Institute for Nuclear Research,

Moscow,

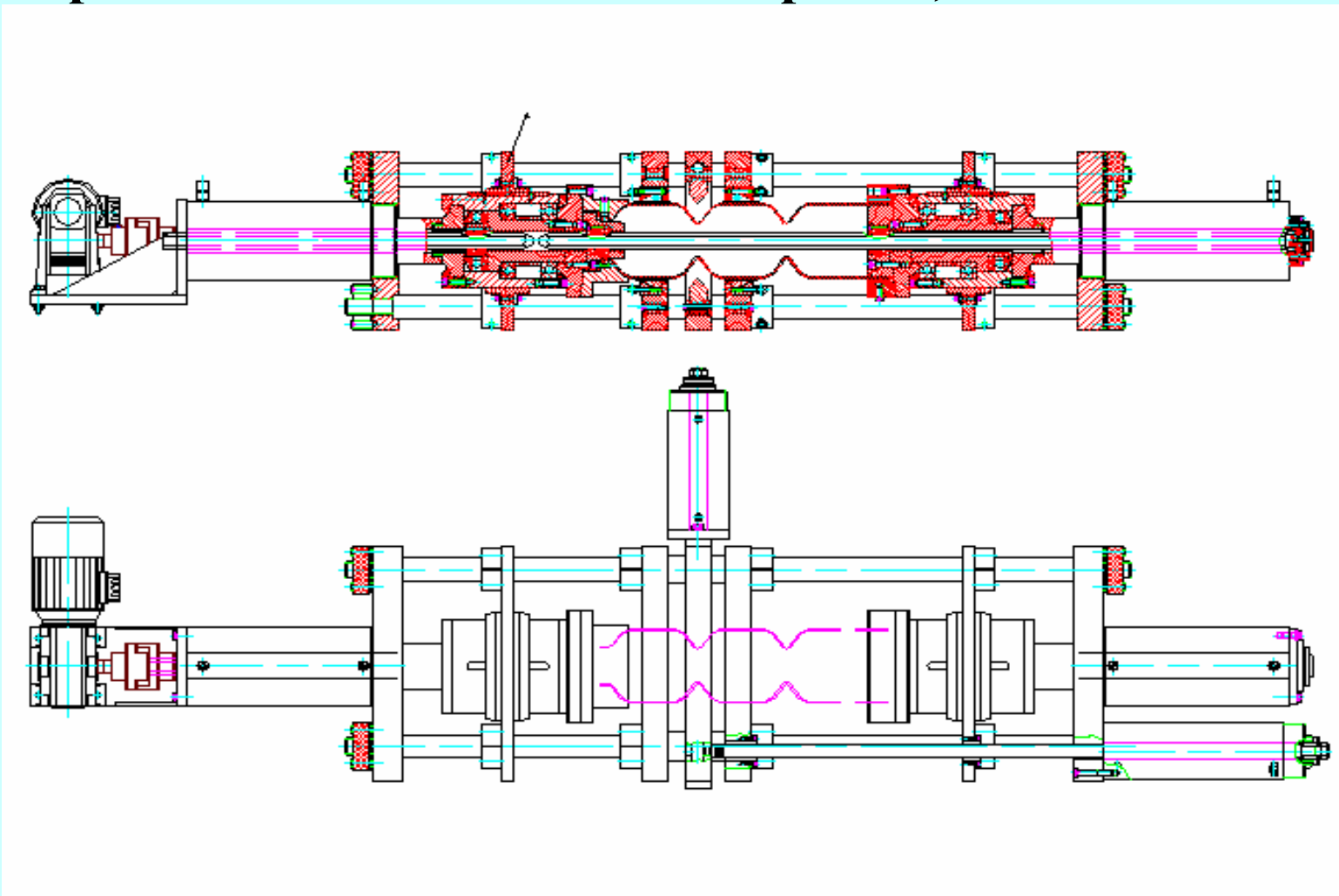
Laboratory report

Valentin Paramonov

TESLA Collaboration Meeting, DESY, Zeuthen,

21-23January 2004

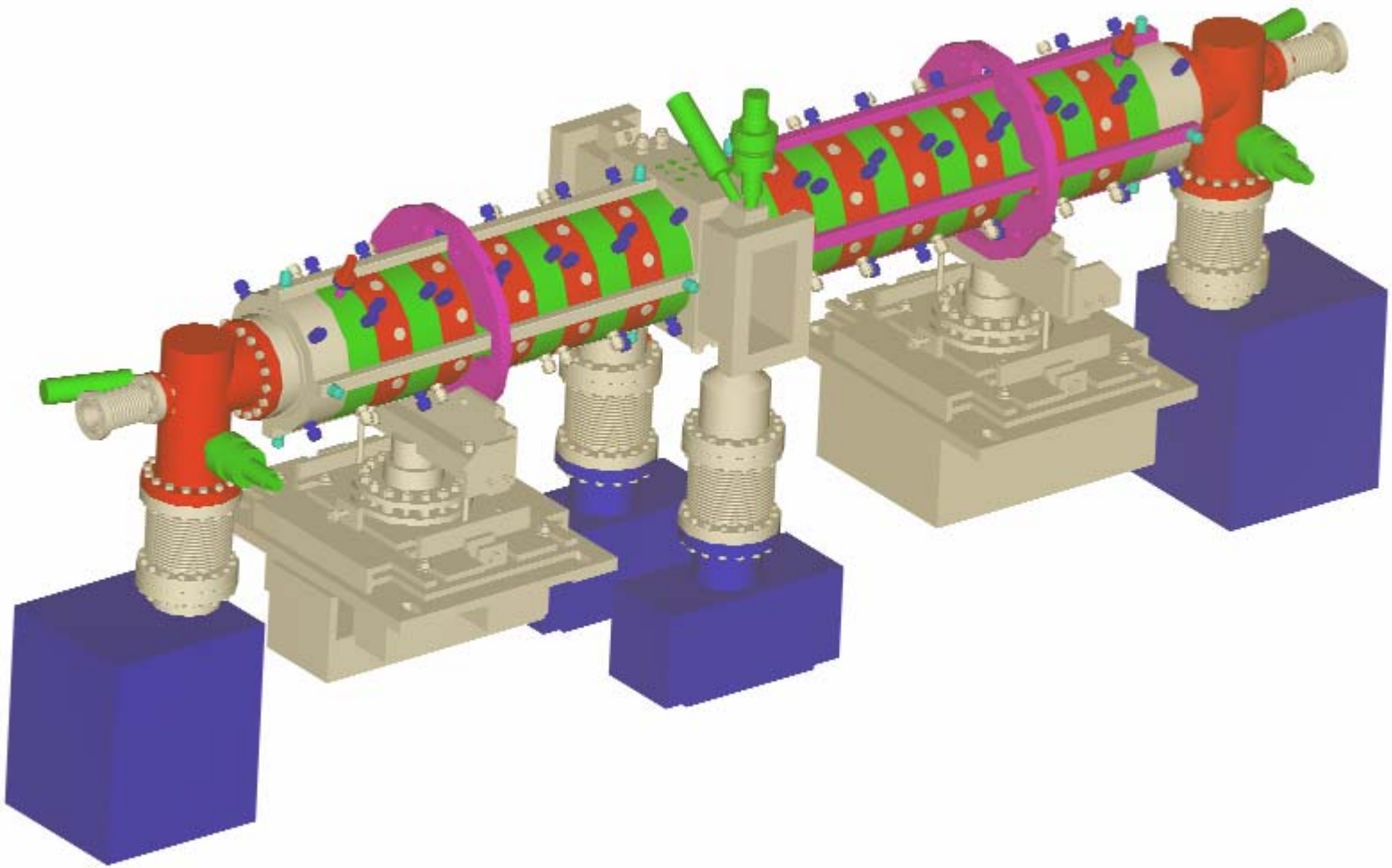
Continued participation in the SC cavities hydro-forming R&D program, DESY.
Participation in the hardware development,



