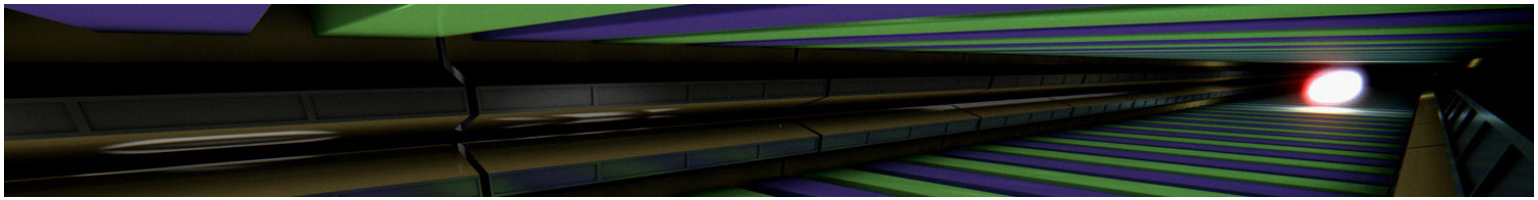
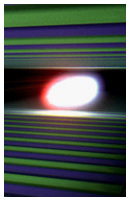


Installation of Undulator Systems

J. Pflüger, WP71

Installation Steps

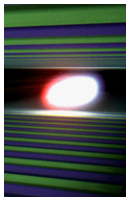


Each Undulator System is built up in three steps:

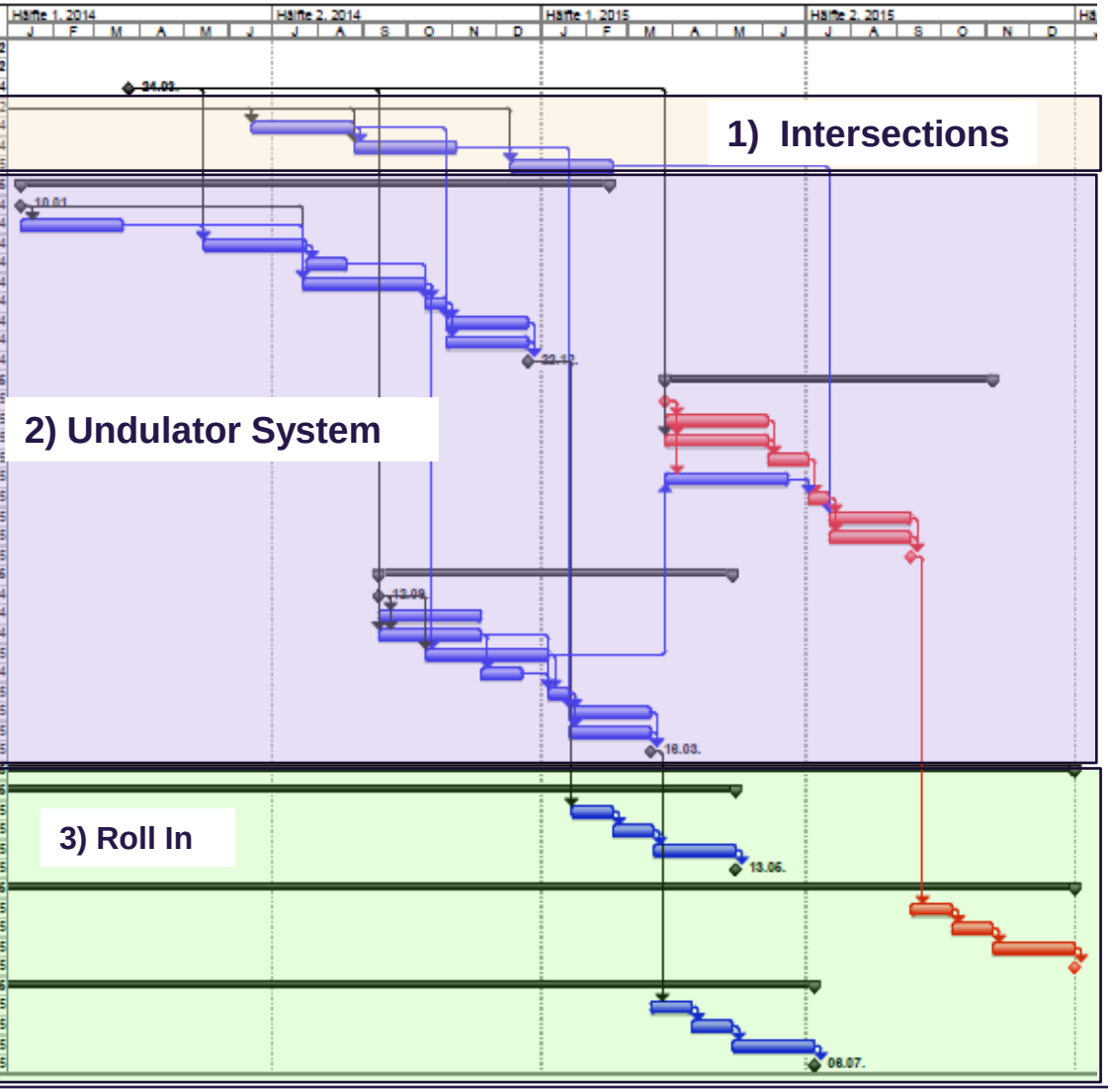
1. The complete Pre-assembly of the Intersection Units by the MEA4 workshop
2. The installation of the undulator systems in the tunnel:
   Dirty part: Installation of pillars, floor mounts, supports
   Clean part: Installation of Intersection Units and vacuum chamber.
3. Installation (Roll In) of the Undulator Segments ans subsequent Commssioning

