Collector Ring Injection/Extraction Status

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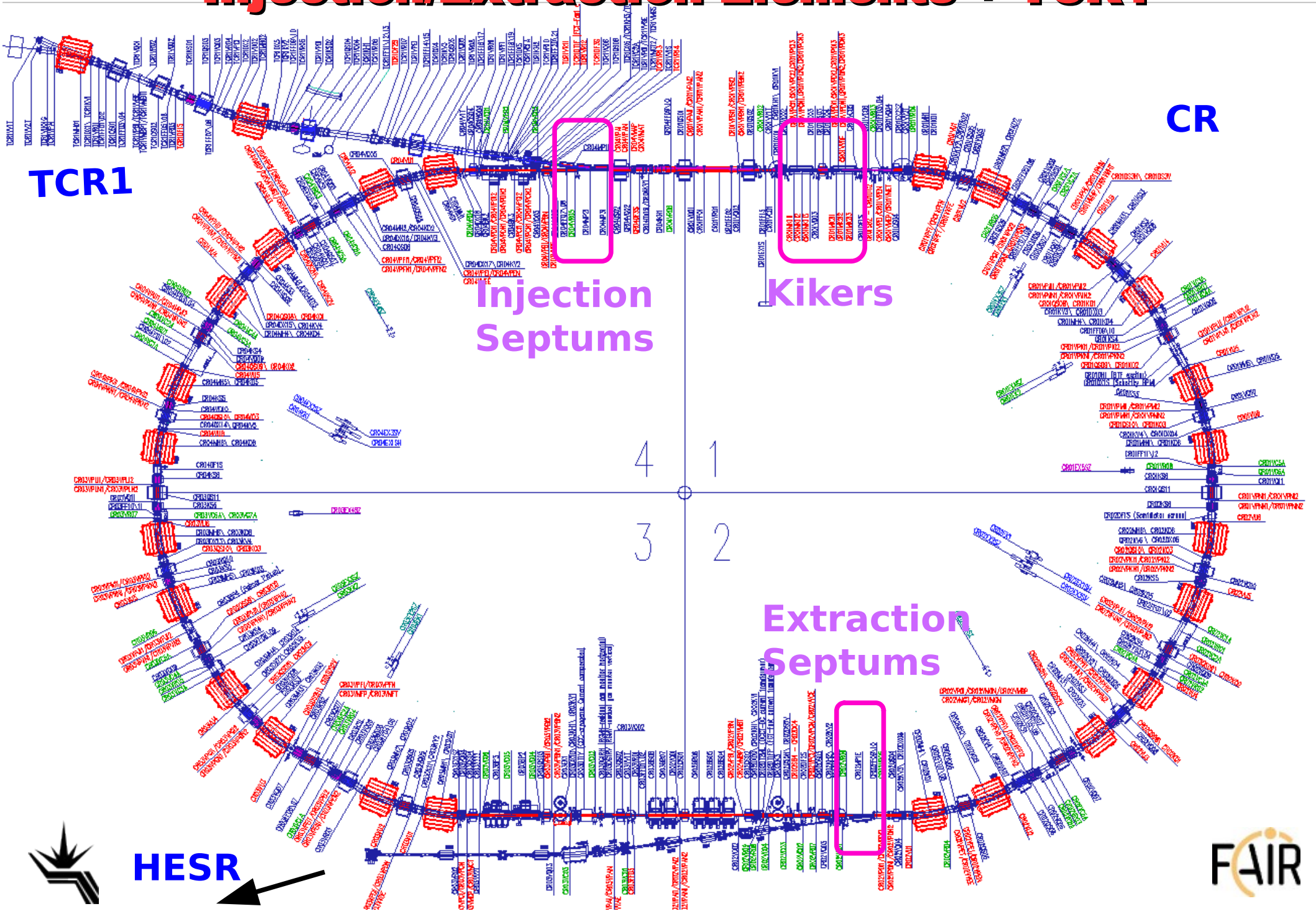
Online
10, November, 2020

Injection/Extraction Elements + TCR1



Status: TCR1

- Dipoles, Wide quads, Correctors, Sextupoles, Power converters, Beam observation - follow the procedure of similar CR elements. Exact schedule is in discussion.
- Vacuum chambers — waiting for specs.
- TCR1QS06 — special type quad, developed and there is spec.
- TCR1DX6, TCR1KH3, TCR1KV4 — knot still in development. Looking for a good solution.

Septum Magnets Further Steps (May 2020)

Injection:

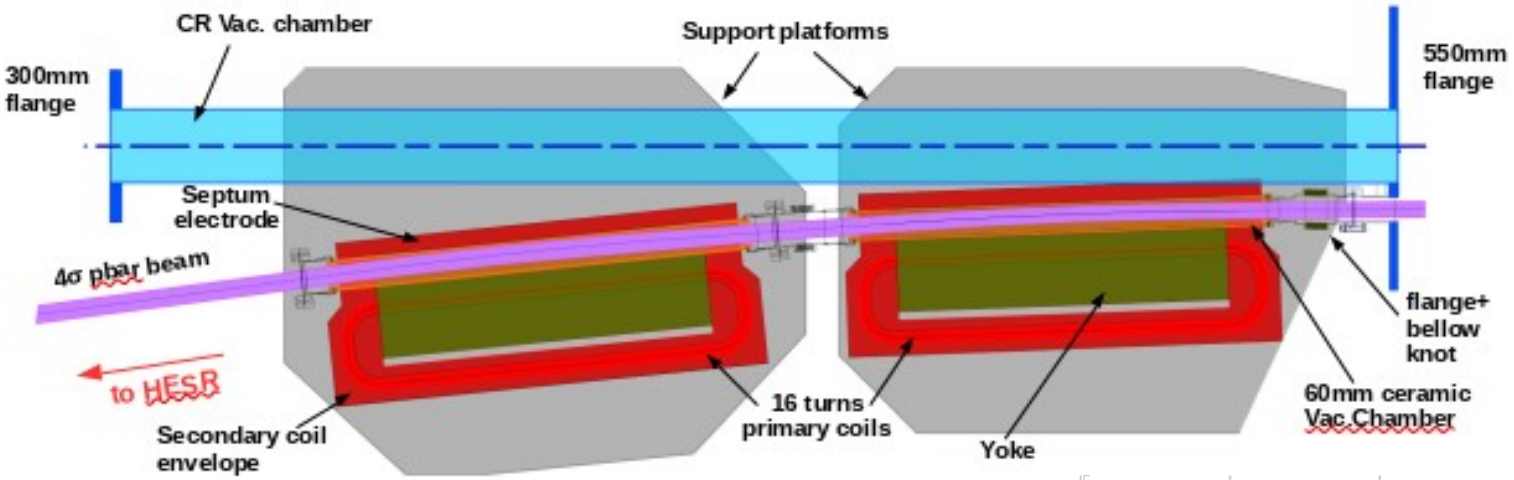
- Spec. Change request → submitted
- Update for detailed injection parameters → ready for submission
- CDR → right after Specs change. Everything is ready.
- FDR → right after CDR. Blueprints are ready.
- Vacuum chambers and tests → August-September 2020
- Production of pre-series and tests → 2021

Extraction:

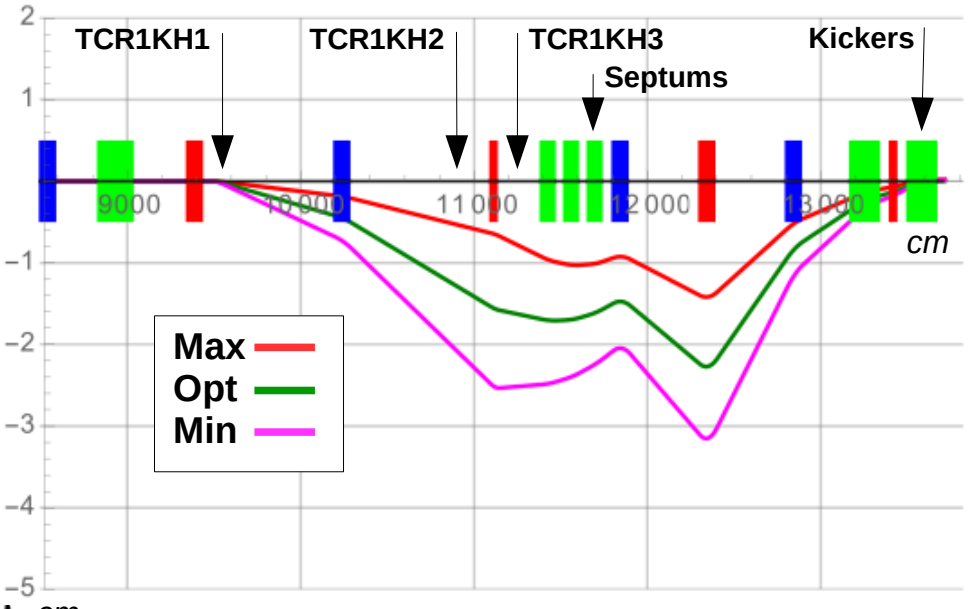
- Spec. Change request → to be submitted after the workshop
- Update for detailed extraction parameters → to be submitted
- Magnetic field calculations → 1-2 Monthes
- Design finalization → end of summer.
- CDR → Autumn 2020
- FDR → As soon as blueprints will be ready.
- Production goal → start after the production of ISM pre-series.

