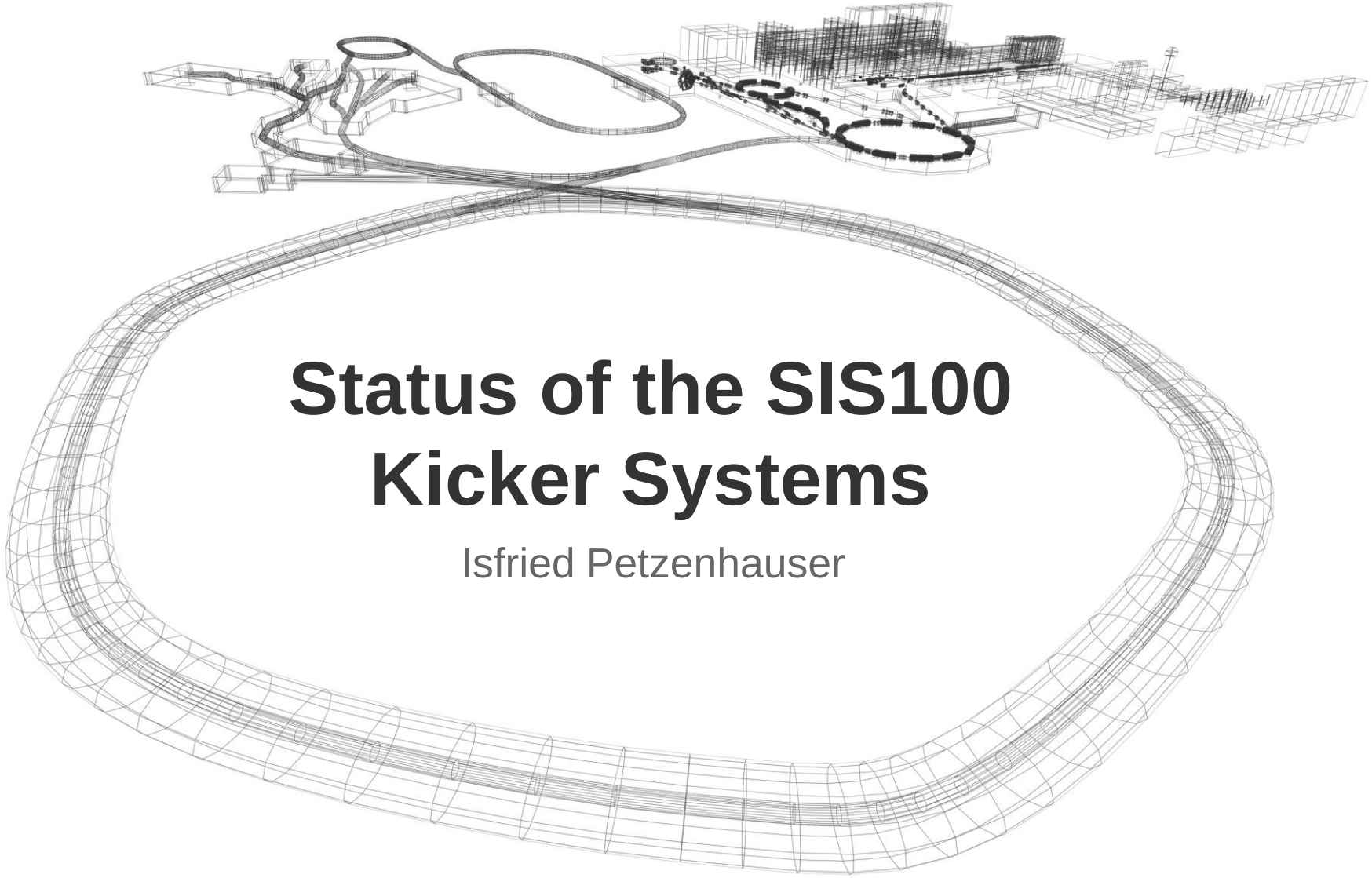


Status of the SIS100 Kicker Systems

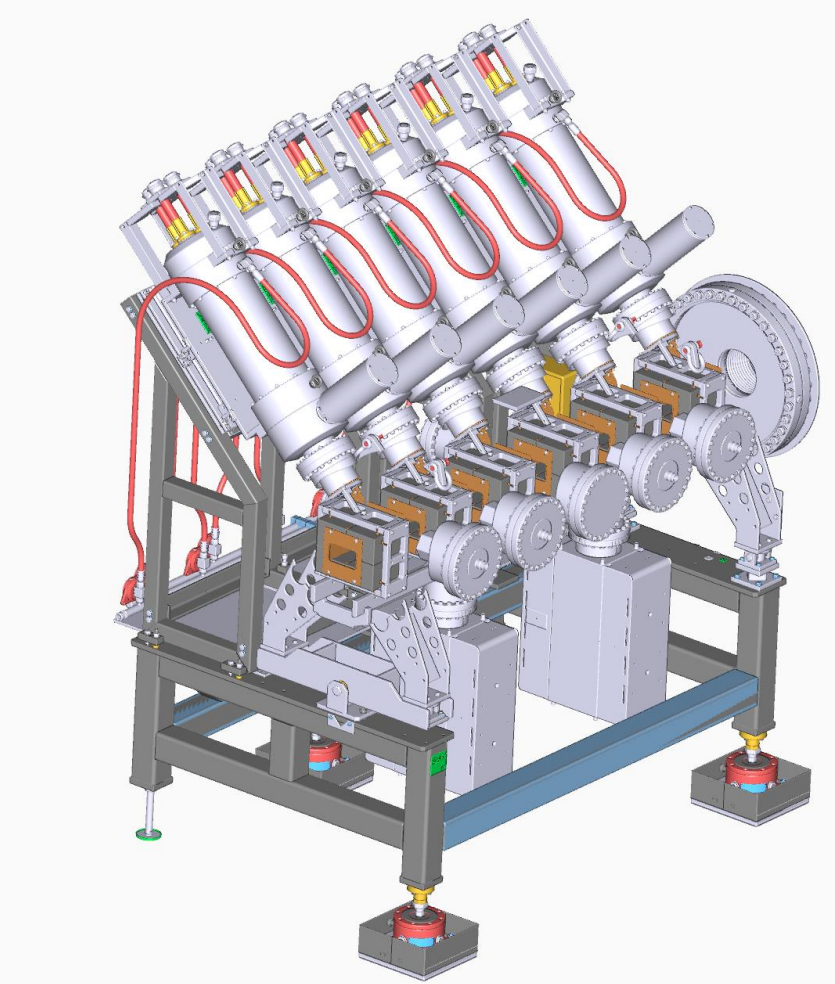
Isfried Petzenhauser

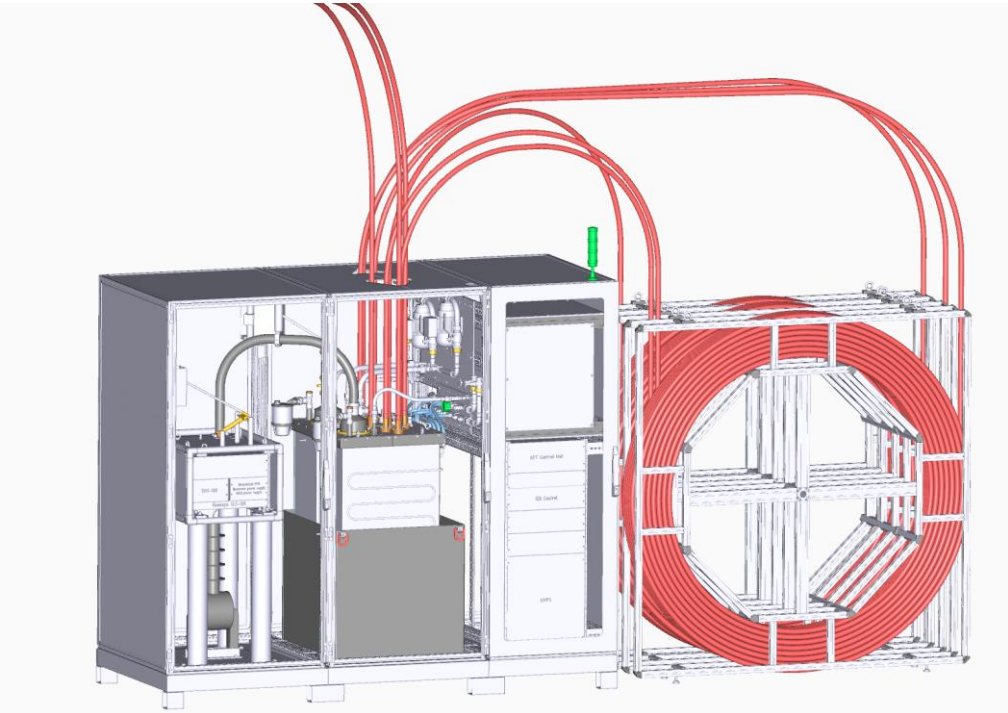