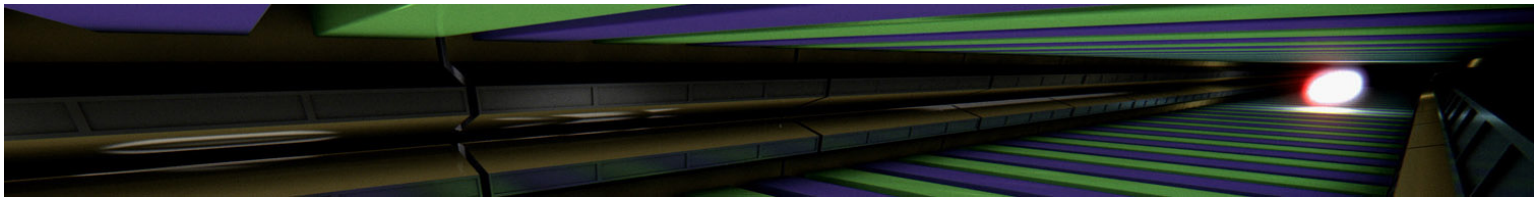
European XFEL

WP71 Time Schedule



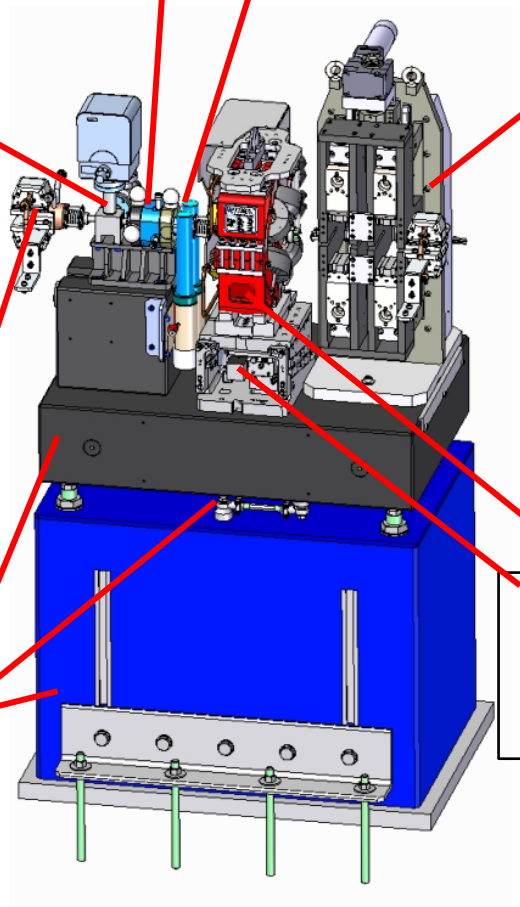
Nr.	Task Name	Dauer	Anfang	Ende
9	**WP-12: Warm Magnets**	**425 Tage**	**Di 30.11.10**	**Di 17.07.12**
12	**WP-17: Standard Beam Diagnostic**	**763 Tage**	**Di 28.12.09**	**Fr 16.11.12**
190	WP71 Components Ready	0 Monate	Mo 24.03.14	Mo 24.03.14
192	Delivery Quadrupoles Vacuum, BPMs,BLMs ready	0 Tage	Fr 16.11.12	Fr 16.11.12
193	Assembly SASE1 in MEA Workshop	2,5 Monate	Di 17.06.14	Mo 25.08.14
194	Assembly SASE3 in MEA Workshop	2,5 Monate	Di 26.08.14	Mo 03.11.14
195	Assembly SASE2 in MEA Workshop	2,5 Monate	Do 11.12.14	Mi 18.02.15
203	SASE 1	287 Tage	Fr 10.01.14	Mo 18.02.16
204	SASE1 Infrastructure ready EXT	0 Tage	Fr 10.01.14	Fr 10.01.14
205	Mark, drill holes, set bolts	2,5 Monate	Fr 10.01.14	Do 20.03.14
206	Mount & align Pillars, Floor Mounts etc.	2,5 Monate	Do 15.05.14	Mi 23.07.14
207	Install Control Racks with Cables	1 Monat	Do 24.07.14	Mi 20.08.14
208	Installation Air Condition SASE1	3 Monate	Di 22.07.14	Mo 13.10.14
209	Tunnel Cleaning	2 Wochen	Di 14.10.14	Mo 27.10.14
210	Install Intersection Base Plates	2 Monate	Di 28.10.14	Mo 22.12.14
211	Install Vacuum System / WP 19	2 Monate	Di 28.10.14	Mo 22.12.14
212	SASE1 ready for Undulator Segments	0 Tage	Mo 22.12.14	Mo 22.12.14
214	SASE 2	160 Tage	Fr 27.03.15	Do 06.11.16
215	SASE2 Infrastructure ready EXT	0 Tage	Fr 27.03.15	Fr 27.03.15
216	Mark, drill holes, set bolts	2,5 Monate	Fr 27.03.15	Do 04.06.15
217	Mount & align Pillars, Floor Mounts etc.	2,5 Monate	Fr 27.03.15	Do 04.06.15
218	Install Control Racks with Cables	1 Monat	Fr 05.06.15	Do 02.07.15
219	Installation Air Condition SASE2	3 Monate	Fr 27.03.15	Do 18.06.15
220	Tunnel cleaning	2 Wochen	Fr 03.07.15	Do 16.07.15
