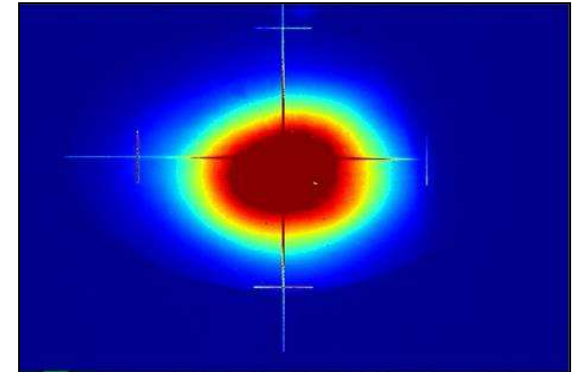


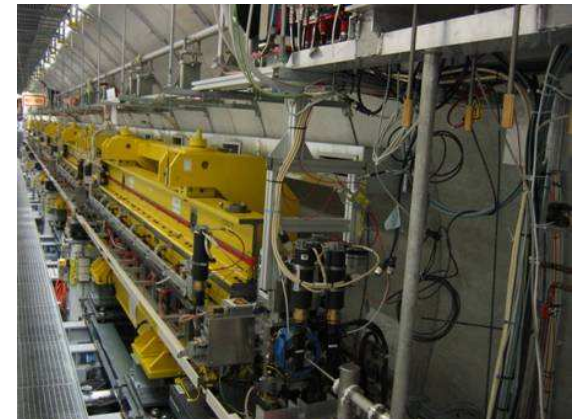
Photon Diagnostics for Day-to-Day Operation.

FLASH.
Free-Electron Laser
in Hamburg

Bart Faatz
DESY



DESY
January 24, 2013



Parameters to be measured (>8000 bunches)

Parameters

- Wavelength/Spectrum
- Intensity
- Position/Angle
- **Pulse Duration**
- Radiation Profile
- Polarization
- Arrival time
- Timing stability

Conditions

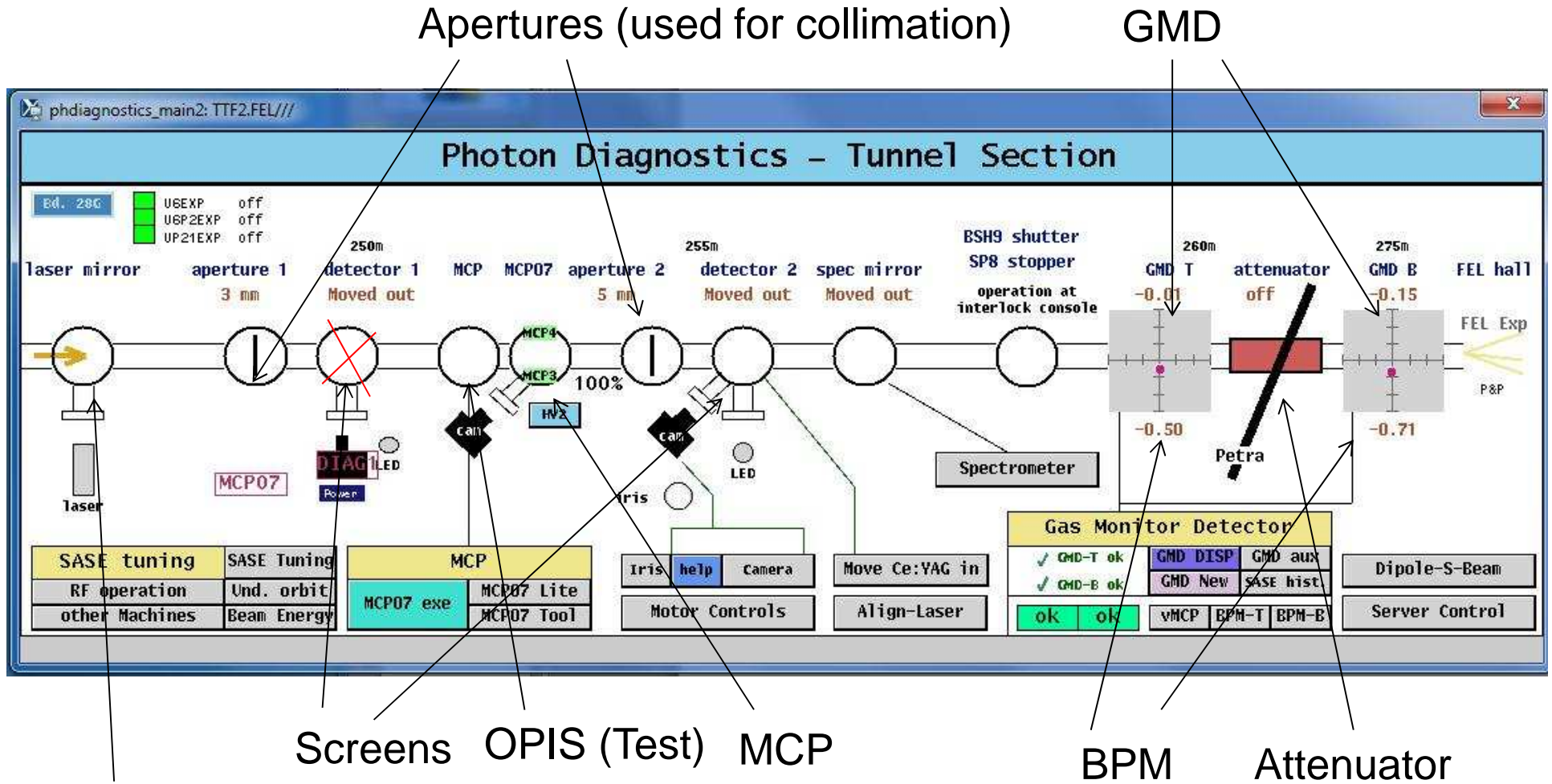
- Each shot/each bunch (Pulse)
- Online
- Non-interceptive