Kickersystems at SIS100

Picture:GSI Helmholtzzentrum für Schwerionenforschung, D. Fehrenz

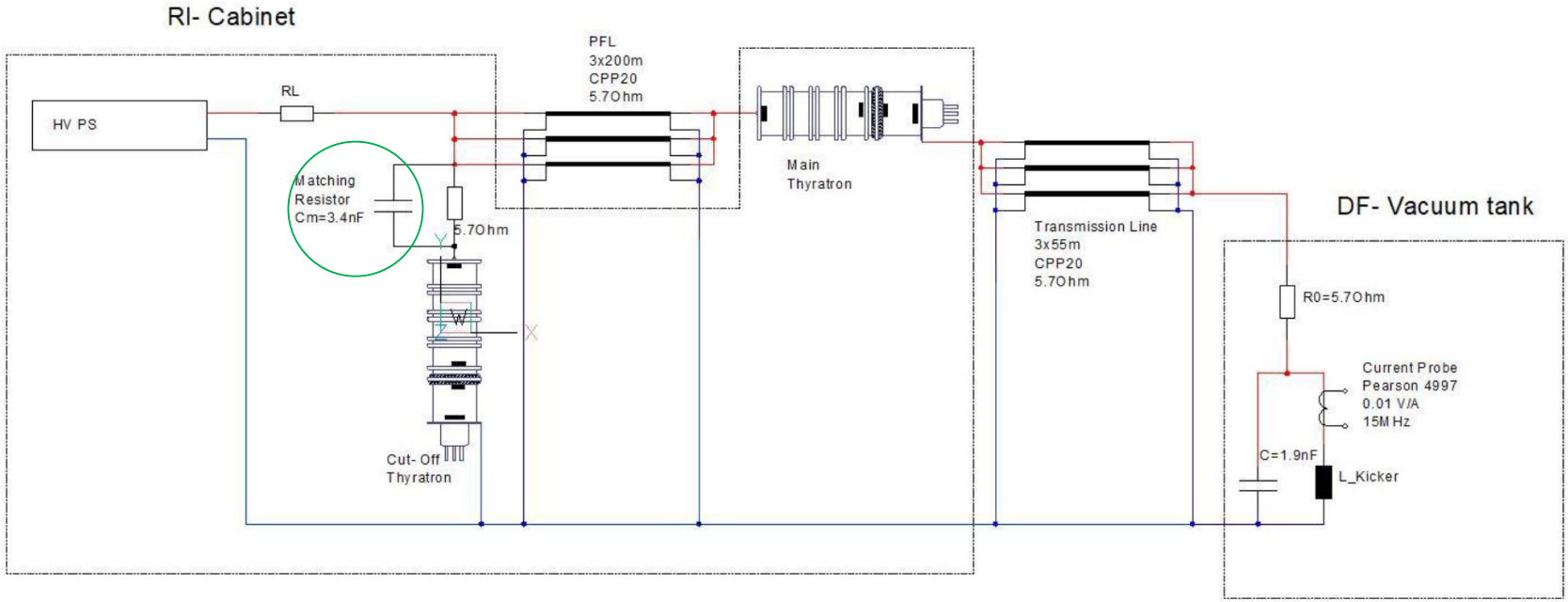
- Injection Kicker
- Extraction/Emergency Kicker
- Q Kicker

