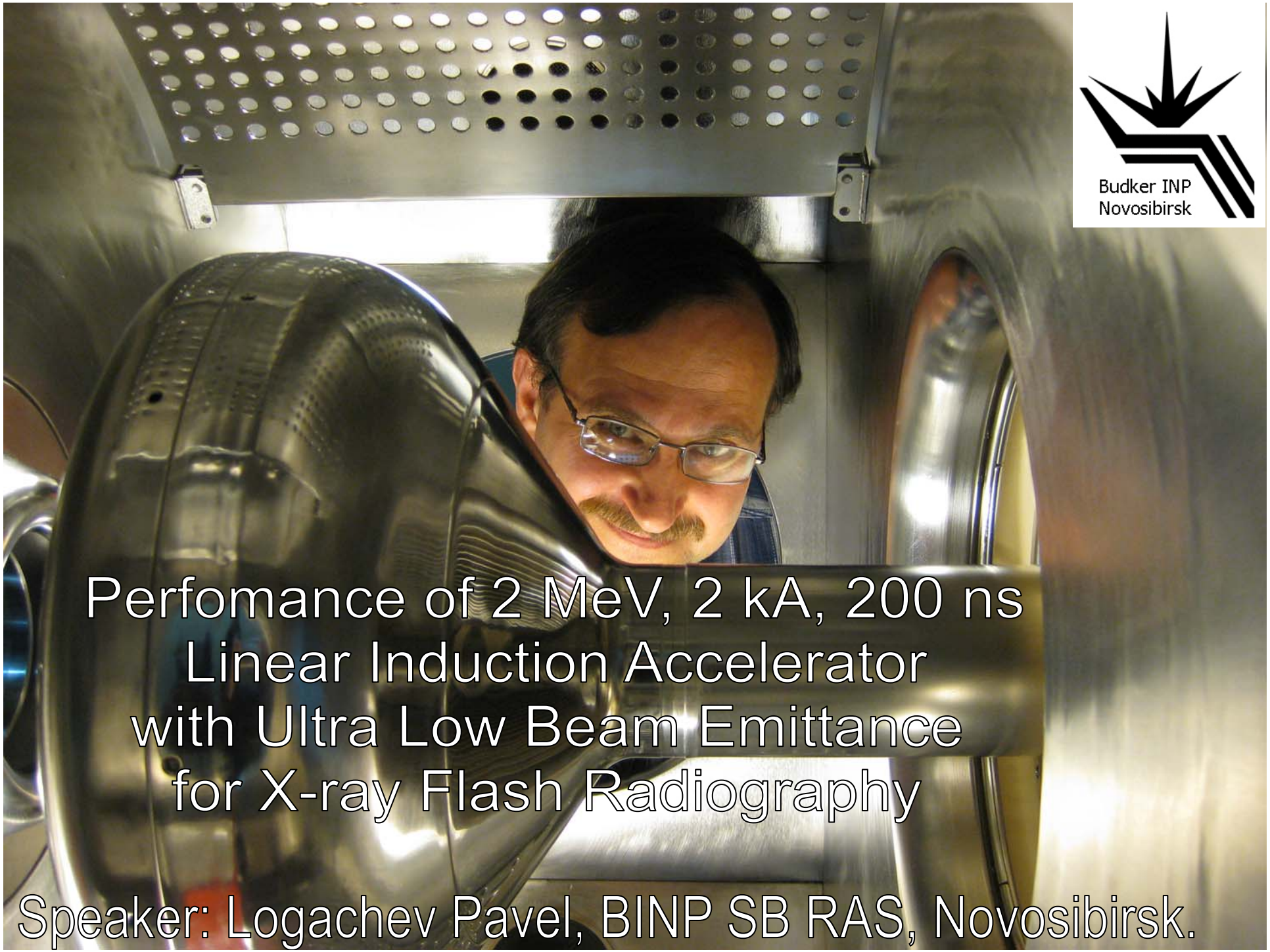

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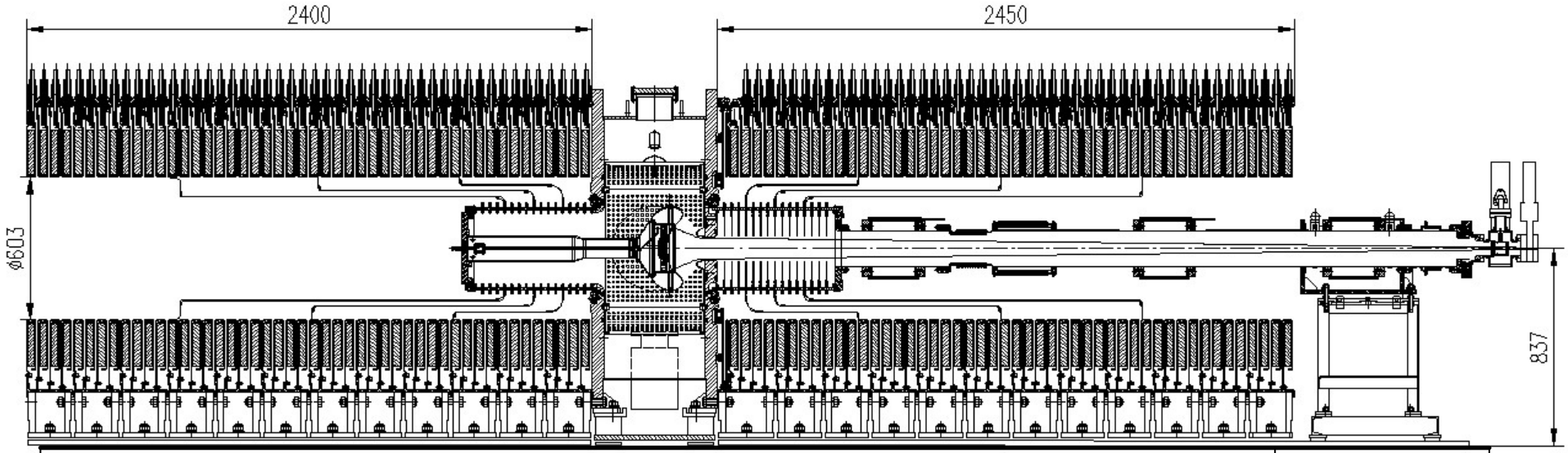
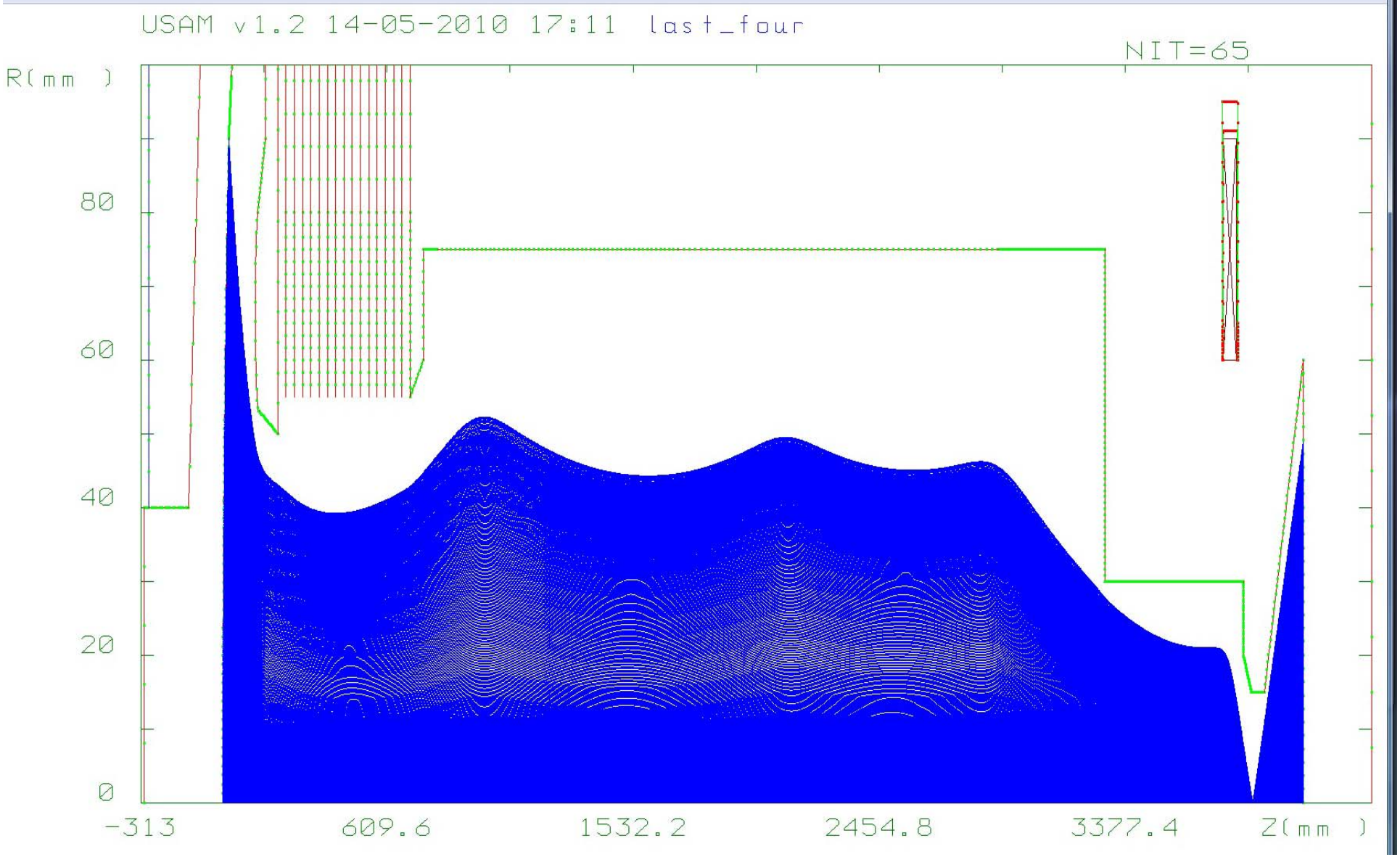
Perfomance of 2 MeV, 2 kA, 200 ns Linear Induction Accelerator with Ultra Low Beam Emittance for X-ray Flash Radiography