Beams Dynamics for Injection/Extraction

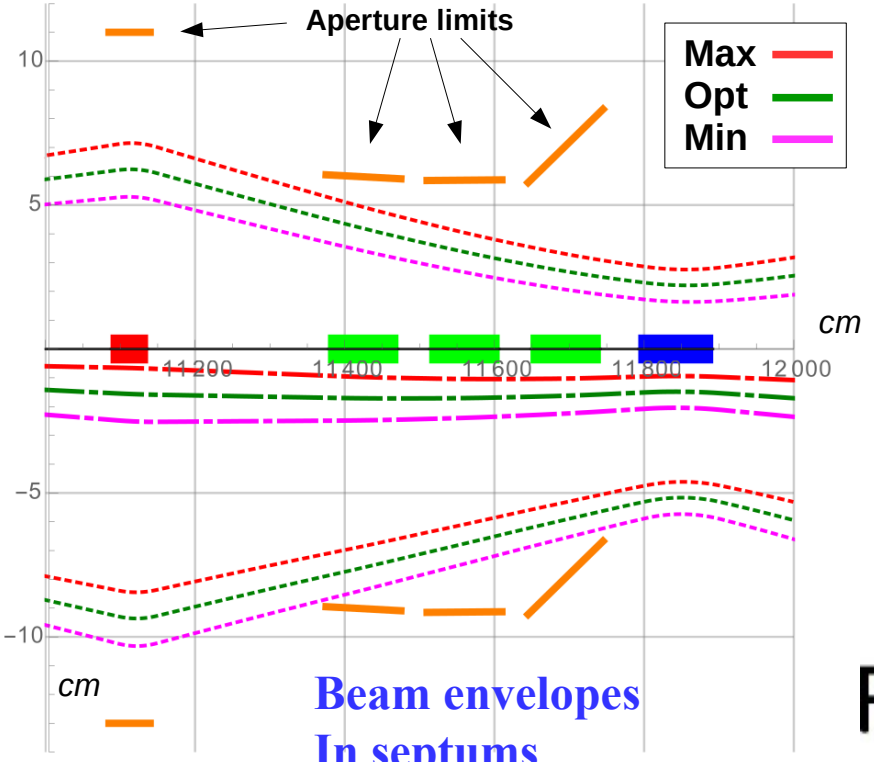
- Scheme for orbit steerers were updated for Injection
- Extraction with two-part extraction septum was recalculated
- The paper was made and published in EDMS.