and in R&D process.

TESLA Collaboration, DESY,
Zeuthen, 21 January 2004

The normal conducting booster cavity development for the PITZ-2 stage (DESY, Zeuthen).

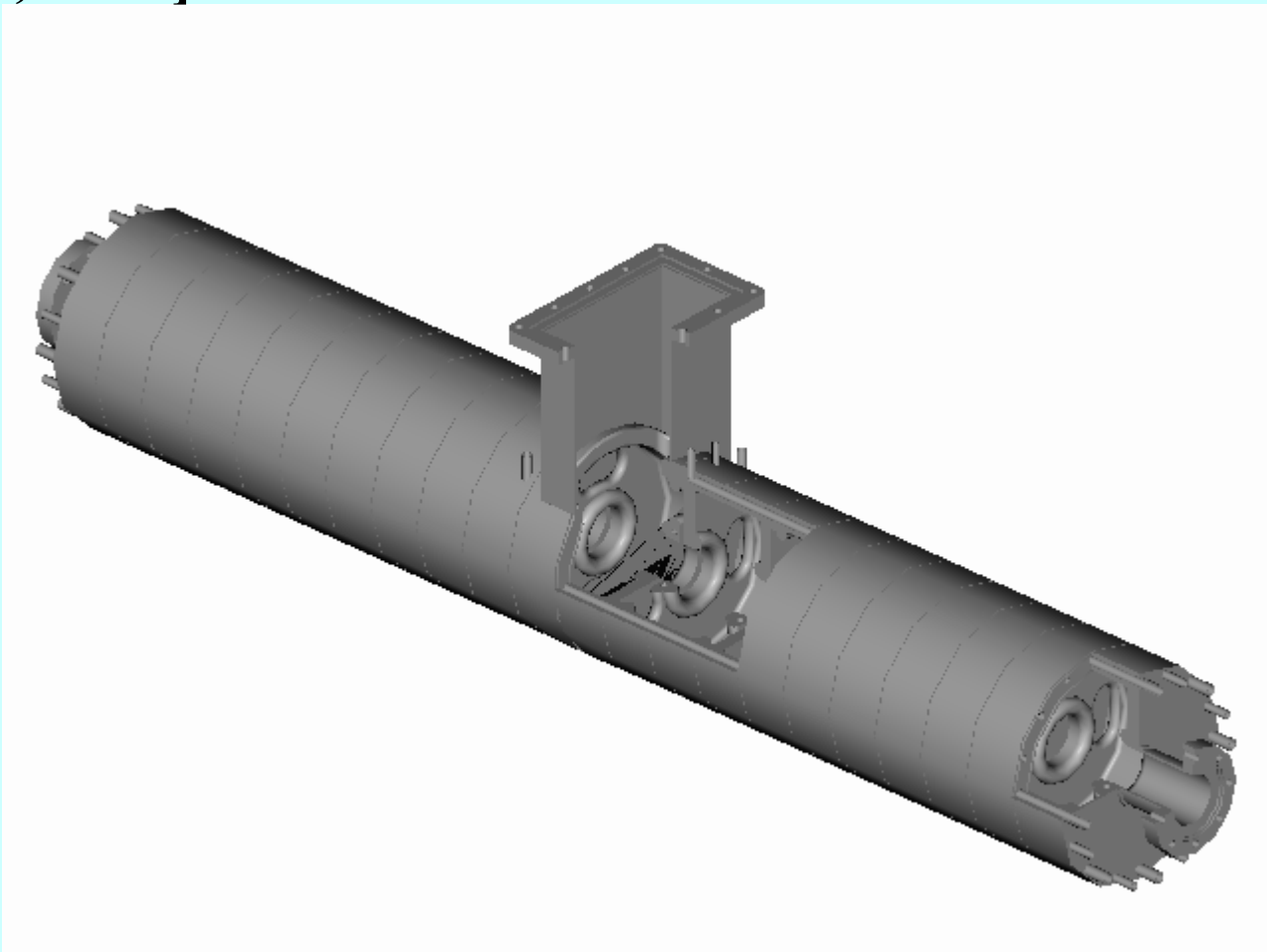


The cavity is based on the CDS compensated accelerating structure (INR proposal) and with the requested parameters:

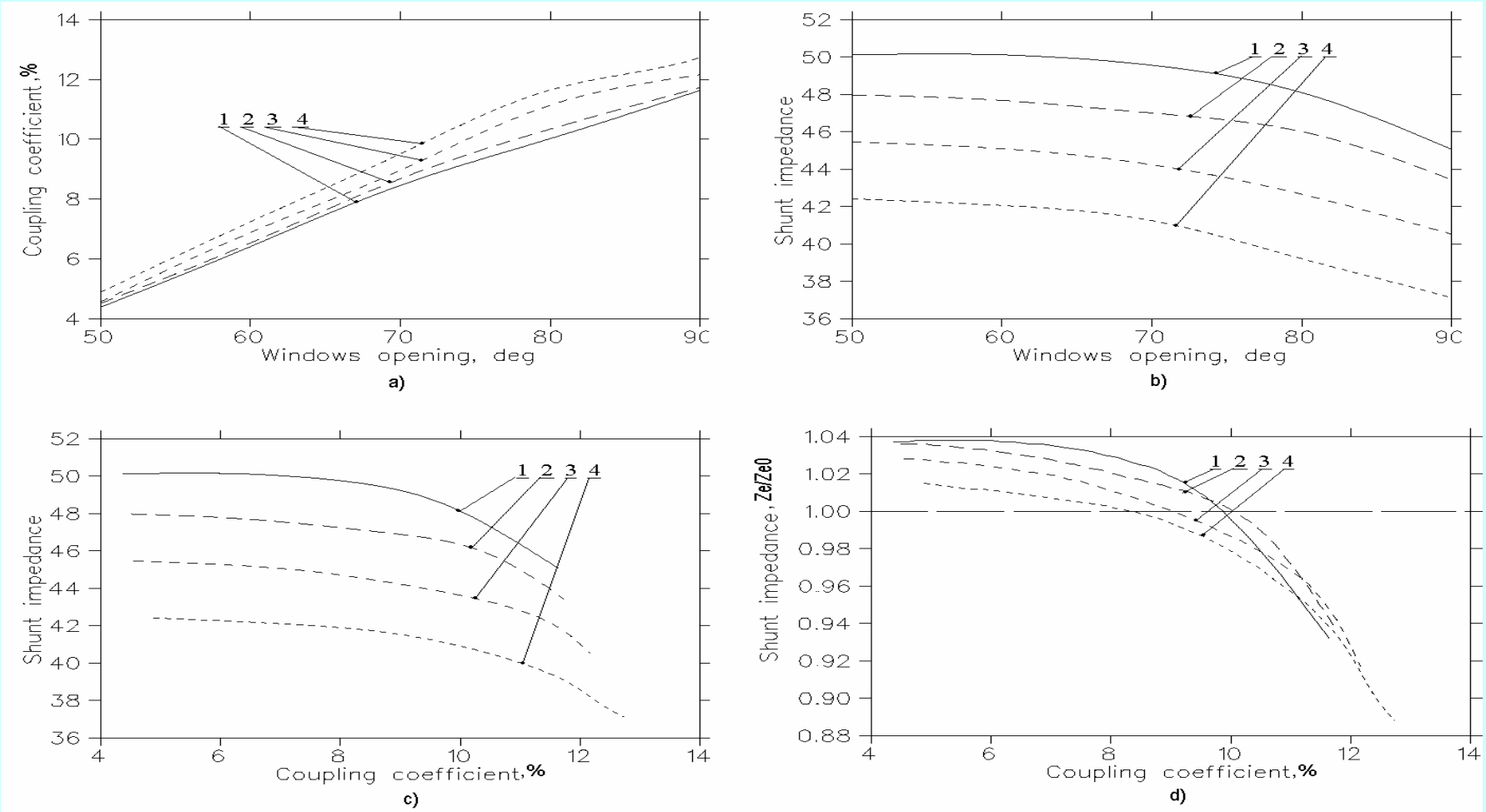
operating frequency	**- 1300 MHz,**
accelerating gradient	**- up to 14 MV/m,**
total rf pulse power	**- 8.6 MW,**
rf pulse length	**- up to 900 mks,**
pulse repetition rate	**- up to 5 Hz,**

realizes also the full scale prototype (in parameters) for the high gradient cavities in TESLA Positron Pre-Accelerator with the different cooling circuit design.

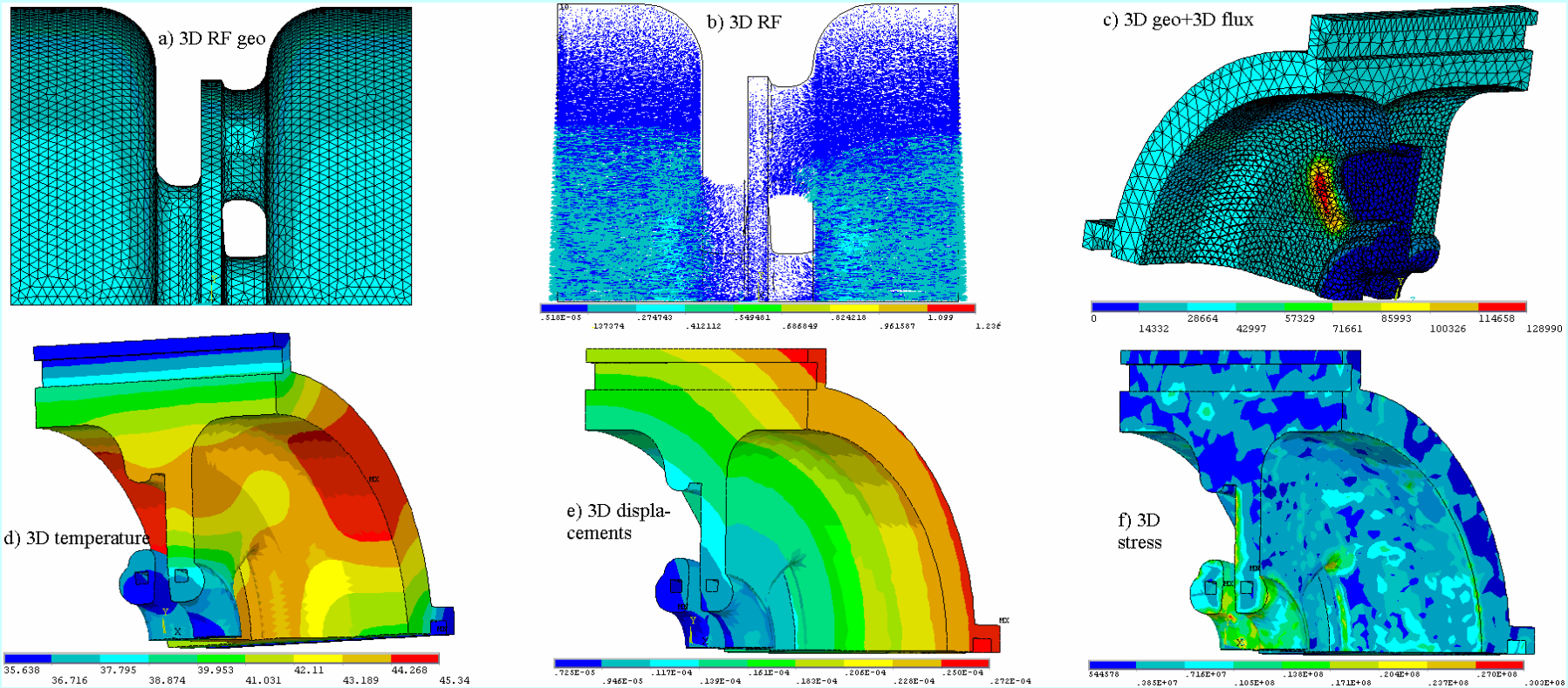
PPA high gradient accelerating cavity, [TESLA 2000-12, DESY, 2000].



