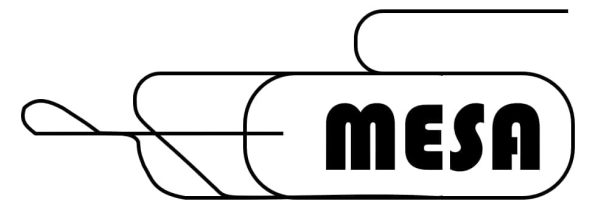


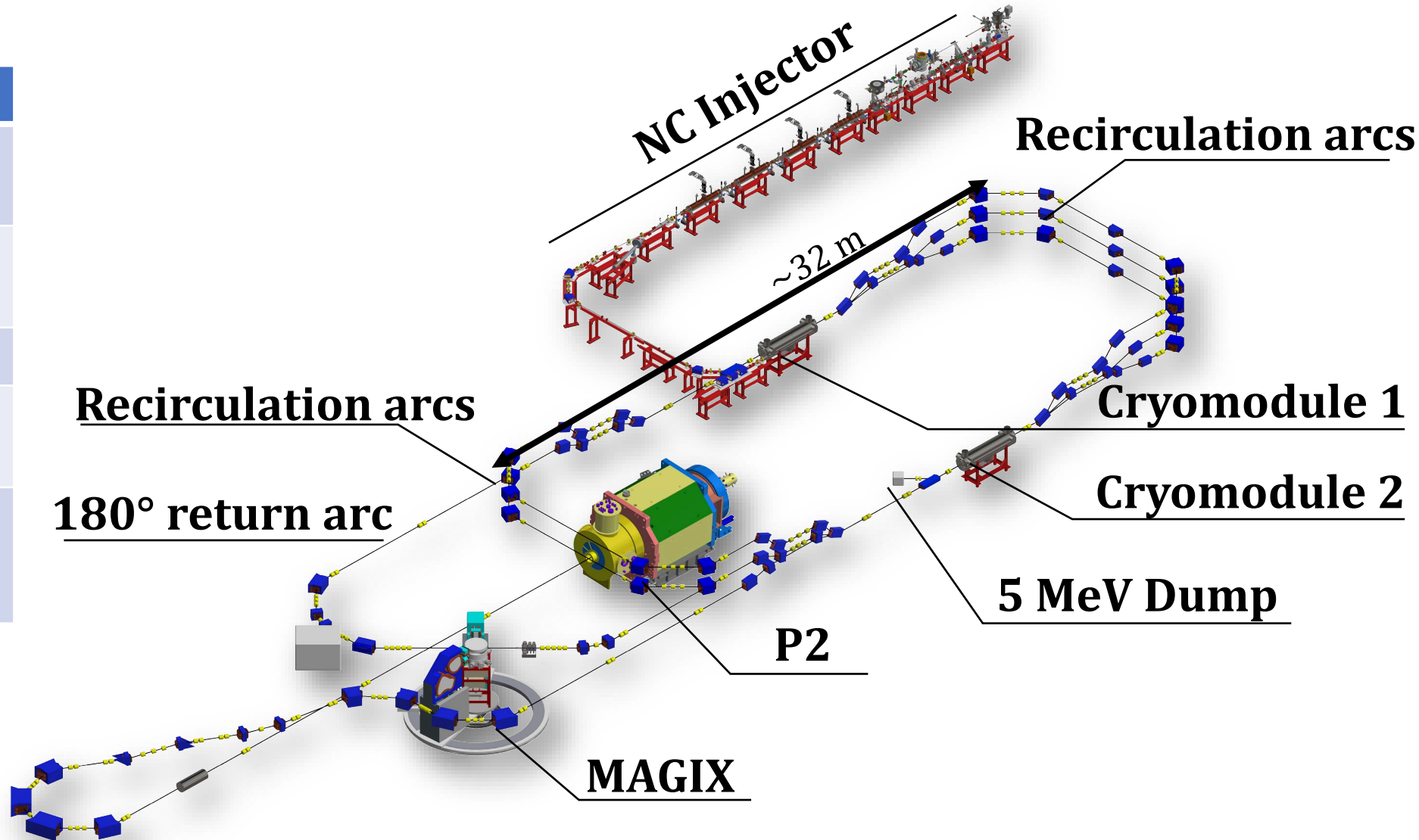
SUPERCONDUCTING THIN FILMS ON HIGHER ORDER MODE ANTENNAS FOR MESA