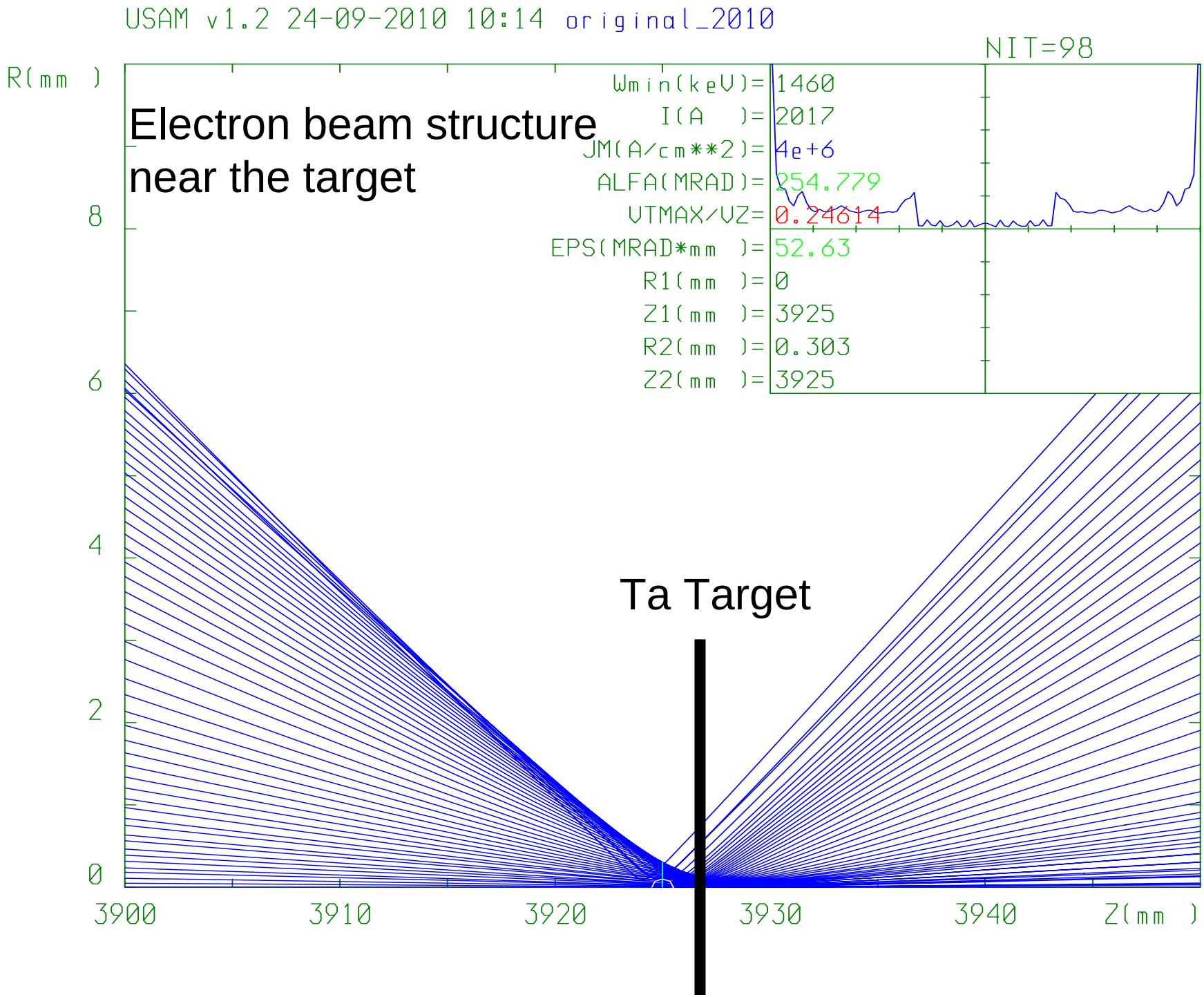
Speaker: Logachev Pavel, BINP SB RAS, Novosibirsk.

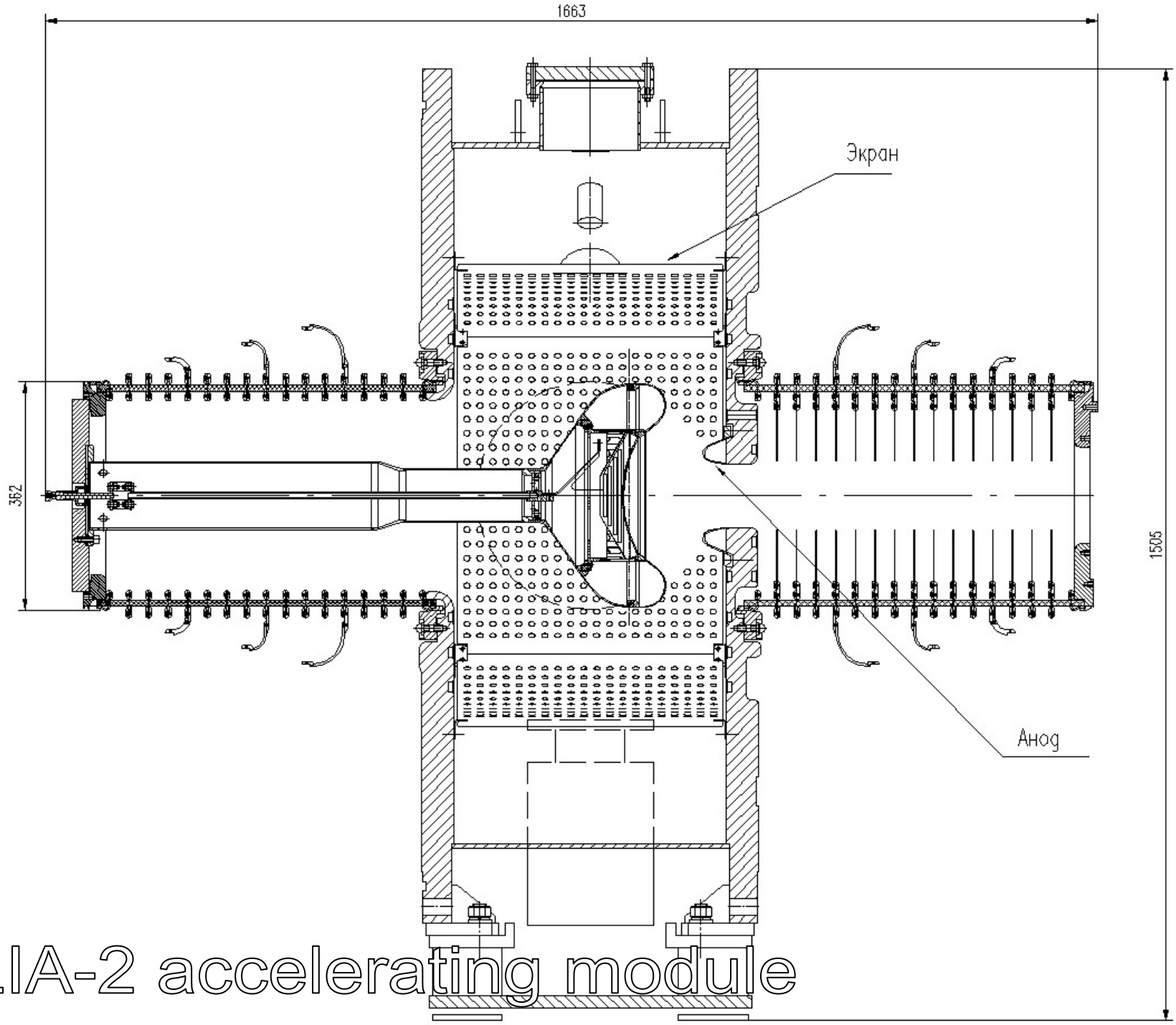


Parameter (Units)	**Value**
Maximum electron beam energy (MeV)	2.0
Maximum electron beam current (kA)	2.0
Number of pulses in the burst	2
Cathode heater DC power (kW)	2.5
Time interval between pulses in the burst (μs)	2 - 10
Pulse duration, flat top ±4% (ns)	200
Maximum repetition rate (Hz)	0.1
Min. beam spot size FWHM on the target (mm)	1.5

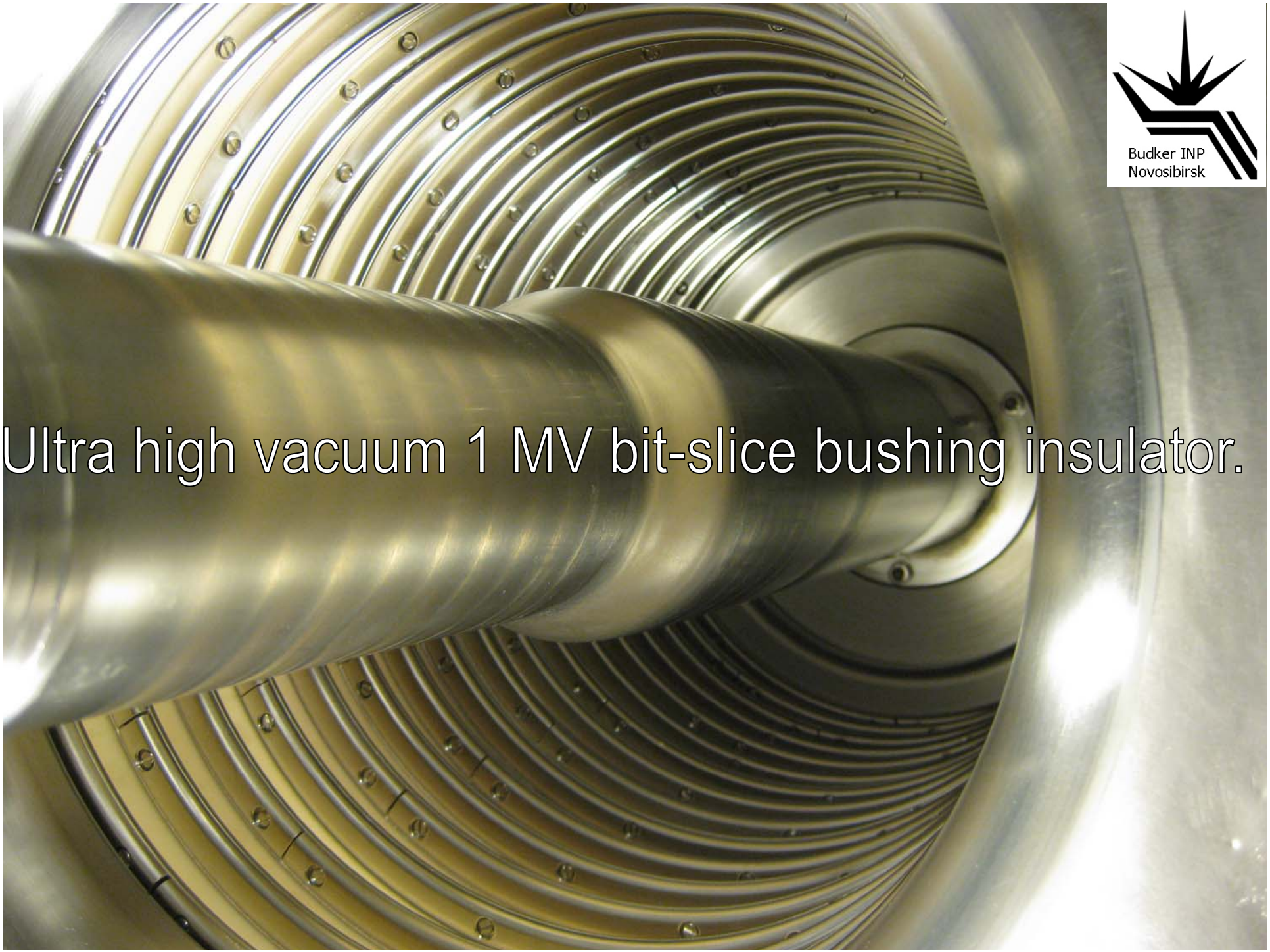
Electron beam envelope at 2 МэВ, 2 кА from cathode up to beam dump.




USAM v1.2 24-09-2010 10:14 original_2010
NIT=98
Electron beam structure
near the target
Wmin(keV)= 1460
I(A)= 2017
JM(A/cm**2)= 4e+6
ALFA(MRAD)= 254.779
VTMAX/VZ= 0.24614
EPS(MRAD*mm)= 52.63
R1(mm)= 0
Z1(mm)= 3925
R2(mm)= 0.303
Z2(mm)= 3925
R(mm)
8
6
4
2
0
Ta Target
3900
3910
3920
3930
3940
Z(mm)



LIA-2 accelerating module



Ultra high vacuum 1 MV bit-slice bushing insulator.

LIA-2 diode.