Additions

- Collimation
- Alignment Laser
- Attenuator
- Protection (of equipment)



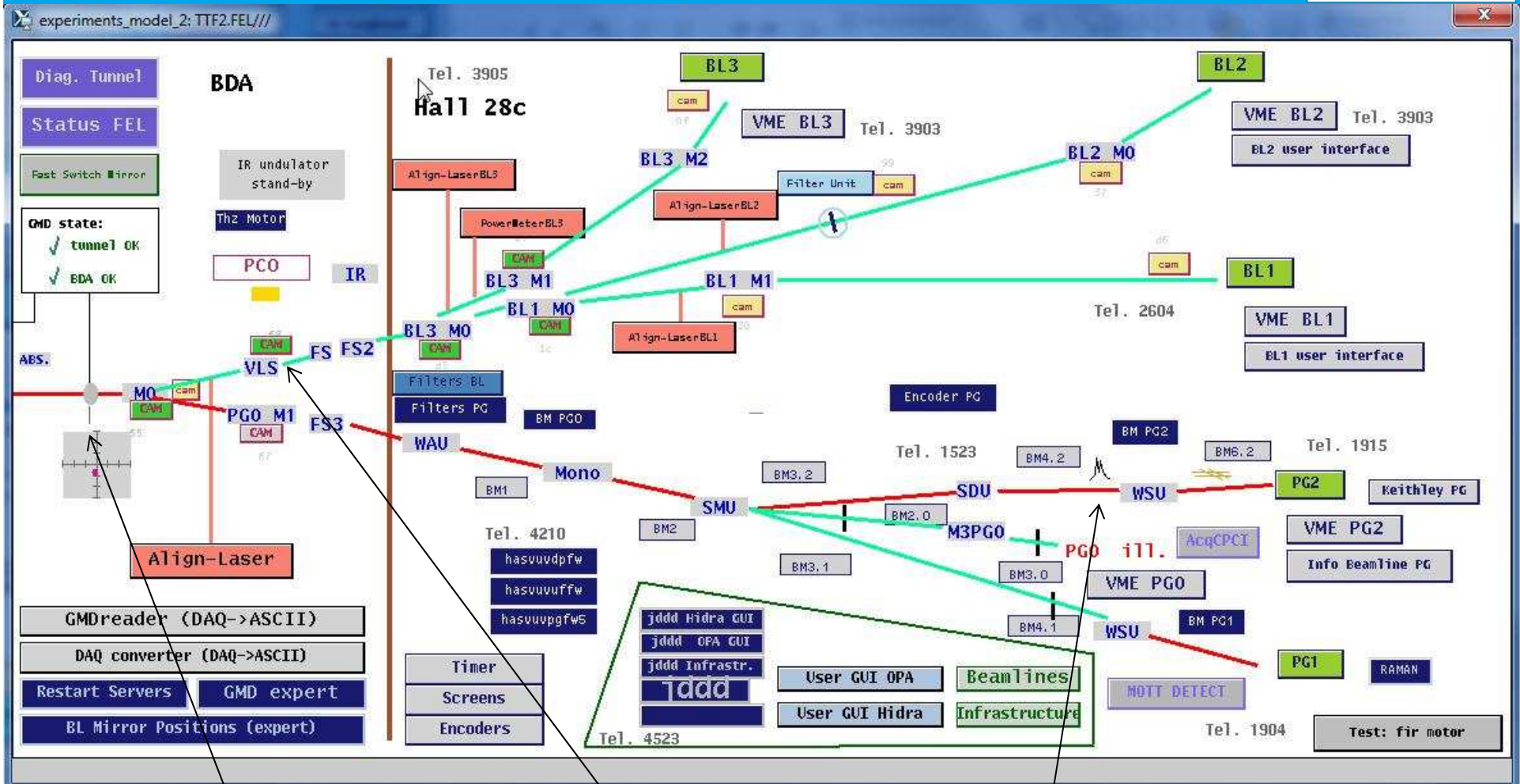
Photon Diagnostics FLASH.



