

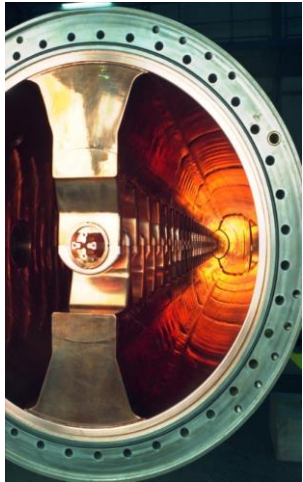
Radio Frequency Quadrupole Accelerator Developments

for heavy ion beams – high current pulsed and cw-applications

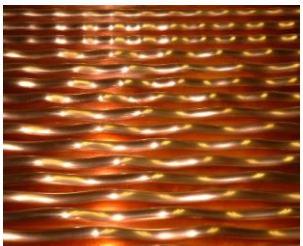
KfB–Workshop 07./08.09.20

W. Barth, Johannes Gutenberg University Mainz

High Current pulsed application (0.1 % duty factor)



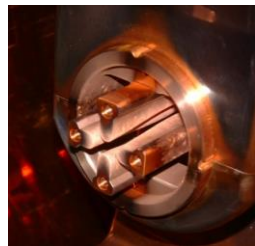
HSI-RFQ	New Design	Existing Design (up to 2008)
Electrode voltage / kV	155	125
Av. aperture radius / cm	0.6	0.54 – 0.52 – 0.77
Electrode width / cm	0.846	0.93 – 0.89 – 1.08
Maximum field / kV/cm	312.0	318.5
Modulation	1.012 – 1.93	1.00 – 2.09
Min. transv. phase advance / rad	0.555	0.45
Synch. Phase, degrees	-90° - -28°	-90° - -34°
Min. aperture radius, cm	0.410	0.381
Norm. transv. acceptance / μm	0.856	0.73
Number of cells with modulation	394	343
Length of electrodes, cm	921.74	921.74



before installation



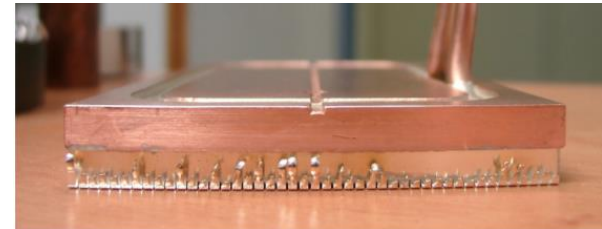
after 5 years operation



High duty factor application (100 %, cw)



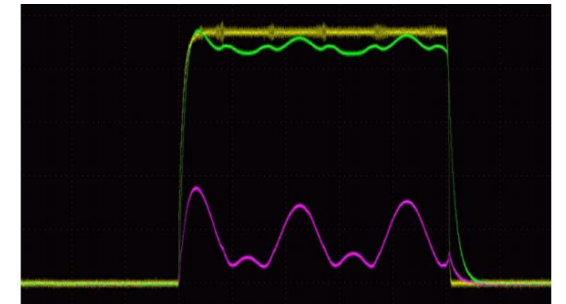
courtesy: P. Gerhard (GSI)



Tuning plate with burnt contact springs after 5 years operation

Injection / extraction energy [keV/u]	2.5 / 300
RF frequency [MHz]	108.408
A/q (cw / max.)	6.0 / 8.5
Power (max. avg. / max. pulse) [kW]	60 / 120
Intervane voltage (cw / max.) [kV]	55 / 78
RMS emittance in / out [π mm mrad]	0.1 / 0.1009
Electrode length [m]	2.0

courtesy: P. Gerhard (GSI)



Modulation of the rf tank signals; Magenta: Reflected power; green: forward power; yellow: Tank amplitude (read out).

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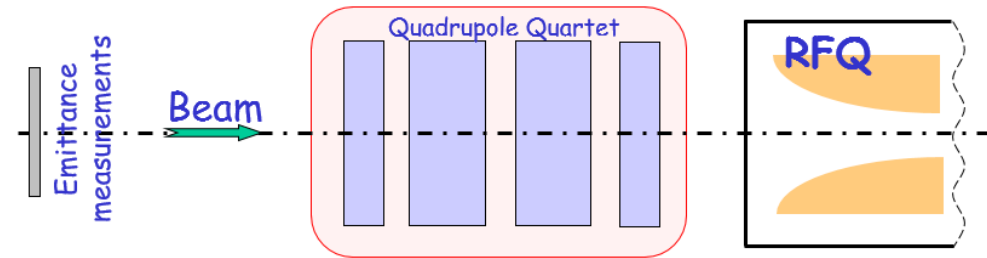
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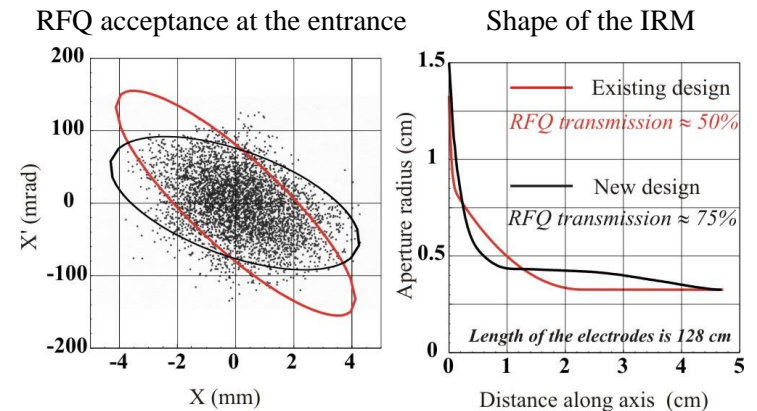
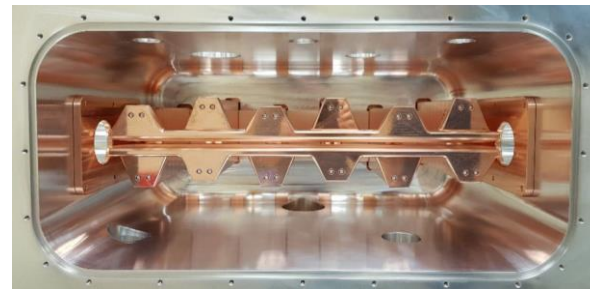
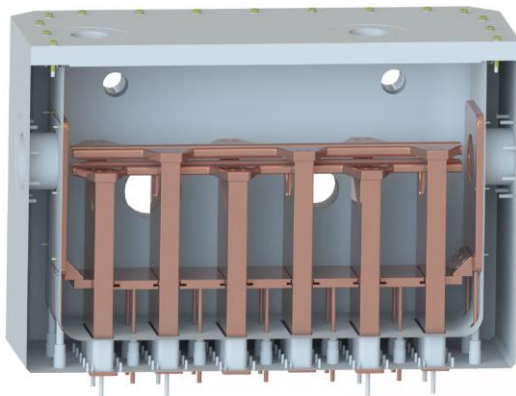
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- Cooling concepts
- Beam dynamics layout
- Matching line
- **Full scale prototyping of a cw-RFQ (4rod-type)**

Beam matching to the HSI-RFQ acceptance



courtesy: H. Podlech(GUF)



courtesy: S. Yaremishchev(GSI)

Funding request: 1 doctorand position, 500 k€