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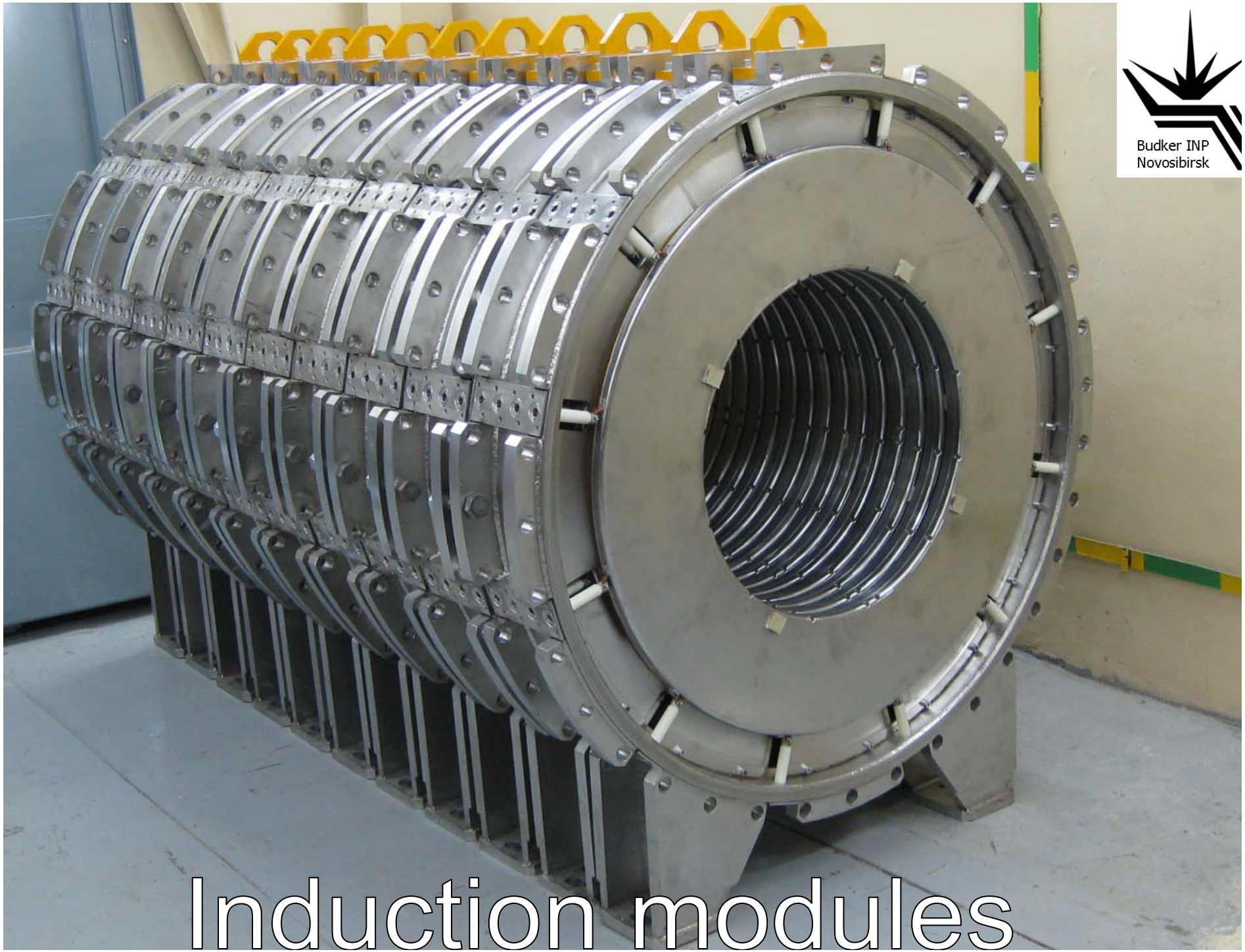
Microperviance: 2.18


View on the cathode from the exit of accelerating system.



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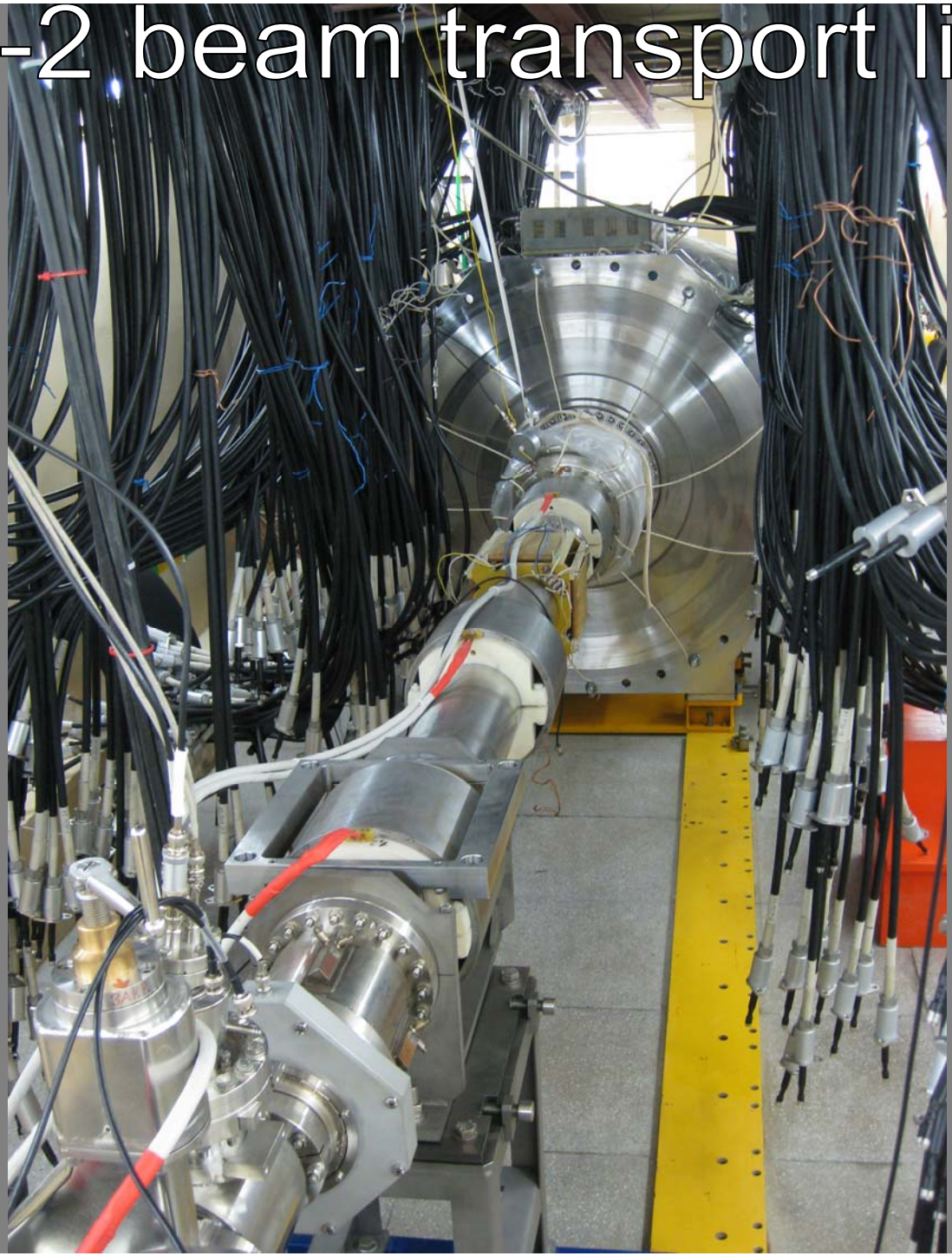
Induction modules

LIA-2 beam transport line.



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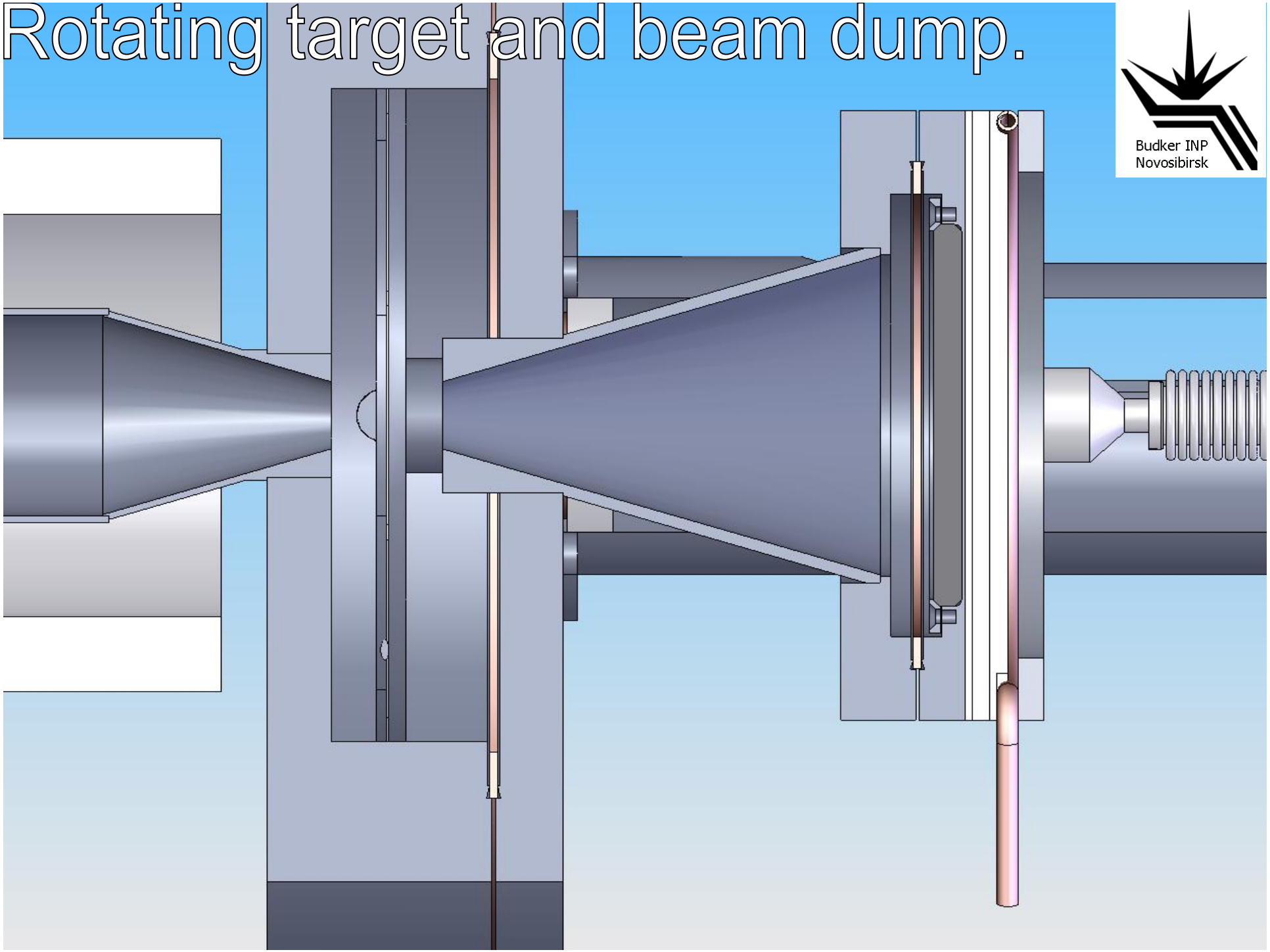
Rotating target and beam dump.