2-part extraction septum

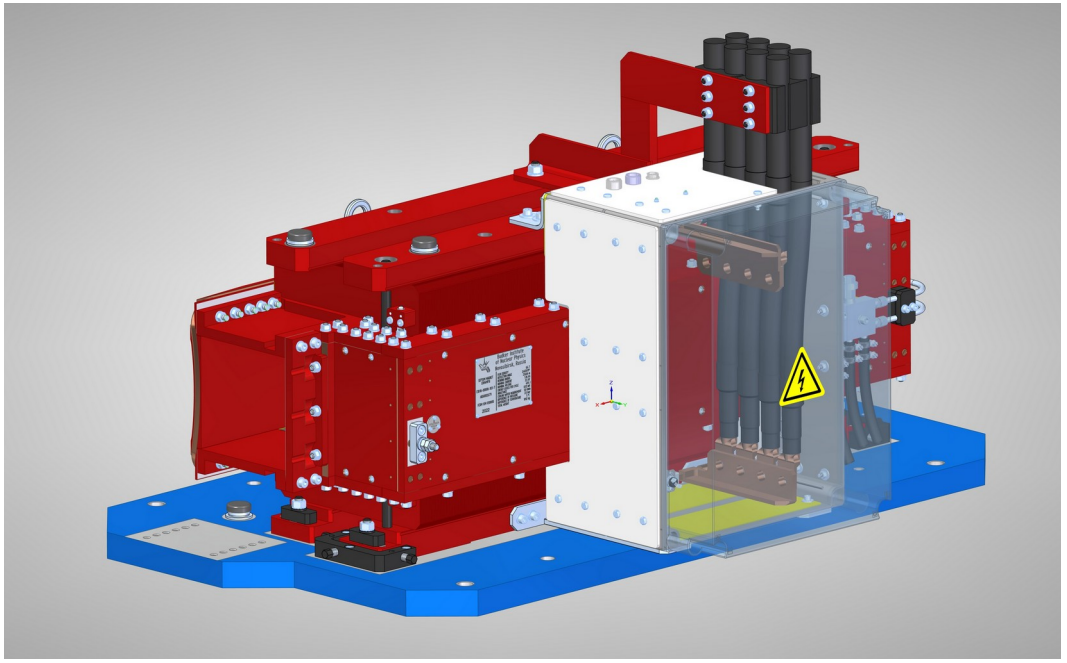


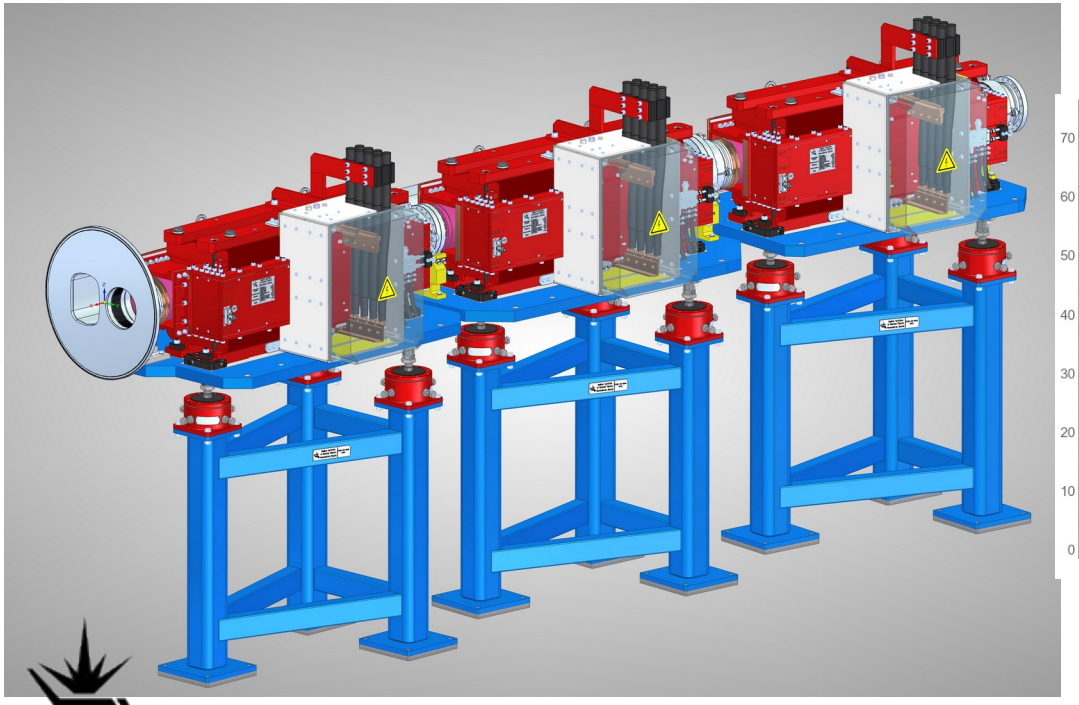
Trajectories



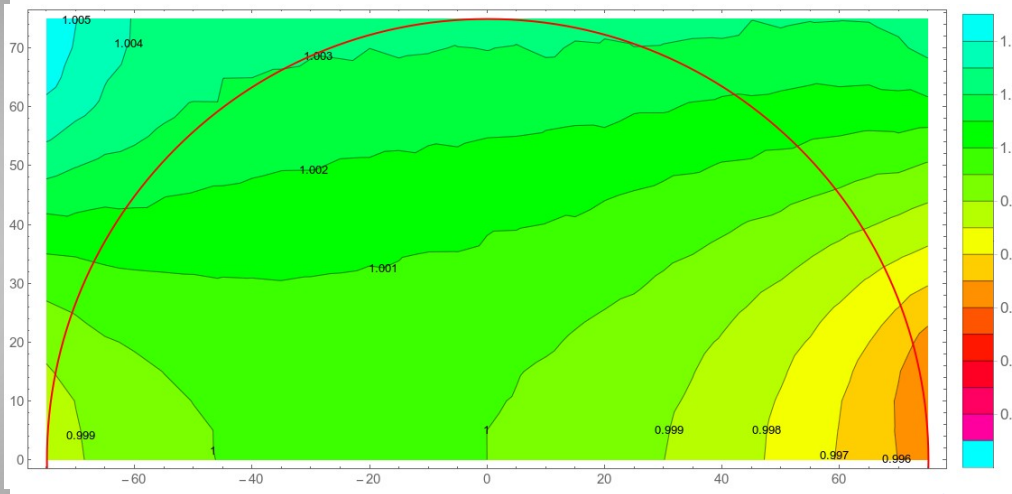
Beam envelopes
In septums

Injection Septum Magnet Status



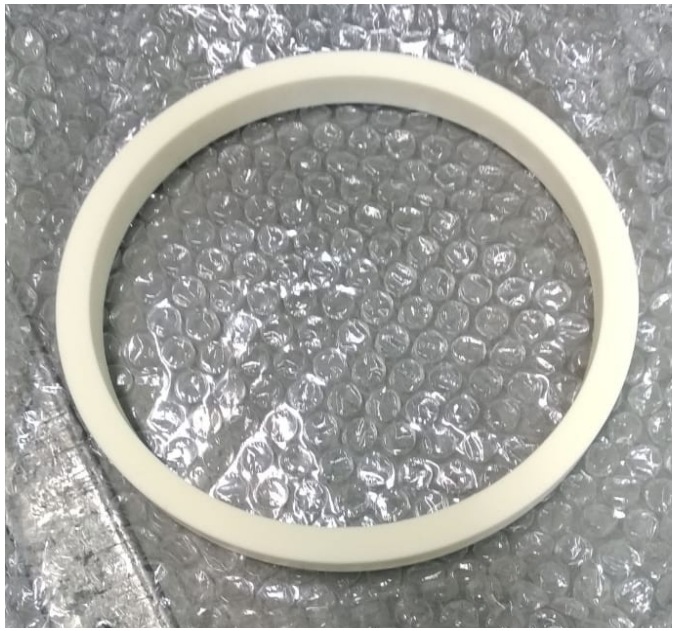


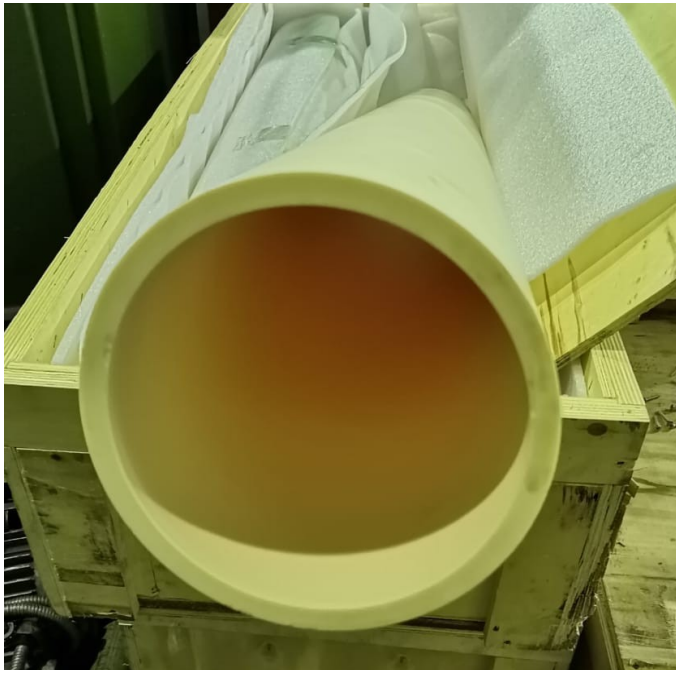
- Magnetic field quality discussion - done
- Spec. Change request – done
- Ceramic vacuum chamber procurement done. Testing is on the way.
- Iron procurement - done
- Copper procurement done
- Blueprints in the workshop
- The stamp is ready for production. Waiting for the order.
- Testing approach is agreed.
- CDR & FDR → still in preparation
- Production and tests → late 2021



Magnetic field quality better than $\pm 1 \cdot 10^{-2}$

Injection Septum Magnet Parts

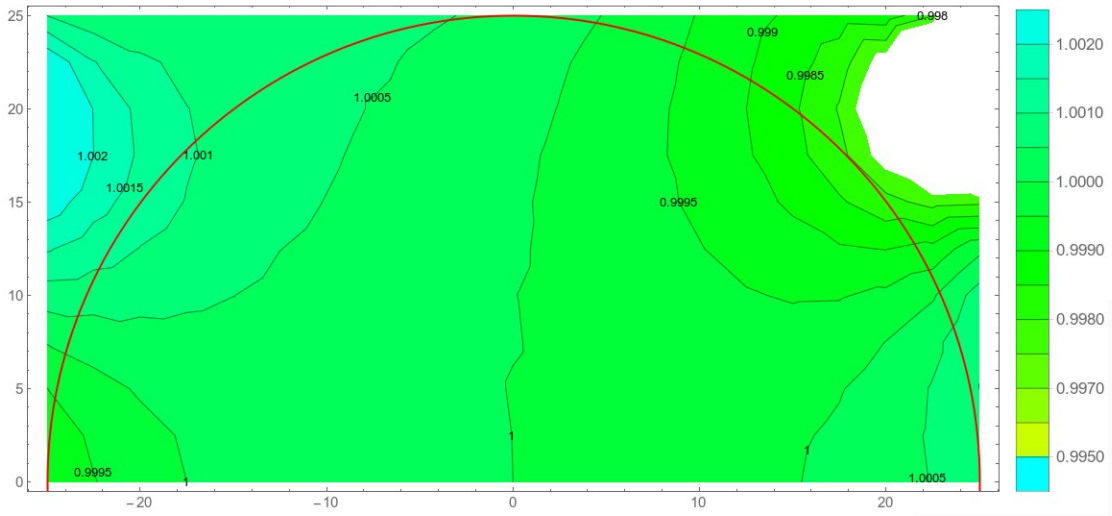




Ceramic vac. chambers

PS for Dubna Booster-Nuclotron

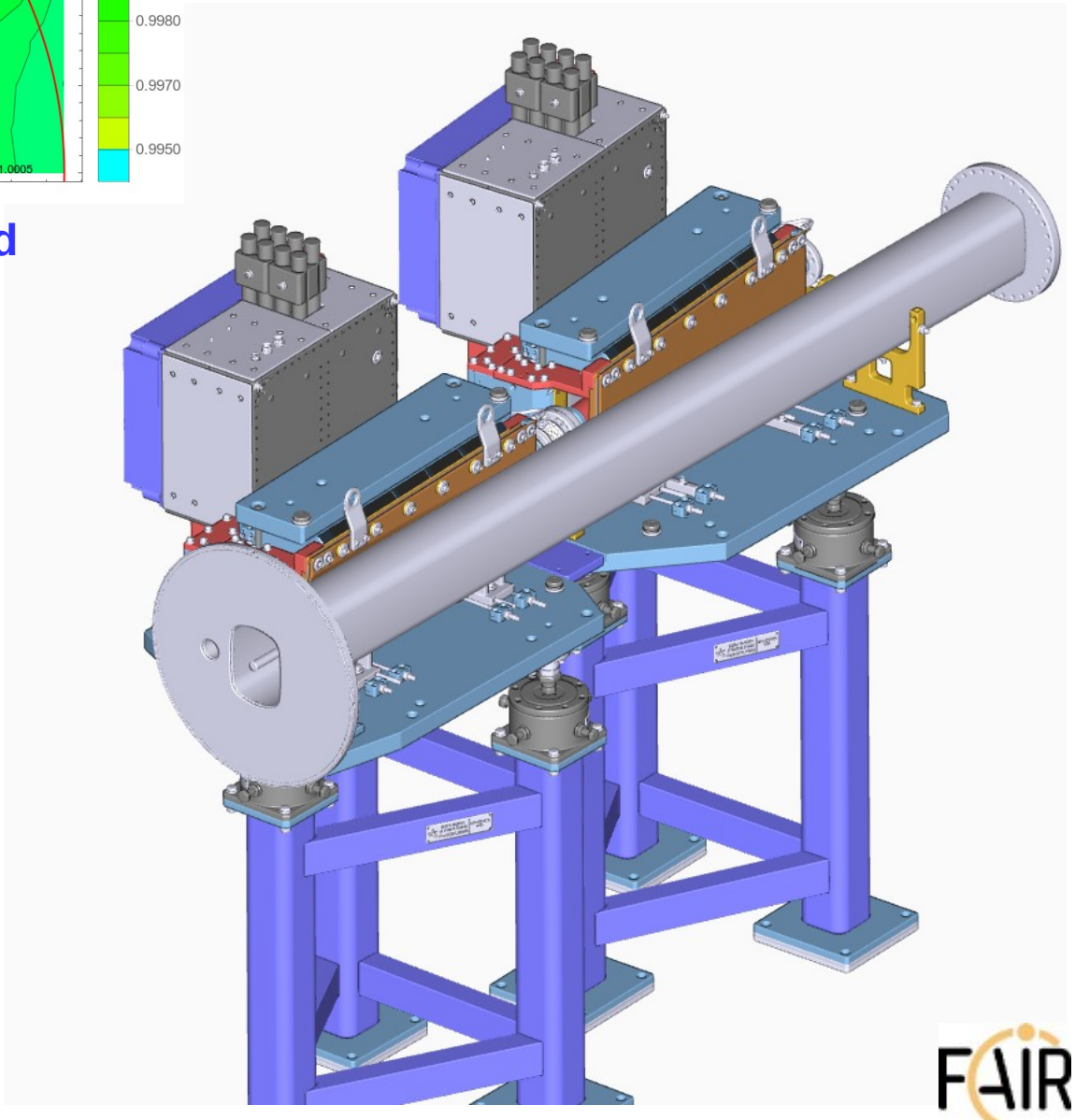
Extraction Septum Status



Magnetic field quality better than $\pm 5 \cdot 10^{-3}$

- **Magnetic field calculations – finished**
- **Development – finished**
- **Blueprints are in the workshop**
- **Laser cutting**
- **CDR & FDR → still in preparation**
- **Production and tests → early 2022**