Injection kicker design





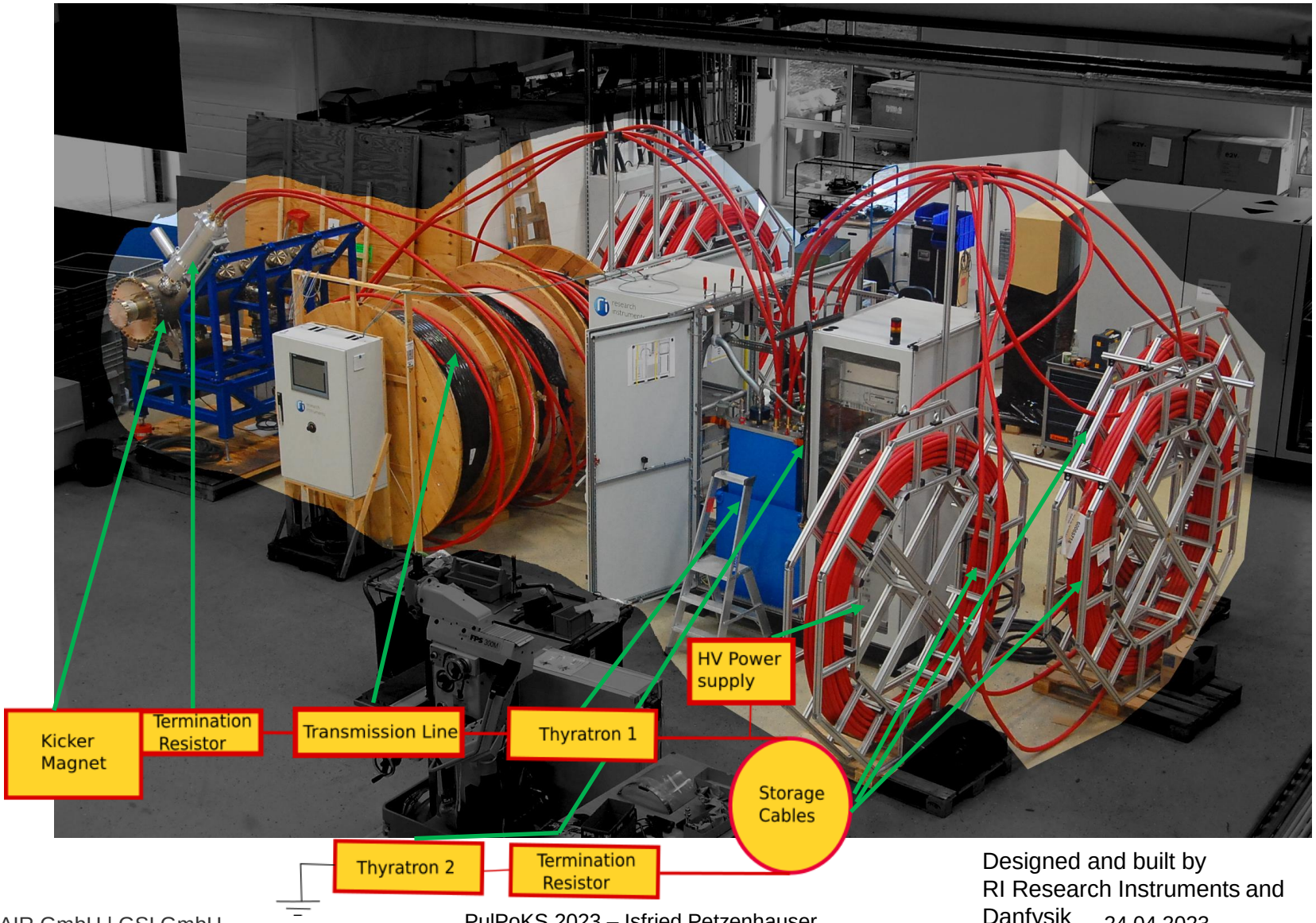
Setup „FoS“ injection kicker



Design parameter set:

Voltage	≤ 80 kV
Current	≤ 7 kA
Repetition rate	≤ 4 Hz
Pulse duration	0.5 - 2 µs
Current rise time	< 130 ns
Current rise rate	> $5*10^{10}$ A/s
Lifetime	> 10^8 shots

Injection kicker (1 module of 6)

