# RF Operation Experience at the European XFEL

**Poster presentation**

**MOPO038**

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HELMHOLTZ RESEARCH FOR GRAND CHALLENGES

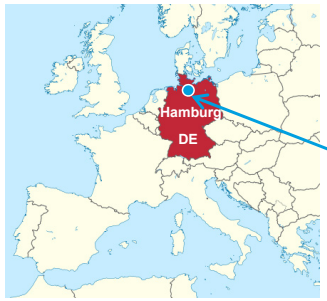

DESY.

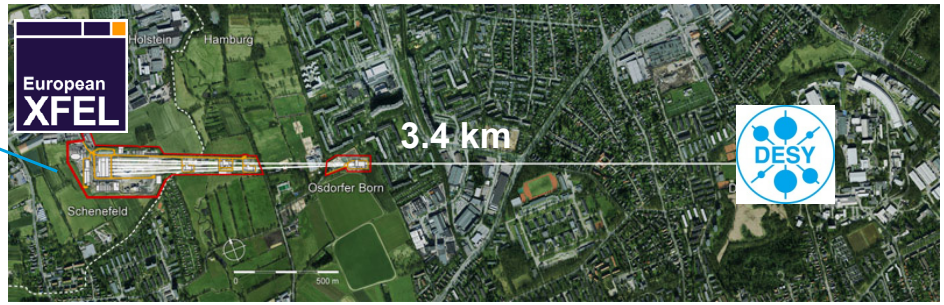
# The European X-ray free electron laser (XFEL)

## Short Overview

### Hard and soft X-ray user facility

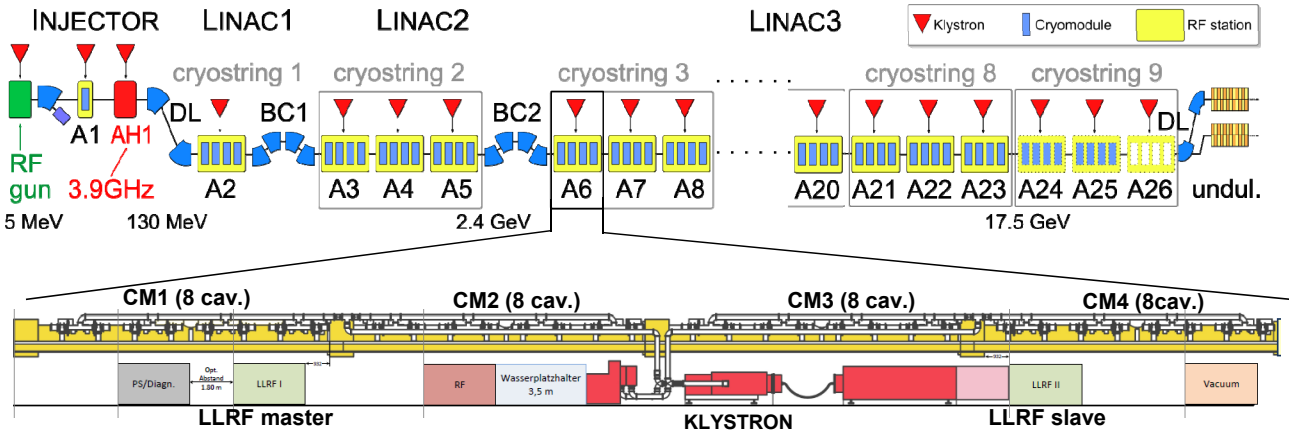
- 17.5 GeV light source user facility
- TESLA 1.3 GHz SRF cavities
- 1.4 msec RF pulses at 10 Hz
- e- beam 1.35 mA nom.




### 1 RF station

- 1x 10 MW klystron
- 32x cavities per 4 cryomodules
- 32x motorized power couplers
- 32x motorized tuners
- 64x piezo (actuator / sensor)
- 36x motorized phase shifters (1/ cav + 1/ cryomodule)



# XFEL Operation Timeline

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**Selected milestones**

- 12/16 Linac cooled down to 4K
- 01/17 RF commissioning
- 05/17 First lasing
- 09/17 First User program (2x 3weeks)
- 04/18 Last 2 RF stations ready for operation
- 05/18 First simultaneous lasing (SASE 1, 2, 3)
- 07/18 17.5 GeV design energy reached!

- User program in 2018: 1600 hours
- User program in 2019 4800 hours

YouTube watch online:
https://www.youtube.com/watch?v=p3G90p4glQA


Talk from D. Noelle on Friday:

FR2A02

"Commissioning of the European XFEL"