Number of magnets	2
Magnetic field	1.2T
Radius of curvature	11070mm
Effective legth	687.35mm
Final orbit deviation angle	7.513˚
Yoke length	640mm
Voltage	2.5kV
Pulse length	3 msec
Gap	65 mm



Injection simulations

Serban Udrea → This Workshop. Wednesday 11.10

Helmut Weick → This Workshop. Wednesday 10.00

Further Steps

Injection:

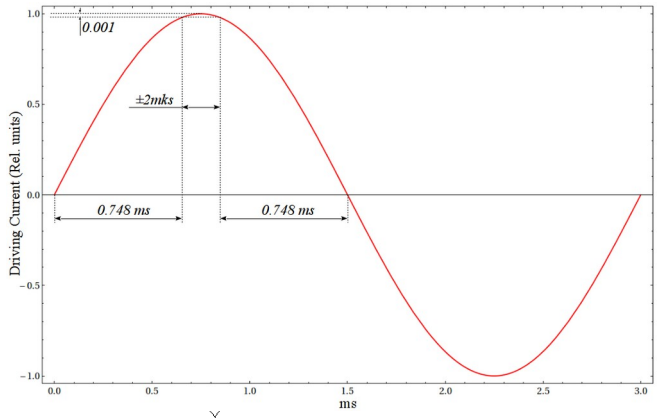
- CDR → In work. Coming soon.
- FDR → right after CDR.
- Production of stamp → Spring 2021
- Stamping → Spring – Summer 2021
- Assembling → Fall 2021
- Testing and possible additional work → End of 2021

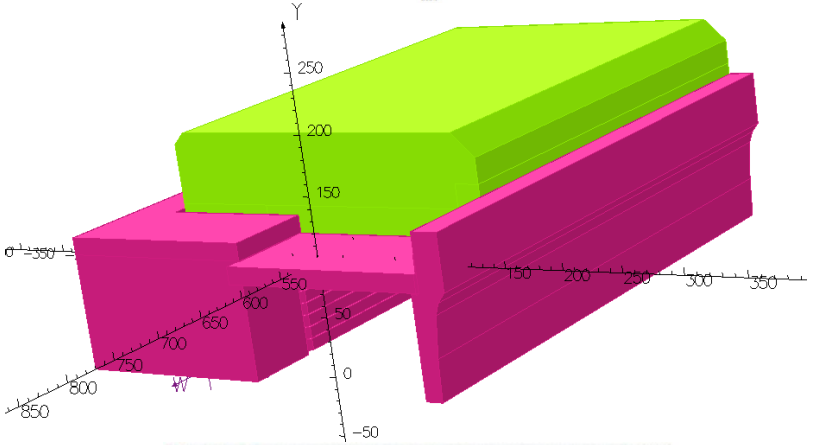
Extraction:

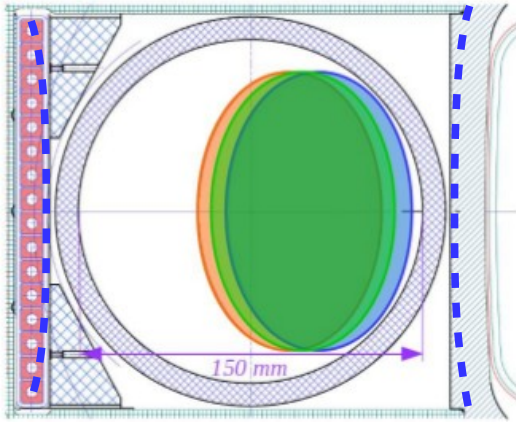
- Spec. Change request
- Production preparations in the workshop
- Testing of laser cutting
- CDR → Right after ISM CDR
- FDR → Right after ISM FDR
- Production goal → early 2022

Thank you!

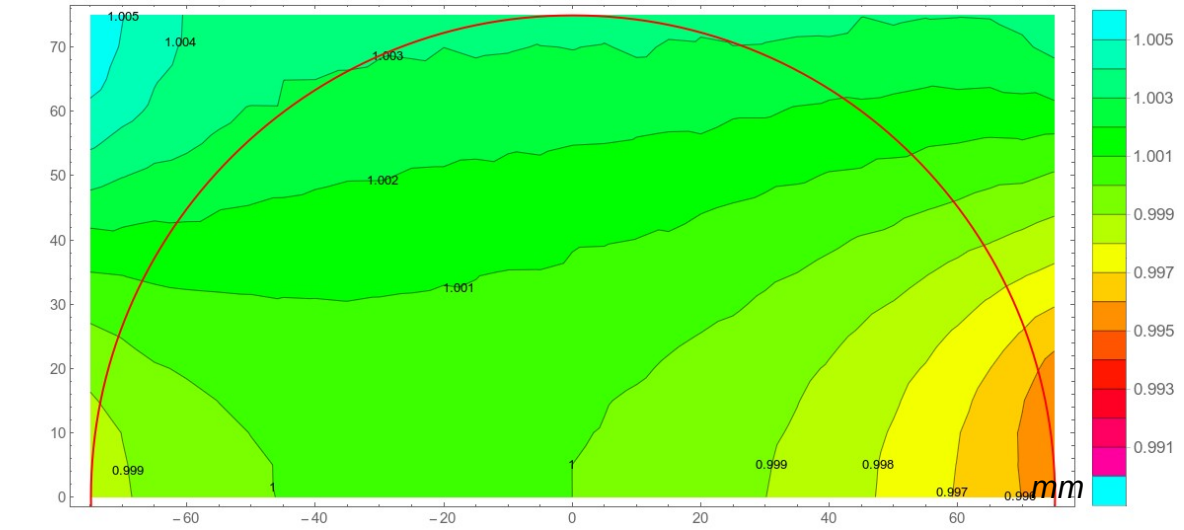
Injection Septum: Magnetic Field Simulations