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10.12.2024

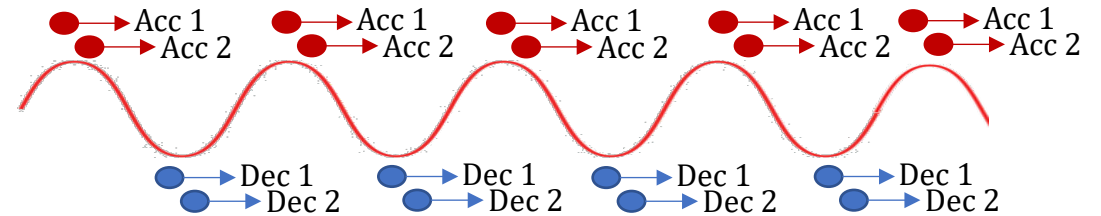
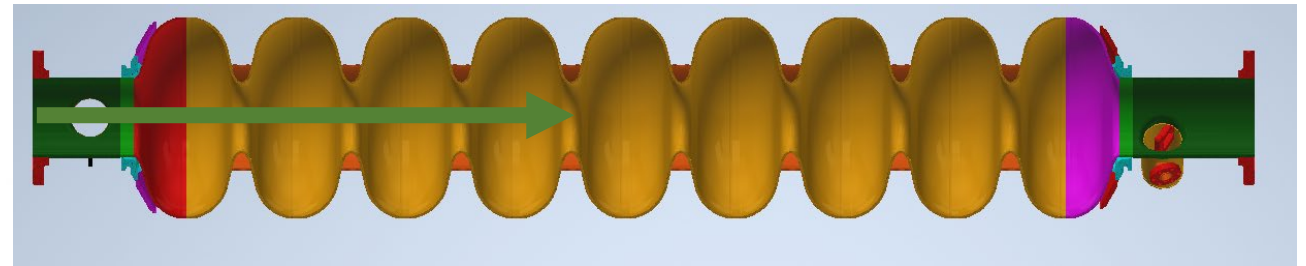
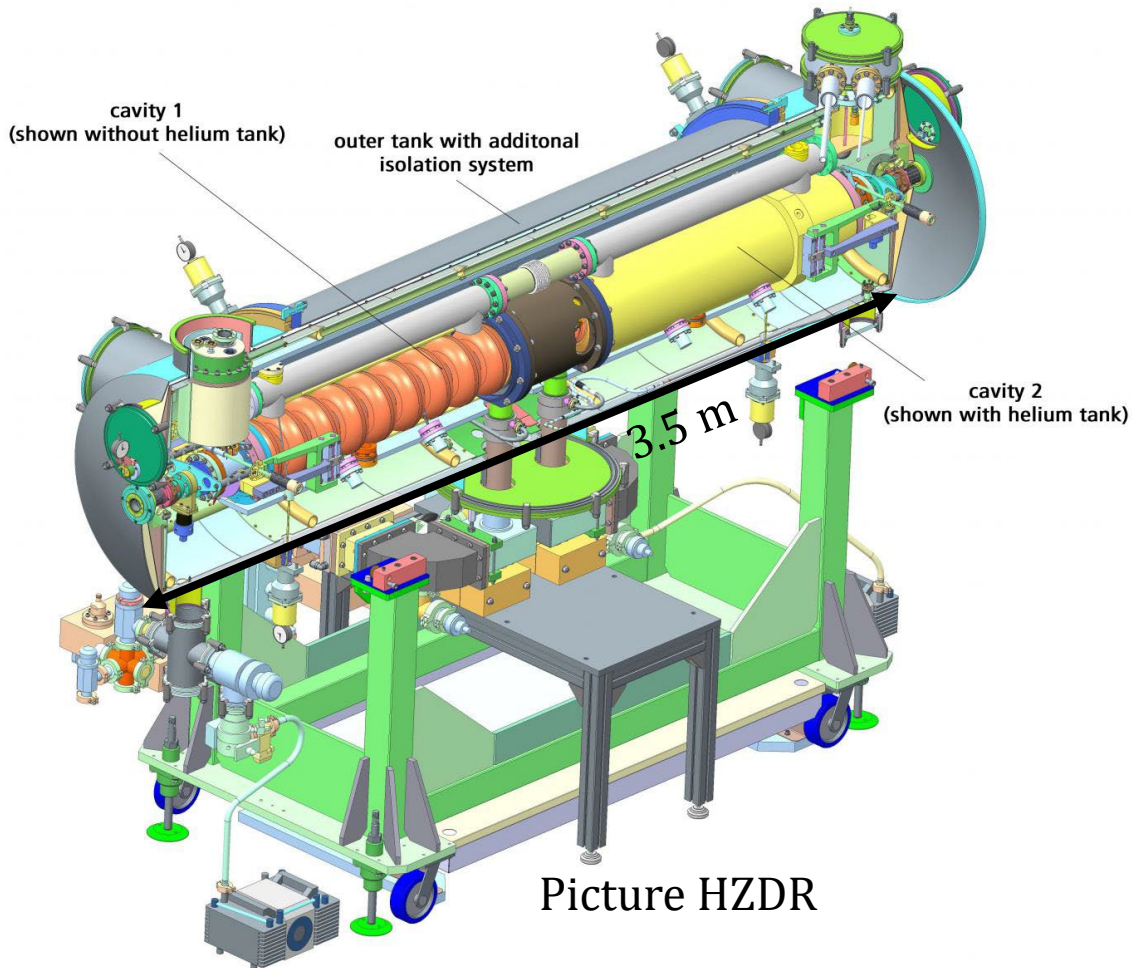


