

STATUS REPORT BESSY + MLS

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Helmholtz-Zentrum for Materials and Energy (HZB)

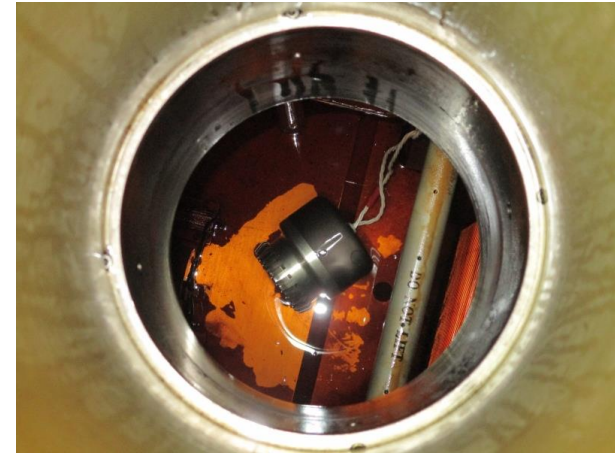
www.helmholtz-berlin.de

8.11.-9.11.2021

at DESY

Outline

- Status of SSAs in Operation
- Smoke from the Rectifiers
- Klystron Change for the LINAC
- Long lasting Mystery solved at MLS
- SMA100B making big steps without stumbling



Status of SSAs in Operation

Modul-No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14 (Driver)
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Last 12 Months:

PAHB: 0 Failed Modules

PAH1R: 3 Failed Modules

PAH2R: 1 Failed Modules

PAH3R: 1 Failed Modules

PAH4R: 1 Failed Modules

6/630 Fails in 1 Year

RF ramp: Much less Fails!

Status of SSAs in Operation



New SSA: 500 MHz 80 kW

New SSAs:

- PAH2B
- PAH3B

→ μ TCA LLRF to be tested



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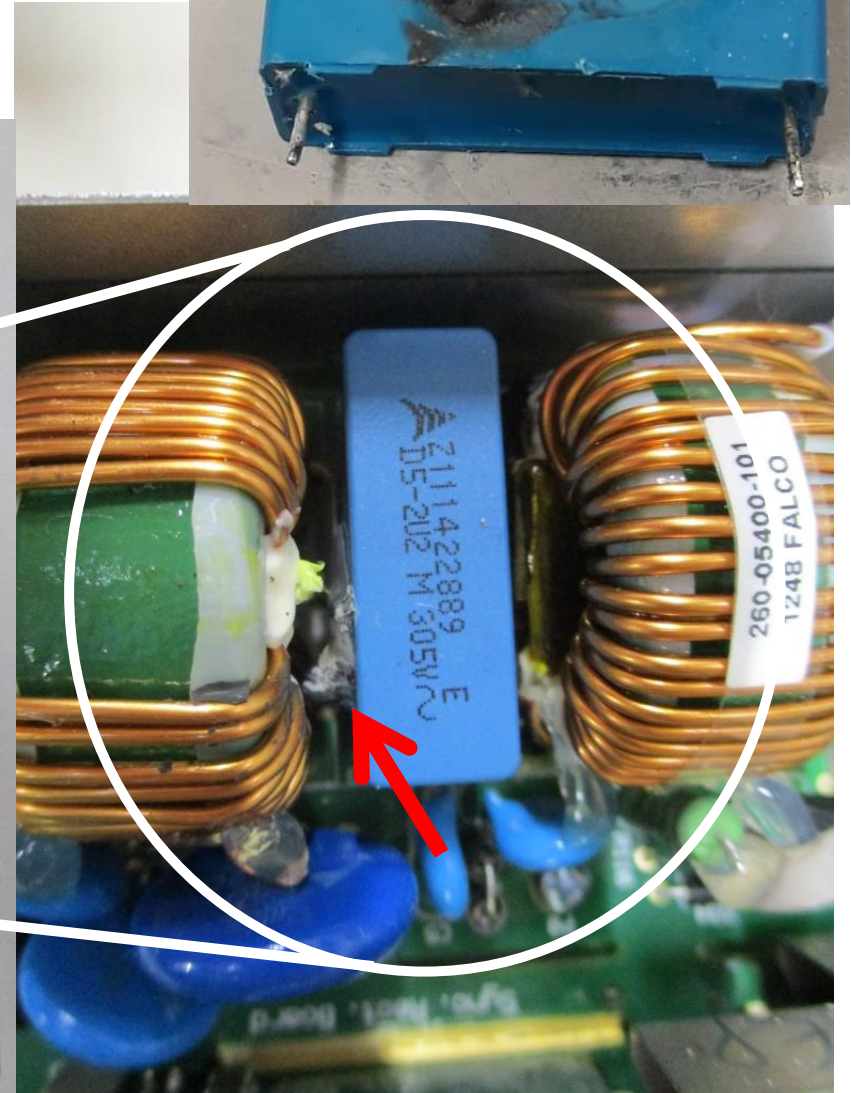
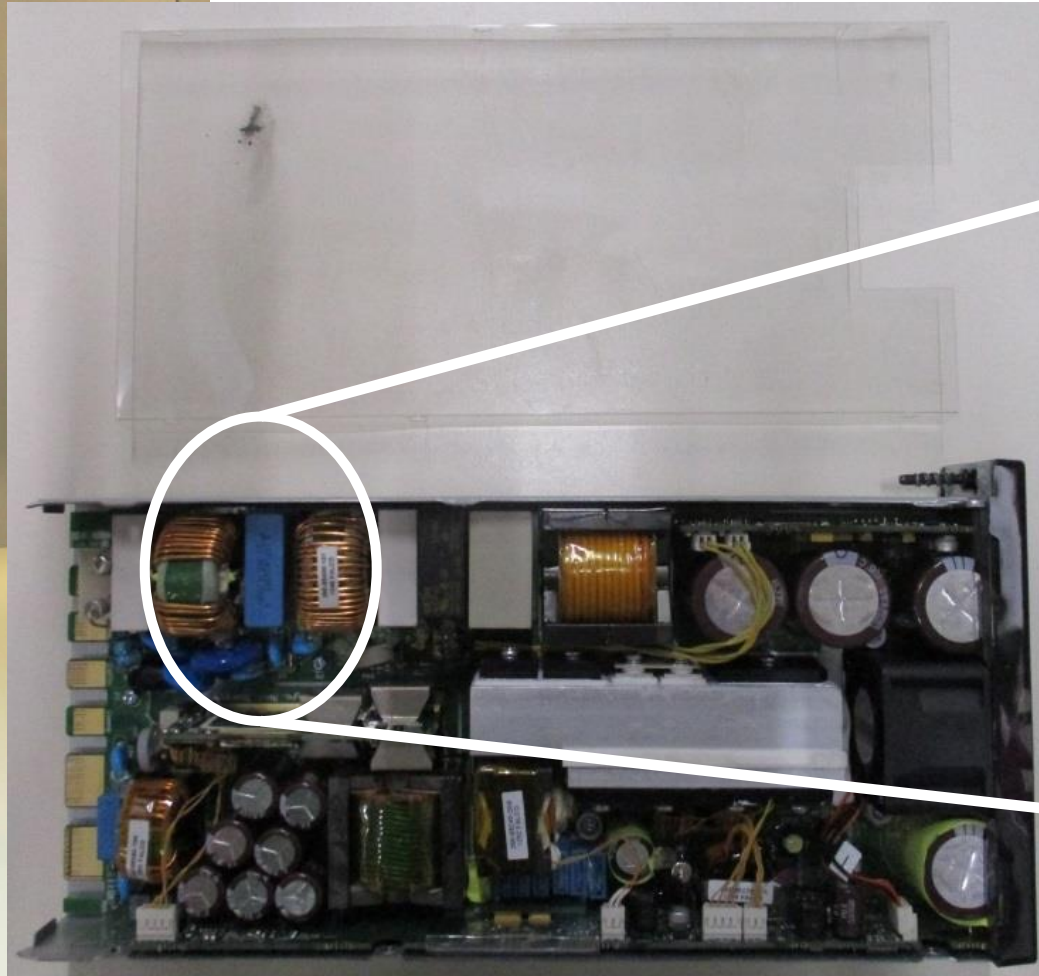