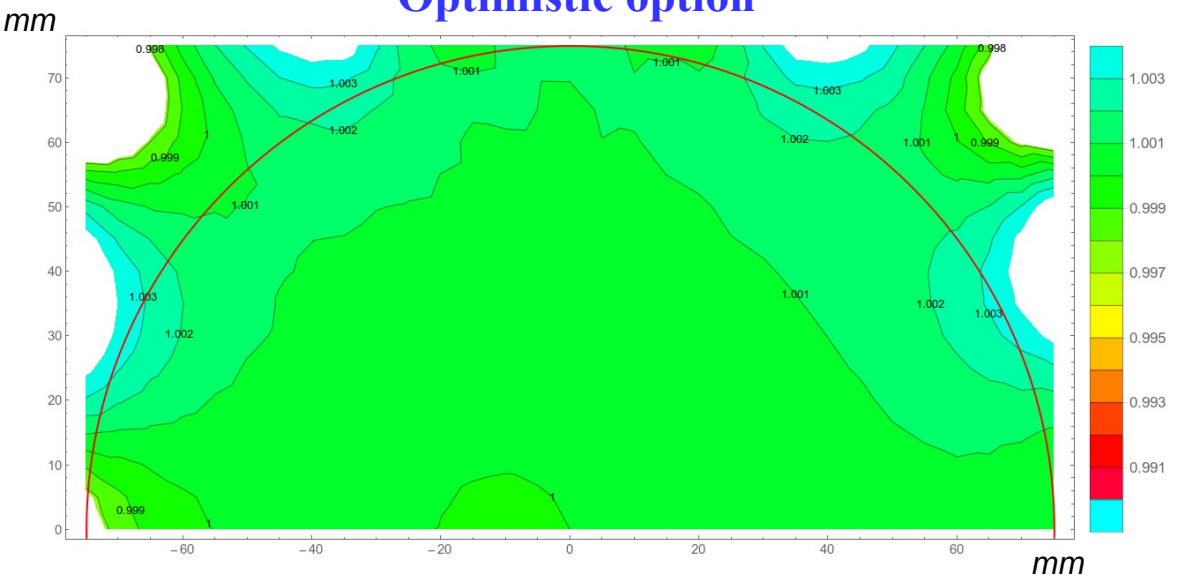




Realistic option

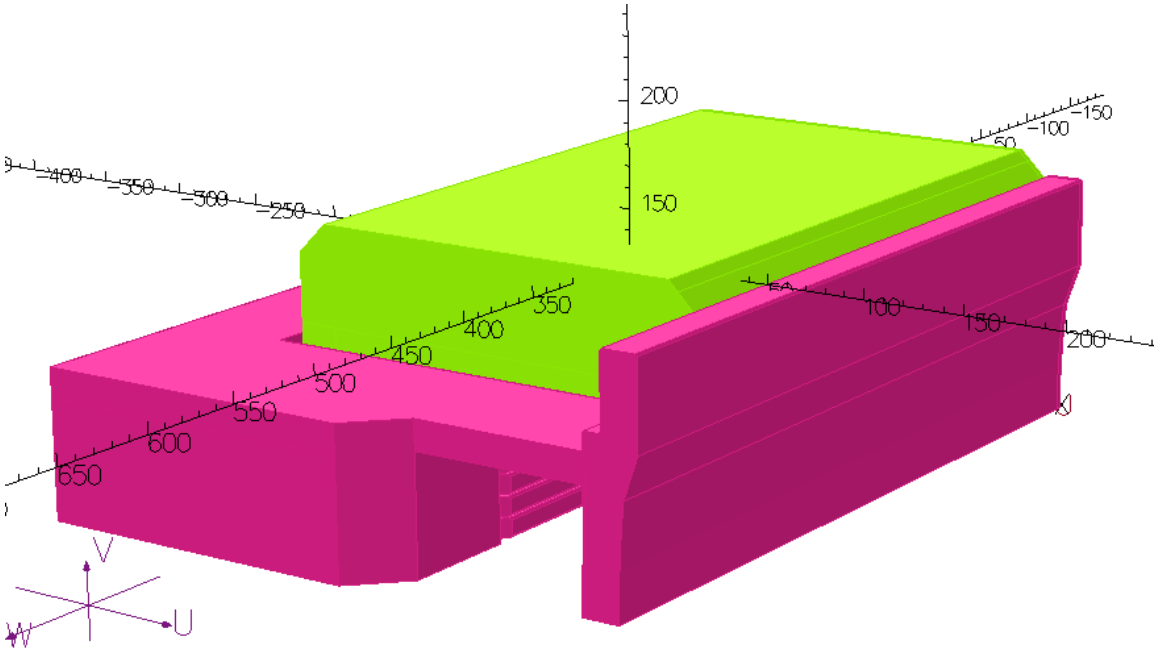


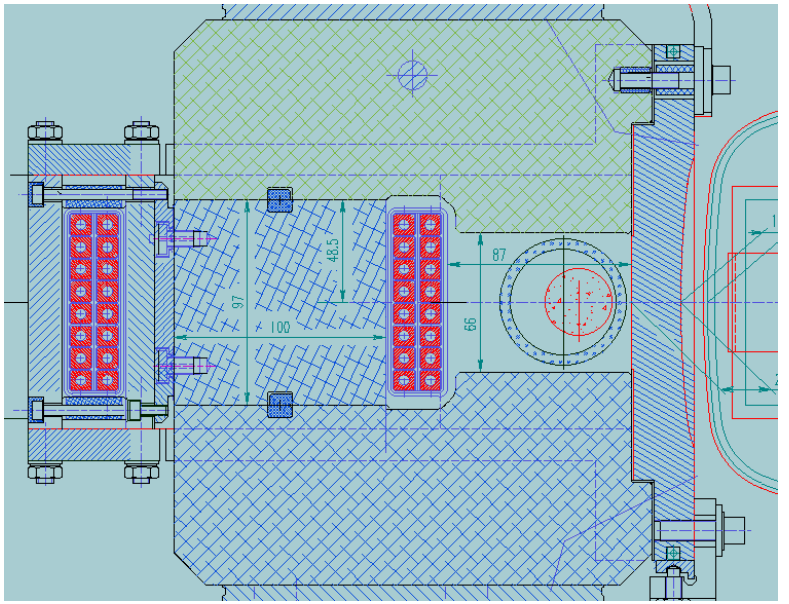
Optimistic option

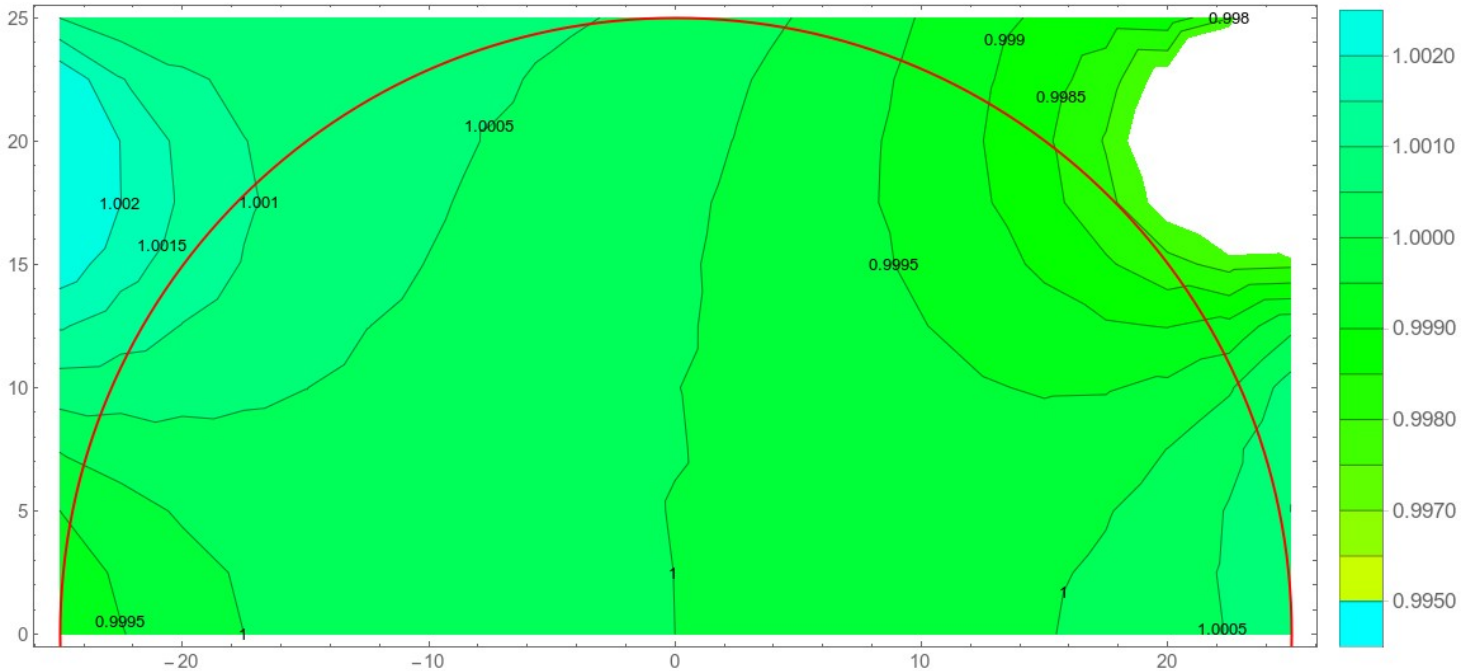


Precision of winding is 0.5mm.
Demand for profile accuracy 0.1mm

Extraction Septum: Magnetic Field Simulations

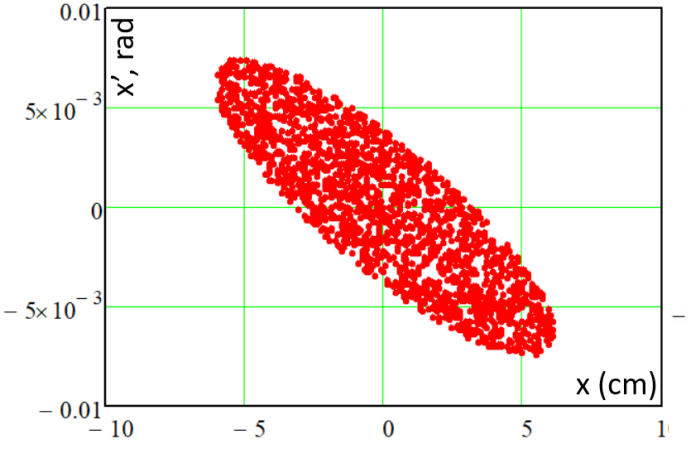


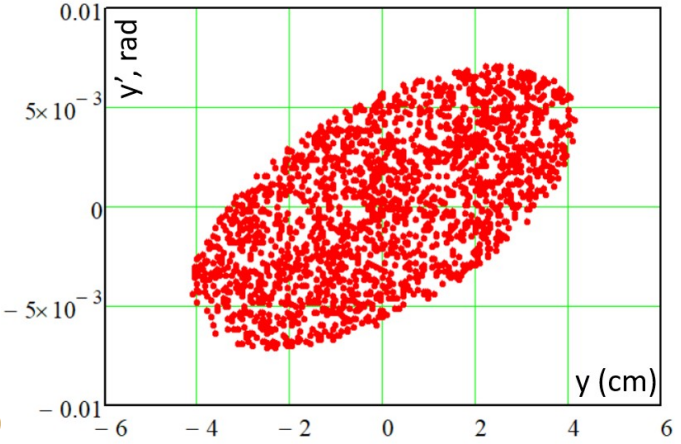