MAINZ ENERGY-RECOVERING SUPERCONDUCTING ACCELERATOR

Parameter	Value
Quality factor Q_0	1.25×10^{10}
Accelerating field	12.5 MV/m
Beam current	1 or 10 mA
Operational frequency	1.3 GHz
Cavity type	9 cell XFEL/TESLA



MESA ENHANCED ELBE-TYPE CRYOMODULES (MEEC)



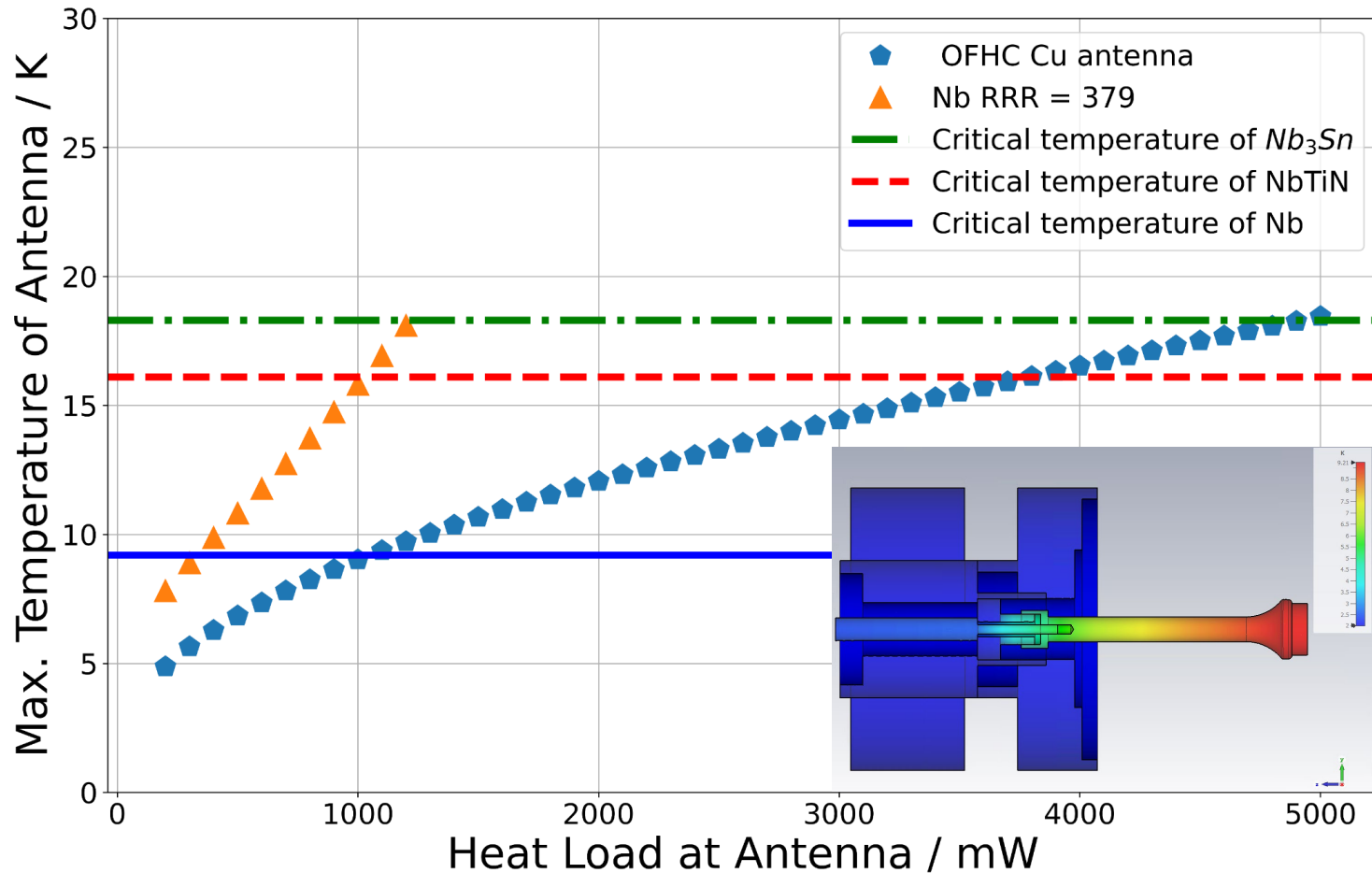
I [mA]	q [pC]	P_{HOM} [mW]	P_{Tip} [mW]
1	0.7	30.8	10
10	7.7	3080	1000

$$P_{HOM} = N * q * k * I; P_{Tip} = 0.3 * P_{HOM}$$

Two MESA Cryomodules are onsite and tested ALICE Module (spare/ERL research)*

*We would like to thank STFC Daresbury for their generous gift.

HEATING OF HOM ANTENNA



MESA 10mA upgrade:

- Beam induced heating exceeds HOM antenna power limit
- $P_{HOM,B} = 1000 \text{ mW} > P_{MESA,lim} = 95 \text{ mW}$
- **SC Thin Films** of NbTiN and Nb₃Sn will **increase the limit**
- Antennas are ready to coat at our partners in Hamburg and Darmstadt
- Performance test of coated antennas are starting in 2025