Alignment Laser



Experimental Hall.



GMD, BPM, VLS-Spectrometer, PG-Spectrometer



Apertures/Detectors.

phdiagnostics_apert1: TTF2.FEL/HASY.MOTOR/STEPPLIB/

Aperture 1

Current position: 3 mm

Set Aperture:

Offset:
Vertical Horizontal

Signals:

Movement:

| | Vertical | Horizontal |
|--------------------|----------|------------|
| Current positions: | 29.1 | -0.5 |
| From encoders: | 28.984 | -0.460 |
| Set position: | 29.1 | -0.5 |

Apertures: standard sizes

Detectors

phdiagnostics_detector2: TTF2.FEL/HASY.MOTOR/STEPPLIB/

Detector 2

Current position: Moved out

Set Device:

Offset:
Vertical Horizontal

Movement:

| | Vertical | Horizontal |
|--------------------|----------|------------|
| Current positions: | 93 | 0 |
| From encoders: | 92.412 | -0.026 |
| Set position: | 93 | 0 |



Problems with FLASH.

GMDs behind Apertures → Status does not show machine performance
→ Users cannot ,simply‘ change apertures

No Absorber in front of V0-Valve → no beam permission when valve closed.

BPMs behind YAG screen → no simultaneous measurement of Position and Profile.