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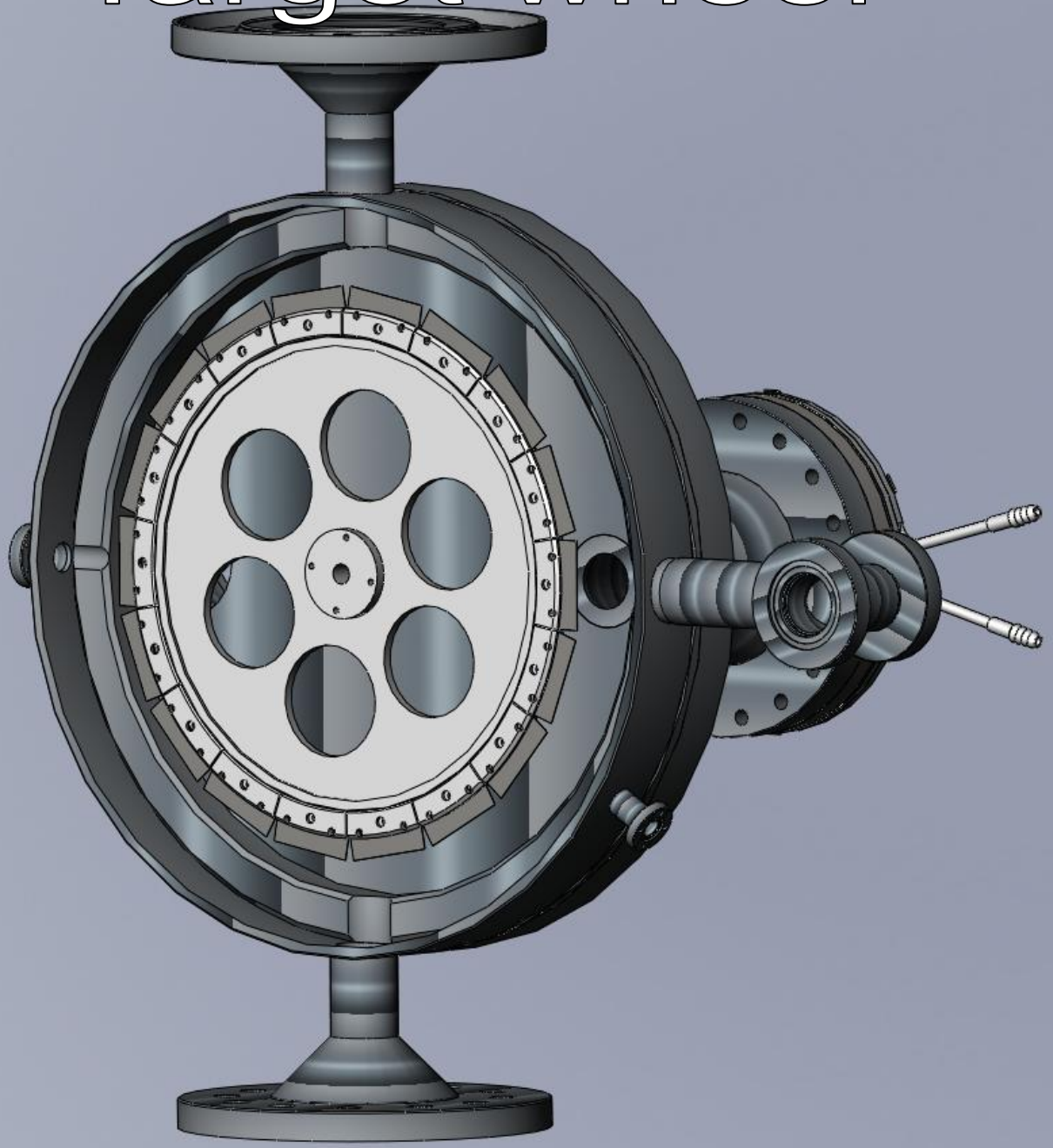
Target wheel



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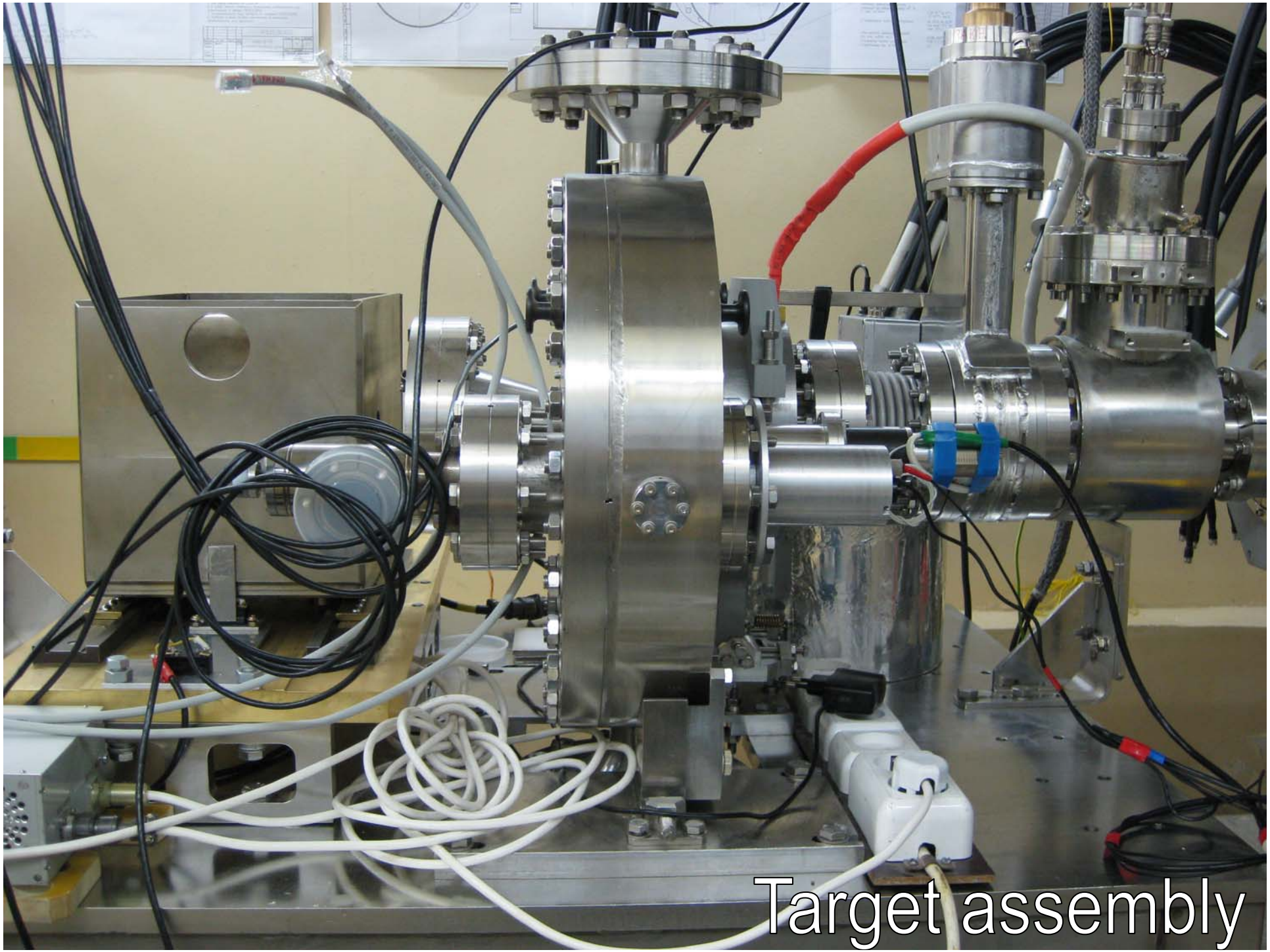
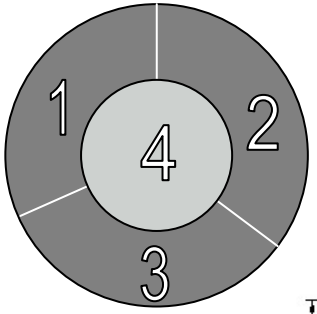
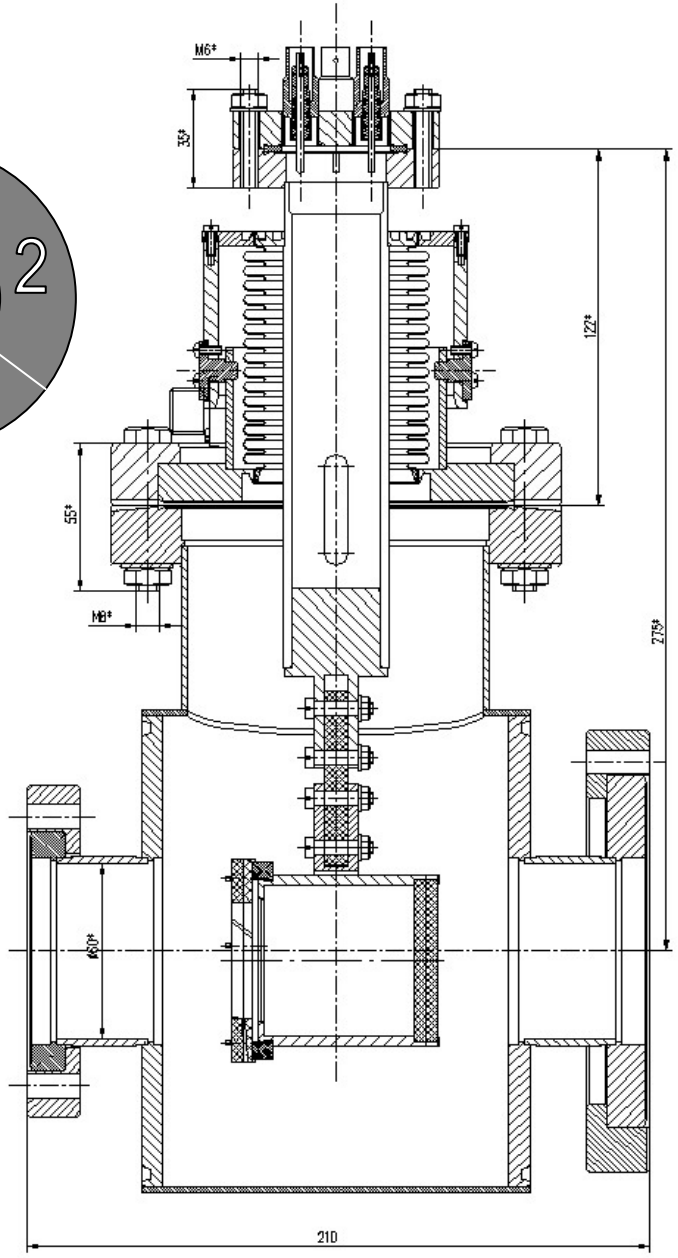
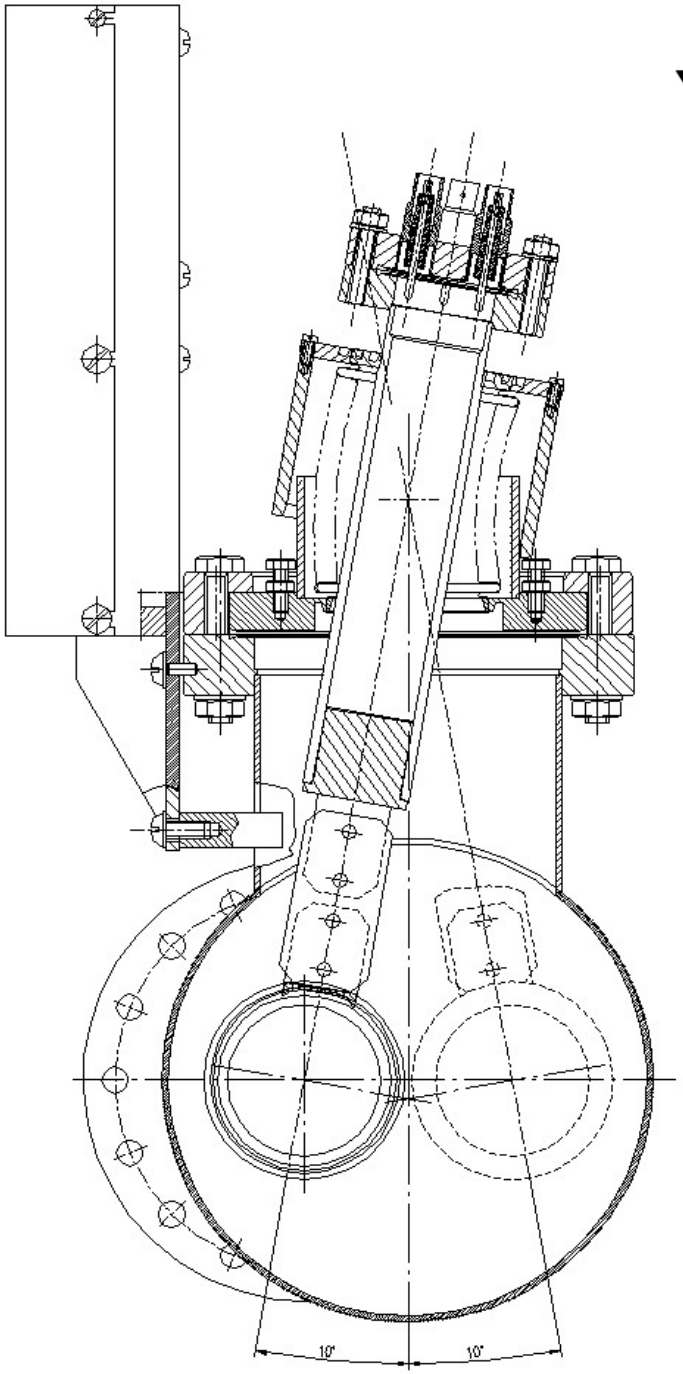