Smoke from the Rectifiers

- First event in **10/2020**: Smoke detector at Transmitter #2 causes Beamloss
 - **AC/DC Converter Rack full of smoke – but smoke is gone after 1 hour**
 - **Reason could not be found, all rectifiers working, no more smoke after a few minutes of troubleshooting**
- Second event in **10/2021**: Same as above, smoke in the cabin causes beamloss
 - **Close inspection of all rectifiers shows defect foil-capacitor**
 - **Only visible due to tiny smoke remains on insulator foil**

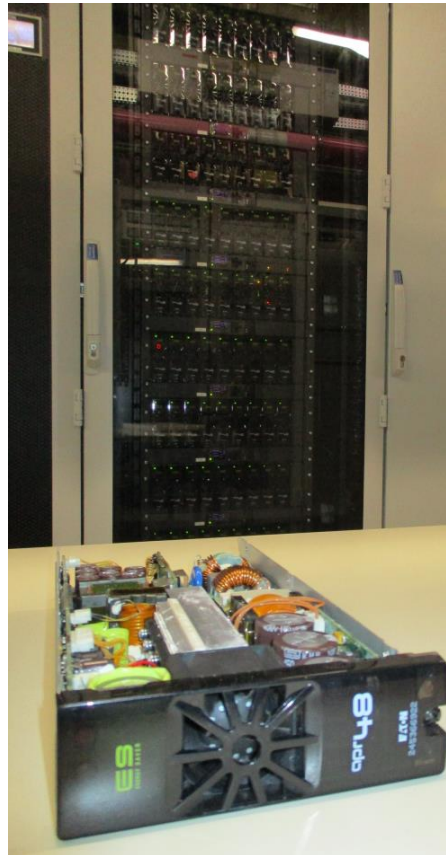
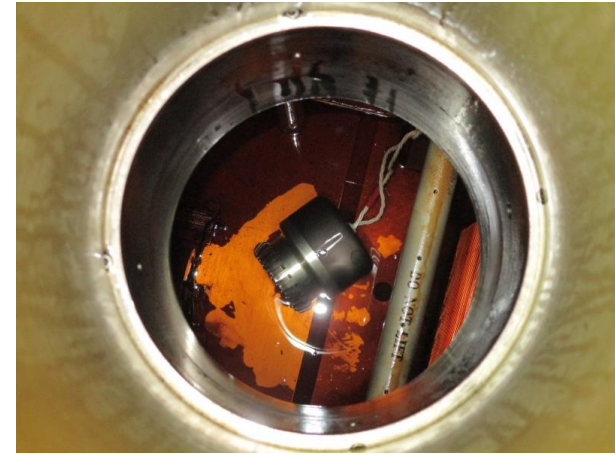