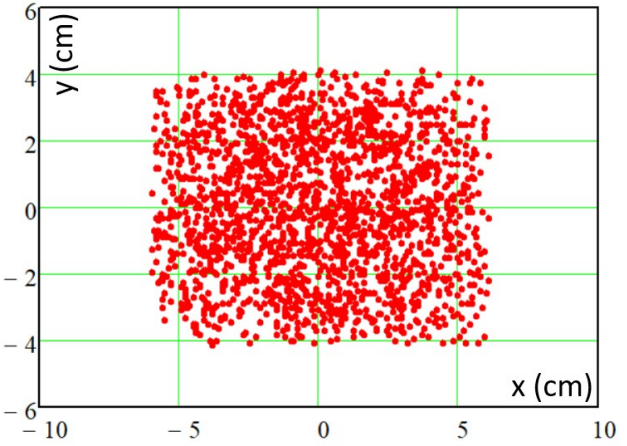


Magnetic Field Quality Requirements

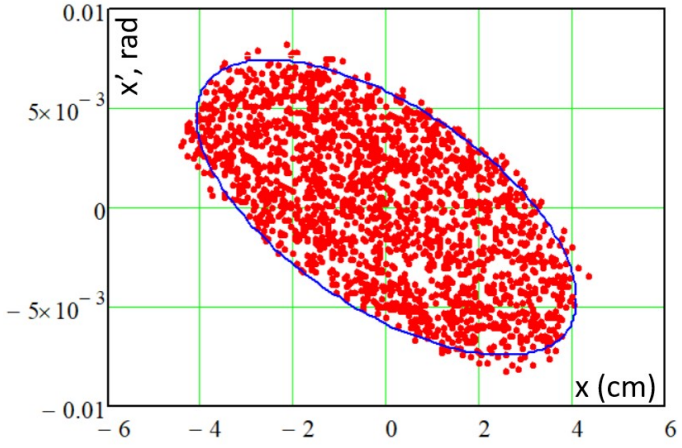
Initial distribution of 2000 particles

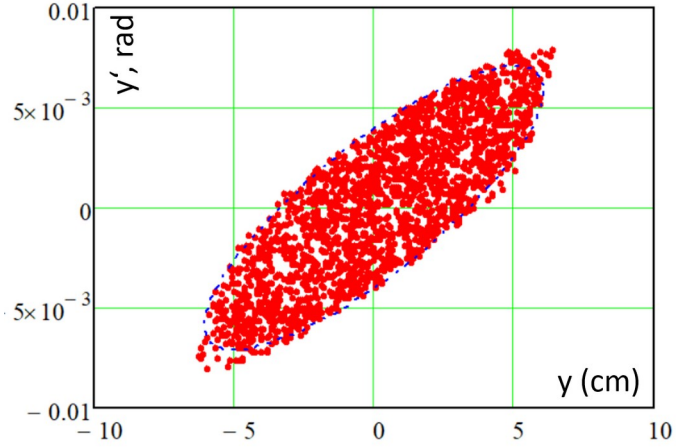


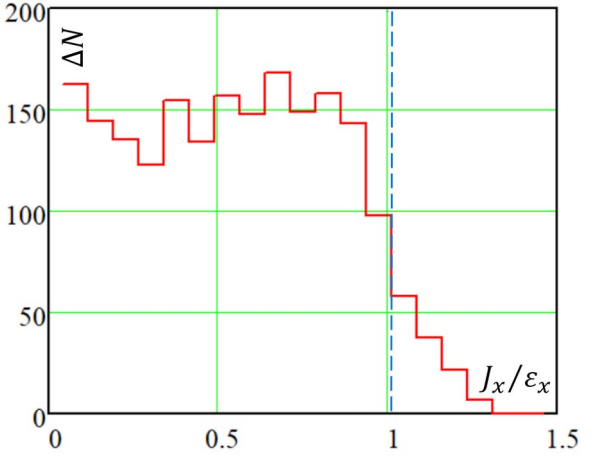




Distribution after 3 Septums with ΔB/B=0.02 at radius 60mm



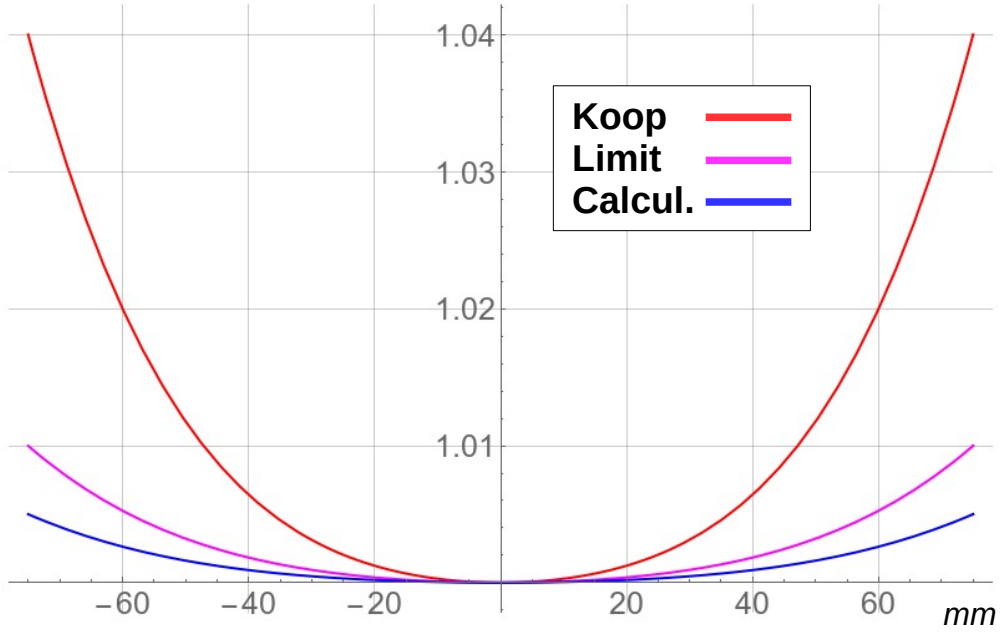


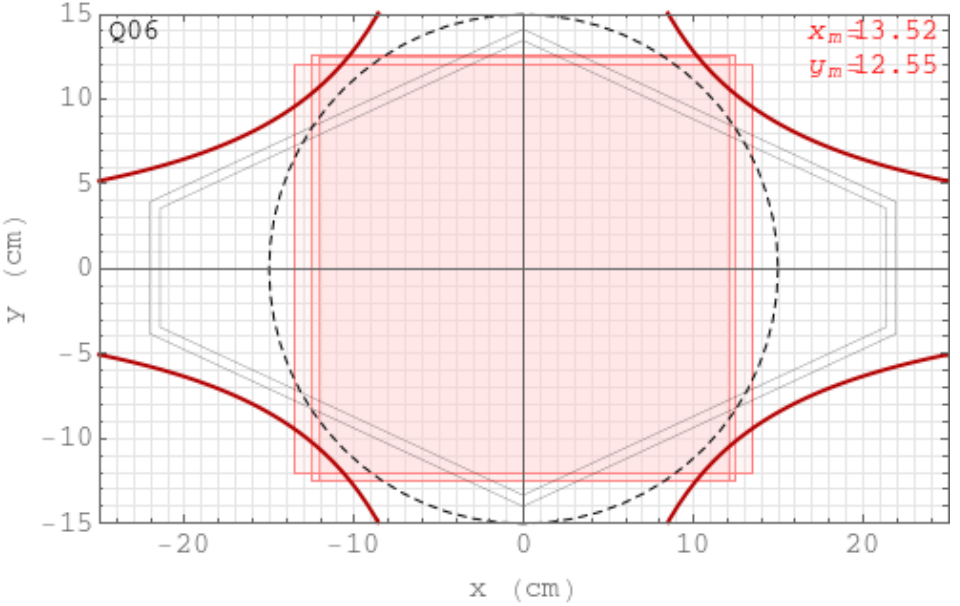