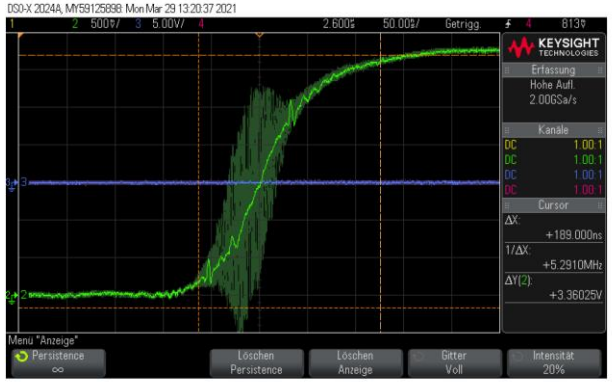


Designed and built by
RI Research Instruments and
Danfysik

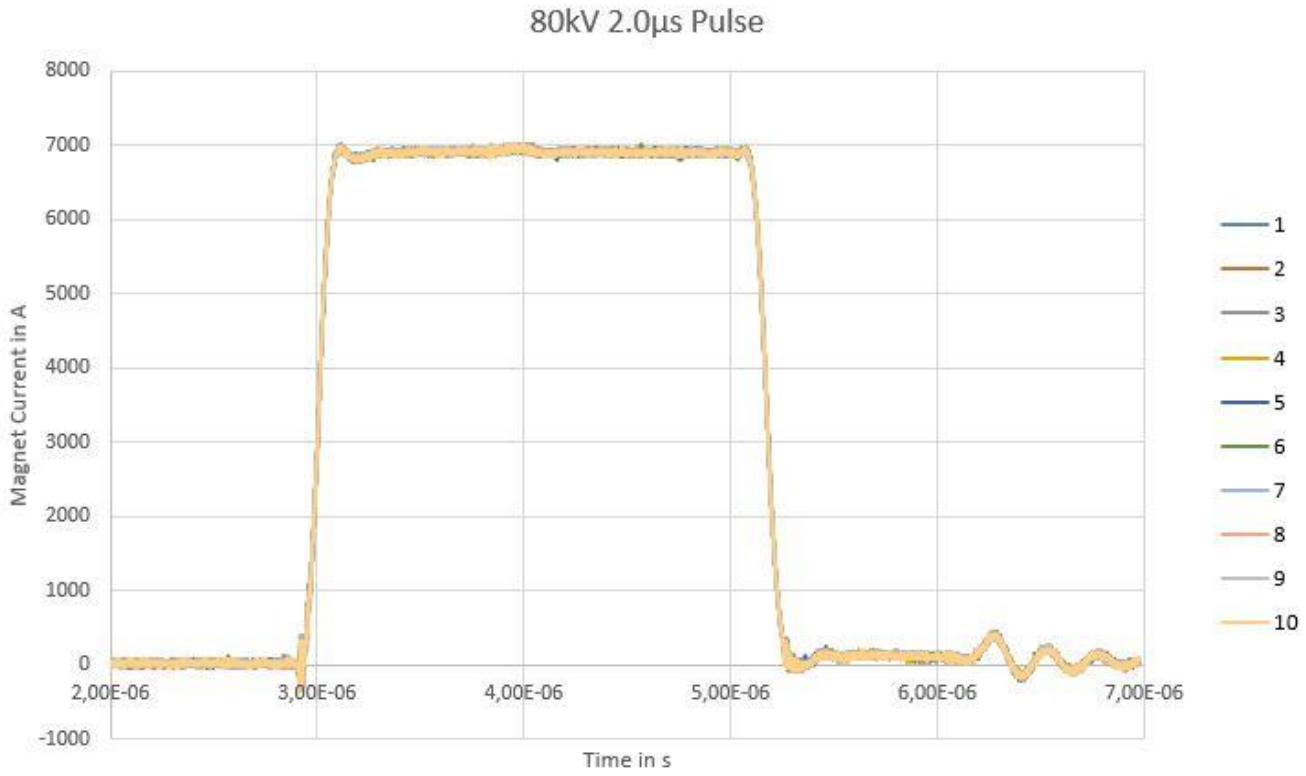
2 main problems resolved since PulPoKS 2020

1) High voltage issue within the vacuum chamber:
   Design changes, larger distances, less „sharp edges“
2) Termination resistor high voltage issues:
   New design, more parts oil insulated

Tests on external coil



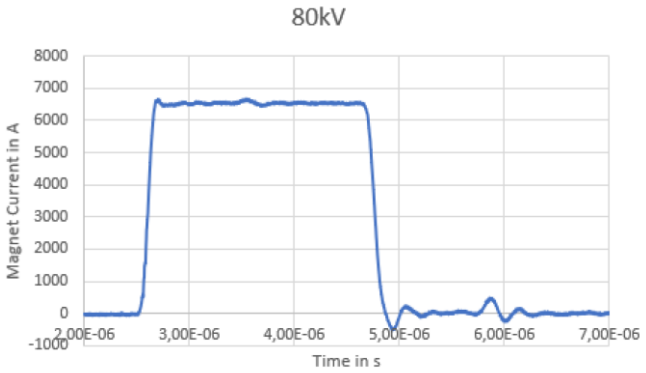
Pulse shape injection kicker (example)



Rise time: <165 ns
Jitter: ~2 ns
Flat-top current: +/- 2,4%
Pulse2pulse: <+/-0,2%
Vacuum: $<5*10^{-11}$ mbar

