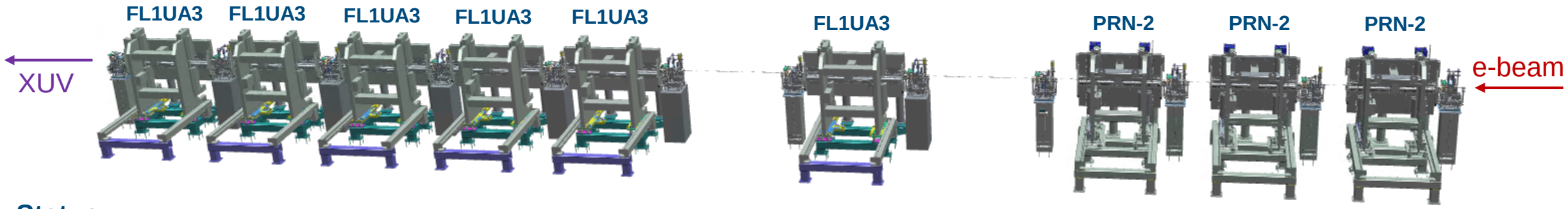


Status:

- Chicane Vacuum Chambers
  - FL1CH3: 2 mm (sheet width) chambers: next step: welding of 12 flanges
- Chicane Dipole Magnets
  - FL1CH3 (TDJ): assembled with new pole shoes ☑
  - Next step: magnetic and transfer measurement
- Undulator (planar U84) ☑
  - see presentation by K. Goetze
- SEED laser beamline (not shown above):
  - see presentation by T. Lang

FL1RADI

Link to FL1RADI



Status:

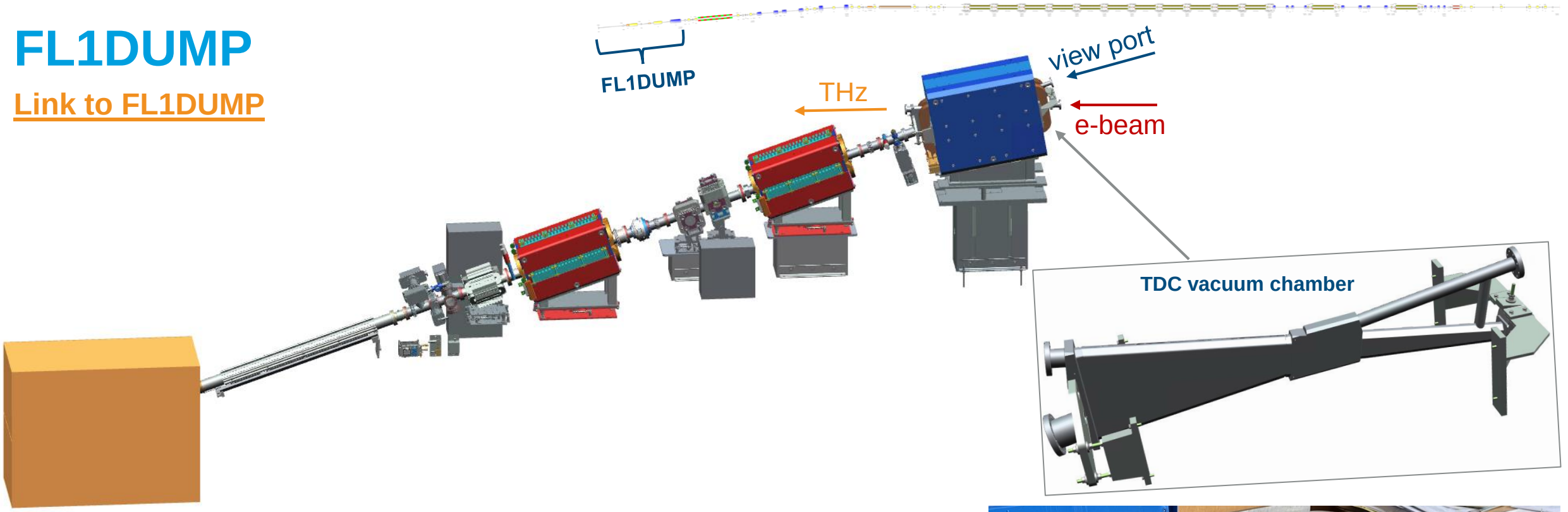
- **Vacuum parts**: RFI ✓

- **Radiators**:
  - 3 PRN-2 undulators: magnetic structure remeasured and refurbished => RFI ✓
  - **6 new APPLE3 type undulators** (FL1UA3, 2.5m long)
    - => see presentation by K. Goetze