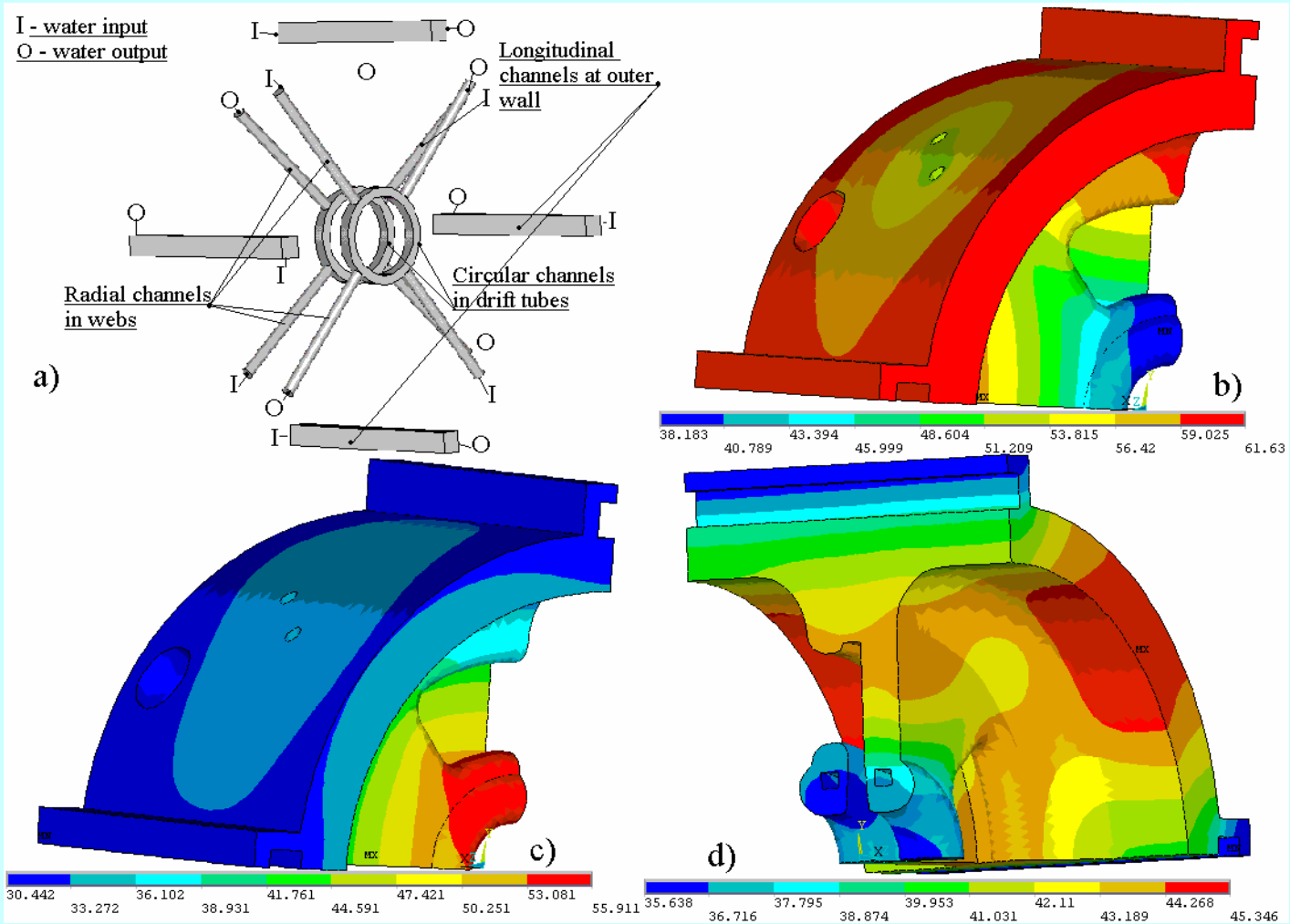
Cell dimensions are optimized (3D) for smaller aperture diameters with maximal surface electric field – 40 MV/m.