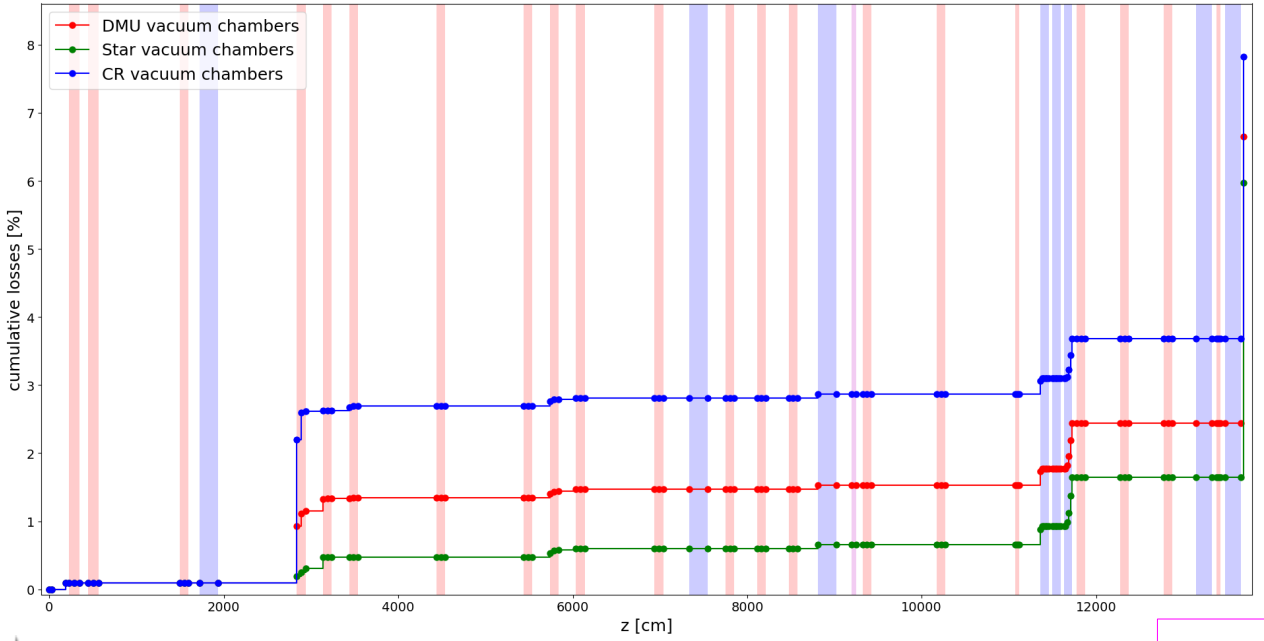
Losses: 94 particles exceeding horizontal amplitude
115 particles exceeding vertical amplitude
~10% off losses

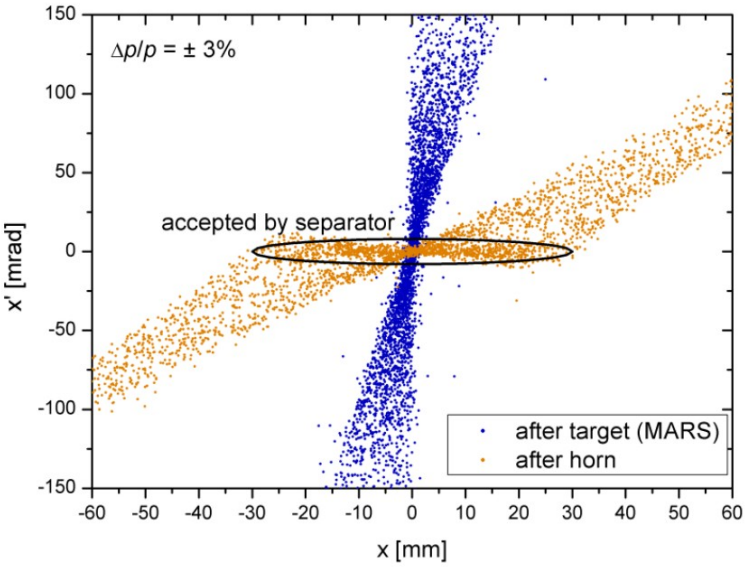
Paper published in EDMS by Ivan Koop in 02.2020

Magnetic Field Quality Requirements





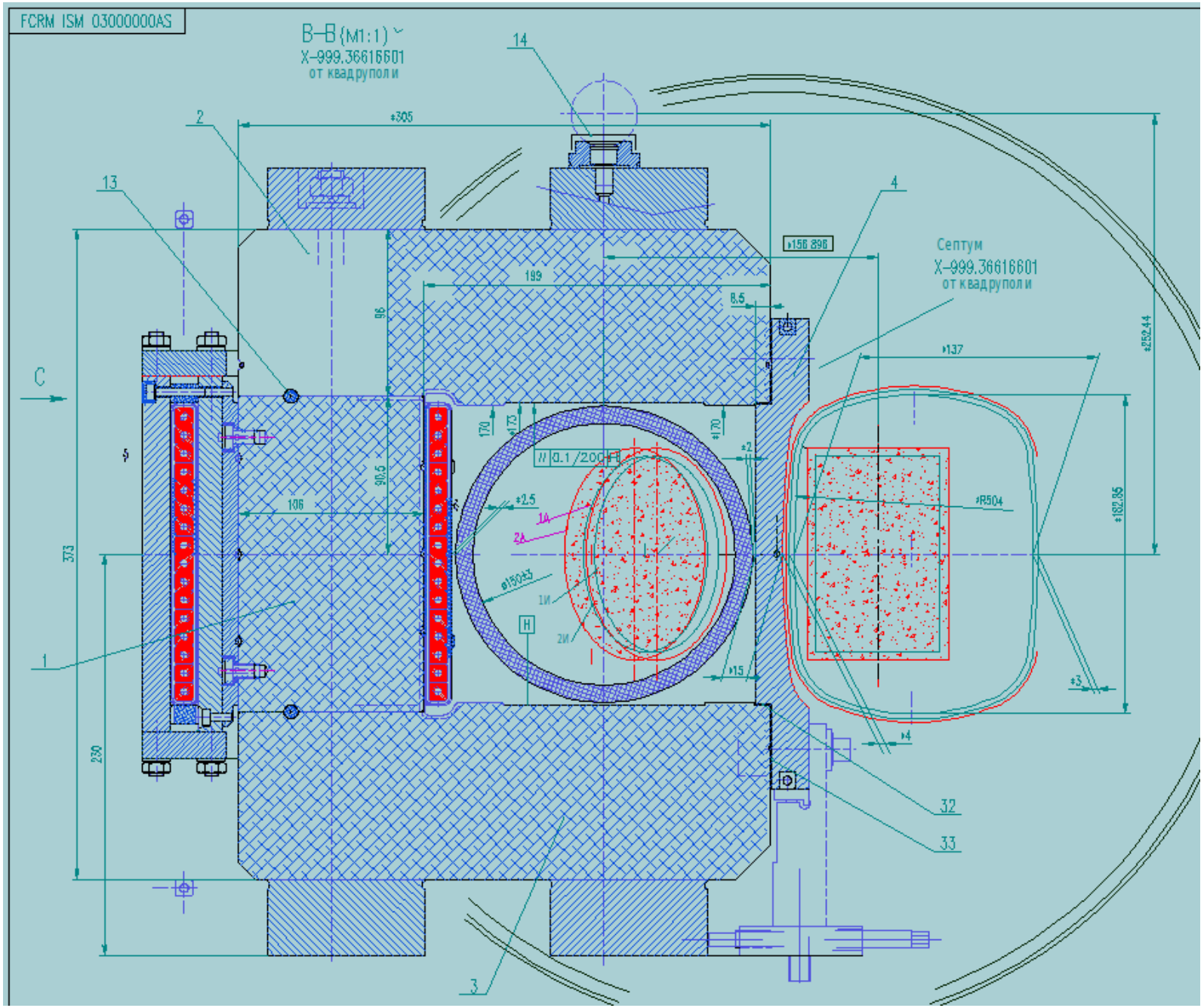




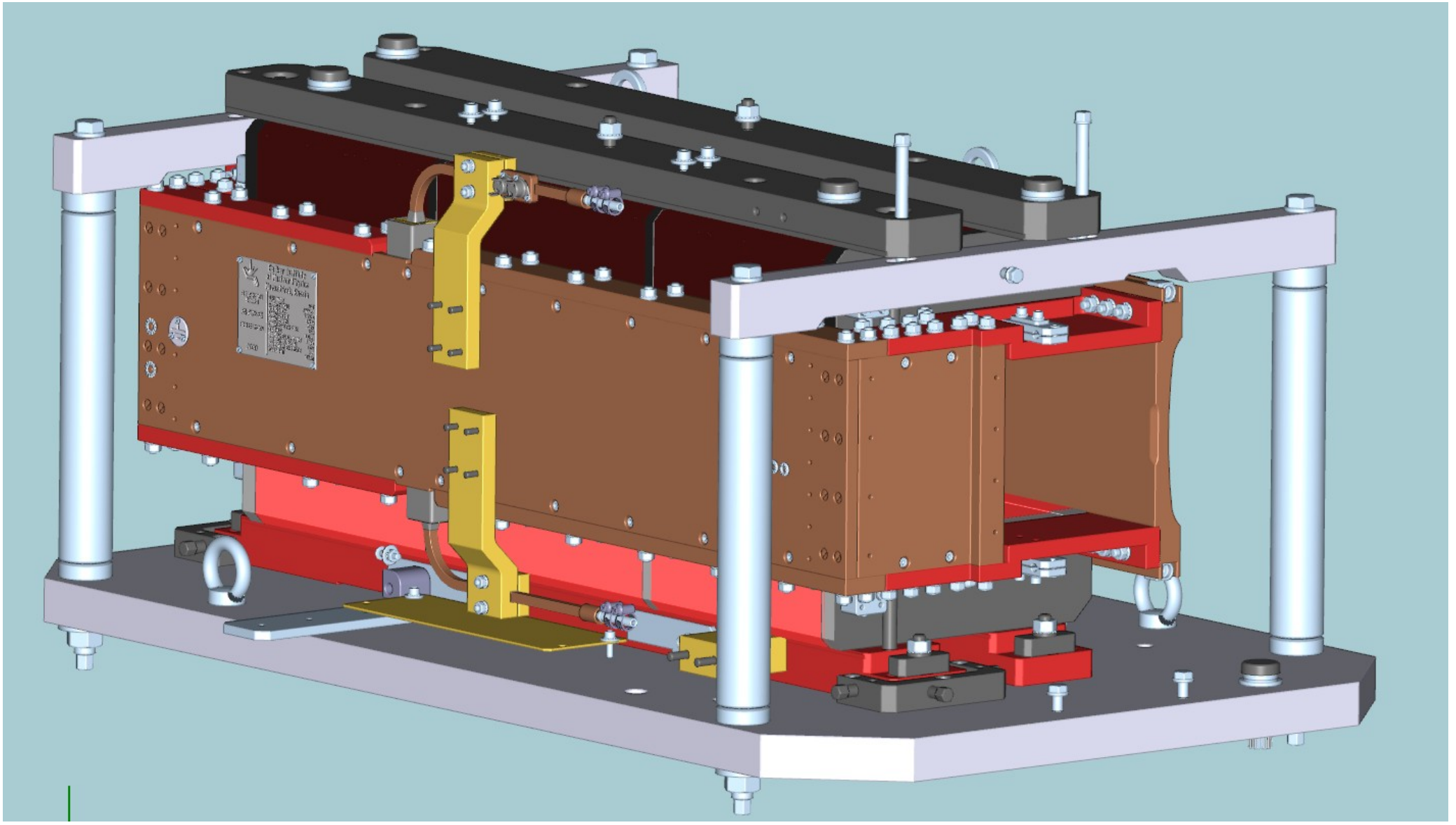
Serban Udrea report at November 2019 Workshop