Smoke from the Rectifiers

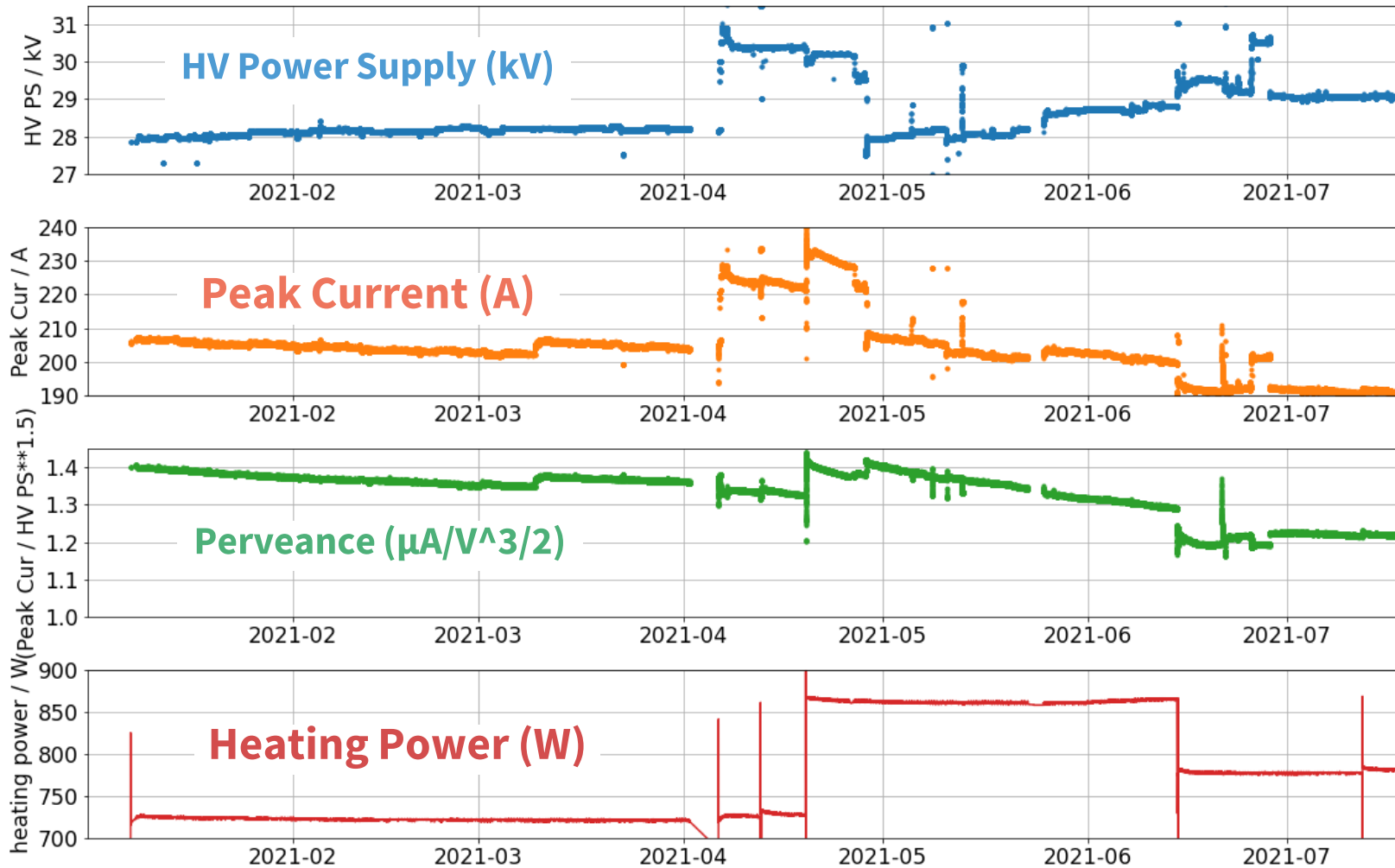


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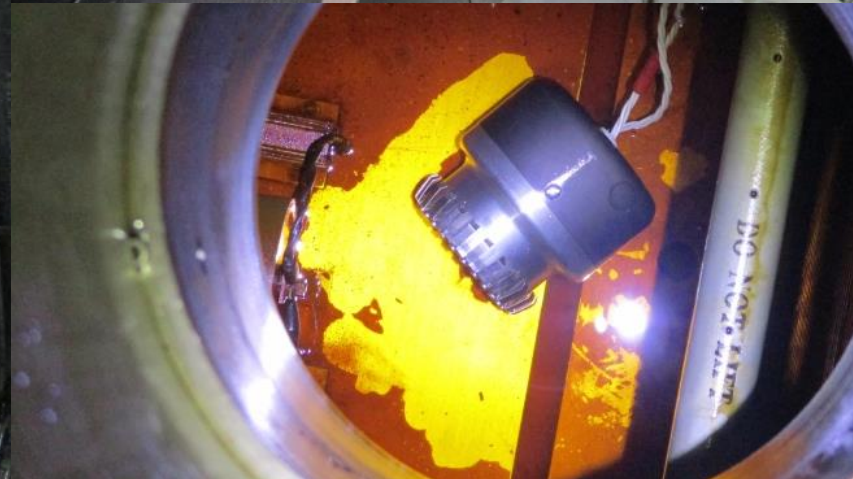
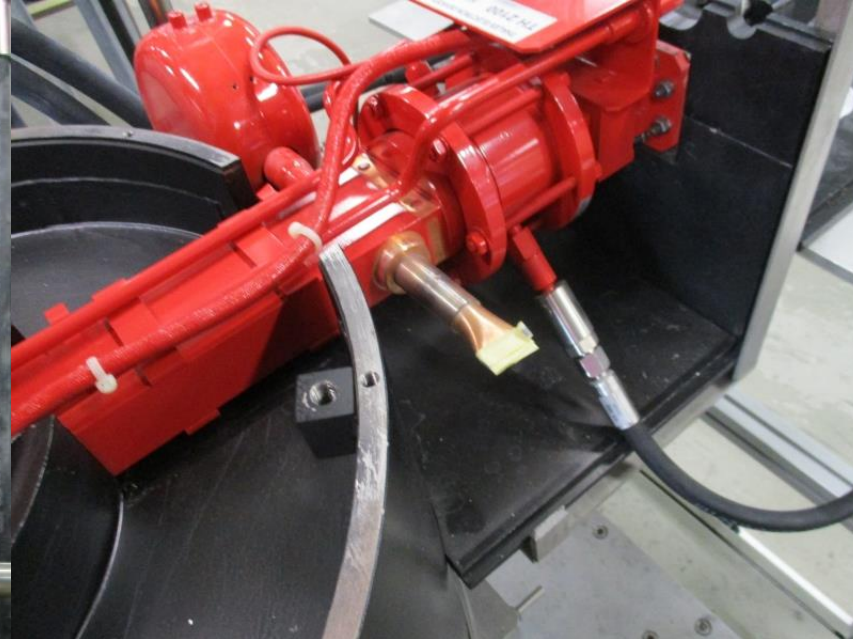