# POSTER OUTLINE

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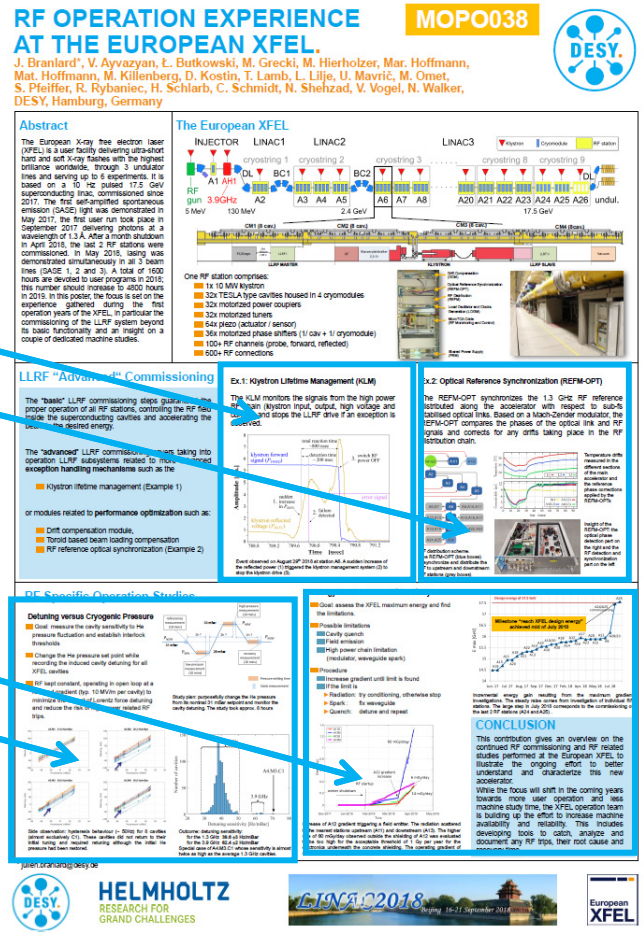
**PART 1: "Advanced" LLRF commissioning**

- Example 1: klystron lifetime management
- Example 2: optical synchronization of the RF reference

**PART 2: RF related study**

- Example 1: Maximum gradient investigations
- Example 2: Cavity detuning versus cryogenic pressure

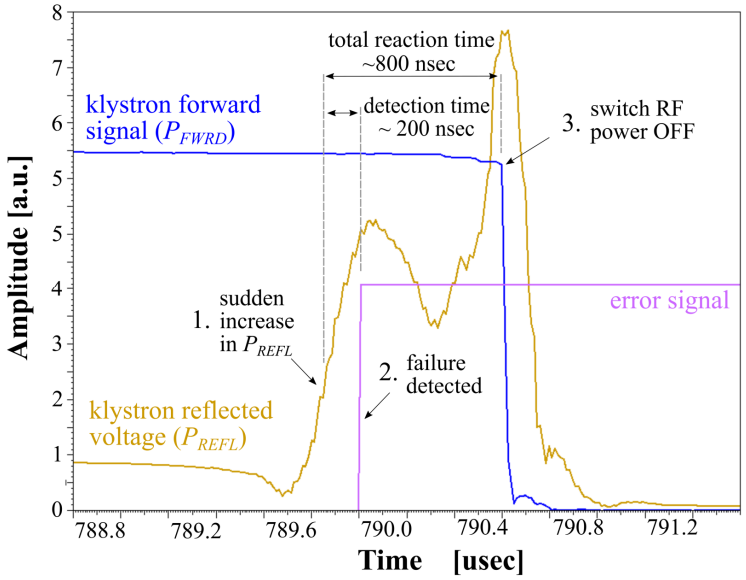


# POSTER OUTLINE

## PART 1: "Advanced" LLRF commissioning

### Ex.1: Klystron Lifetime Management

- Monitors klystron signals
- Stops the RF if some exception occurs




### Ex. 2 Optical RF reference synchronization

- Re-synchs the RF with optical links
- sub-fs resolution

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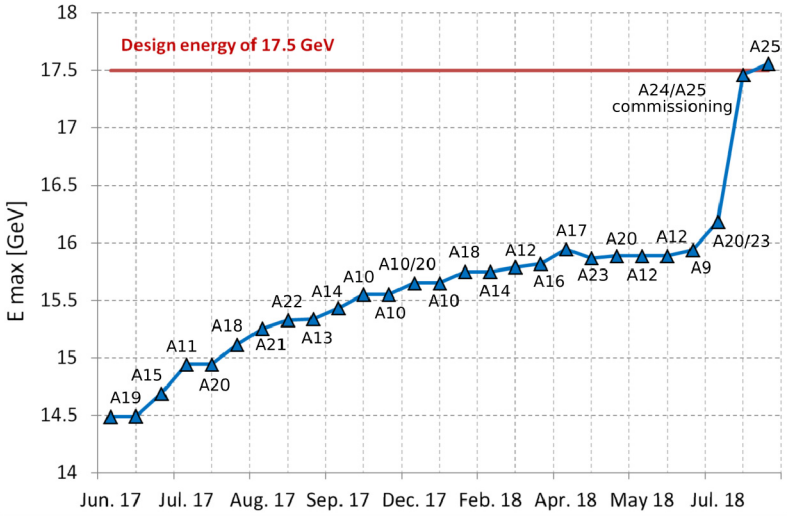
## PART 2: RF related studies

### Ex.1: Energy reach

- What is the max energy for each RF station?
- What are the limitations?
- What can we do about it?




### Ex.2 Detuning versus He pressure

- Cryo fluctuations: what's safe for RF operation?

# Thank you

# 谢谢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