221	Install Intersection Base Plates	2 Monate	Fr 17.07.15	Do 10.09.15
222	Install Vacuum System / WP 19	2 Monate	Fr 17.07.15	Do 10.09.15
223	SASE2 Ready for Undulator Segments	0 Tage	Do 10.09.15	Do 10.09.15
225	SASE 3	172 Tage	Fr 12.09.14	Mo 11.05.16
226	SASE3 Infrastructure ready EXT	0 Tage	Fr 12.09.14	Fr 12.09.14
227	Mark, drill holes, set bolts	2,5 Monate	Fr 12.09.14	Do 20.11.14
228	Mount & align Pillars, Floor Mounts etc.	2,5 Monate	Fr 12.09.14	Do 20.11.14
229	Installation Air Condition SASE3	3 Monate	Di 14.10.14	Mo 05.01.15
230	Install Control Racks with cables	1 Monat	Fr 21.11.14	Do 18.12.14
231	Tunnel Cleaning	2 Wochen	Di 06.01.15	Mo 19.01.15
232	Install Intersection Base Plates	2 Monate	Di 20.01.15	Mo 16.03.15
233	Vacuum System by WP 19	2 Monate	Di 20.01.15	Mo 16.03.15
234	SASE3 ready for Undulator Segments	0 Tage	Mo 16.03.15	Mo 16.03.15
238	**Production of SASE1**	**840 Tage**	**Do 23.02.12**	**Mi 13.06.16**
241	Roll in SASE1	1 Monat	Do 22.01.15	Mi 18.02.15
242	Alignment	1 Monat	Do 19.02.15	Mi 18.03.15
243	Test of control system	2 Monate	Do 19.03.15	Mi 13.05.15
244	SASE1 Ready for Beam	0 Tage	Mi 13.05.15	Mi 13.05.15
245	**Production of SASE2**	**1008 Tage**	**Do 23.02.12**	**Do 31.12.16**
248	Roll in SASE2	1 Monat	Fr 11.09.15	Do 08.10.15
249	Alignment	1 Monat	Fr 09.10.15	Do 05.11.15
250	Test of control system	2 Monate	Fr 06.11.15	Do 31.12.15
251	SASE 2 Ready for Beam	0 Tage	Do 31.12.15	Do 31.12.15
252	**Production of SASE3**	**878 Tage**	**Do 23.02.12**	**Mo 08.07.16**
255	Roll in SASE3	1 Monat	Di 17.03.15	Mo 13.04.15
256	Alignment	1 Monat	Di 14.04.15	Mo 11.05.15
257	Test of Control System	2 Monate	Di 12.05.15	Mo 06.07.15
258	SASE 3 Ready for Beam	0 Tage	Mo 06.07.15	Mo 06.07.15