Auxiliary capacitance added (see page 3), reflections reduced

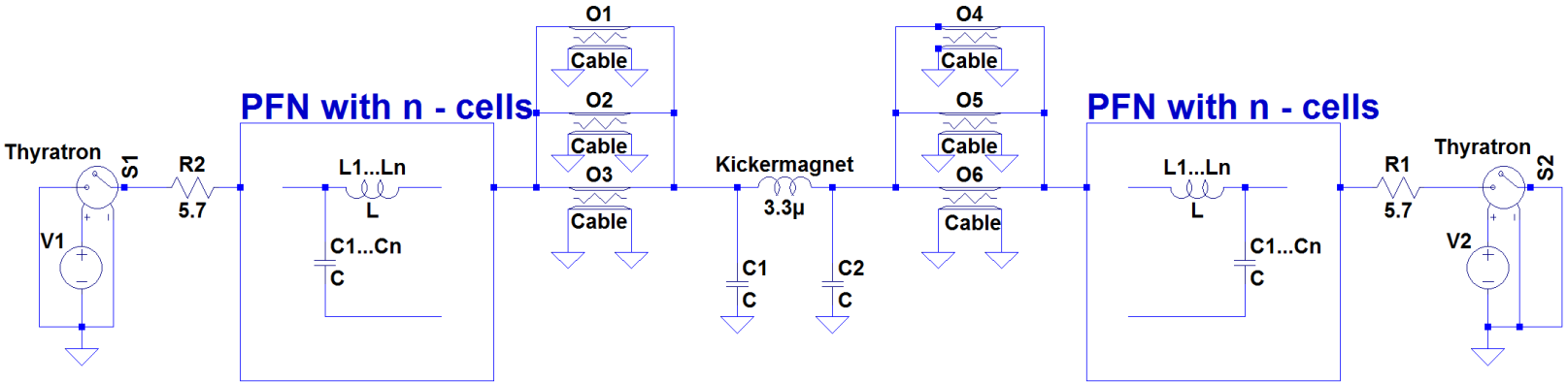
presented in 2020:



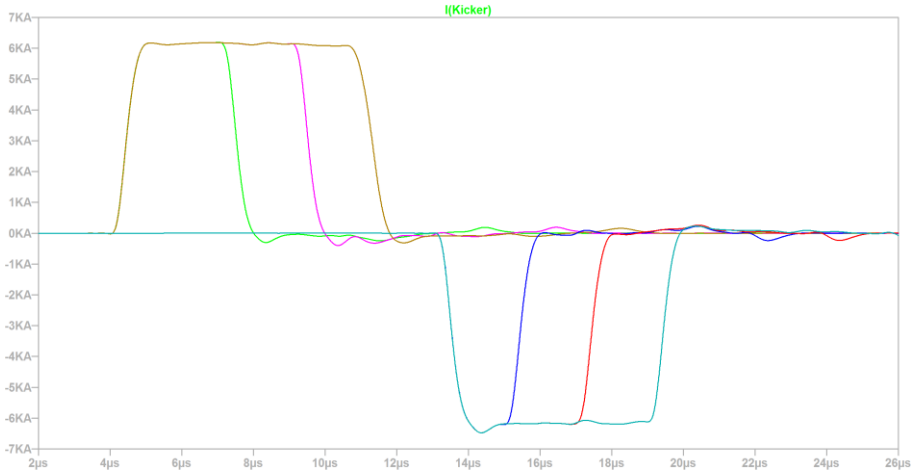
Pulse shape (i kicker) with different cable lengths

Simplified LTSpice simulation for storage cable lengths of 195 m, 200 m and 205 m with transmission lines: 65 m, 67 m, 70 m, 74 m, 74 m, 76 m