Klystron Change at Bessy LINAC

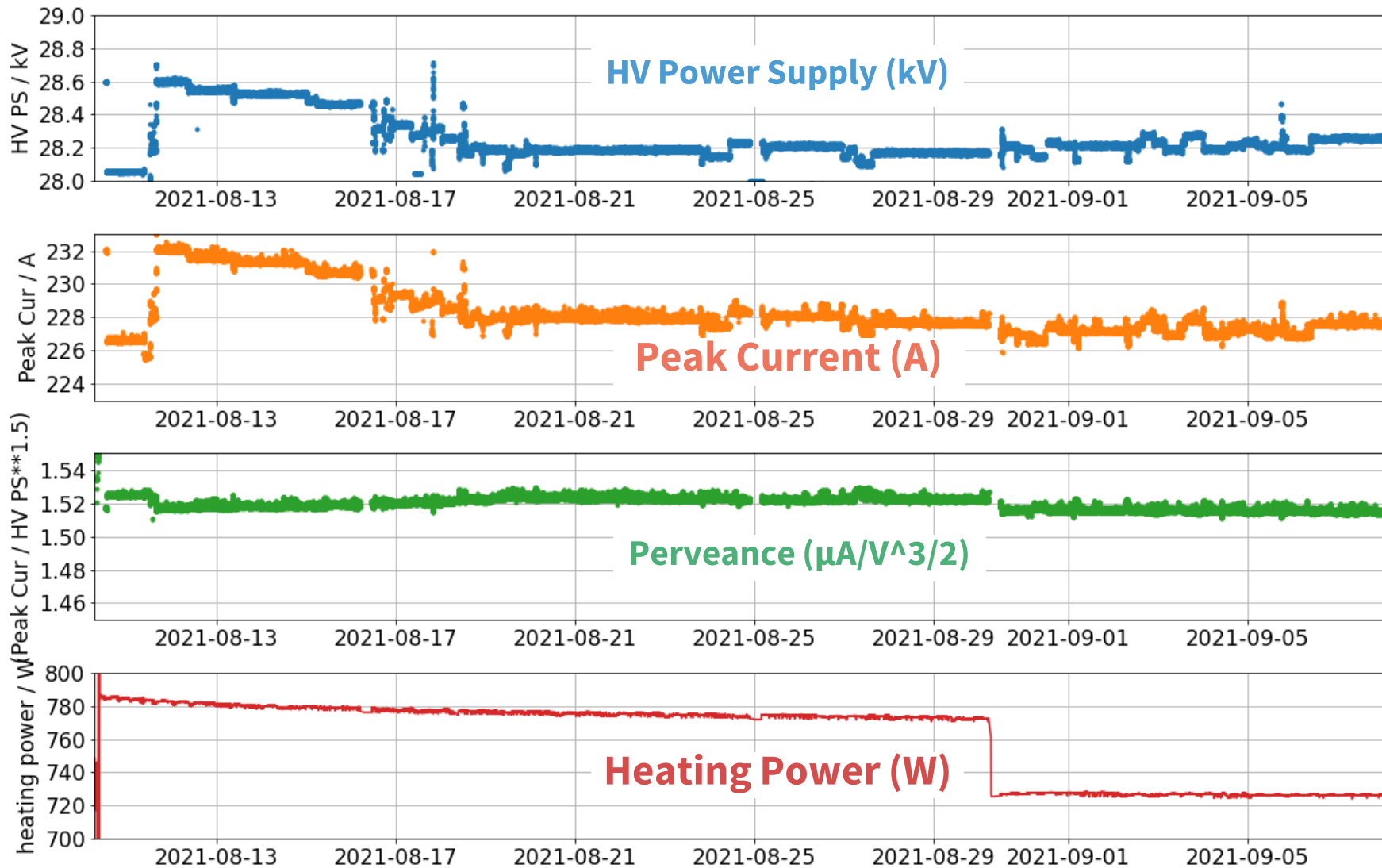


- We lost 0.45% Klystron Current per week
- (0.074% in 2017)
- 75917 h Heating
- 62536 h High Voltage
- → End of lifetime reached

