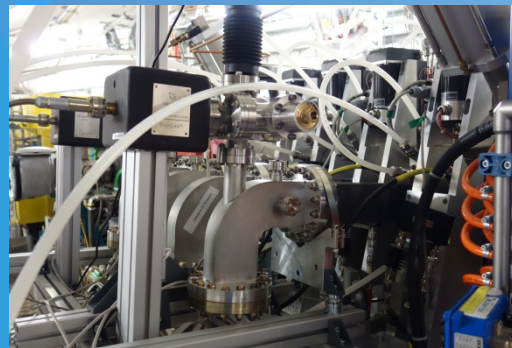
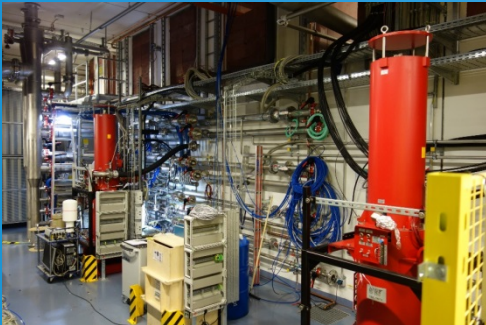


Status of RF at HZB: BESSY II, MLS, bERLinPro and BESSY VSR

Wolfgang Anders

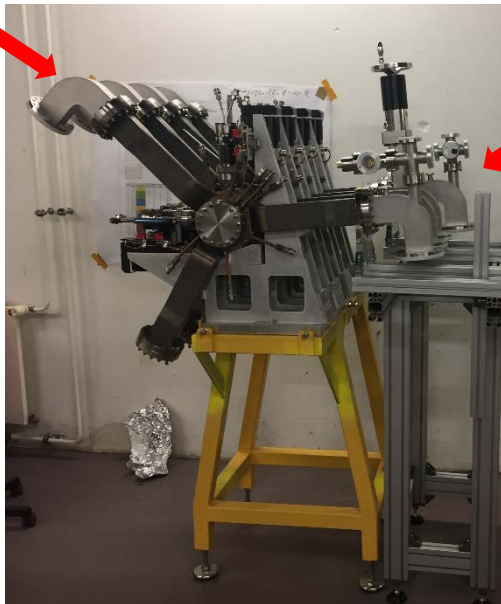
Helmholtz-Zentrum Berlin for Materials and Energy (HZB)

22th ESLS-RF Meeting 8.-9.11.2018 at Soleil

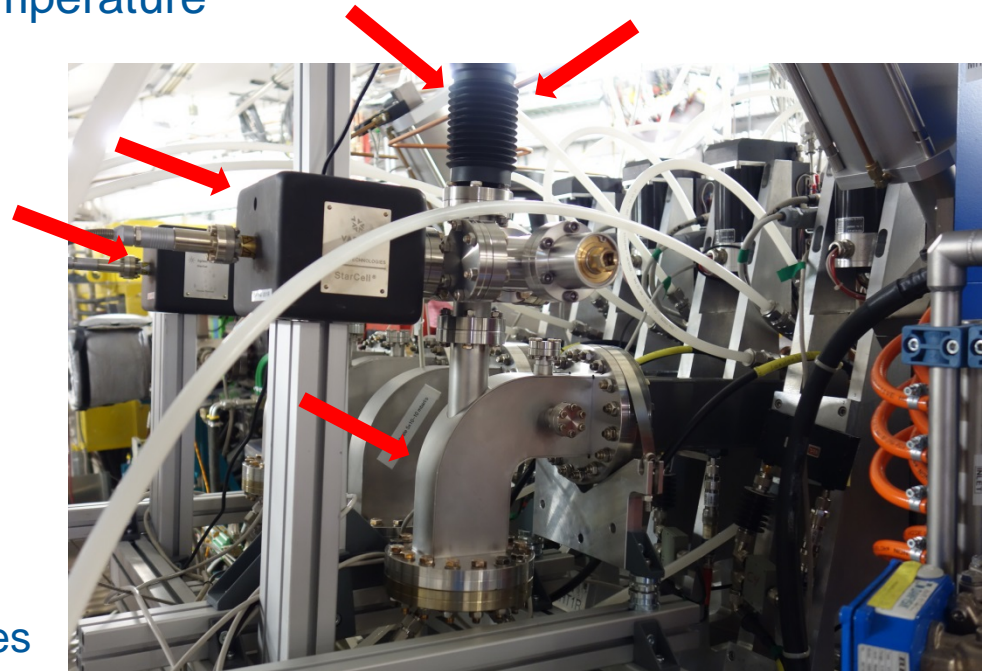


- **BESSY II**
 - **Harmonic cavities repaired and installed**
- **MLS**
 - **Diodes in IOT power supply partly burned**
- **BERLinPro**
 - **270 kW Prototype transmitter tests finished**
 - **300 kW loads from St. Petersburg arrived**
 - **First klystron at bERLinPro diode operation**
- **BESSY VSR**
 - **SSA L-band transmitters ordered**
 - **Two more 5 cell PETRA cavities and 80 kW 500 MHz transmitters for booster**

