

MAX IV Front Ends in the 3GeV Ring

Front Ends for the initial beamlines

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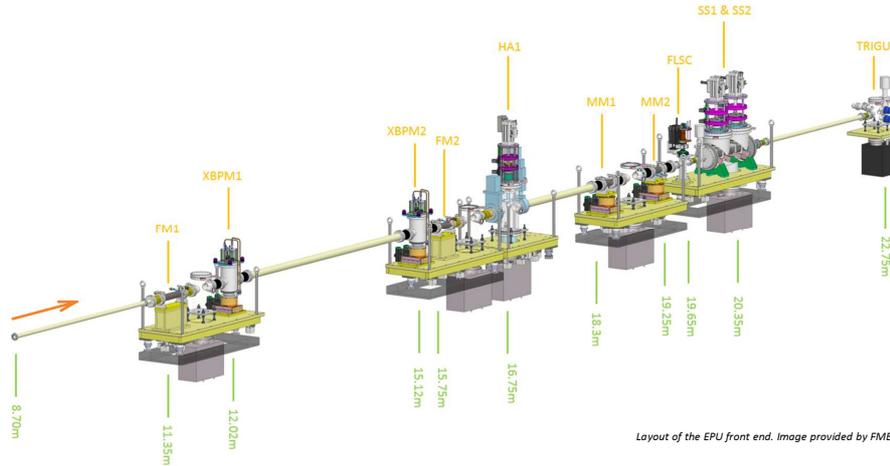
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Modularity and standardization are the main characteristics of these 14m long front ends. A standard design with same components but with small differences in apertures and heat absorbing surfaces allows to host all insertion devices of the five initial beamlines.

The **E-Deflector**, a singular component of the MAXIV Front Ends, is a permanent magnet installed not only for personal safety but also to prevent damage of the beamline optics in case of stored electron beam enters to the optical hutch. This component is designed and manufactured by MAX IV.

The design is now undergoing a revision and consists of three **Fixed Masks** for the Wiggler and PMU and two Fixed Masks in the case of the EPUs.

All components except the supports are manufactured and designed by the german company **FMB Berlin**.

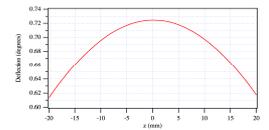


Layout of the EPU front end. Image provided by FMB.

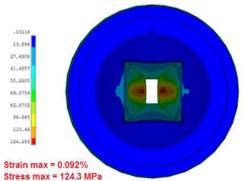
The cooled and pneumatically driven **Photon Shutter (HA1)** is made of Glidcop and installed **in-vacuum**, located after the second fixed mask, stops the beam and protects the tungsten blocks of the Safety Shutters.

The two **Bremsstrahlung Collimators (Safety Shutters)** consist of two Tungsten blocks of 200mm length. Controlled by the PSS of the machine system they prevent the radiation to pass through the Ratchet Wall and enter in the beamline.

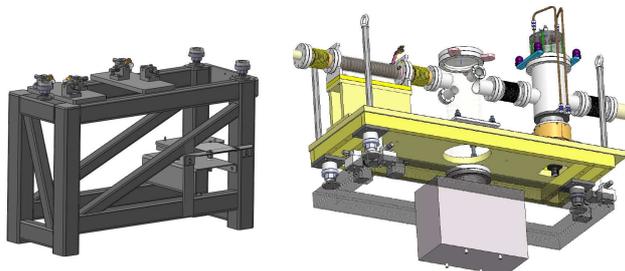
Two **XBPMs** (four cooled tungsten blades design) will provide the monitoring in vertical and horizontal position of the beam. In the case of the Wiggler a design of four blades located vis-à-vis and staggered has been chosen.



The deflection angle for a 3GeV electron as a function of the vertical distance to the dipole centerline.



Stress distribution on the FM2 for the EPU48 Front End. First results of stress and strain.



MAX IV Modular support design.

XBPM and Fixed Mask unit. Image from FMB.