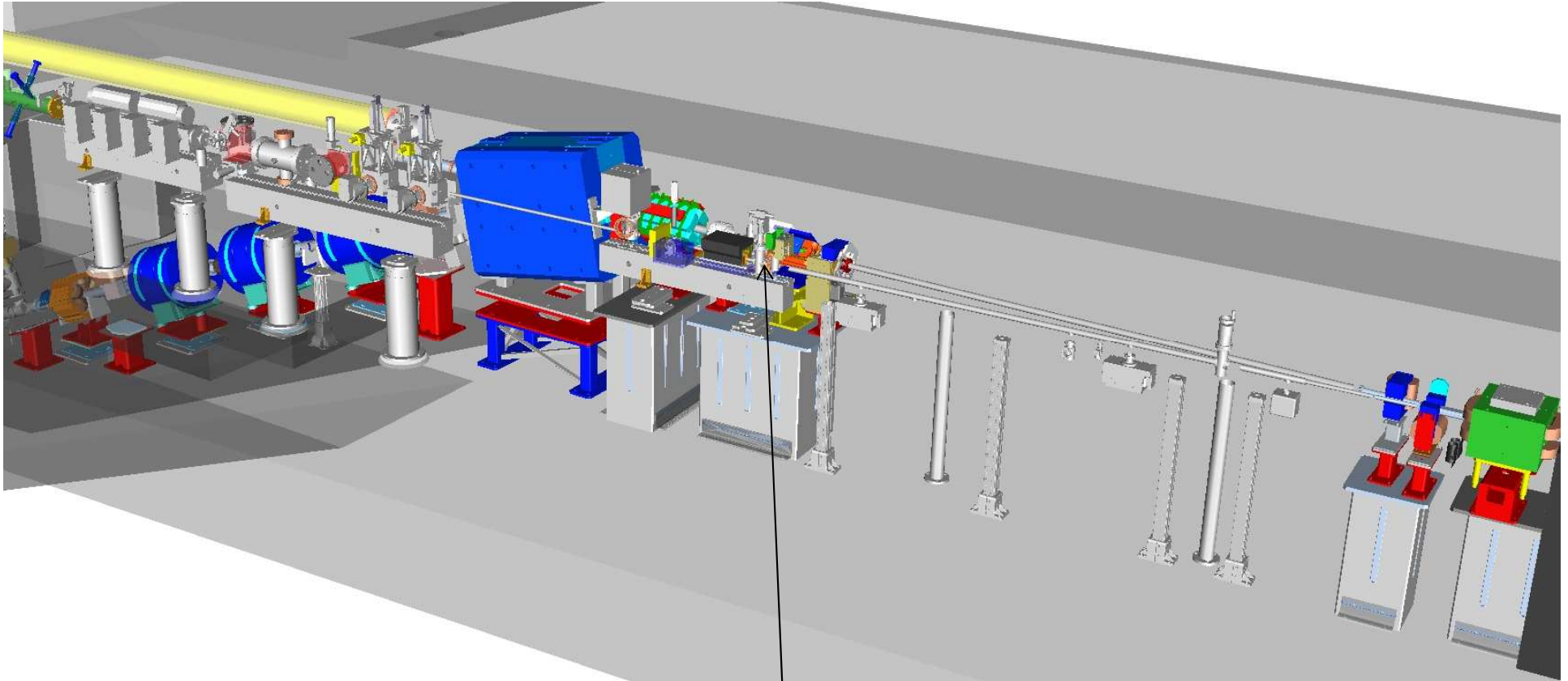
No spectrometer in front of YAG screen (OPIS only as test).

With Attenuator to max., no signal on BPM/GMD in Hall(?)

Cross-talk GMD-T and Attenuator.

BURN & DUMP Section at FLASH2 .

