

From CAD Beamline Design to Tunnel Installation at XFEL

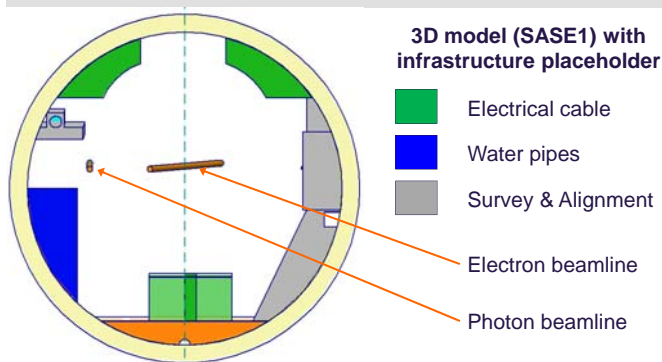
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The European XFEL will generate up to 27000 ultra short X-ray pulses per second with a brilliance that is a billion times higher than that of the best conventional X-ray radiation sources. The outstanding characteristics of the facility are unique worldwide. Starting in 2017, it will open up completely new research opportunities for scientists and industrial users.

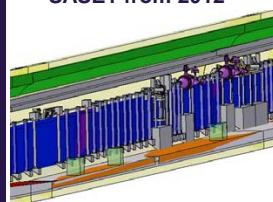
This poster explains the steps from CAD Design of the photon beam transport system to tunnel installation.



The initial step is a 3D model of the tunnel with rough placeholders of the infrastructure and a nearly empty tunnel in 2013.

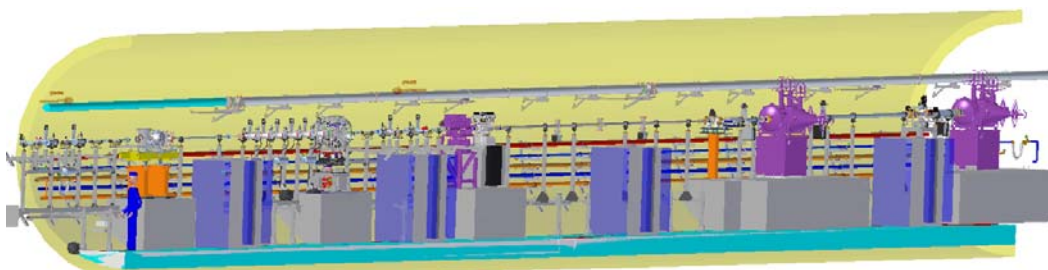
In a second step, a complete integration model is built up of the photon beam transport system with placeholders for all components and beamline sections.

Placeholder model SASE1 from 2012

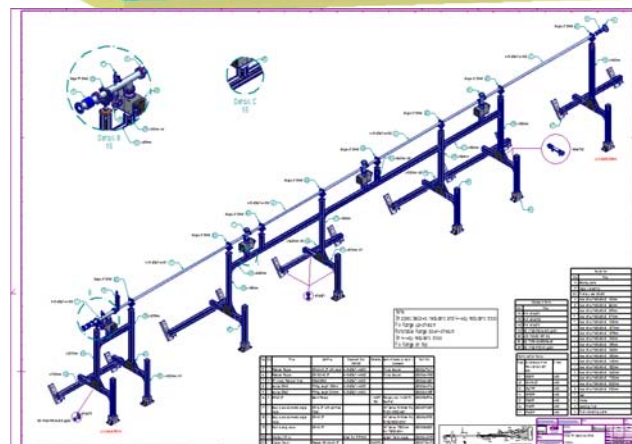


To know exactly the location of the single components a separate component list with all the coordinates is created.[3] Since the European XFEL facility is overall more than 3 km long, two coordinate systems have been defined to follow the curvature of the earth: The linear accelerator (LA) system is designed for the XTL tunnel, while the photon distribution (PD) system describes a line in the plane of the undulator and photon system along the SASE1 beam.[4]

Chn	CADRoom	FUNC.	LABEL	Exp	WP	DEVICE	TYPE	E DIST	DIST.	H	LA	LA	LA	PD	PD	PD
T9	XTD2	COLA1	2677 T9		73	Collimator 12x20mm (DN63/100)	COLA1	243.36	38.50	0.98	0.0000	-2.6878	2677.1371	0.0000	0.0000	682.6451
T9	XTD2				73	beam pipe DN100	START	243.85	38.99	1.90	0.0000	-2.6890	2677.6271	0.0000	0.0000	683.1361
T9	XTD2					gate valve DN100	STAN	244.44	39.57	0.070						
T9	XTD2				73	ion pump 1500	STAN	244.47	39.60							
T9	XTD2				73	roughing valve DN40 WC	STAN	245.27	40.41							
T9	XTD2				73	roughing valve DN40 WC	STAN	245.50	40.63	0.250						
T9	XTD2				73	reducer DN100/DN160	STAN	245.69	40.82	0.127						
T9	XTD2				73	beam pipe DN100 (DN160 flange)	END	246.72	40.89		0.0000	-2.6887	2679.5271	0.0000	0.0000	685.0361
T9	XTD2	MIRR	2680 T9		73	1st offset mirror (M1)	MIRR	246.50	41.64	1.80	0.0000	-2.6890	2680.2771	0.0000	0.0000	685.7851
T9	XTD2				73	beam pipe DN100 (DN160 flange)	START	247.55	42.69	7.105	0.0000	-2.6894	2681.3271	0.0000	0.0000	686.8351
T9	XTD2				73	reducer DN160/DN100 (0.33")	STAN	247.61	42.75	0.127						
T9	XTD2				73	bellows DN100 (0.33")	STAN	247.80	42.94	0.250						



Step by step placeholders are filled with the detailed design of the components. Defined reference planes are used to place components into integration model according to the positions from the component list. Very important is to check collisions during the early design phase.



Finally workshop drawings are created for building up the beamline sections and components in the tunnel. Important information like coordinates of the drill holes, parts lists (separated in standard vacuum parts and general parts) and pallet list can be found on a single drawing. [5]



References

- [1] H. Sinn et al.: "Conceptual Design Report X-Ray Optics and Beam Transport" (2011), DOI: <http://dx.doi.org/10.3204/XFEL.EU/TR-2011-002>
- [2] H. Sinn et al.: "Technical Design Report X-Ray Optics and Beam Transport" (2012), DOI: <http://dx.doi.org/10.3204/XFEL.EU/TR-2012-006>
- [3] N. Kohlstrunk: "CAD Component List", https://teamcenter.desy.de/TC90PRD/controller/download_file?file_name=change+request+component+list+04-2016.xlsx&file_handle_name=MTIOBJECTHandle-0002-1-R-AhCj5wkadam--mmpdrusr--ExcelShtX-mmpdrusr--L
- [4] H. Sinn: "Coordinate Systems for the Beam distribution systems", (2012) XFEL.EU TN-2012-003-02
- [5] H. Sinn: "X-Ray Component List" https://docs.xfel.eu/alfresco/d/a/workspace/SpacesStore/76bd0e9c-fe53-4622-8768-628c8876178/X_ray_component_list.xlsx