Target assembly

Faraday Cup







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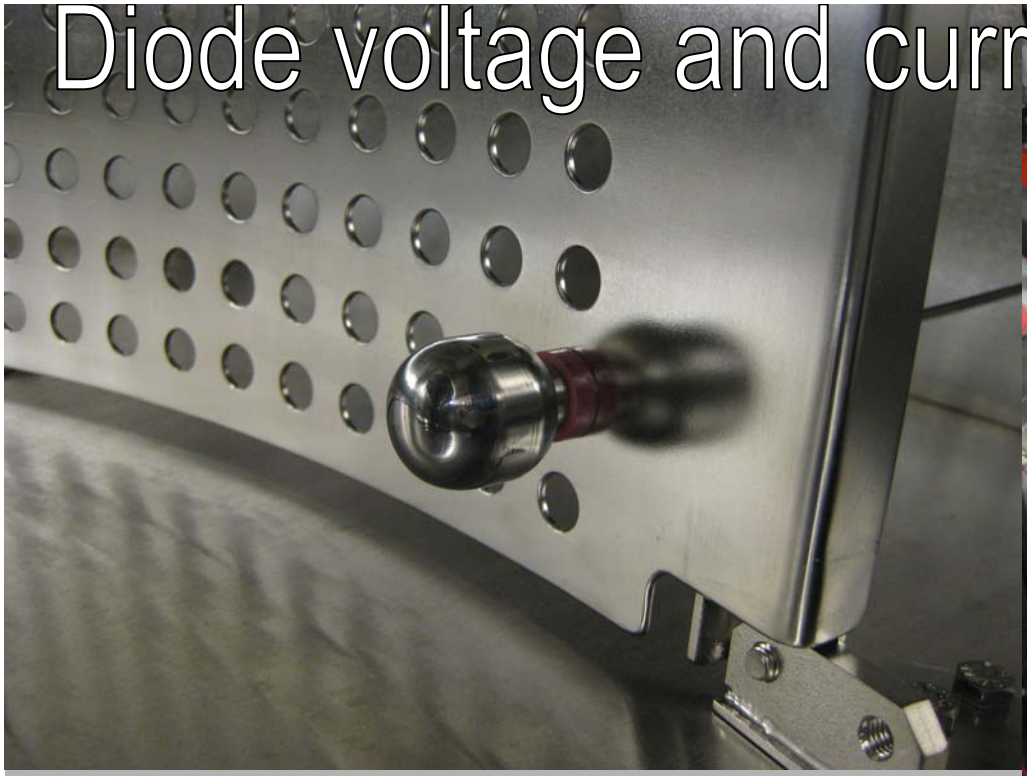
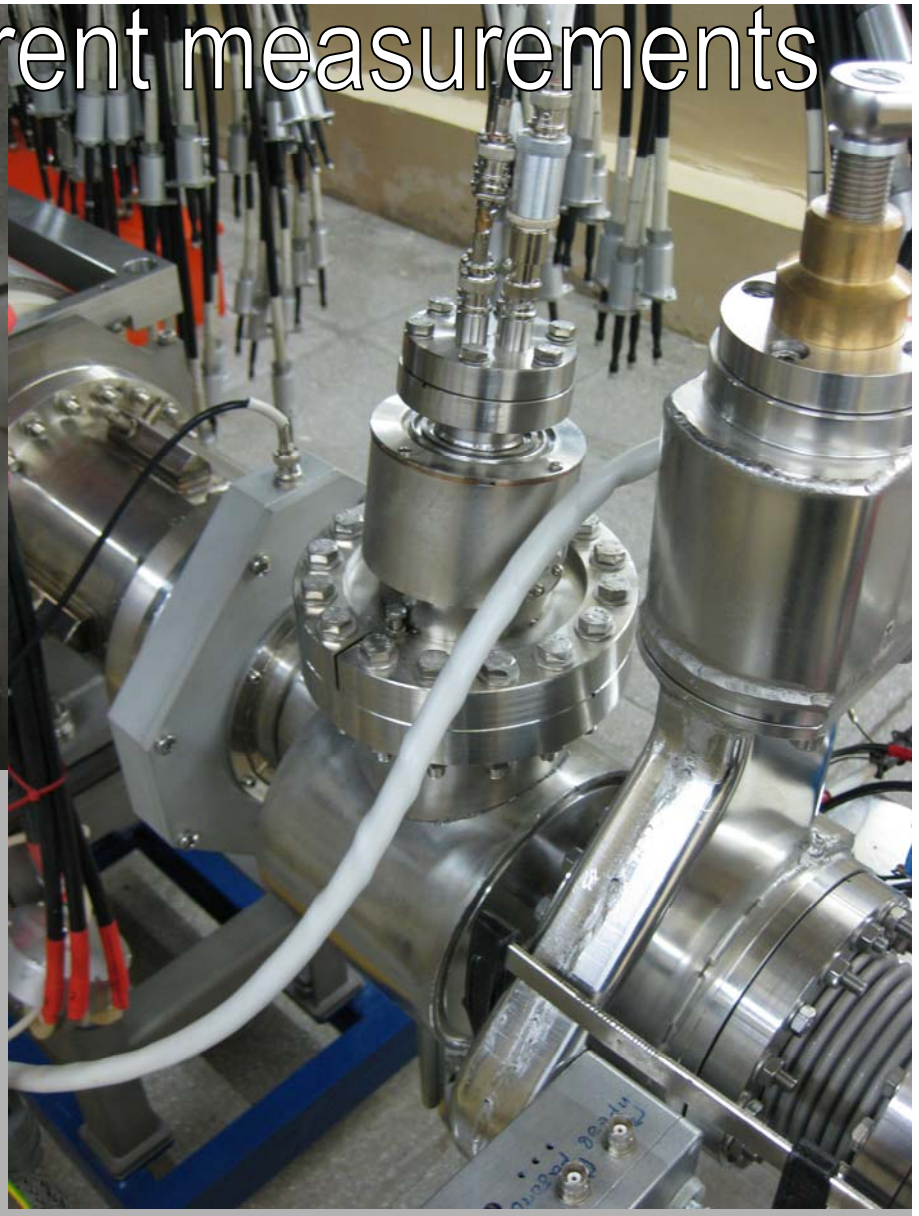
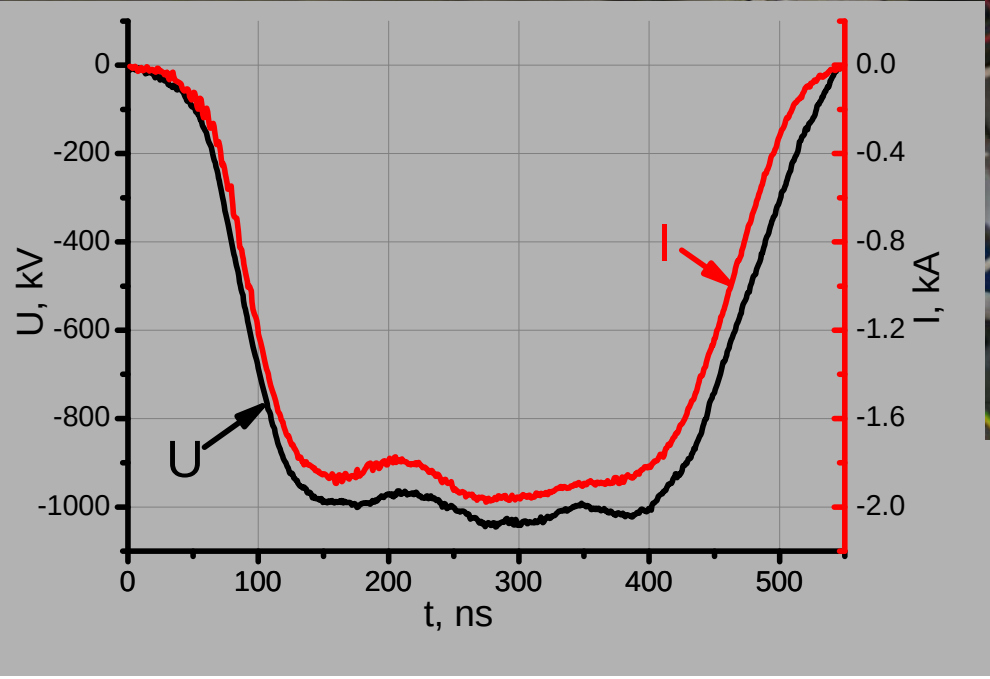
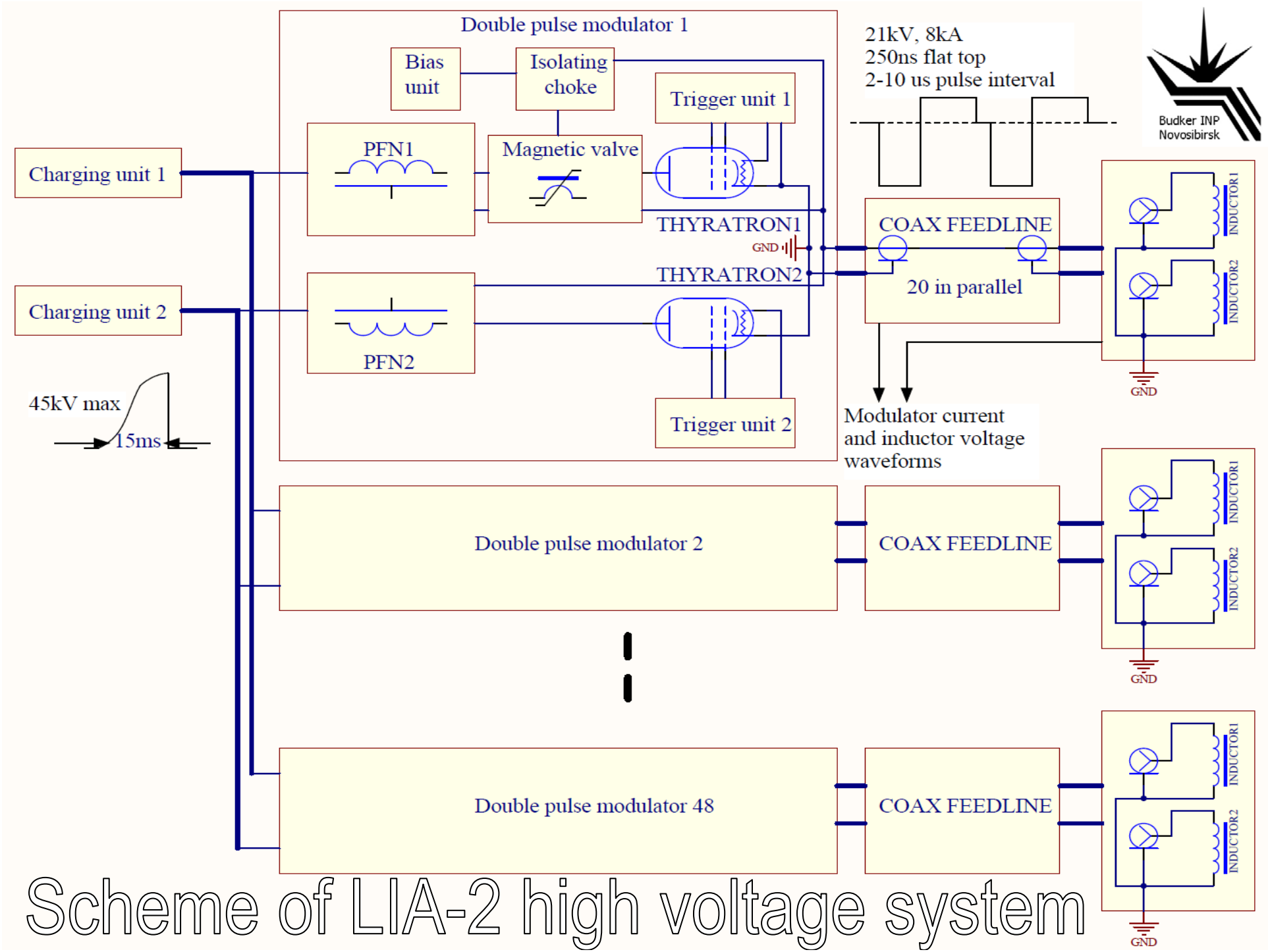
Diode voltage and current measurements