Klystron Change at Bessy LINAC



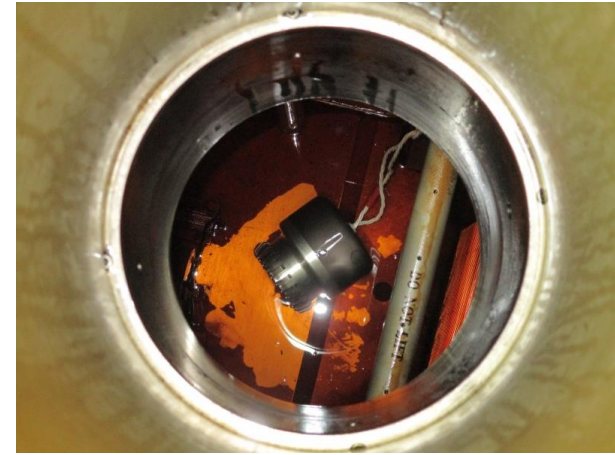
Klystron Change at Bessy LINAC



New Klystron:
Stable Conditions 😊

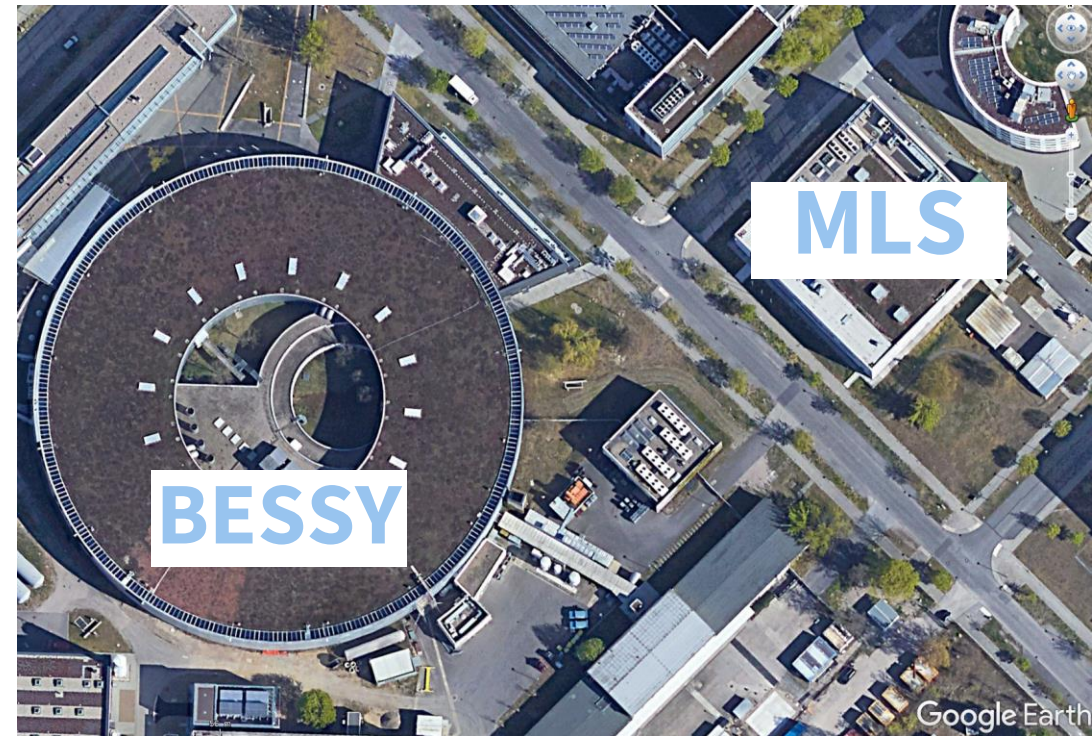
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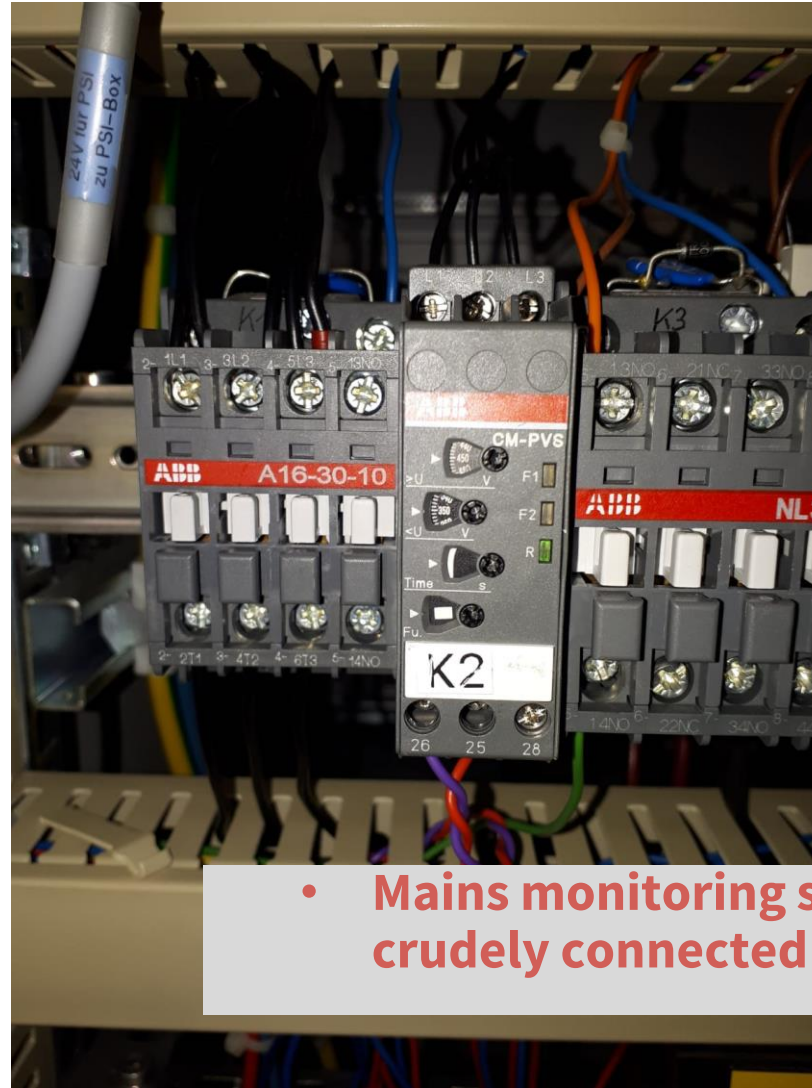
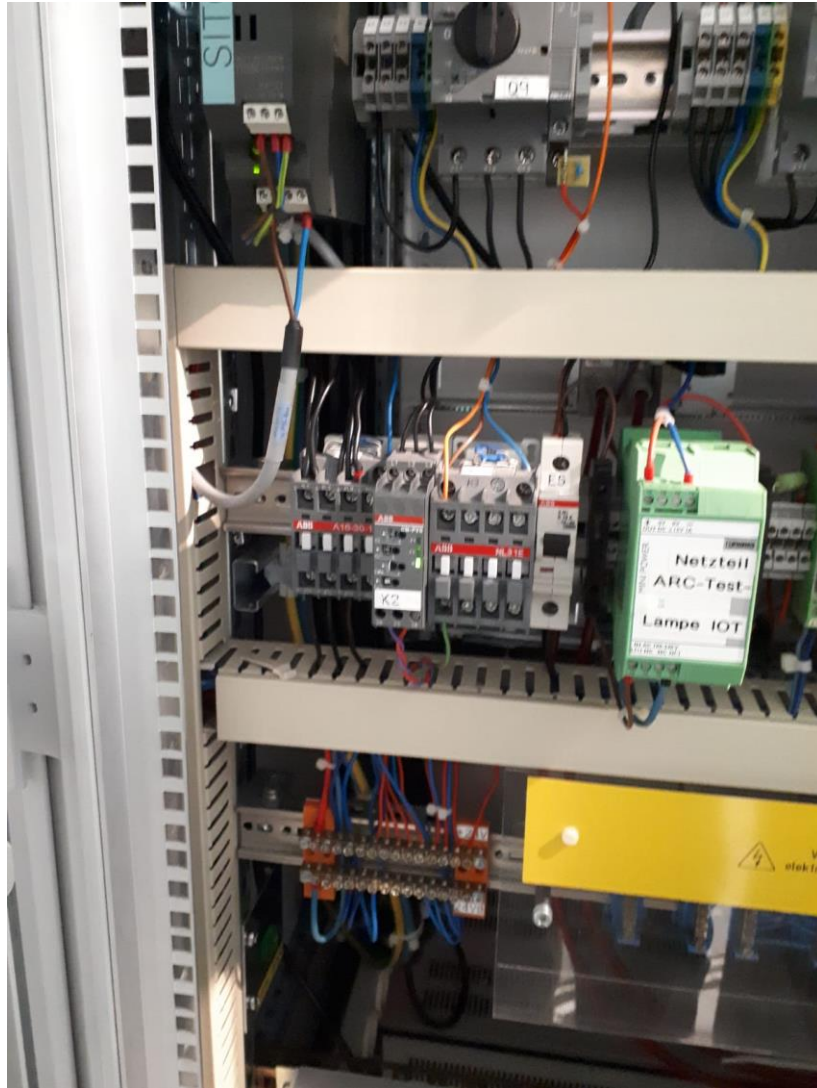
Long Lasting Mystery solved at MLS