Extraction/Emergency kicker

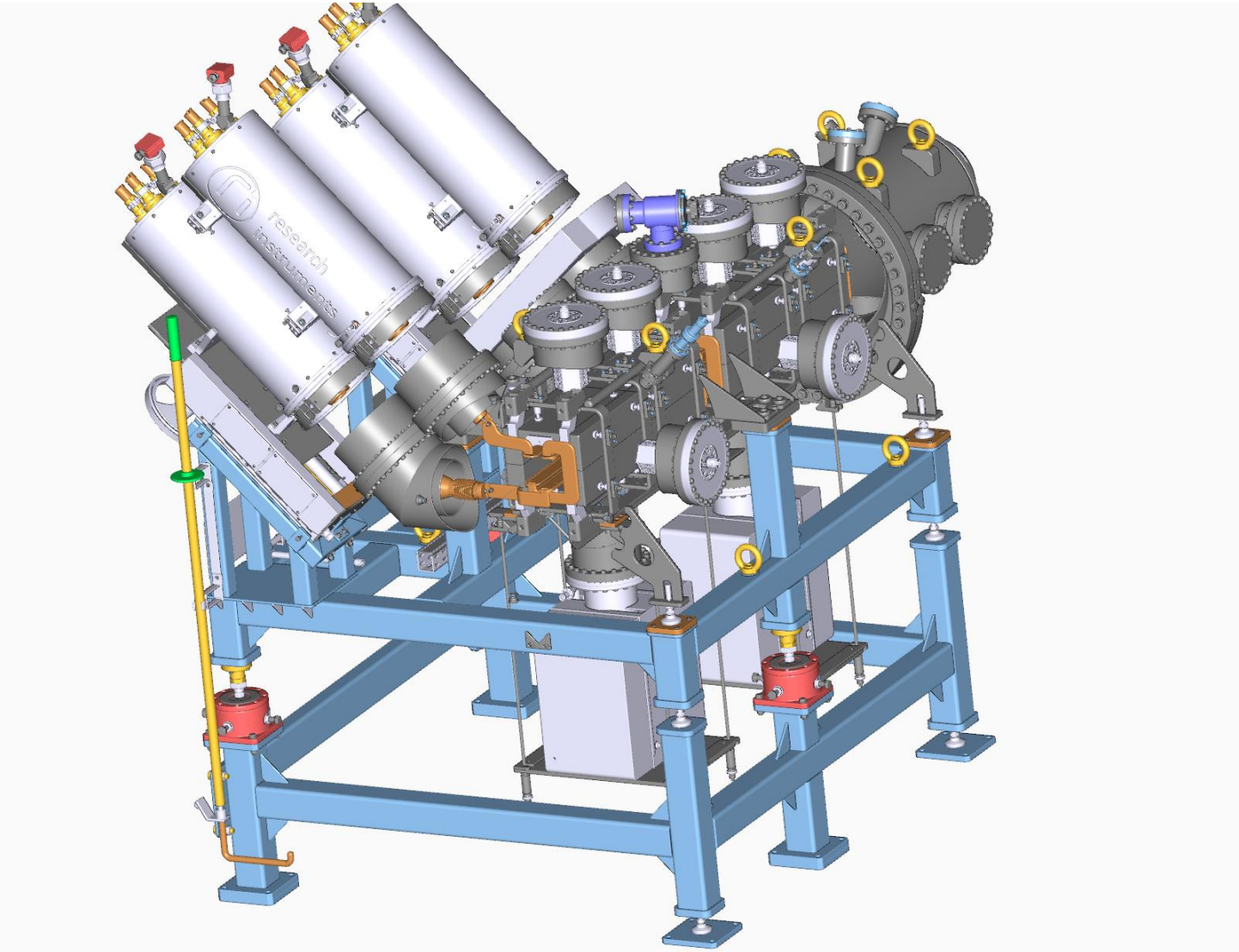


Voltage	~7kV - 80 kV
Current	≤ 7 kA
Repetition rate	≤ 1 Hz
Pulse duration	≤ 7 µs
Current rise time	< 800 ns
Current rise rate	> $9*10^9$ A/s
Lifetime	> 10^8 shots



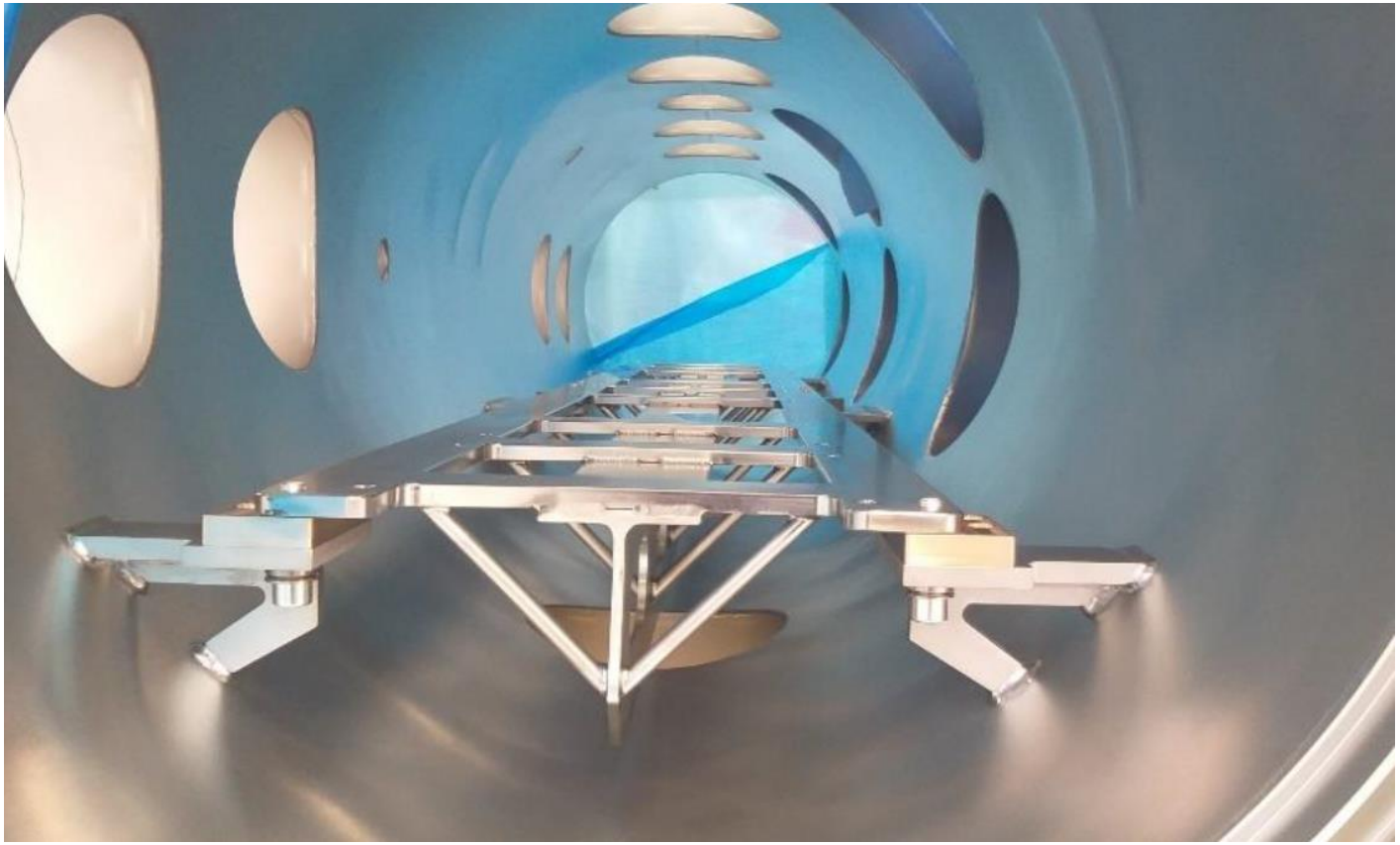
- Bipolar Kicker
- PFN (40 cells) instead of PFL (due to pulse width)
- Wide range of operation (~ 7 kV – 80 kV)
- 8 Modules in 3 Vacuum chambers