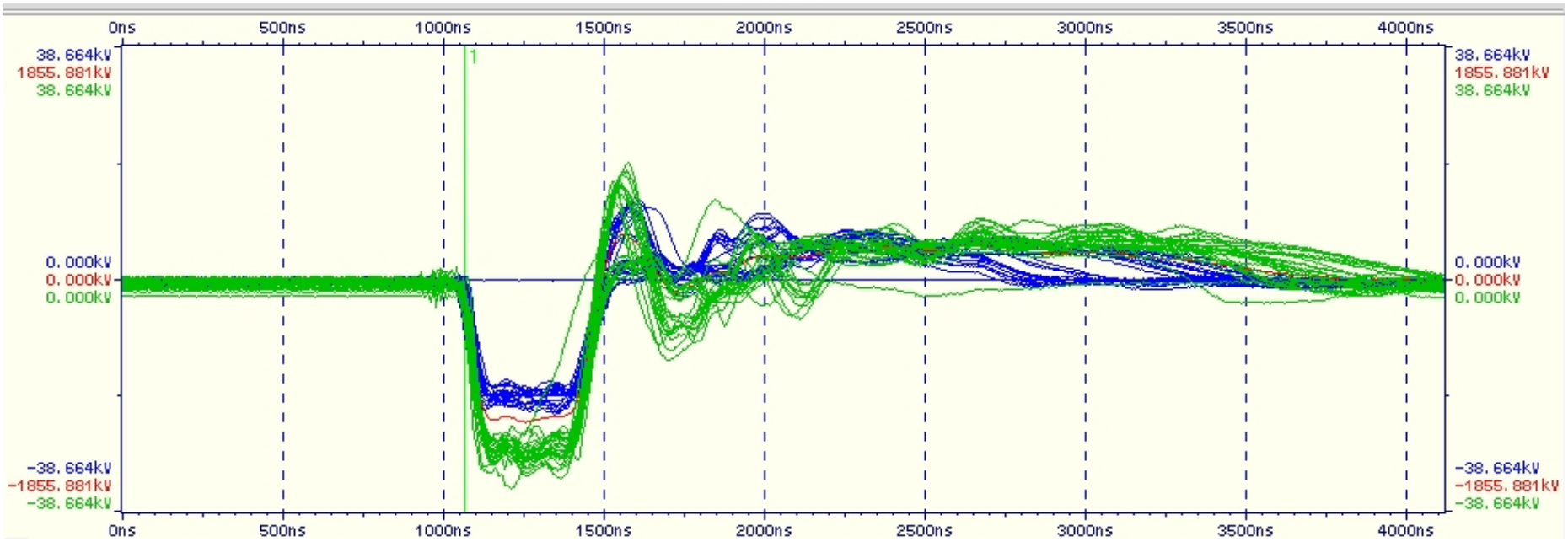


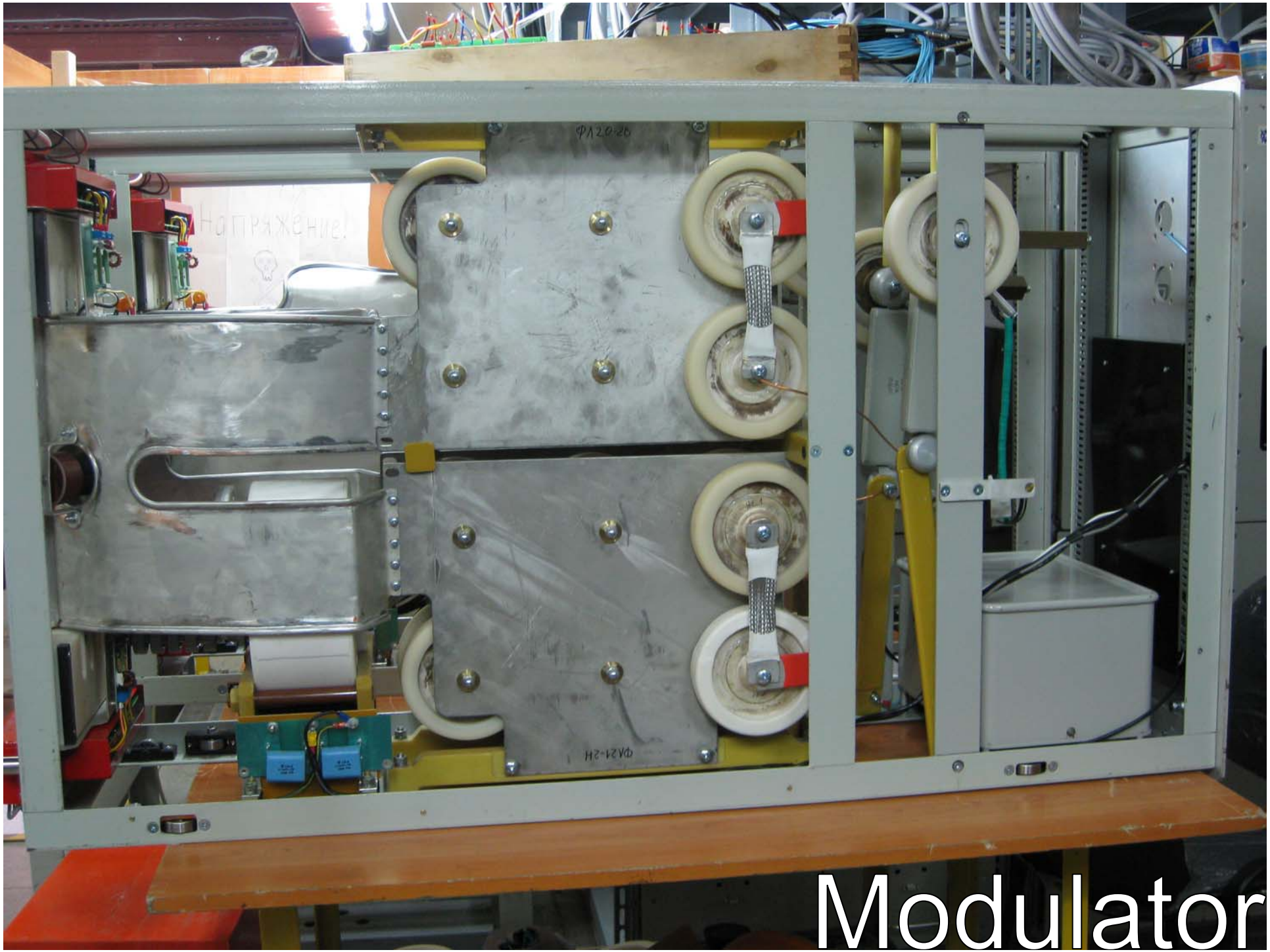
1000 kV, 2000 A.

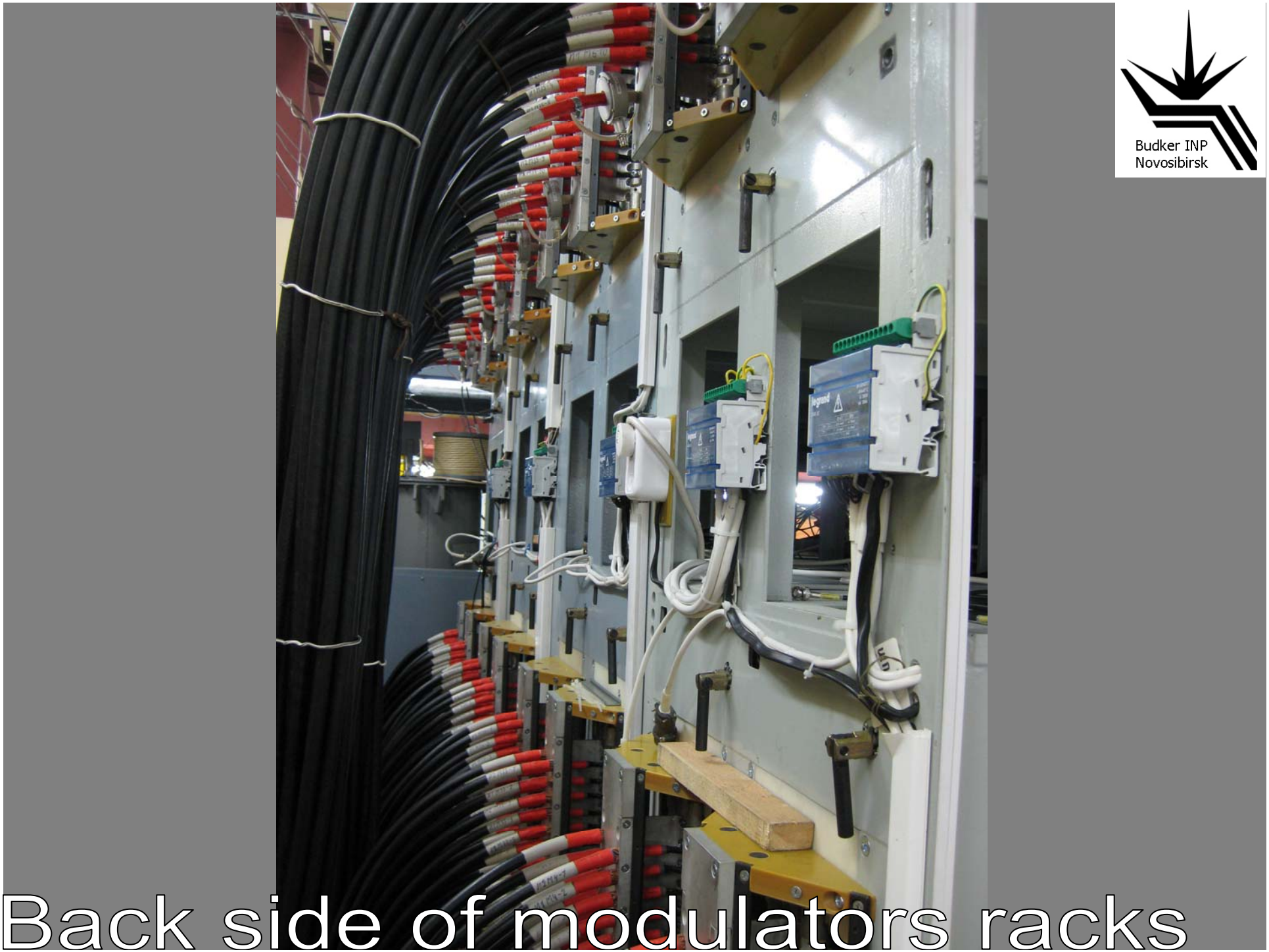


Scheme of LIA-2 high voltage system

Voltage and current measurements in pulsed high voltage system.