- Door with active Interlock is opened -> MLS gets Beamloss
- **Error message indicates problem with IOT biasing**
- **→ Bias Supply and lots of other parts changed, no change at all**
- **Asked software guys to rule out connection, they claimed to be innocent**
- **Tried to reproduce: Caused beamloss at Bessy intentionally, observed MLS: No success ☹️**
- **Correlation undeniable: Beamloss happens like once in weeks, but in many cases just seconds apart**



Long Lasting Mystery solved at MLS

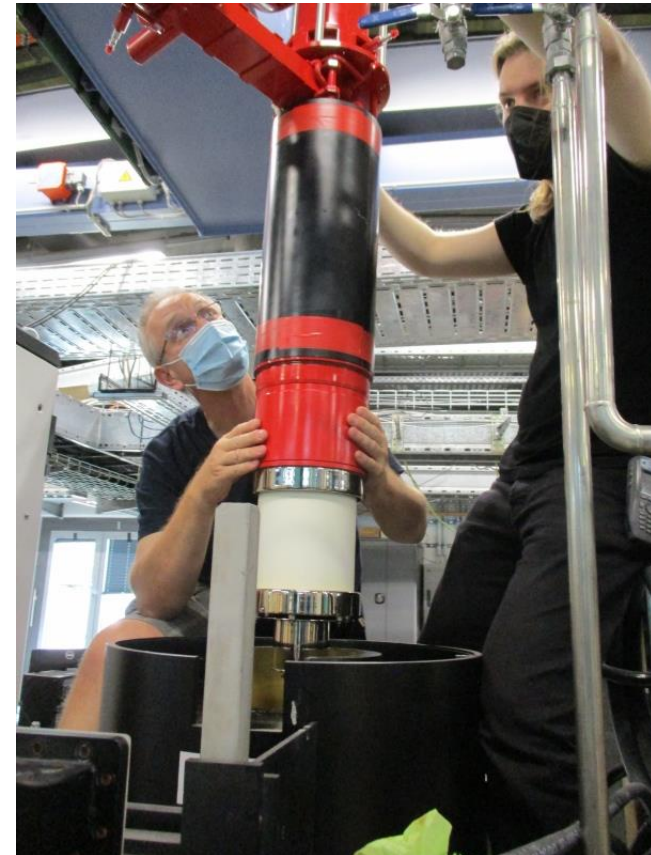
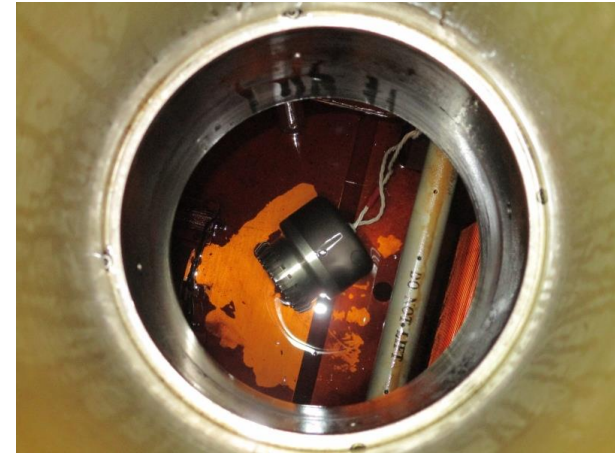
- After a long day of troubleshooting with the whole RF group this was found