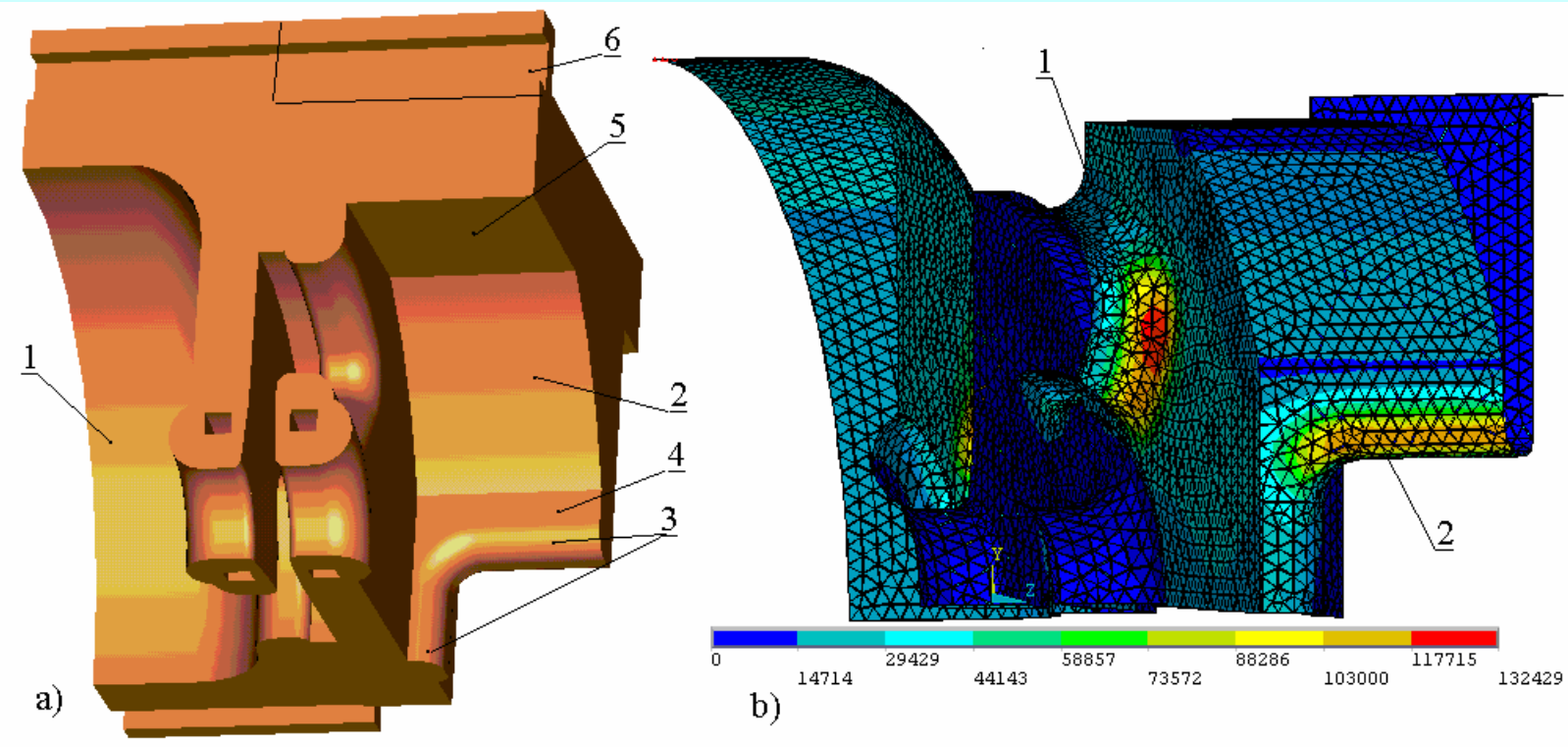
High heat loading (2.5 kW average power per cell) for scientific linacs demands precise 3D coupled analysis – geometry –rf – temperature – displacements -rf



Two circuits are required for effective cooling. Drift tubes cooling is necessary – the surface with high electric field should be cold.

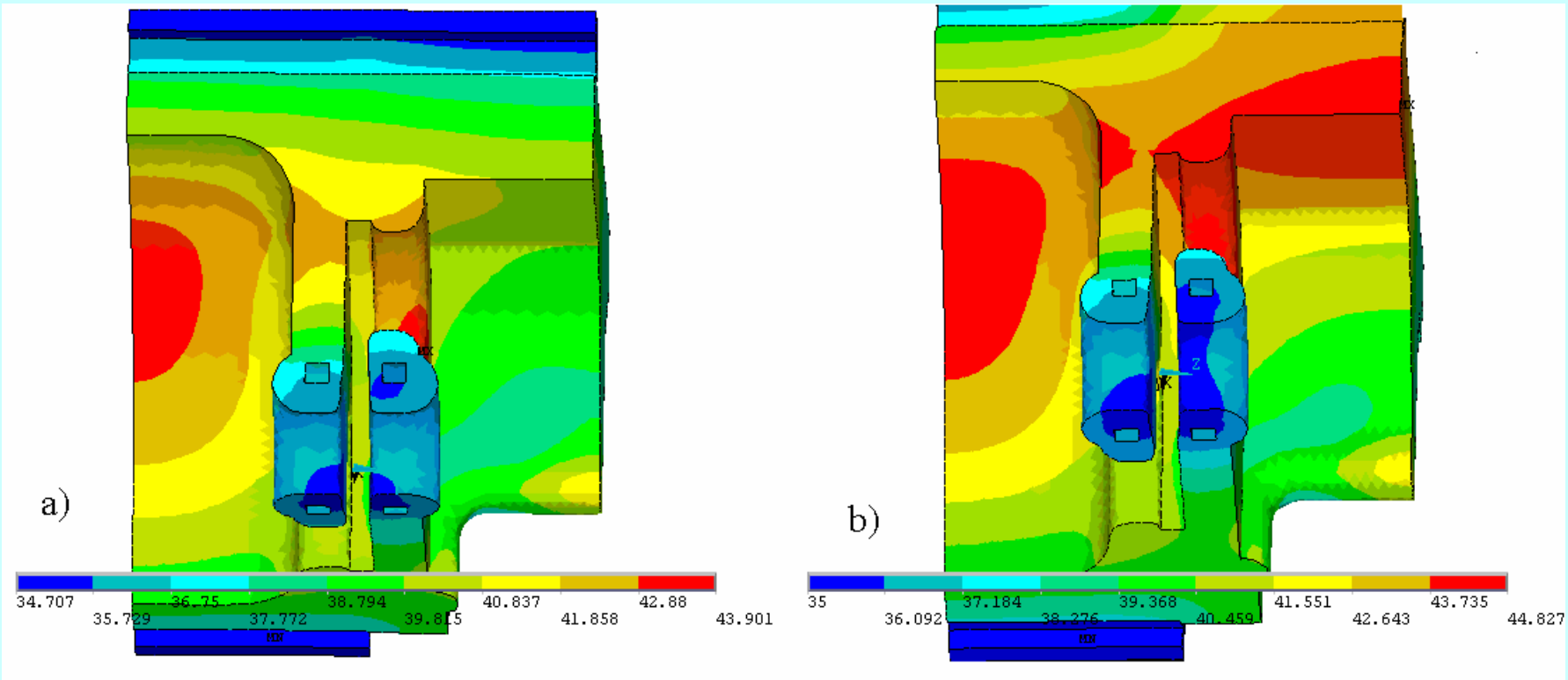


Symmetrical rf coupler is accepted due to a lot of reasons. Additionally to the normal cooling requirements, the matching diaphragm edges should be cold, instead of the increased rf losses density