Modulator



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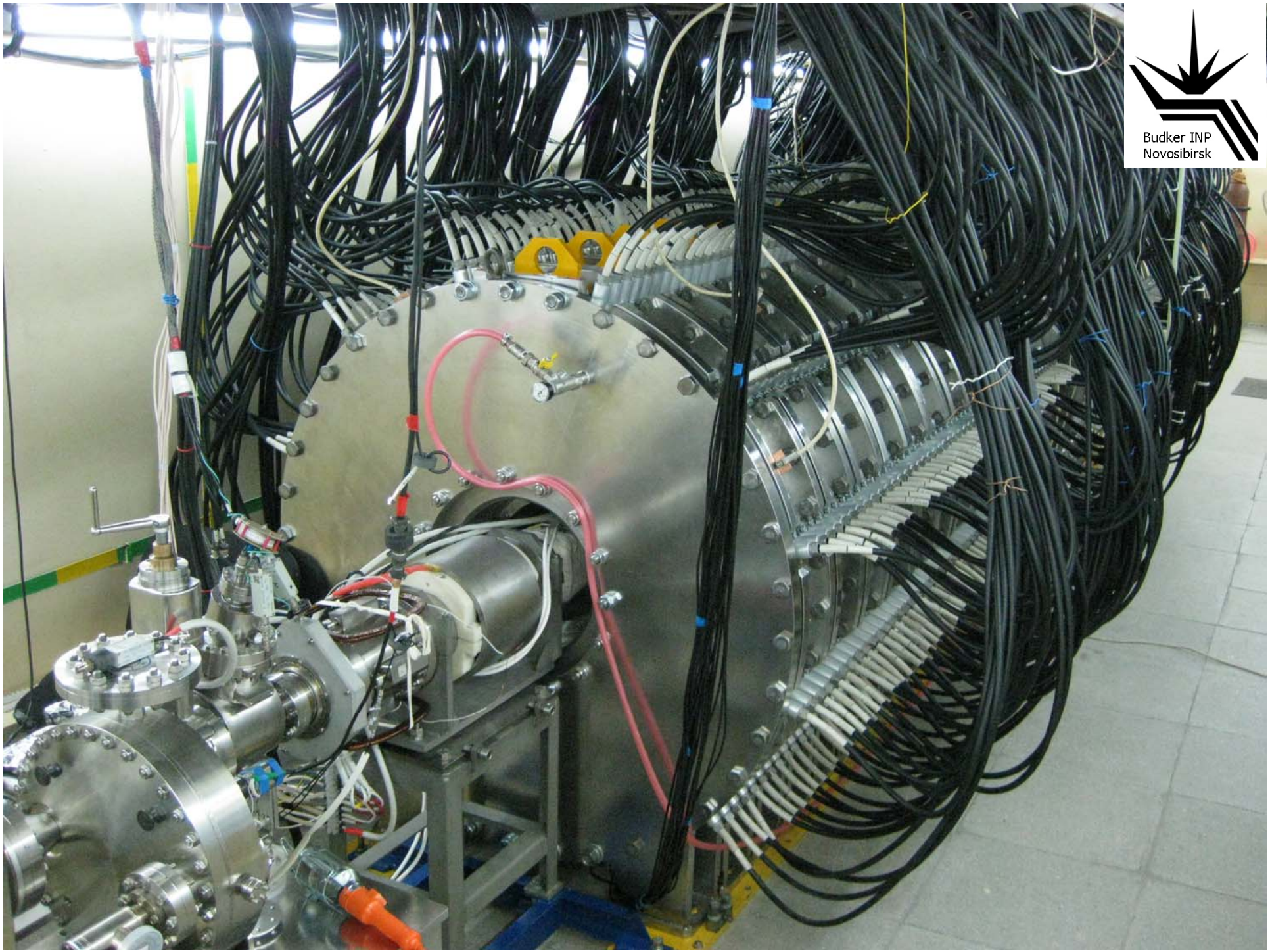
Back side of modulators racks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Racks with modulators


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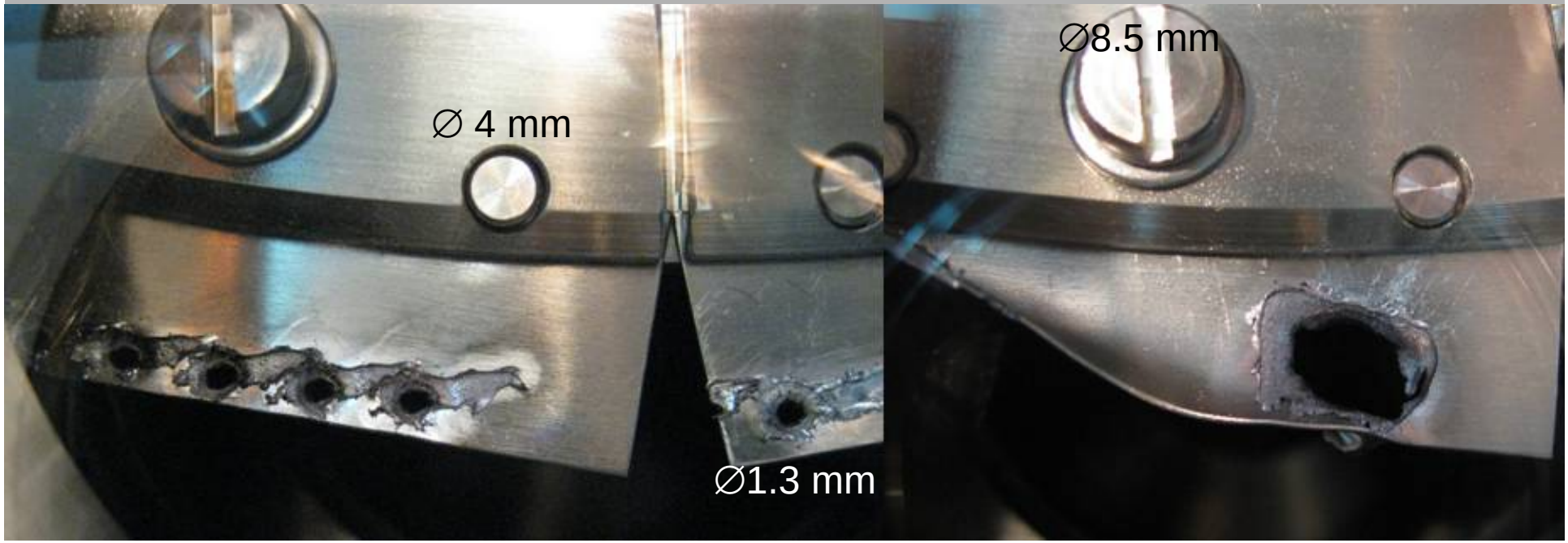
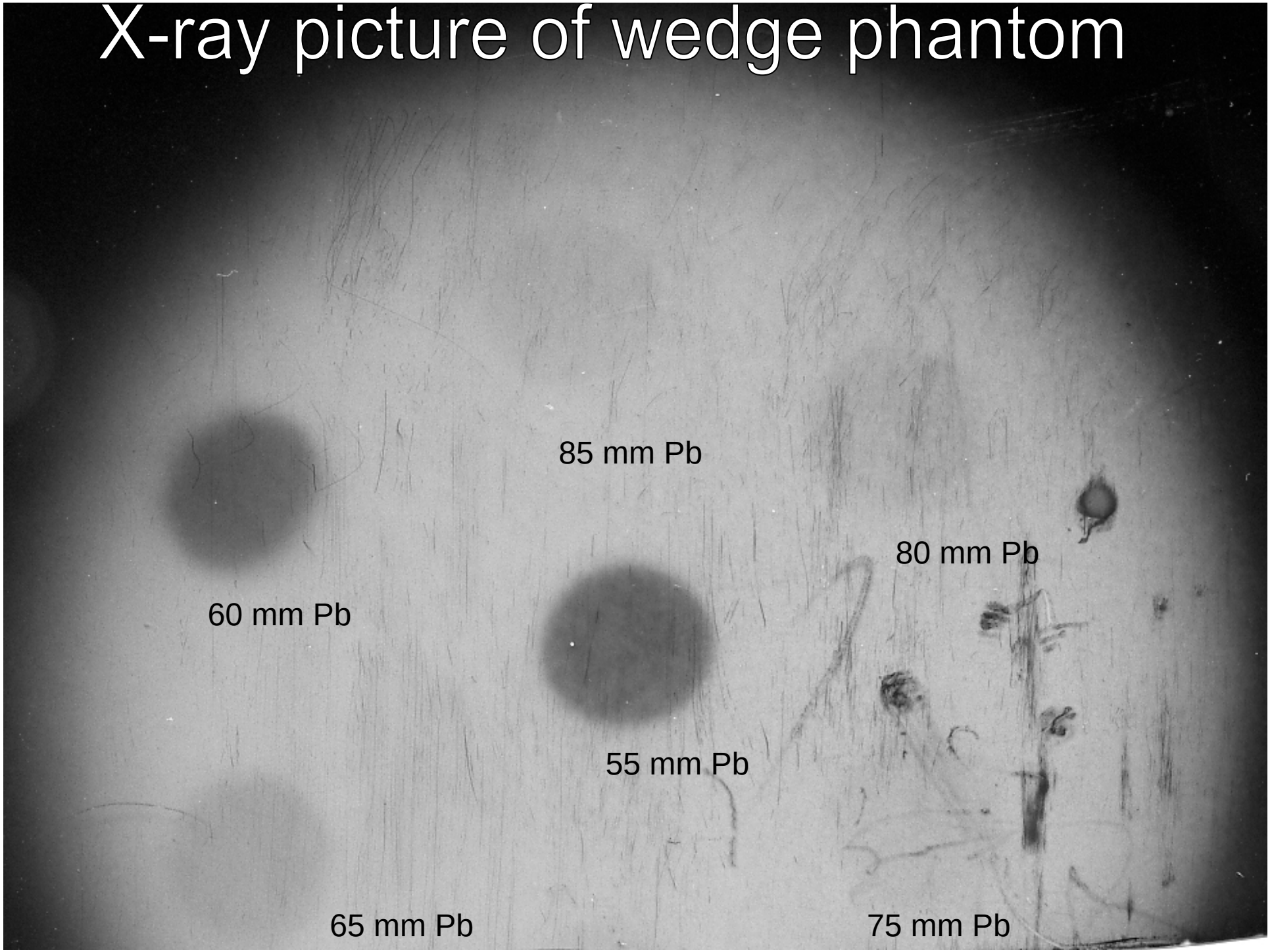
The results of beam interaction with 0.5 mm thick tantalum target for best beam focusing (on the left, 6 shots) and for smaller than optimum current in final focusing lens (on the right, 1 shot). All other parameters are the same for all shots and correspond to maximum beam energy and current (2 MeV, 2 kA, 200 ns). Bolt head diameter on the picture is equal to 8.5 mm, pin diameter – 4 mm.

