**BAM : General Layout**

- **BAM = Bunch Arrival Time Monitor**
- measurement of electron bunch timing with femtosecond resolution (< 10 fs) (relative to optical timing reference)
- complex system, comprises 3 sub-units:
  - RF Unit (broad-band up to 40 GHz)
  - Electro-Optical Unit
  - Electronics (read-out, control, general I/O, …)

- 40 GHz pick-up design by TU Darmstadt, housing made by DESY
- Electro-Optical Modulator
  - Telecomm. standard → 40 Gbps
- Intensity Modulator
- TMCB2
  - Temp. controller
  - Laser-Diode Driver (LDD)
- FMC25 + DSBAM
- FMC20 + MD22 (2x)
- Laser-Diode Driver (LDD)
BAM : Components

**RF Unit**
- RF pickup
- low-loss, phase-stable cables
- power combiner
- power limiter (50 GHz BW)
- optional power amplifier
- optional attenuator, voltage-controlled

**EO Unit**
- connected to stabilised fibreflink (fs synchronisation system)
- 2x motorised, optical delay line
- 1x motorised (static) optical delay
- 2x electro-optical modulators: 20 GHz and 40 GHz BW
- optical switch (50 ns rise-time)
- diverse, polarisation maintaining fibre-optical components
  - circulator
  - combiner/splitter
  - optical amplifier
  - optical power coupler

**Electronics**
- MTAC.4
  - FMC25 + DSBAM
  - FMC20 + 2x MD22
- TMCB2 + backplane
- FRED
- LDD (1 channel)
- temperature controller
- optional fan control
- optical switch control

**BAM Box :**
- 19” module, 4U, 530 mm depth
Installations

- 1st BAM installed at FLASH in 2006
- until 2012, 3 more followed, further planned

- final stage: 8 BAMs at FLASH
  - 4 in FLASH linac
  - 1 in FLASH1 beamline
  - 2 in FLASH2 beamline
  - 1 in FLASH3 beamline

- planned: 8+1+2 BAMs at XFEL
  - 1 per injector
  - 4 in linac
  - 1+1 in collimation section
  - up to 3 in SASE beamlines (min. 1)
**Timeline**

**ORIGINAL PLAN** (from Feb. 2013) listed all installations which needed at least **FMC25+DSBAM**

<table>
<thead>
<tr>
<th>BAM Locations</th>
<th>Deadline</th>
<th># Electronics required</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLASH ACC7</td>
<td>2013 Jun.</td>
<td>1x</td>
</tr>
<tr>
<td>FLASH DBC2/DBC3</td>
<td>2013 Aug./Sep.</td>
<td>2x</td>
</tr>
<tr>
<td>FLASH UBC2/SFELC</td>
<td>2013 Dez.</td>
<td>2x</td>
</tr>
<tr>
<td>FLASH2</td>
<td>2014 Jun.</td>
<td>2x</td>
</tr>
<tr>
<td>XFEL XTIN</td>
<td>2014 Sep.</td>
<td>1x</td>
</tr>
</tbody>
</table>
Timeline... seriously

THE PLAN  (from May. 2014)
listed all installations which need FMC25+DSBAM, FMC20+MD22
& partly TMCB2+backplane, FRED, LDD, ....

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<td>2014 Aug./Sep.</td>
<td>2x</td>
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<tr>
<td>FLASH UBC2/FLASH2</td>
<td>2014 Dez.</td>
<td>3x</td>
</tr>
<tr>
<td>FLASH SFELC/XFEL XTN</td>
<td>2015 Jan.</td>
<td>2x</td>
</tr>
</tbody>
</table>