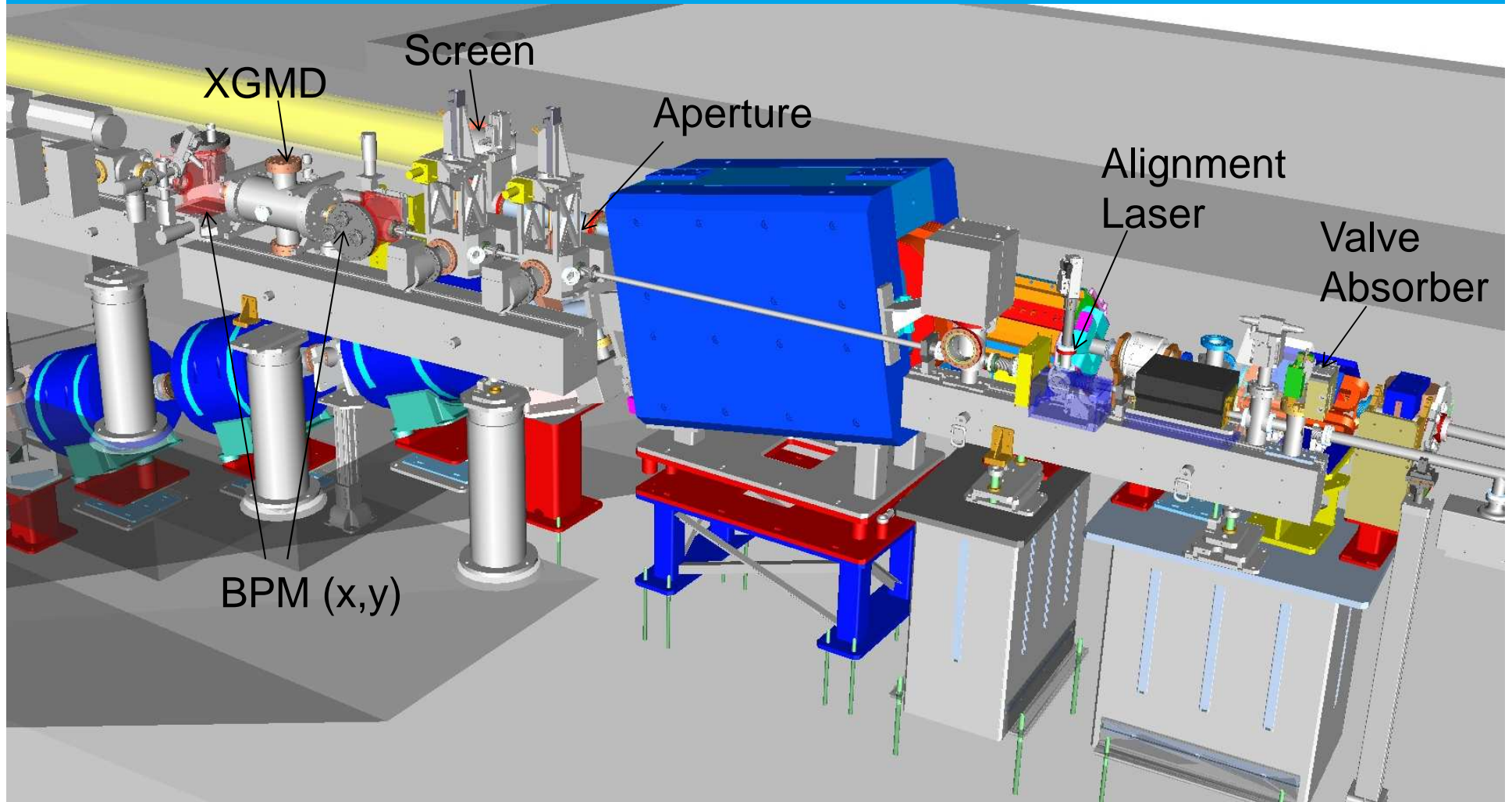
FLASH.
Free-Electron Laser
in Hamburg



Arrival time monitor (e-beam) and slow/fast FB

Separation of XUV and e-beam

Photon Diagnostics (part 1).