- In 2016 we had problems with the harmonic cavities (1.5 GHz nc) and we removed them from the ring
- In this shutdown we reinstall with some modifications:
 - One body has to be changed because of a leakage
 - Upper waveguides now bend, so that no ferrite crumbs can fall into the cavity
 - Vacuum pumps at the waveguides
 - IR camera to monitor ferrite temperature



Modified
harmonic cavities



At the MLS IOT transmitter we had some minor instabilities but do hear the noise of arcing in the power supply.

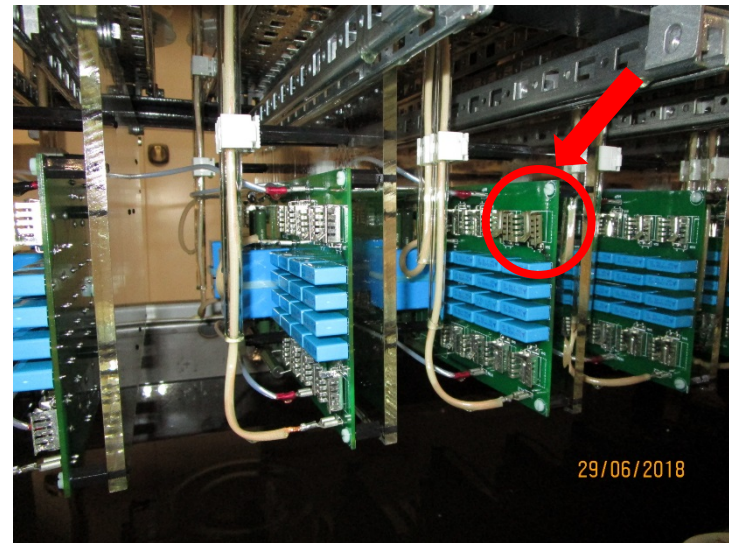
We lifted the power supply out of the oil vessel.

Some of the diodes have been burned.

We changed all rectifier boards.



IOT transmitter power supply lifted out of the oil vessel



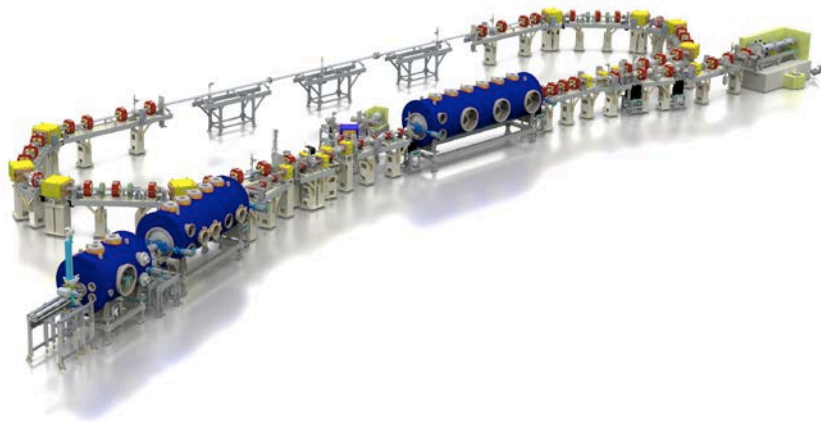
Diodes and capacitors in oil

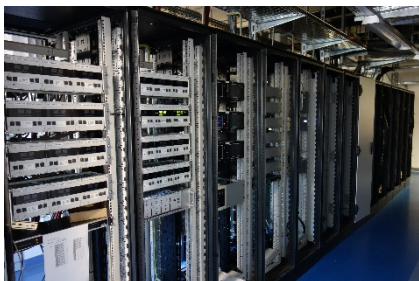


Berlin Energy Recovery Linac Project is now in the installation phase

- Building mostly ready
- Cabling mostly done
- Magnets installed
- Vacuum chamber partly installed
- Cryogenic preparing commissioning
- Gunmodule tested in test-hall → now cavity cleaned again to be installed in summer 2019
- First beam expected end of 2019