Design kicker in vacuum chamber

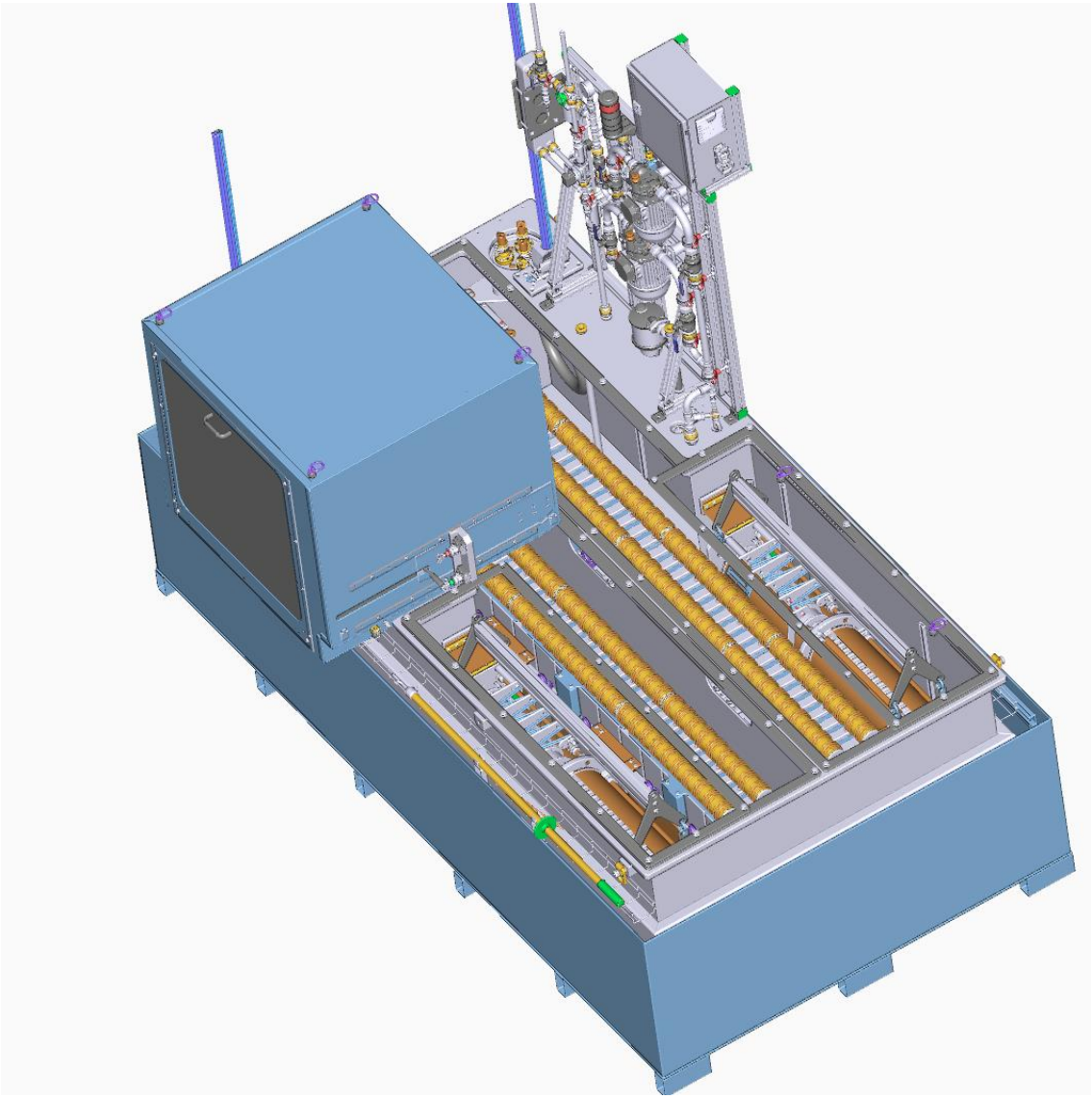


Experience in injection kicker / redesign Extraction/Emergency kicker

- All distances were rechecked
- To avoid influence on beam, the eddy currents shields are on high potential
- system is in production, „first of series“ test will be conducted in Q2/23

