XFEL LLRF installation overview

Julien Branlard
OVERVIEW

- Steps

- Team

- Schedule
INSTALLATION STEPS

- Incoming inspection
- Device test
- Crate installation
- Rack installation
- Tunnel installation
**Incoming inspection**

- Delivery in Helgoland,
- Archiving of shipping documentation
- Device Labelling
- KDS documentation
- Review of the company tests (present? complete?)
- Random verification of company tests
- Storage and “ready-for-test” notification
- Incoming inspection sheet sign off
- Uploading of sign off sheet to EDMS
**INSTALLATION STEPS**

- **Incoming inspection**
- **Device test**
  - a. Initial tests are performed (not requiring test stand)
  - b. Test stand is in proper configuration and calibrated
  - c. Device is installed in test stand and test is carried
  - d. Test report is generated, stored on N drive
  - e. Acceptance of the device
  - f. Device is marked as tested / approved
  - g. Acceptance report is uploaded in EDMS (link to acceptance report)
  - h. Storage and “ready for installation” notification
  - i. EDMS number of device test is documented in KDS

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Julien Branlard, **MSK collaboration workshop**

DESY, May 12-13th 2014, DESY
XFEL LLRF installation overview

INSTALLATION STEPS

- Incoming inspection
- Device test
- Crate installation

Julien Branlard, MSK collaboration workshop
DESY, May 12-13th 2014, DESY
 XFEL LLRF installation overview

INSTALLATION STEPS

- Incoming inspection
- Device test
- Crate installation
  a. Selection of components from storage
  b. Crate infrastructure assembly
     (MTCA crate , MCH, CPU, uPM), power on
  c. Basic functionality checks
     (telnet, verification of MCH settings)
  d. Crate full population is performed
     (all MTCA components)
  e. Basic functionality checks
     (PCIe, verification of drivers)
  f. Installation of servers
     (llrf, timer, MPS, watchdog, diagnostics)
  g. Fill-in crate assembly checklist report
  h. Storage of assembled LLRF crate
     (Helgoland or Rack assembly facility XTIN UG5)
  i. Notification “ready for cabinet assembly” is sent
  j. KDS documentation and EDMS upload of crate assembly check list
INSTALLATION STEPS

- Incoming inspection
- Device test
- Crate installation
- Rack installation
INSTALLATION STEPS

- Incoming inspection
- Device test
- Crate installation
- Rack installation

LLRF rack assembly and test area (RATA)

→ Wojciech Wierba’s talk
Installation overview

**Installation Steps**

- **Incoming inspection**
- **Device test**
- **Crate installation**
- **Rack installation**
  - a. Installation of all 19” modules
  - b. Installation of MTCA crate
  - c. Installation of all inner rack cabling
  - d. Installation of non-LLRF components
  - e. Connection to mains, to Ethernet, to water
  - f. Cabinet integral test (checklist)
  - g. Storage of cabinet in LLRF racks assembly facility
  - h. Ready for tunnel installation notification
  - i. KDS final documentation and EDMS upload of cabinet assembly checklist
- Incoming inspection
- Device test
- Crate installation
- Rack installation
  a. Installation of all 19” modules
  b. Installation of MTCA crate
  c. **Installation of all inner rack cabling**
  d. Installation of non-LLRF components
  e. Connection to mains, to Ethernet, to water
  f. Cabinet integral test (checklist)
  g. Storage of cabinet in LLRF racks assembly facility
  h. Ready for tunnel installation notification
  i. KDS final documentation and EDMS upload of cabinet assembly checklist
- **Incoming inspection**
- **Device test**
- **Crate installation**

**Rack installation**

a. Installation of all 19" modules
b. Installation of MTCA crate
c. Installation of all inner rack cabling
d. Installation of non-LLRF components
e. Connection to mains, to Ethernet, to water
f. **Cabinet integral test (checklist)**
g. Storage of cabinet in LLRF racks assembly facility
h. Ready for tunnel installation notification
i. KDS final documentation and EDMS upload of cabinet assembly checklist
INSTALLATION STEPS

- Incoming inspection
- Device test
- Crate installation
- Rack installation

Tunnel installation
  a. cabinet transport
  b. RF cabling
  c. Fibre optics connections
  d. Connections to mains, water and Ethernet
  e. Installation of shielding if applicable
  f. Power ON
  g. Installation complete checklist
  h. Notification “system ready for commissioning”
  i. Installation complete sign-off and upload to EDMS

Christian Schmidt’s talk
All information available in one document on N drive

- N:\4all\public\MSK_Projekte\XFEL\Installation\XFEL LLRF system installation procedure.docx
Maciek Kudła:
Organization, inner-rack cabling, incoming inspection, documentation, etc…

Michael Fenner:
Device incoming tests and quality control, etc…

Bart Szczepanski:
Electrical safety, crate installation, device testing, etc…

Adam Galant:
Rack installation, pre-commissioning, etc…

Wojciech Wierba:
Rack preparation and logistics, outer rack cabling, patch panels, etc…
Supporting MSK members