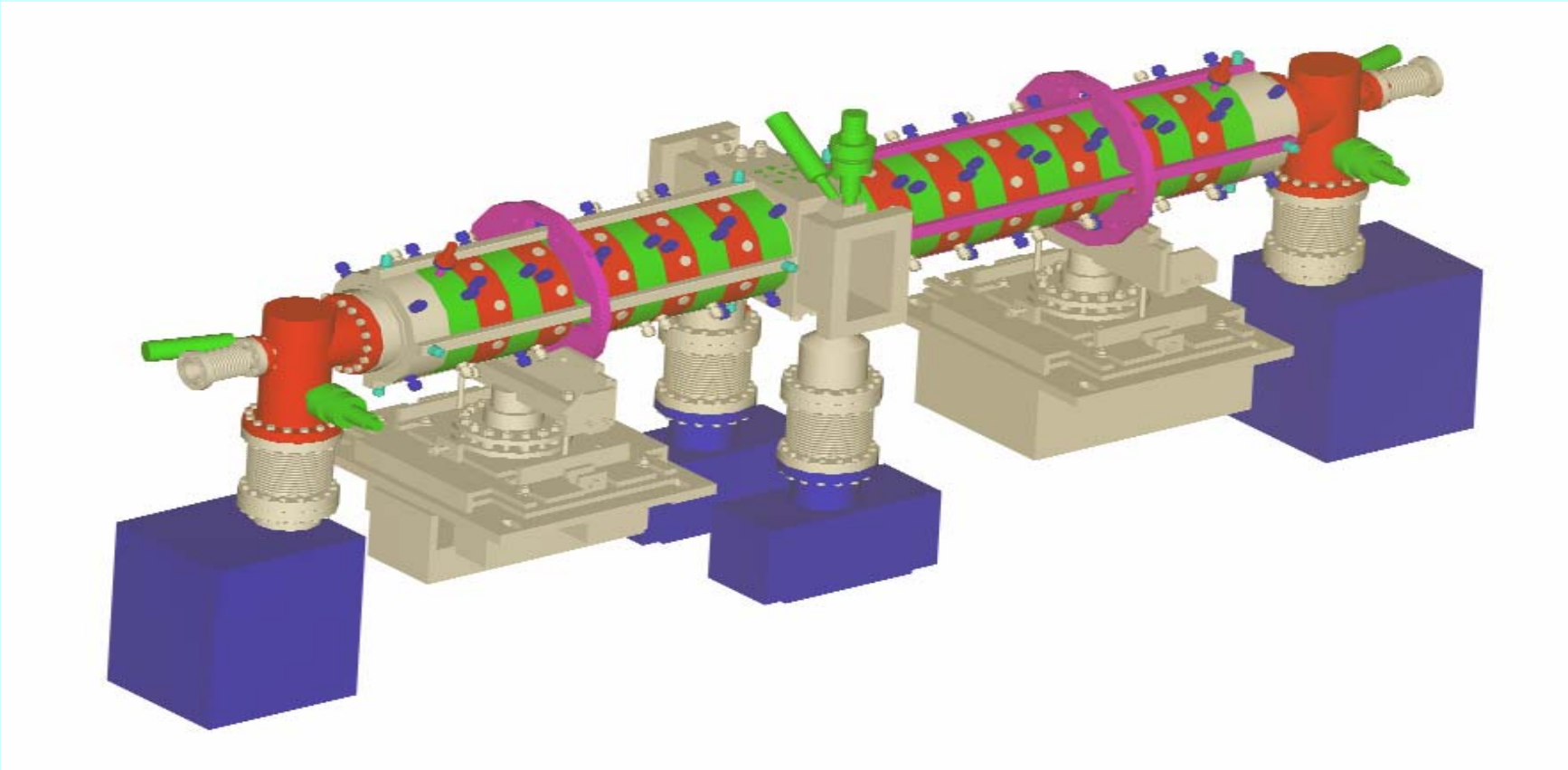


With the special cooling circuit the rounded diaphragm edges are expected to be cold, avoiding surface overheating, high internal stresses, micro-cracks.

Outer cooling circuit can be removed.