- **12 Intersections** ISRA/B/C/D (600 mm):
  - Girders with vacuum parts (incl. BPM) pre-assembled and transfer measured => RFI ✓
  - EASy Movers: tested => RFI ✓
  - Quadrupoles TQG70 => transfer measurement
  - Phase shifters (FS-US) pre-assembled => RFI ✓
  - Steerers => pre-assembly at FS-US
  - => Test assembly of a full girder planned for mid November

FL1DUMP

Link to FL1DUMP



- **Beam Dump has been taken out**
  - Spare dump to be installed

Status: Slow but steady progress due to lowest priority

- Last section to be reviewed (lowest priority)
- Supports to be designed and manufactured
- All vacuum parts RFI apart from TDC dipole chamber
  - still in fabrication (… shall not become critical)

Outlook

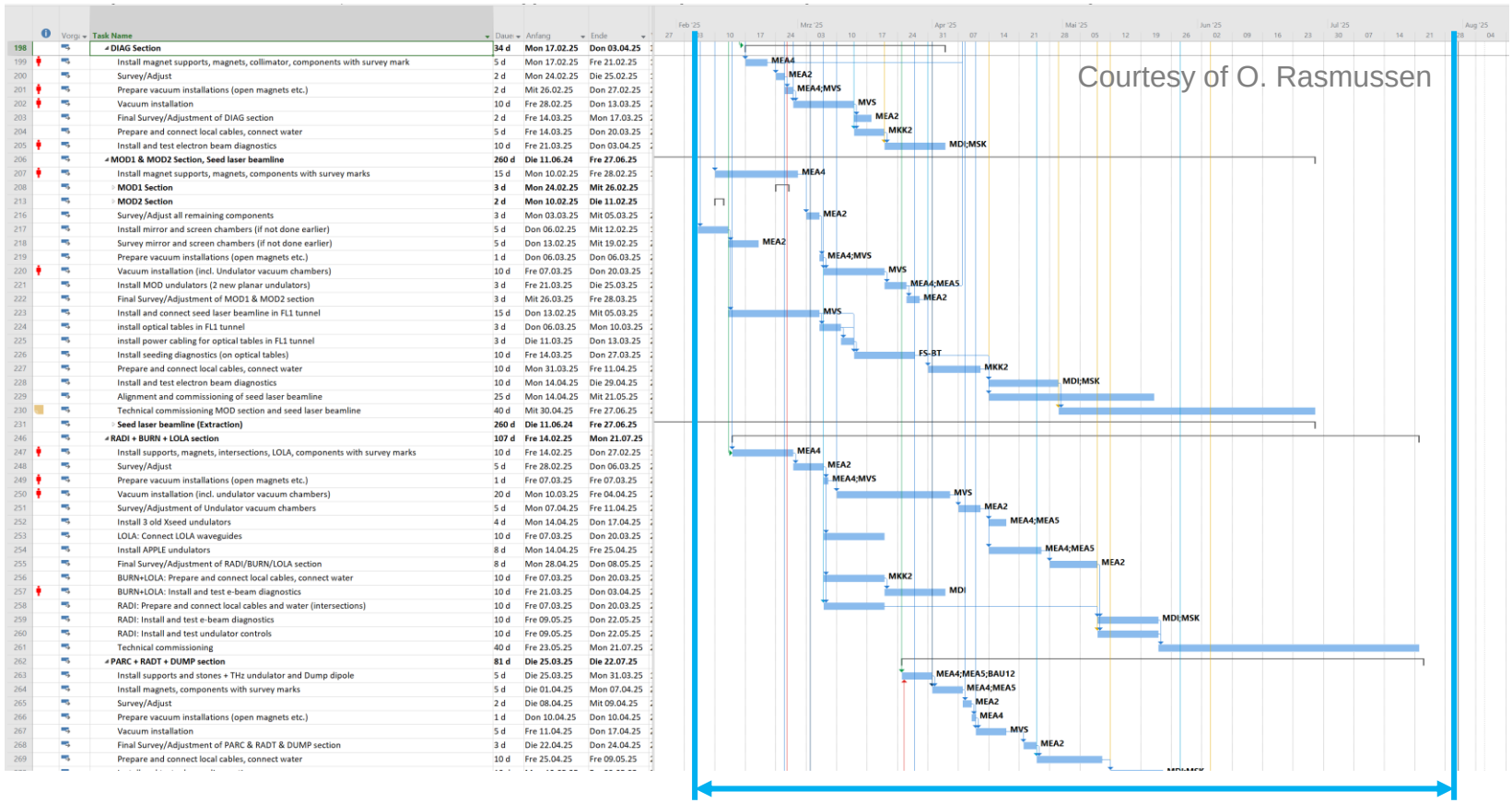
From preparation to installation …

FL1 beamline assembly & installation:

Time schedule: first assumption
⇒ Start: 06 Feb 25
⇒ sequential installation (DIAG to DUMP)

However, will require flexible re-scheduling
⇒ Availability of components
⇒ Coordination with other work in tunnel

⇒ Subject for next progress review meeting

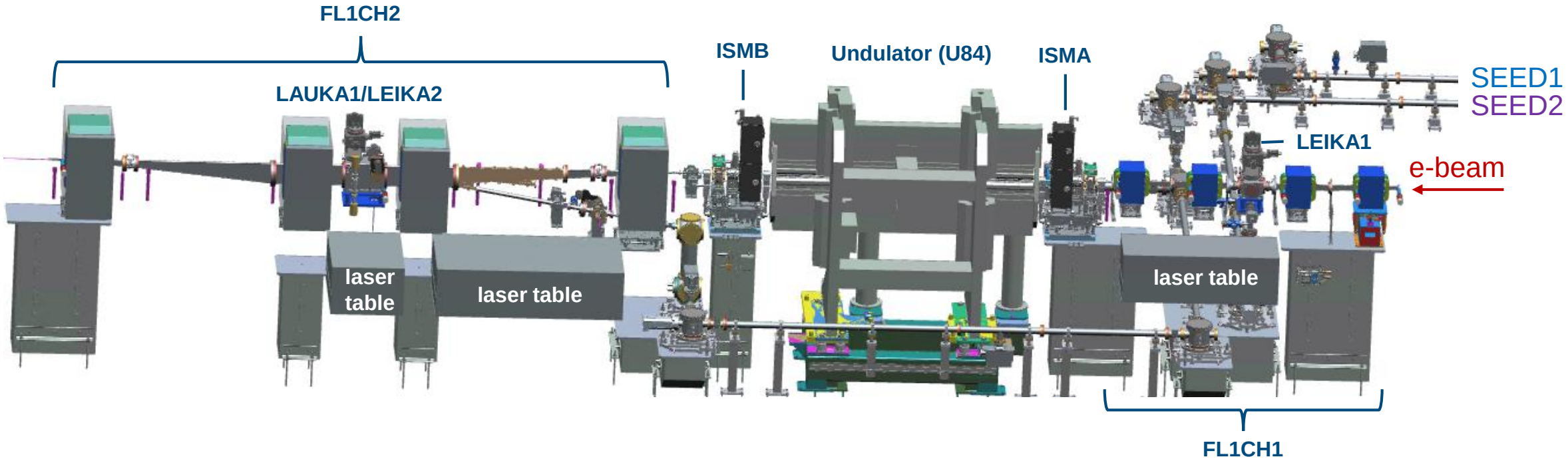


Start: 06 Feb 25
(> Install mirror chambers)

03 Aug 25
End of shutdown

FL1MOD1

Assembly strategy



For assembly of FL1MOD1 and FL1MOD2 a more detailed installation schedule / workflow is required:

- Many groups are involved (M and FS)
- Many interfaces / overlap of e-beamlines (FL2 not shown) and both SEED laser beamlines
- Many components only hard to access after installation of others (many parts are not shown above)
  - Cabling work, access during technical commissioning (movers (e.g. position switches), cameras, …)
  - survey (visibility of fiducials)
  - ”Late in-vacuum components” require local clean room
  - …

Summary / Outlook

FL1 Beamline Installation

- **Sections**: Most sections are RFI ☑ except for **Seeding (MOD1/2)** and **DUMP** section

- **Vacuum Parts (**smooth workflow from ZM to MVS)
  - Almost all parts are RFI except for chicane chambers (and TDC chamber)
    - Remaining steps:
      - Welding of flanges: shortage of man power
      - Copper plating: last fabrication step at external company

- **Magnets**
  - Almost all magnets to be re-used except for chicane dipoles
    - So far, delivery / RFI dates not delayed
    - TDK / TDI: In fabrication (delivery date Jan 25, Feb 25 RFI → reflected in schedule)
    - TDJ: assembled with new pole shoes → reflected in schedule

- **Undulators**
  - See next presentation by K. Goetze

- **Outlook**
  - Still: All vacuum components in time according to assembly and installation schedule (start 06 Feb 25)
  - Nevertheless, flexible adjustment of installation schedule according to availability
  - Complex FL1MOD1/2 sections require more detailed planning of workflow

Contact

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