- Mains monitoring system was found that was crudely connected with Bias Supply Interlock

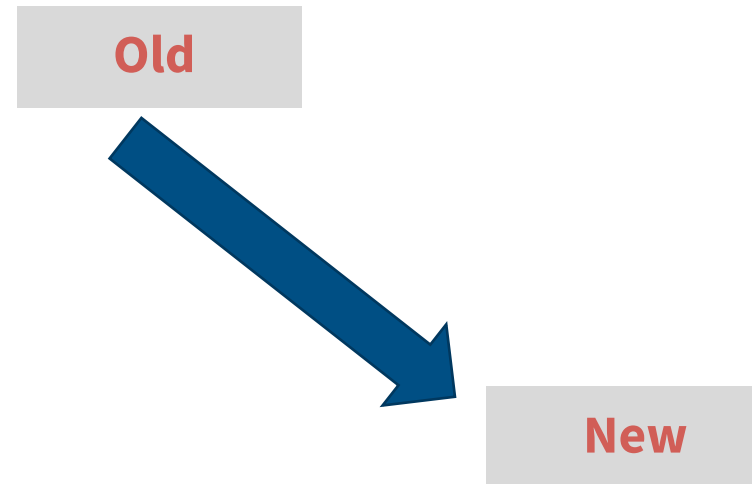
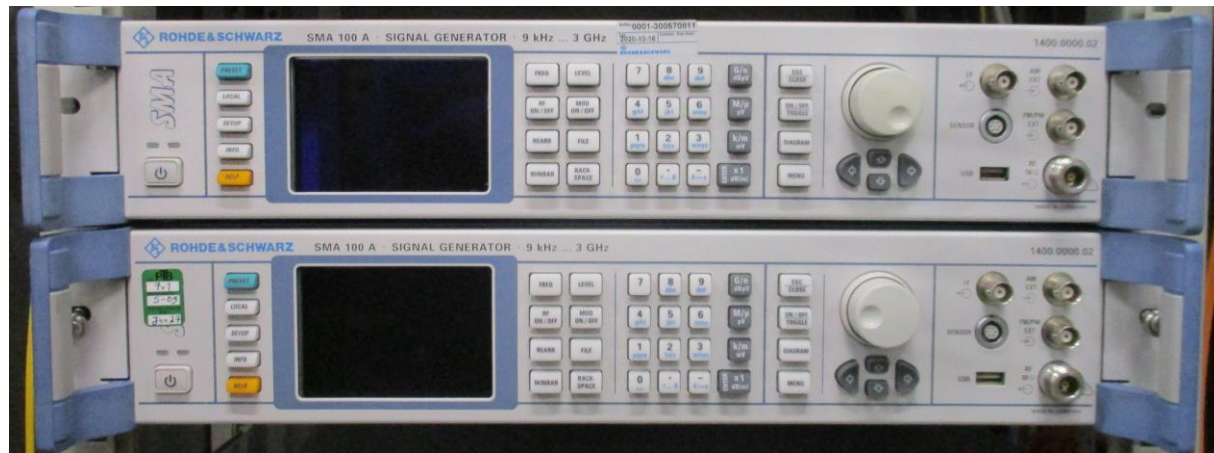
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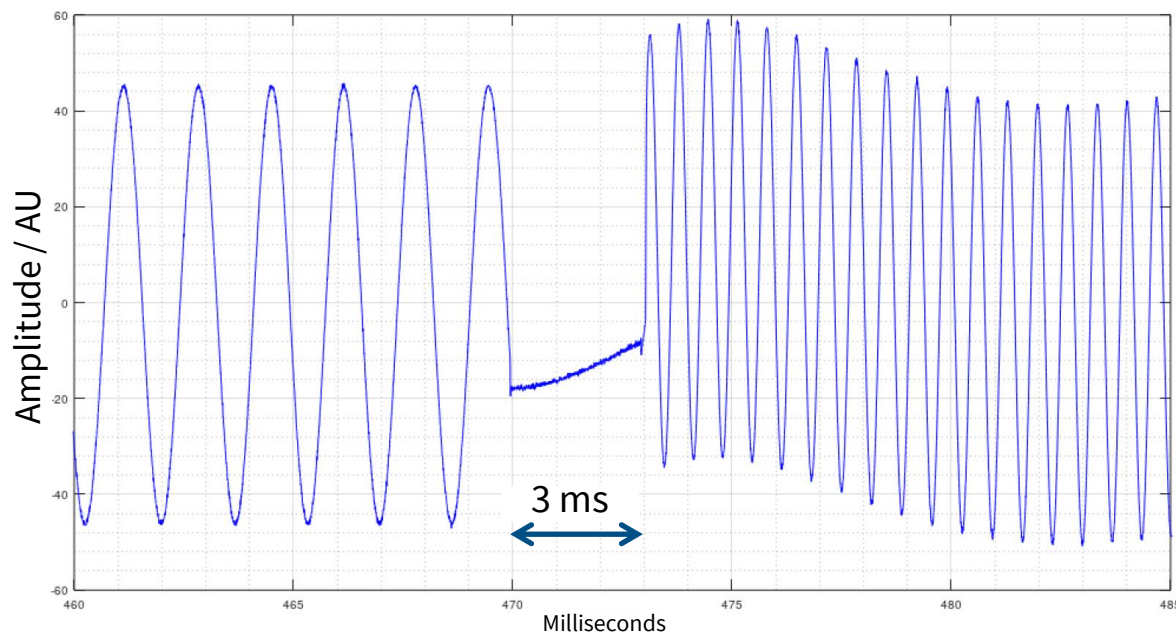
SMA100A → SMA100B