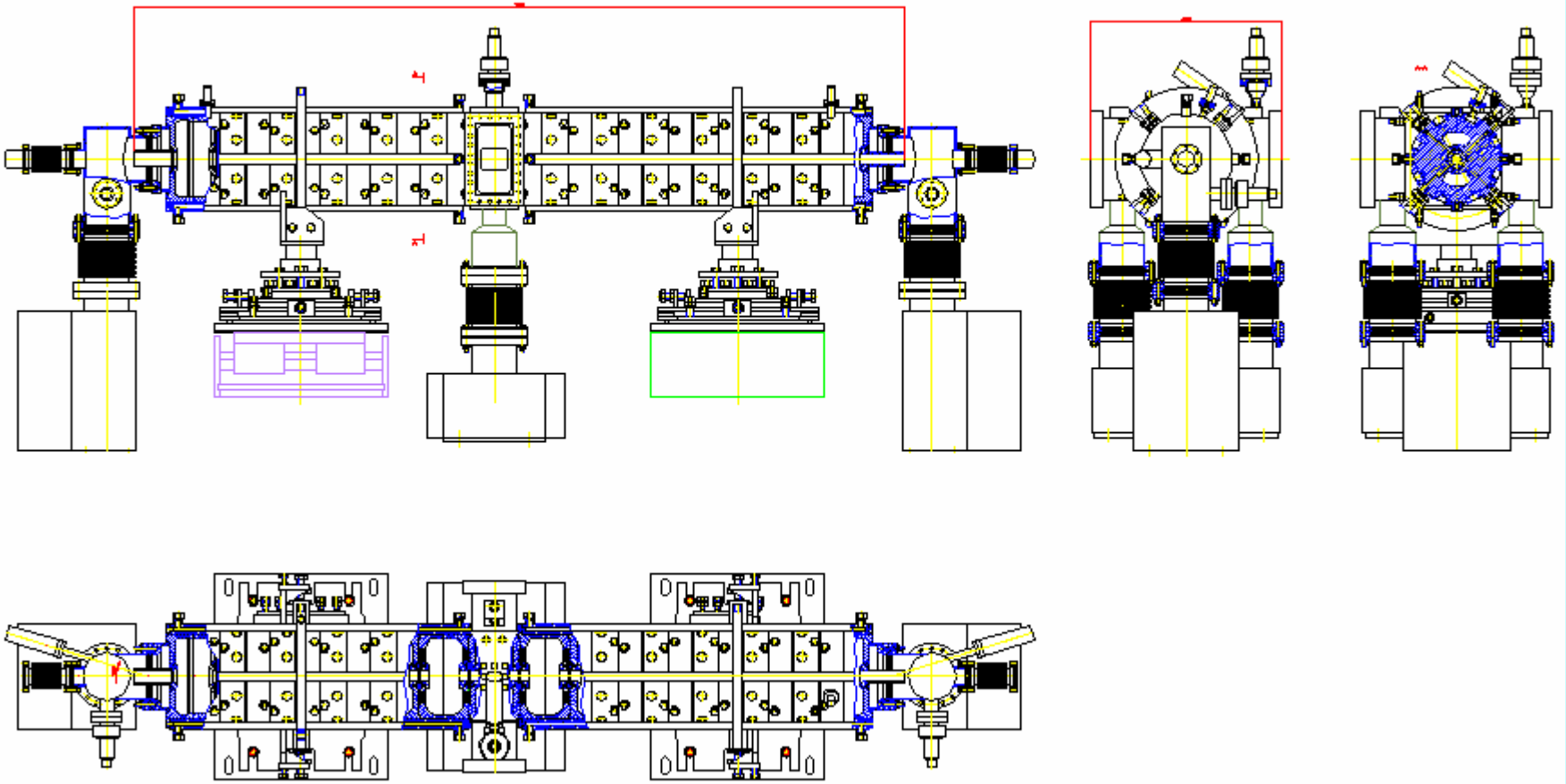


Cavity diagnostics. RF probes –2, photo-multipliers 2+2?, vacuum gauges –1+2?, reserve port – 1.