Effective CR sextupole: 0.1 T/m^2
Real CR sextupole: ~8 T/m^2

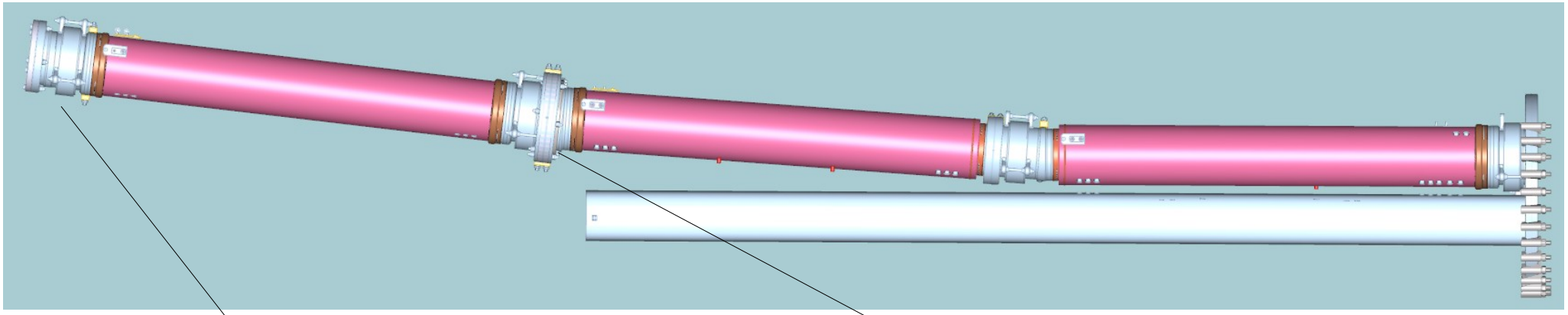
Assembling: Parts order

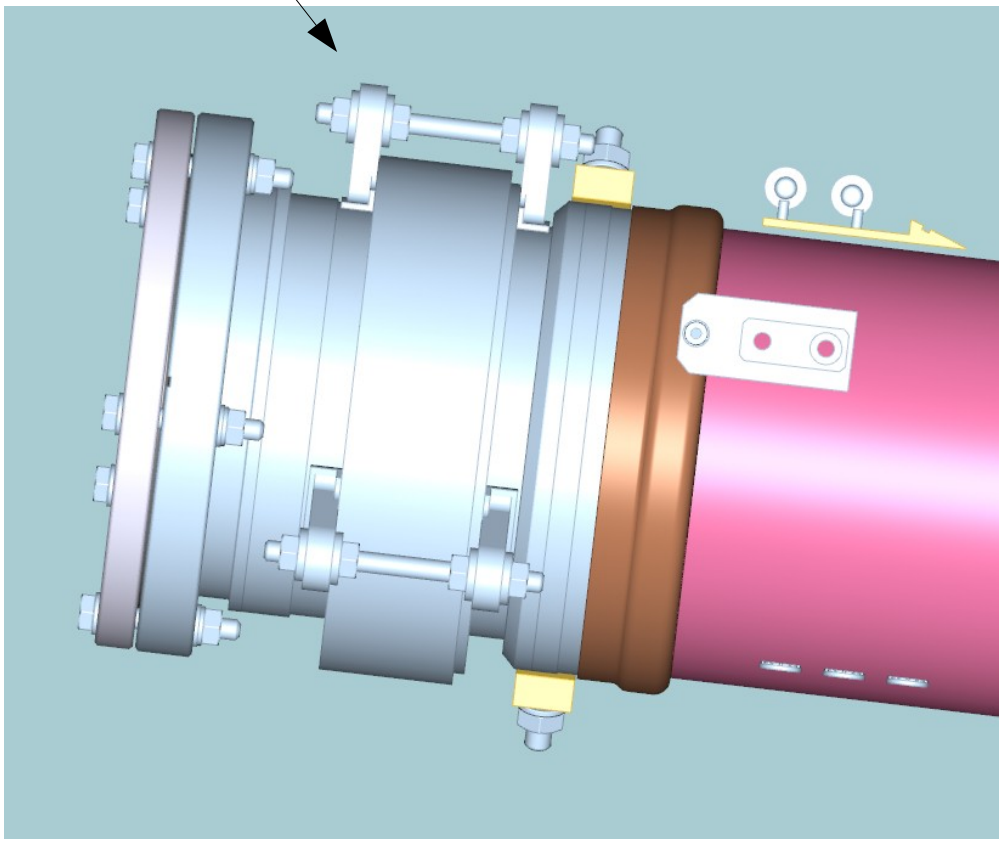


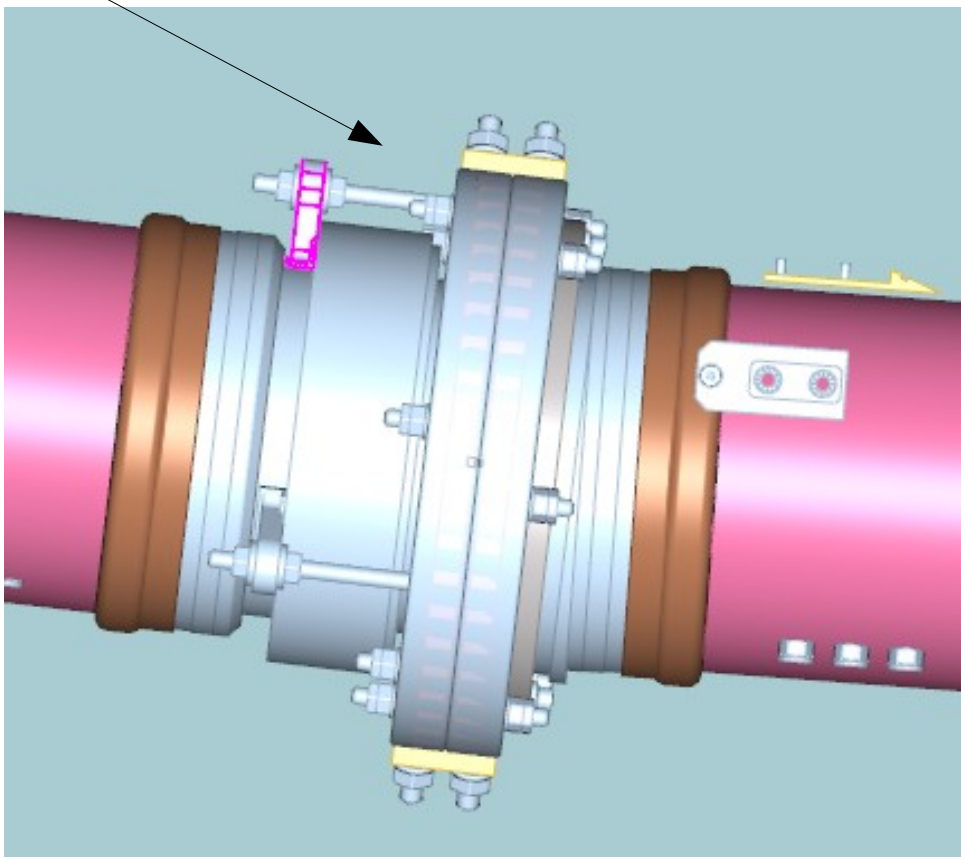
Assembling: Yoke is finished



Vacuum chamber







Vacuum chamber