bERLinPro ring and building

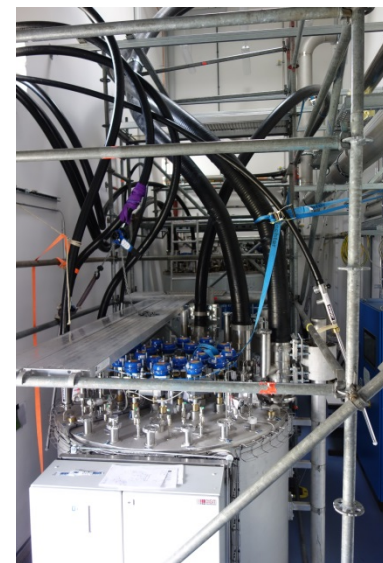




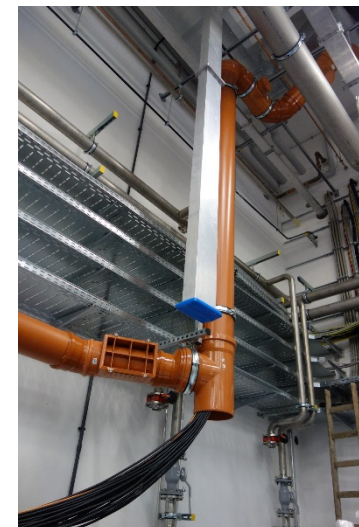
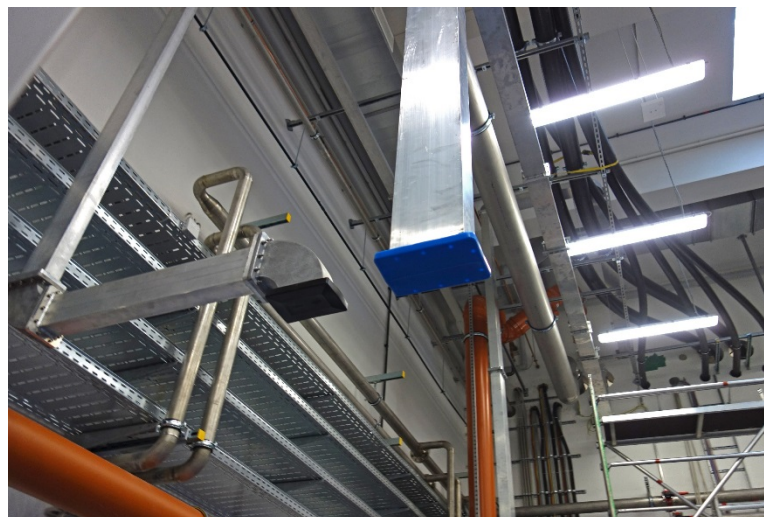
Vacuum controls



Cryogenic installations



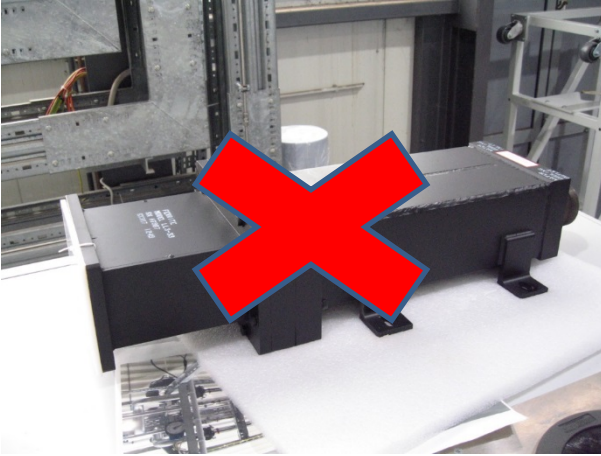
Cables and waveguides



- 1.3 GHz 270 kW_{cw} transmitter was commissioned in the testing hall
- Maximum was 220 kW limited by the water load, but we ordered better loads
- Tests are finished and transmitter will be moved to bERLinPro beginning next year



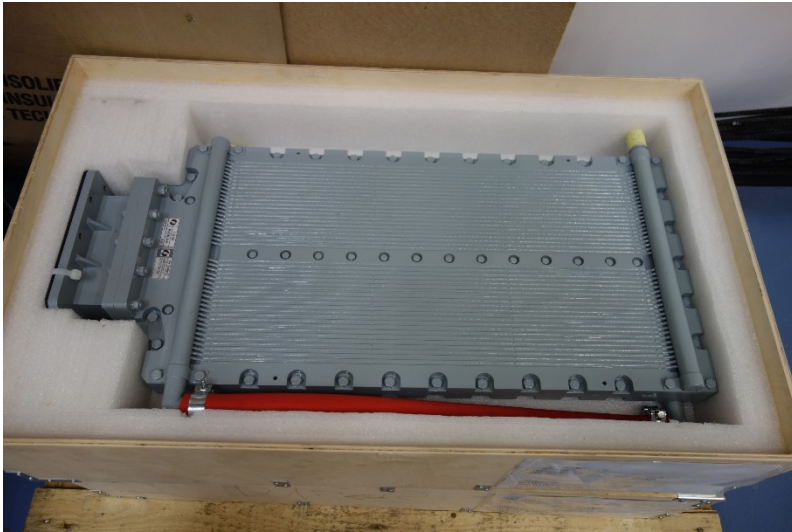
1.3 GHz 270 kW_{cw} transmitter
in the testing hall