- New signal generators are purchased, Phase Noise is superior
- Old SMA100A had „Bessy Option“ ensuring stable phase
- New SMA100B do not have this option, and it is not available

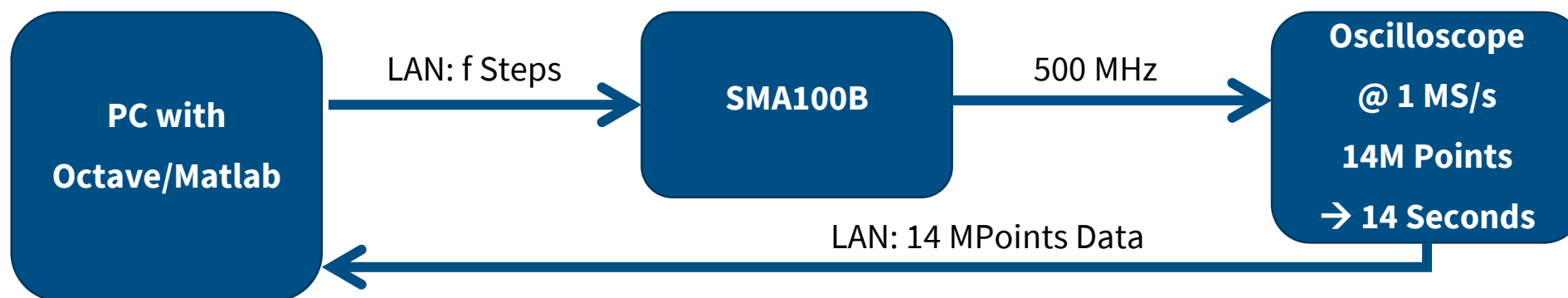
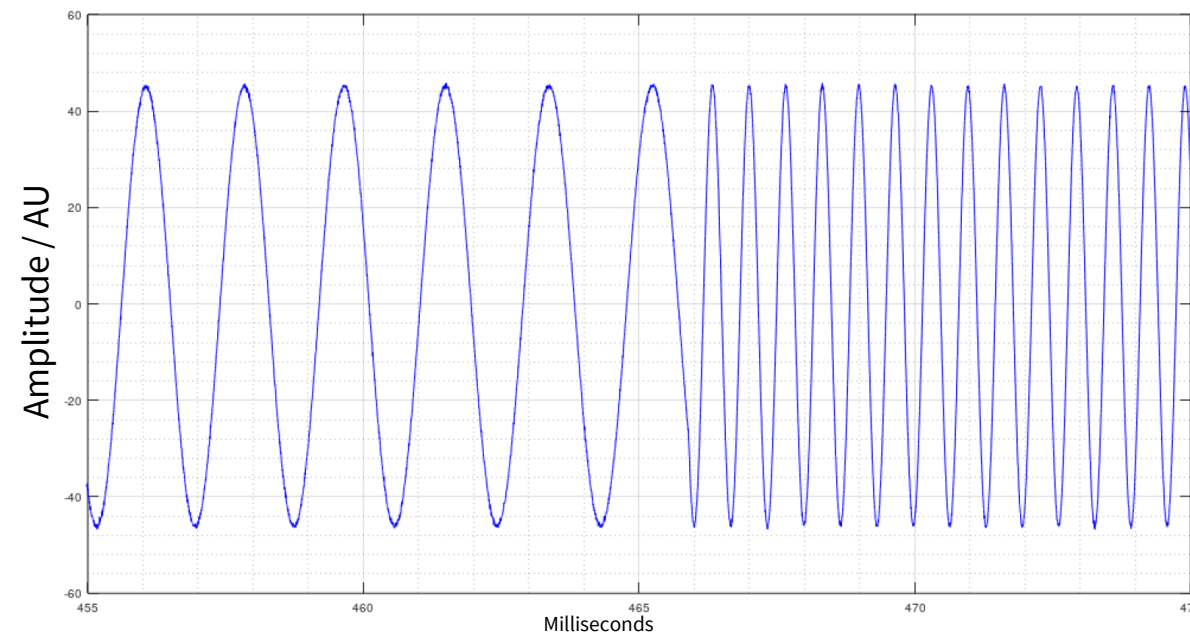


SMA100A → SMA100B

Step of **968.752** Hz @ 500.002 MHz



Step of **968.751** Hz @ 500.002 MHz



- a few 1000 steps @ 2.5ms each were tested
- A step less than 1/516130 (relative) turned out to be OK in all cases

Thank you for your attention