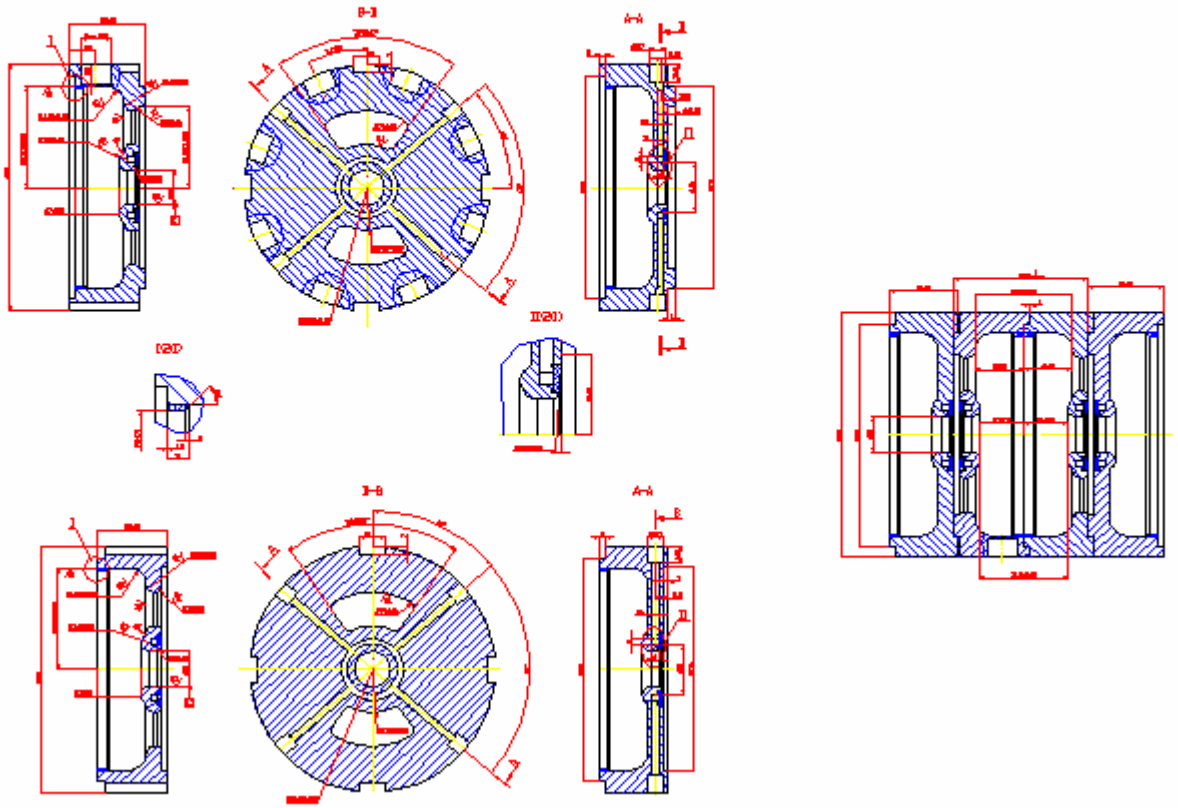


Cavity pumping. Gas pressure less than 10(-7) Torr**

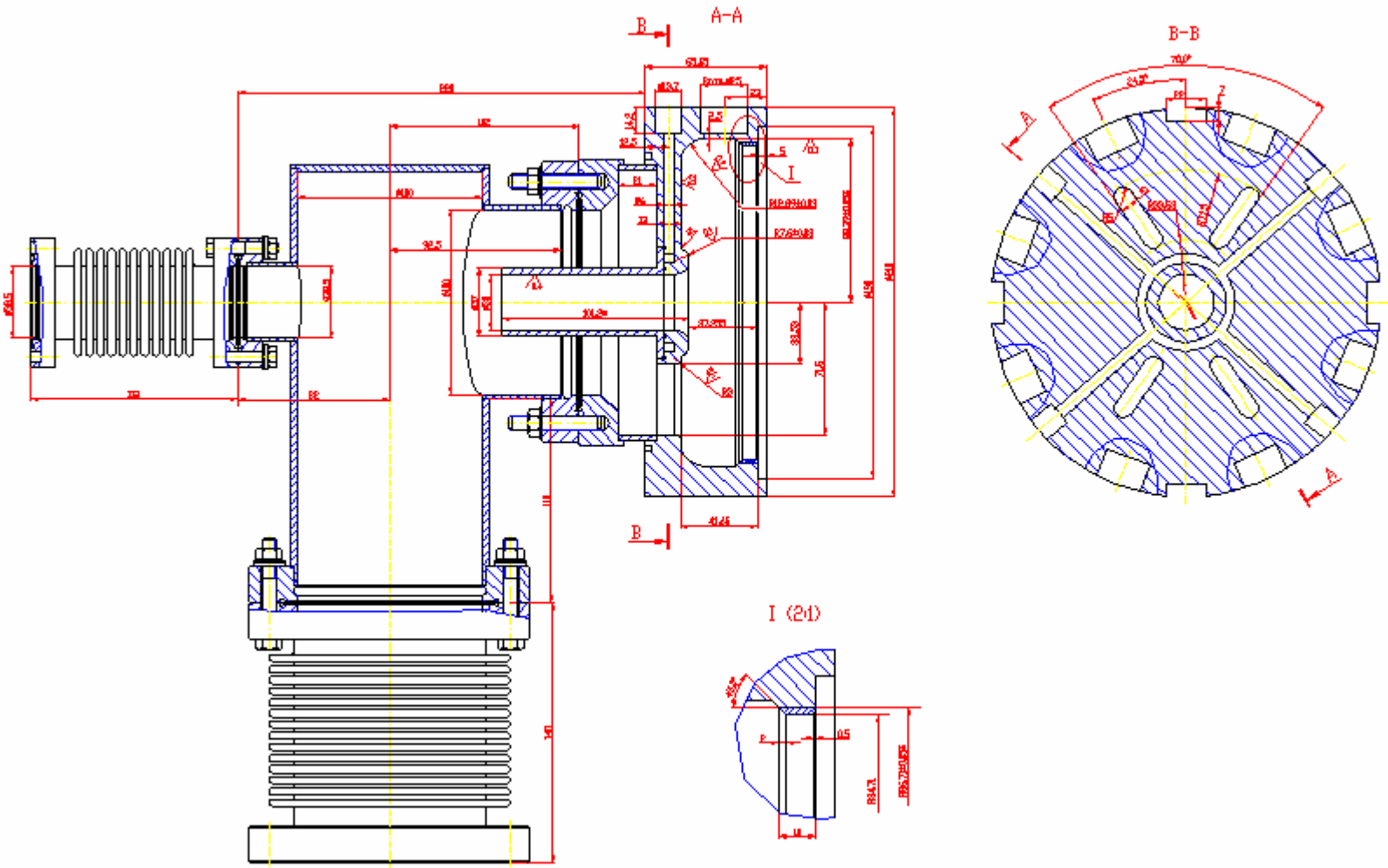
Technical proposal for the cavity looks like …



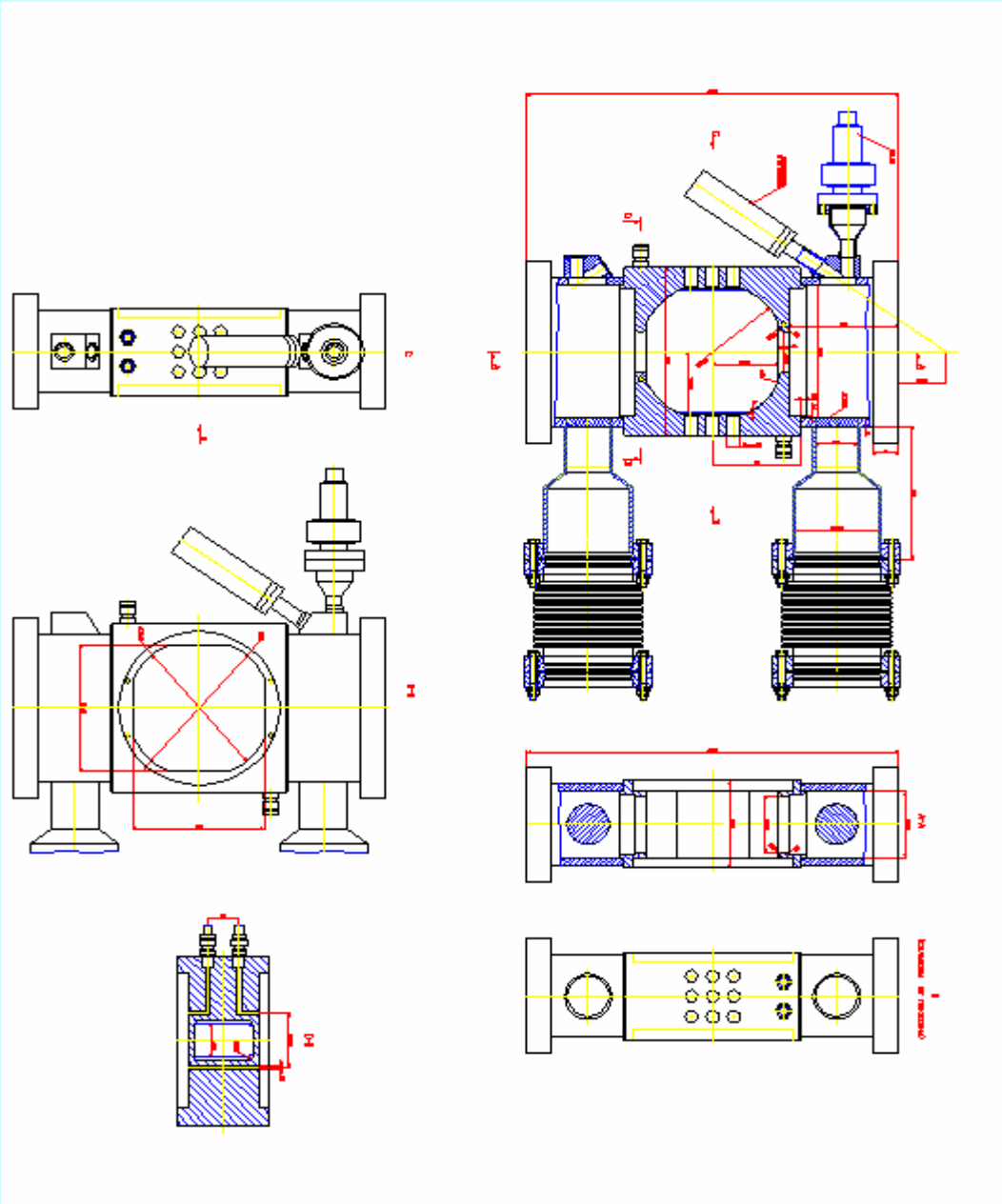
And for elements...
Regular cells



End cell with pumping port.



RF coupler



14 cells in the cavity. The energy gain for nominal accelerating gradient 12.5 MV/m is 20.18 MeV.

Individual cells tuning and rf coupler tuning before brazing by reserve material mechanical removing. Cavity tuning after final brazing in the range +190 kHz –40 kHz – by wall deformation.

Relaxed tolerances for the cells manufacturing. Realistic surface roughness requirements.

Cavity length – 1800 mm, rf coupler width – 440 mm.

Totally brazed design. Technological limitations for scientific laboratories are understood. Construction study and conversations are in progress.