For the supports MAX IV is designing and manufacturing them following the same concept of **modular support** already used at the Linac.

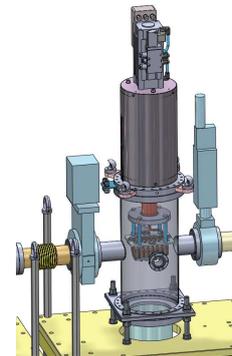
This standard support with an adjustment system consisting of screw poles and screws with springs guides will be used at the beamline components as well.

Due to the high **heat load** coming from our sources, the wiggler with 18.3kW and the PMU18 with 7.7kW, most of our absorbers are made of **Glidcop (AL-15)** with spiral cooling system.

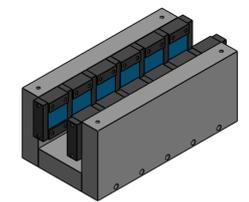
All absorbers and XBPMs have 2 thermocouples for controlling the temperature.



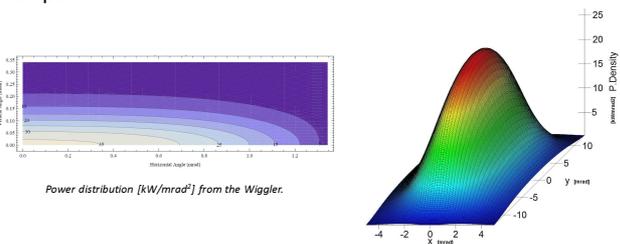
Fluorescent Screen and Safety Shutters with their tungsten blocks before the Collimator. Image from FMB.



Photon Shutter in-vacuum design. Image provided by FMB.



The Electron Beam Deflector or permanent magnet dipole located at 13.5m from source.



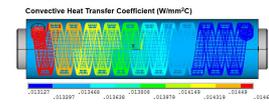
Power distribution [kW/mrad²] from the Wiggler.

Power distribution for the EPUS3, planar mode at 25m from source.

Fluorescent Screen and Safety Shutters with their tungsten blocks before the Collimator. Image from FMB.

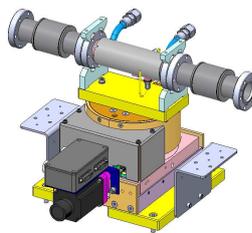
Photon Shutter in-vacuum design. Image provided by FMB.

Connective Heat Transfer Coefficient (W/mm²C)



FEA result of the convective heat transfer coef. at the FM2 of the EPU48 front end.

The **Fast Closing Valve** located at 16,4m from the source protects the vacuum of the machine in case of an air in-rush, using our timing system the beam can be dumped in less than 1msec with a time beam loss of approx 740µsec.



FMB Movable Mask design for all front ends.

Comp.	PMU18			EPU48 - EPU53			WIGGLER		
	Aperture [mrad]	Aperture [mm]	Abs-Power [kW]	Aperture [mrad]	Aperture [mm]	Abs-Power [kW]	Aperture [mrad]	Aperture [mm]	Abs-Power [kW]
FM1	1 x 1	11.35x11	0.059	1 x 1	11.4x11.4	2.75	1.13x1.18	12x12.5	7.2
FM2	0.32x0.22	5.14x3.53	4.49	0.22x0.42	3.57x6.8	6.5	0.4x0.1	6.8x3.6	8.2
FM3	0.1 x 0.1	1.63x1.63	2.45	-	-	-	0.4x0.1	6.65x1.66	1.5
MM1	0.22x0.22	0.92x0.74	0.5	0.136x0.36	3x6.7	1.9	0.36x0.08	6.3x1.4	0.16/1.1
MM2	0.21x0.21	0.97x0.77	0.5	0.135x0.36	3x6.7	1.9	0.36x0.08	6.7x1.5	0.19/1.1
COL	0.71x0.33	15x7	0	0.95x0.95	20x20	0	1x0.5	20x10	0

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TIME LINE