1.) Assembly of Intersection Units

SASE2 Type Intersection



WP17
Re-entrant Cavity
BPMs+ Electronics

WP17
Beam Loss Monitors

WP71
Phase Shifters

WP19
Vacuum System

WP12
Quadrupoles

WP71
Air Coil
Correctors

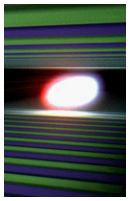
WP71
Quadrupole Movers

WP71
Support Bases
Adjustors
Concrete Pillars

Status 1/2013:

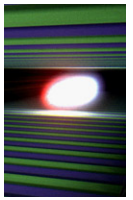
- **Delivered: Quadrupoles, WP12**
- **In Production 91 Intersections:**
  - **Phase Shifters (Nov 12), WP71**
  - **BPMS, WP17**
  - **BLMs, WP17**
  - **Vacuum systems, WP19**
  - **Air Coil Correctors, WP71**
  - **Base Plates, WP71**
  - **Adjustors, WP71**
  - **Concrete Pillars , WP71**
- **Released for production:**
  - **Quadrupole Movers (Dec12), Ciemat**
- **Start of Assembly @ XFEL: June 2014**

Description of Work Flow I



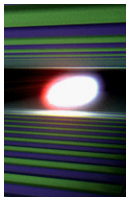
1. The Support Base Plate is equipped with
   - the parts needed for the turnbuckle adjustor (Bed Plates, actuators etc)
   - the alignment fiducials
2. The BPM is mounted by or with assistance of WP17
3. The first part of the vacuum system, Ion-Getter-Pump, Angle Valve and Absorber are inserted either by or through assistance of WP19. The vacuum to the BPM is connected.
4. Quadrupole Mover is mounted by MEA4 / WP71 / CIEMAT details tbd.
5. The Phase Shifter is mounted by MEA4 / WP71
6. The BLM is mounted by or with assistance of WP17
7. The Quadrupole is mounted by MEA4. The vacuum chamber is NOT yet inserted. This is postponed until the installation in the tunnels.
8. Wrap in protective plastic foil and keep covered

Description of Work Flow II



9. Alignment and survey: includes two steps:
   1. the transfer measurement of the survey fiducials including those on the BPMs
   2. Initialization measurement of the position of Quadrupole Mover axes: The LVDT reading at the nominal beam position is determined and protocolled.
   3. QM must be moveable. There must be a readout of the LVDT
10. Transport / locking belts to secure the Quadrupole on the Mover need to be applied.
11. The support base plate is wrapped in protective plastic foil
12. These steps are the same irrespective whether a SASE1/3 or SASE2 support base is assembled.
13. After these steps are done all components are pre-assembled on the support base plate, which is now ready for further installation.
    Until the items are needed for installation intermediate suitable buffer storage space is required. (WP71)

Open Points:



- Workshop area minimum 50-70 m^2 (better 100-150m^2)
  'clean': "Non magnetic dust" area, needed. Can be separated by a plastic foil tent.
- No heavy crane needed
  Loads: Base plate ≈ 150kg fork lift; Phase Shifter ≈200kg roller crane sufficient
- Final Survey and Aligment / Transfer Measurements. Needs to be organized with MEA. Where it can be done?
- Special Requirements:
  - Intersection Units are sensitive Items. QMs with mounted Quadrupoles require sensitive transport with < 0.5g .
  - Transportation locking of Quadrupole on the Mover required.
  - Cleanliness
    Plastic covers, protective plastic foils, hoods etc. for transport and intermediate storage.
- Buffer storage space needed:
  for 3 – 6 months starting August 2014: 100-200m^2 · Space at DESY minimizes transport

Corner Dates

- March 2014: Components Readiness Review
- Start 17.6.2014: Assembly of first batch of 35 Intersections Duration: 2.5 Months
- Start 26.8.2014: Second batch Duration 2.5 Months
- Start 11.12.14: Third Batch; Duration 2.5 Months

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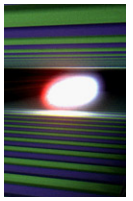
European XFEL