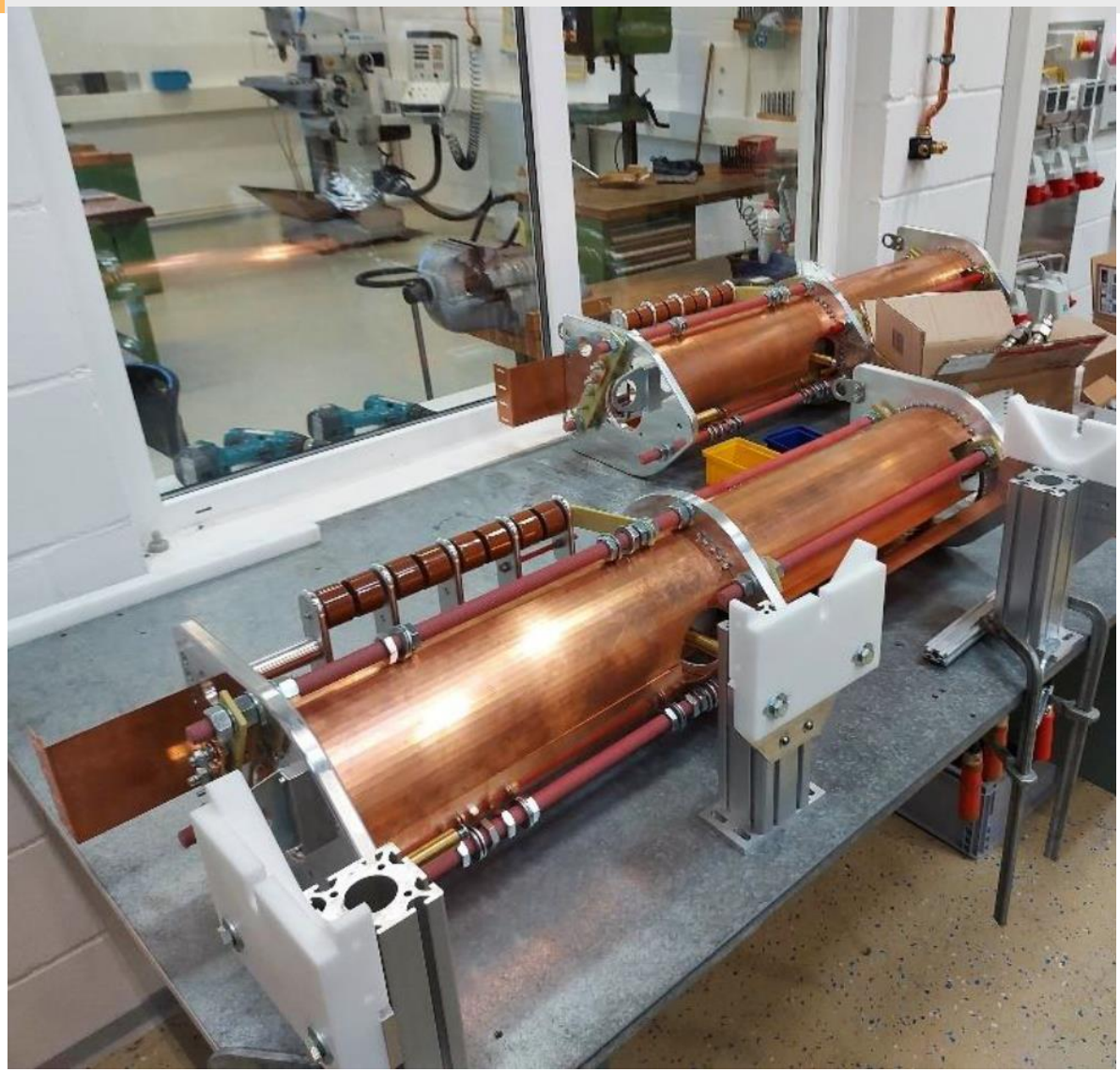


Design PFN/Switch setup

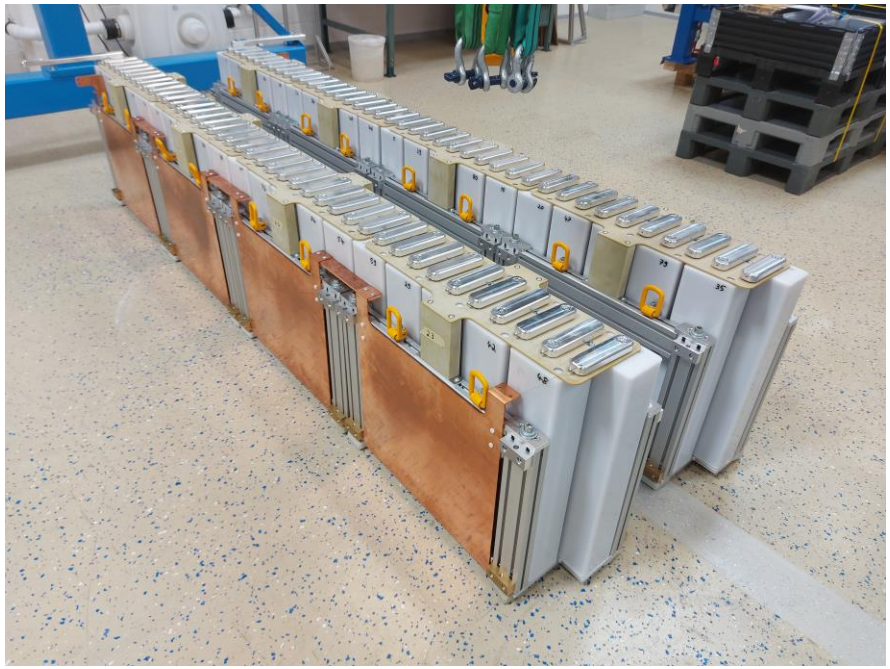


EE kicker PFN oil tub

EE kicker thyratron/resistor housings



EE kicker PFN setup



Outlook / Thanks

- Delivery of injection kicker expected Q1/24
- Delivery of extraction/emergency kicker expected Q2/24
- In both systems lead times of SPS modules an issue, the last modules to be integrated in autumn 2024

I would like to thank Michael Osemann (Research Instruments) und Michael Pedersen (DanFysik) and their teams for their continuous efforts to build and to optimize the systems.
Also I would like to thank all other colleagues who participate in the kicker projects.