Old 300 kW load started arcing at ~40 kW. There was only a O-ring and a ceramic window between cooling water and RF area.

As advice of some instituts we bought new loads from Ferite St. Petersburg

Old 300 kW load



100 kW load



300 kW load

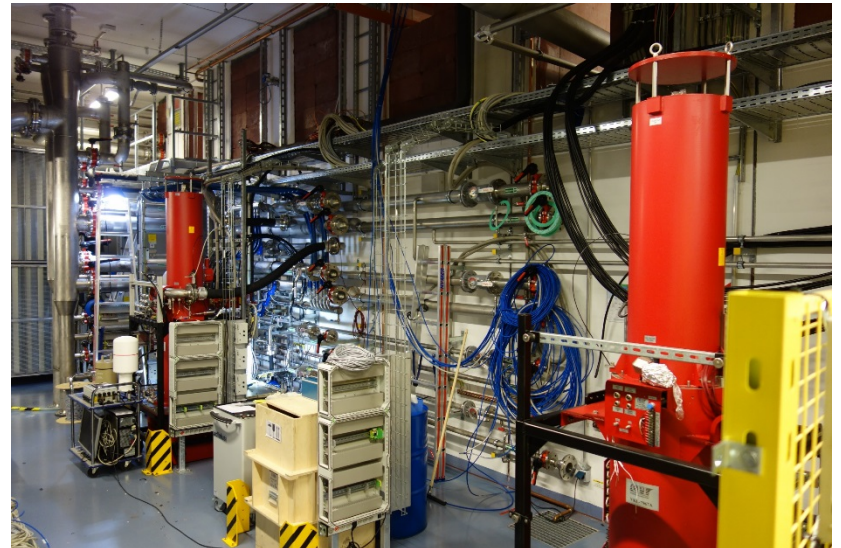
Two 600 kW power supplies and two 1.3 GHz 270 kW klystrons are installed in bERLinPro building. Third transmitter is still in testing hall.

Water cooling is ready since end of September.

→ We started commissioning of the first transmitter !



Two 600 kW power supplies



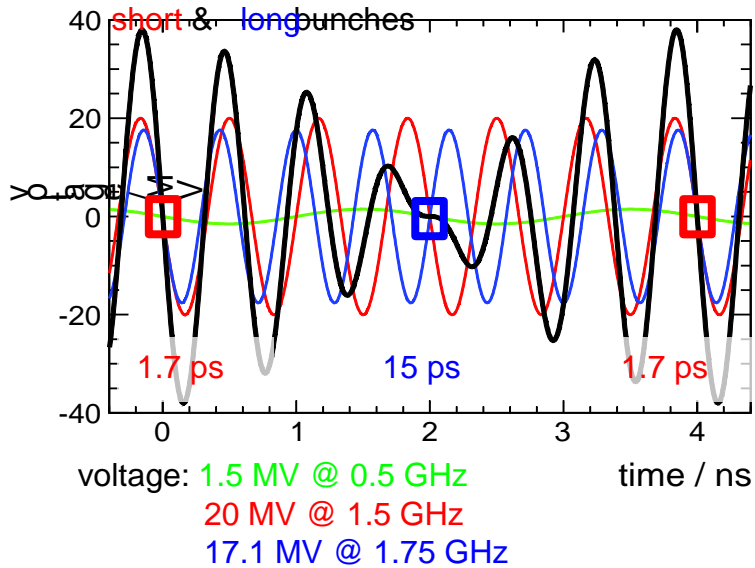
Two 270 kW klystrons

First klystron was commissioned in diode operation up to the design values of 61 kV and 8.5 A beam current. RF operation will follow soon. The water piping for the second RF load is missing.