- Uros Mavrič, Günter Möller, Henning Weddig,
  device testing, crate and rack installation and testing
- Gohar Ayvazyan, Izabela Małka
  EDMS, payments, archiving

All 19” module designers

- DCM : Jan Piekarski
- REFM : Dominik Sikora
- LOGM : Mateusz Zukocinski
- PSM : Daniel Kühn
- PZ16M : Konrad Przygoda
- CPIM : Günter Möller
Commissioning team support

- Valery Ayvazyan
- Wojciech Cichalewski
- Mariusz Grecki
- Matthias Hoffmann
- Christian Schmidt
- Julien Branlard

→ major effort, stretched over 2 years
→ requires organization (consistent + rigorous)
→ “ad hoc” help
## INSTALLATION SCHEDULE

From: Massimo Altarelli’s talk, XFEL collaboration workshop, April 2014

### Revised milestones (Council Meeting Nov. 2013)

- Problems with mass production and integration of linear accelerator components leads to shift of major milestones by about one year.

<table>
<thead>
<tr>
<th>Milestone</th>
<th>Description</th>
<th>Old date</th>
<th>New date</th>
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<tbody>
<tr>
<td>Linac tunnel closed</td>
<td>Linac is ready to be cooled down in order to take beam</td>
<td>30 Jun 2015</td>
<td>30 Jun 2016</td>
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<tr>
<td>First beam to XS1 Dump</td>
<td>Beam has been passed through the Linac from injector all the way to the main dump</td>
<td>30 Sep 2015</td>
<td>30 Sep. 2016</td>
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<tr>
<td>First Lasing SASE1 possible</td>
<td>First SASE1 (SPB &amp; FXE) Photons in XHEXP1 possible</td>
<td>15 Dec 2015</td>
<td>31 Dec 2016</td>
</tr>
<tr>
<td>First Lasing SASE3 possible</td>
<td>First SASE3 (SQS &amp;SCS) Photons in XHEXP1 possible</td>
<td>31 Jan 2016</td>
<td>15 Feb 2017</td>
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<tr>
<td>SASE1 Instruments users’ operation</td>
<td>First user experiment at SASE1 (SPB &amp; FXE) possible</td>
<td>31 Mar 2016</td>
<td>30 Apr 2017</td>
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### INSTALLATION SCHEDULE

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<td>INSTALL DATE</td>
<td>May-14</td>
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- DCM: 2 2 2 2 2 2 2 2
- DCM39: 2 2 2 2 2
- LOGM: 1 1 1 1
- LOGM39: 1
- REFM-OPT: 1
- REFM-L1: 1
- REFM-SLAVE-L1: 1
- REFM-L2: 1
- REFM-L2.1: 1
- REFM-L2.2: 1
- REFM-SLAVE: 1 1 1 1 1 1 1 1
- REFM-L3.1: 1
- REFM-L3.2: 1
- REFM-L3.3: 1
- REFM-L3.4: 1
- REFM-L3.5: 1
- PZ16M: 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
- PSM: 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
- CPIM: 1 1 1 1 1 1 1 1 1 1 1

- N:\4all\public\MSK_Projekte\XFEL\Installation\XFEL-LLRF installations schedule.xlsx

Julien Branlard, MSK collaboration workshop
DESY, May 12-13th 2014, DESY
BEYOND THE INSTALLATION

2 years

PRE-COMMISSIONING
A3 A4 A5 A26

TUNNEL INSTALLATION
A2 A3 A4 A26

WARM COMMISSIONING
A2 A3 A4 A26

LLRF installation finished
LLRF ready for cool down
LLRF ready for beam
LLRF ready for linac operation

COOL DOWN

COLD COMMISSIONING
A2 A3 A6 A24
A4 A7 A25
A5 A8 A26

NO BEAM

LOW BEAM

NOMINAL BEAM

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SUMMARY: The XFEL LLRF station recipe

**Ingredients:** (for a standard Linac RF station)
- 2 MTCA crates
- 4 power modules
- 2 CPU, 2 MCH
- 2 timing modules (x2timer with RTM)
- 2 MPS modules (DAMC02 with RTM)
- 2 LLRF controllers (TCK7)
- 1 vector modulator (VM2LF)
- 12 digitizers (SIS8300L)
- 12 down-converters
- 2 prepared racks
- 2 DCM
- 2 REFM
- 2 LOGM
- 2 PZ16M
- 1 CPIM
- cables, optical fibers

**Preparation:**
1. Make sure all your components are well tested in advance
2. Place all MTCA components inside the crate, install drivers, servers and verify basic system functionality.
3. Take all components in the RATA, and install them inside the racks.
4. Mount all cabling inside the rack.
5. Connect to power and check the complete system. If you see a problem, better fix it now. It will be harder later.
6. Wait until the modules are installed inside the tunnel. When ready, bring the LLRF rack inside the tunnel,
7. Connect all external cables to the rack, add power, water, and Ethernet.
8. Installation job done, let the commissioning team know they can start.

**Variations:**
- For a station in L1, simply double the ingredients
- For a station in L3, replace the LOGM with a uLOG