Mirror for alignment Laser can be inserted without losing beam permission

- Close V0/Absorber

- Open undulator gaps

- Reduce bunch number to 30 or 1

Apertures to collimate beam for

- FEL measurements

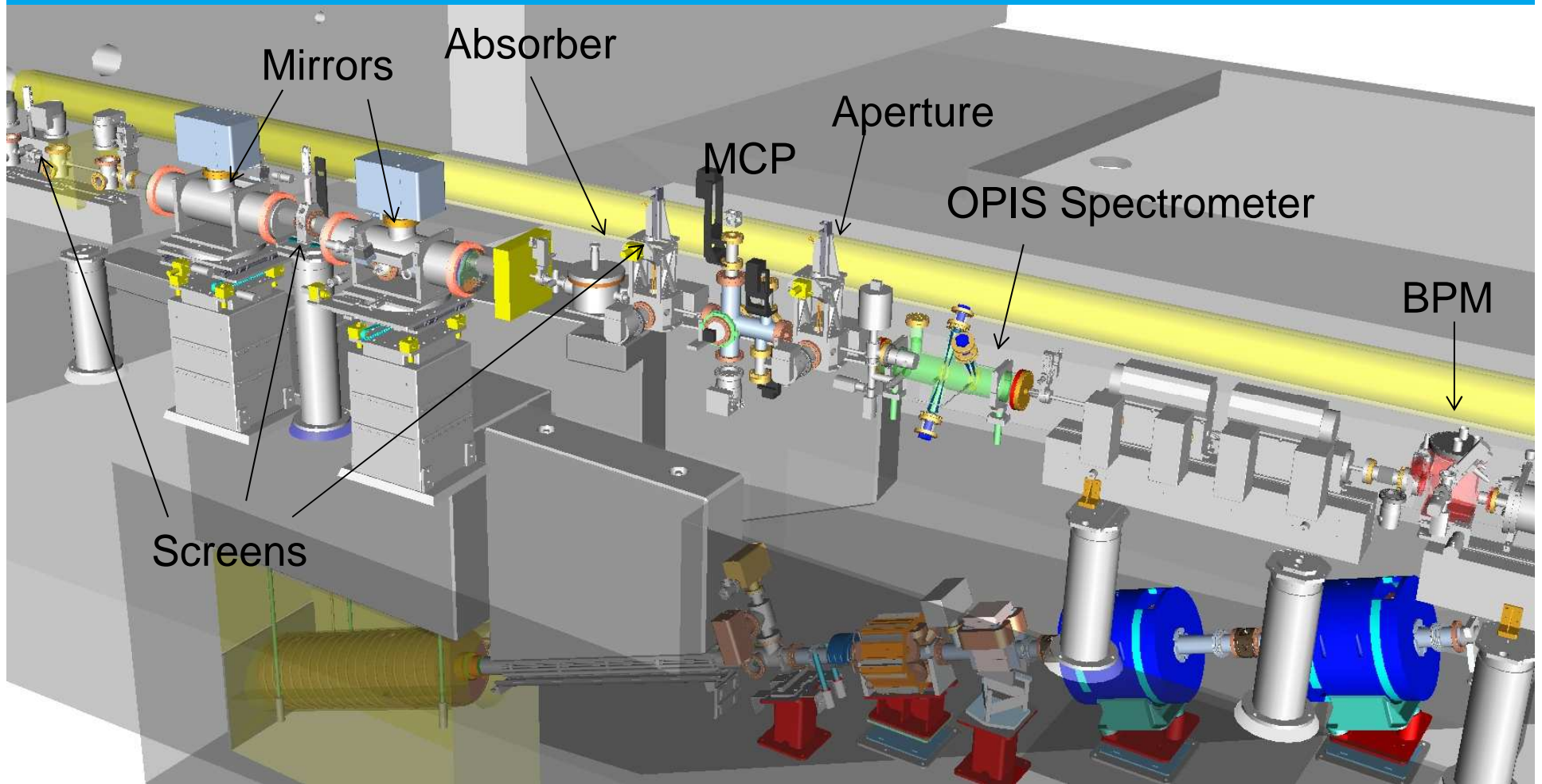
- Protection of mirror coatings

- Not for users

Screen for alignment and first beam profile measurements

First Position and Intensity measurement

Photon Diagnostics (part 2).



BPMs + Screen for Angle and Position measurement
Online spectrometer
MCP for Startup/backup intensity detector

Absorber behind tunnel photon diagnostics for up 800 bunches,
10 Hz (in front of mirrors).

Lack of space:

Only one BPM in Tunnel, 2nd in Hall with mirrors in between.
No pulse length possibility foreseen.

Similar in the experimental Hall

+

Space reserved for pulse length measurements (2 m).

- Filters
- Apertures (for users).

- Diagnostics needs to be easy in use.
- Operators must be able to change settings.
- Control system must signal if the measurement makes sense.
- All measurements need to be simultaneous.

For a multi-beamline Facility

Don't control beamlines simultaneously, but all need to be visible at the same time.

Tests performed at FLASH

Test at 25.8 nm at equal charge (left)
and factor of 2 difference (right)

SASE Signal

- Maximum
- Average
- Actual