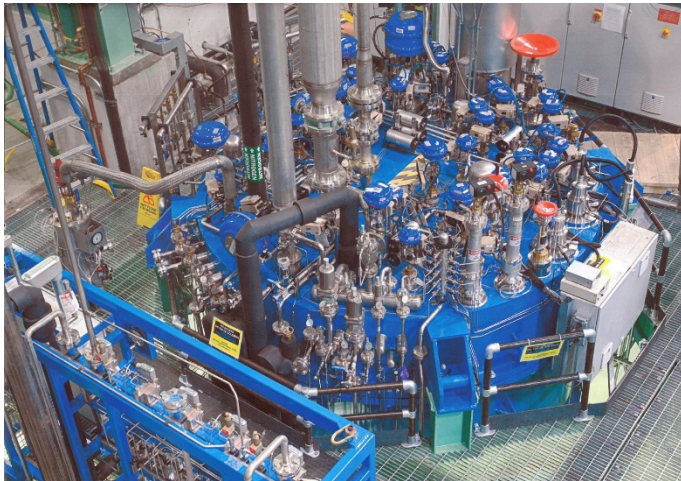
The transmitter is the first device at berlinPro using the complete infrastructure as cabling, mains, water cooling and control system.

Andreas and Harry commissioning the transmitter

61 kV 8.5 A achieved



RF voltage at BESSY VSR



BESSY VSR is a project to provide short and long bunches simultaneously to the users. The accelerating voltage is 1.5 MV at 500 MHz using nc cavities. By installing superconducting cavities at the 3rd and 3.5th harmonic the gradient is alternately flat or steep

- Machine studies and diagnostics upgrade
- Cryoplant ordered
- Transmitters ordered
- 1.5 GHz cavity designed call for tender
- Couplers call for tender
- HOM loads are designed
- Upgrade of booster in preparation
- New testing hall
- Much infrastructure

Ordered cryoplant at FermiLab and installation area



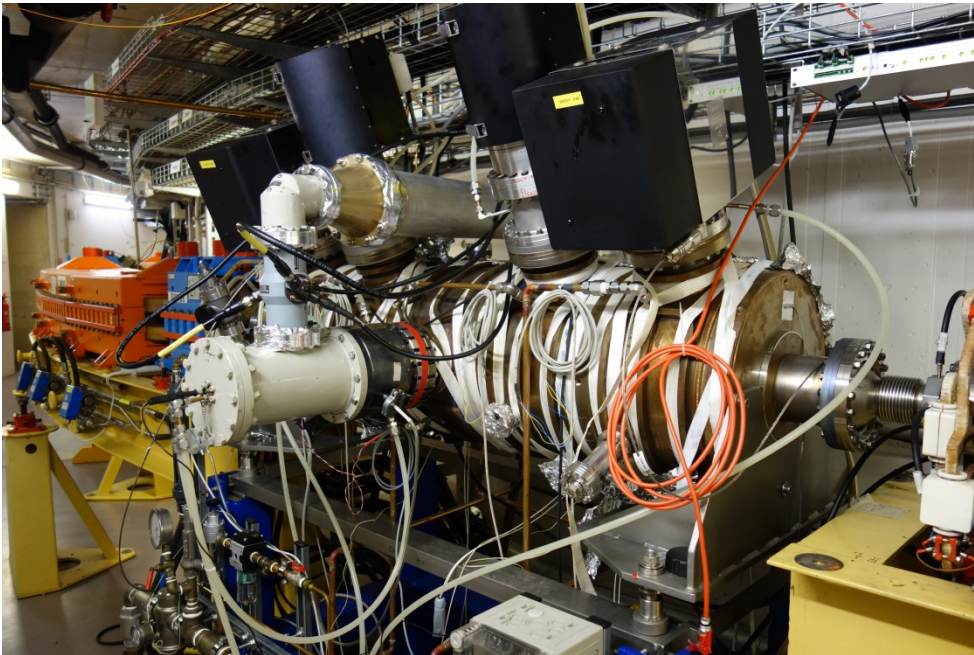
- For the bERLinPro linac we need 15 kW transmitters at 1.3 GHz
 - For BESSY VSR we need 15 kW transmitters at 1.5 & 1.75 GHz
- ➔ We put all together and made a call for tender for all these transmitters

There was very strong competition, because the companies wanted to have a good reference for a industrial project

As a result we achieved a very good price.
Delivery date will be August 2019



- BESSY VSR need short bunches for injection
- We will install two more 5-cell PETRA cavities and two 80 kW SSA
- PETRA cavities are bought from DESY
- 80 kW SSA will be the same as we installed in 2015



PETRA cavity in the BESSY II booster

- At BESSY II the 3rd harmonic cavities are reinstalled with some modifications
- At the MLS several diodes burned in the IOT power supply
- bERLinPro is in the installation phase
- BESSY VSR is in the ordering phase