WP71 Time Schedule



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229	Installation Air Condition SASE3	3 Monate	Di 14.10.14	Mo 05.01.15
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249	Alignment	1 Monat	Fr 09.10.15	Do 05.11.15
250	Test of control system	2 Monate	Fr 06.11.15	Do 31.12.15
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256	Alignment	1 Monat	Di 14.04.15	Mo 11.05.15
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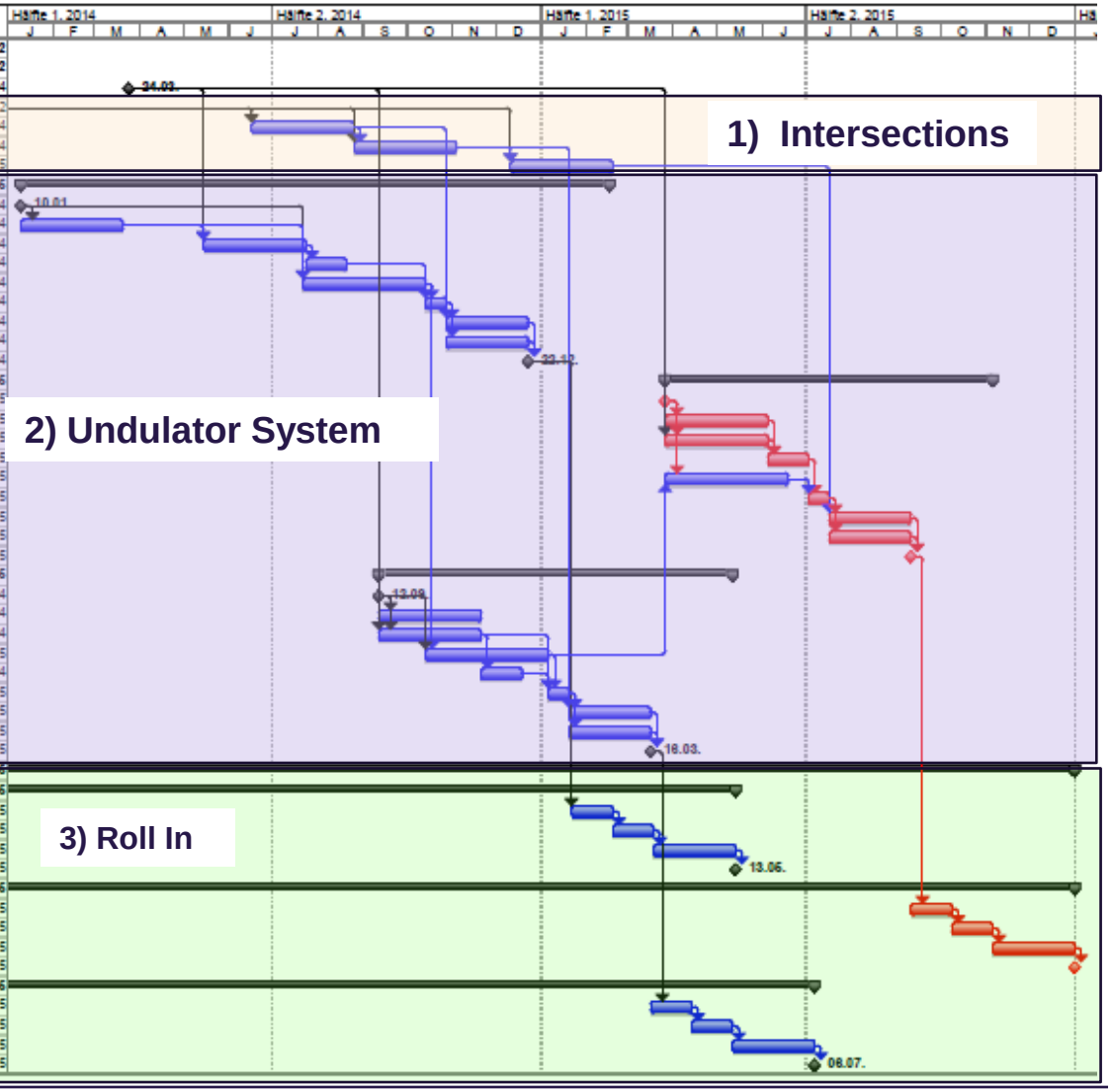

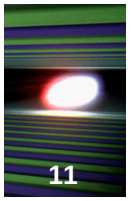

The End