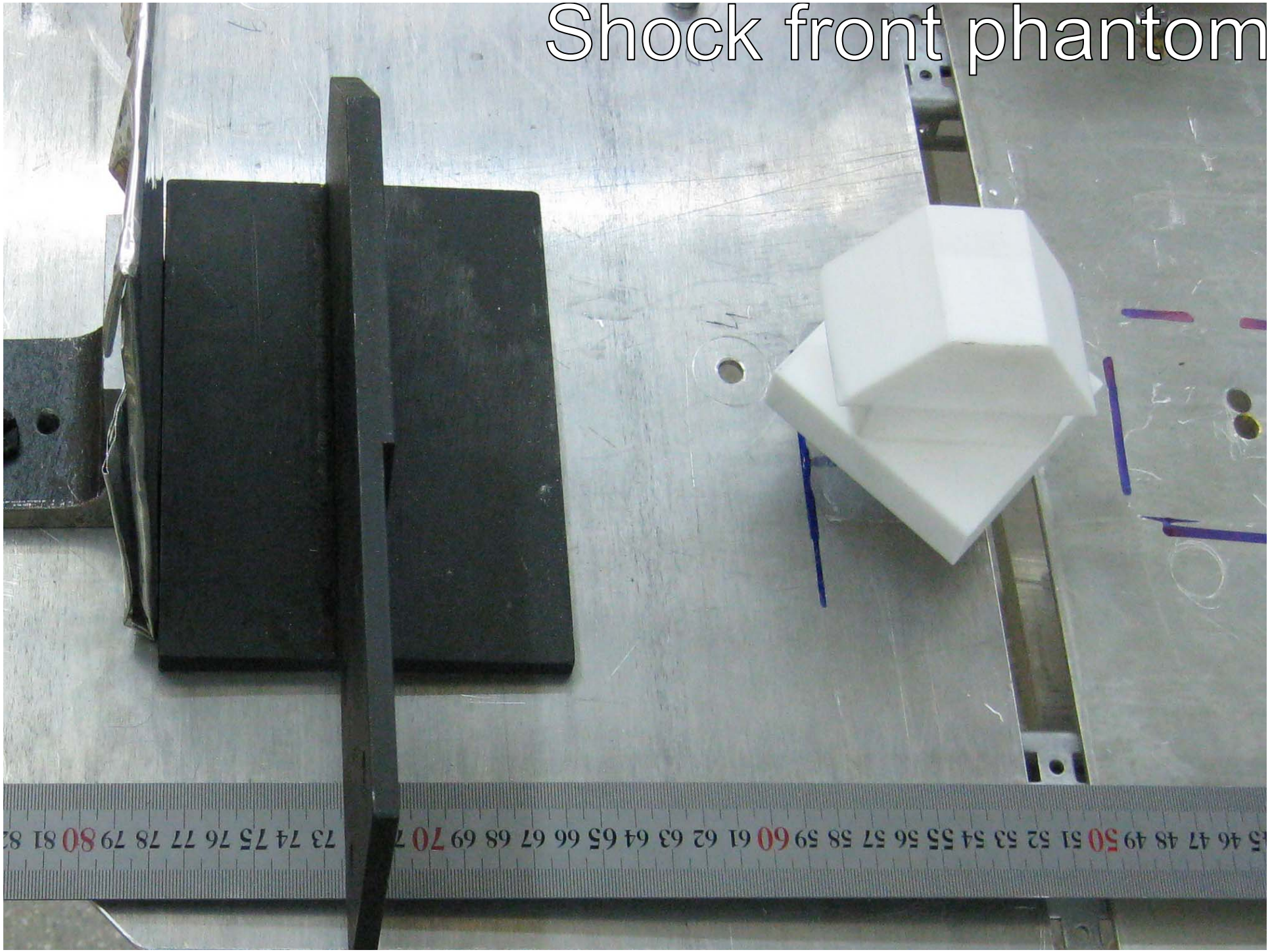


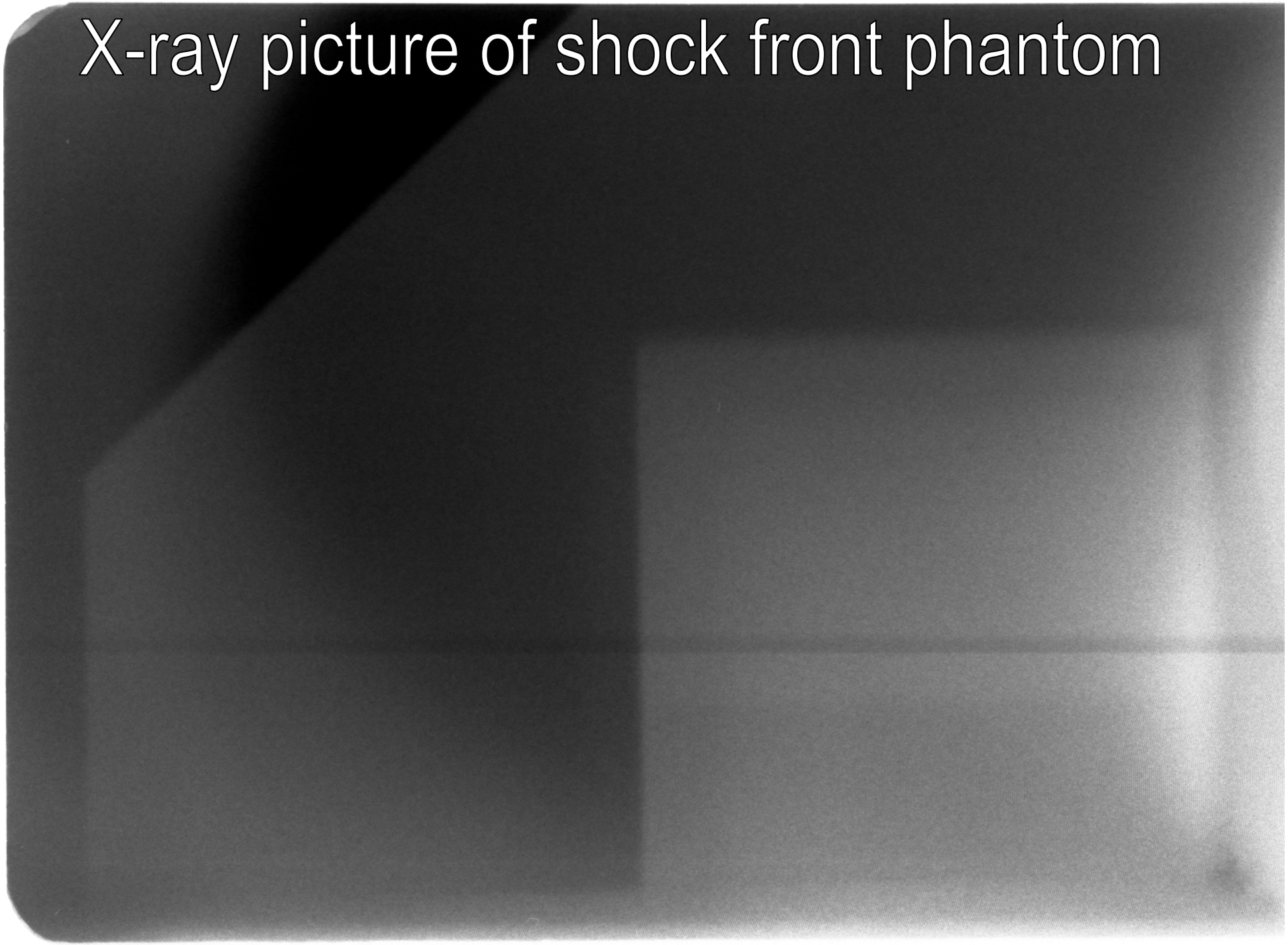

Wedge phantom

X-ray picture of wedge phantom



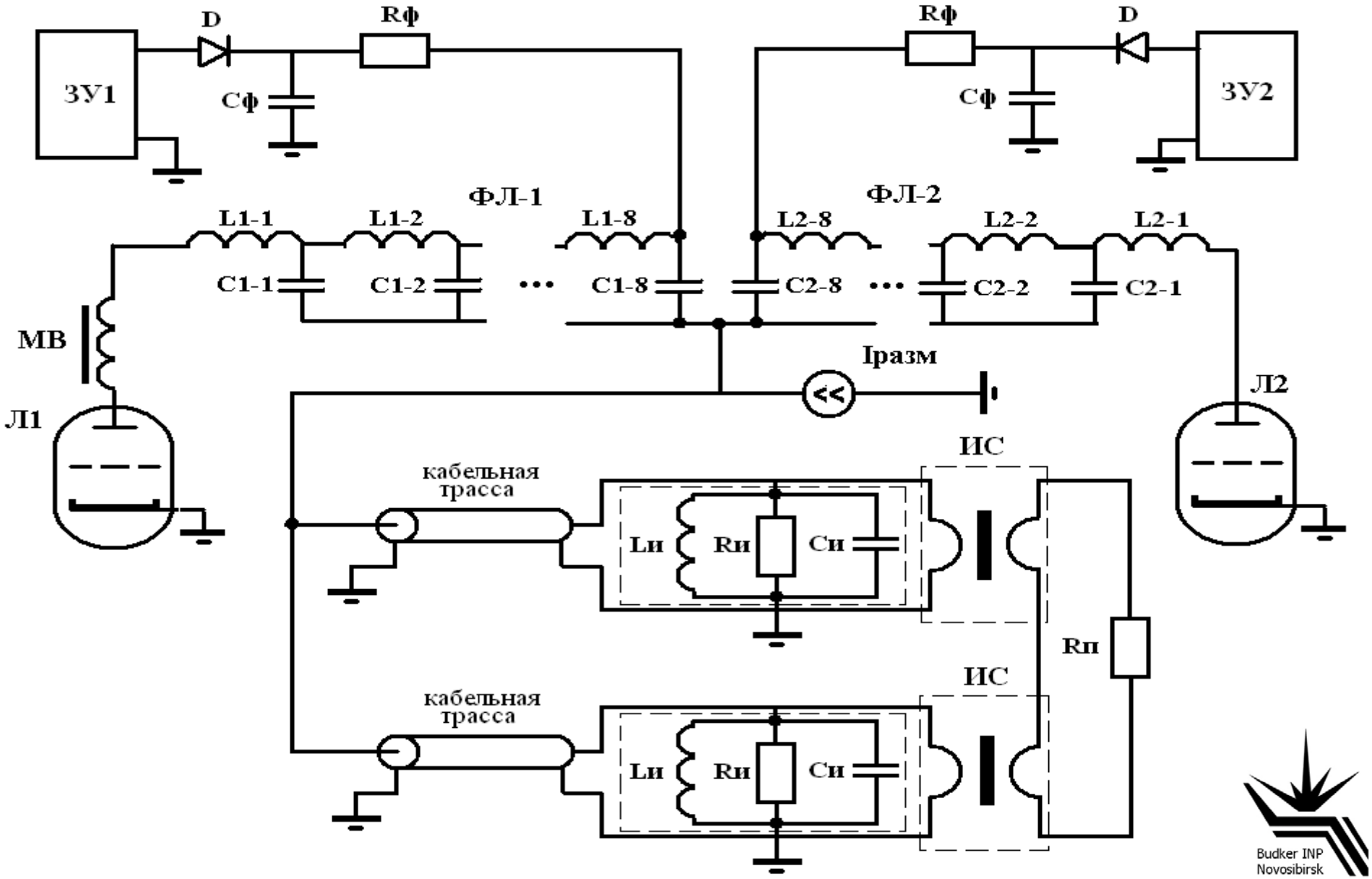
Shock front phantom




X-ray picture of shock front phantom

Thank you for your attention !

Scheme of LIA-2 pulsed high voltage system



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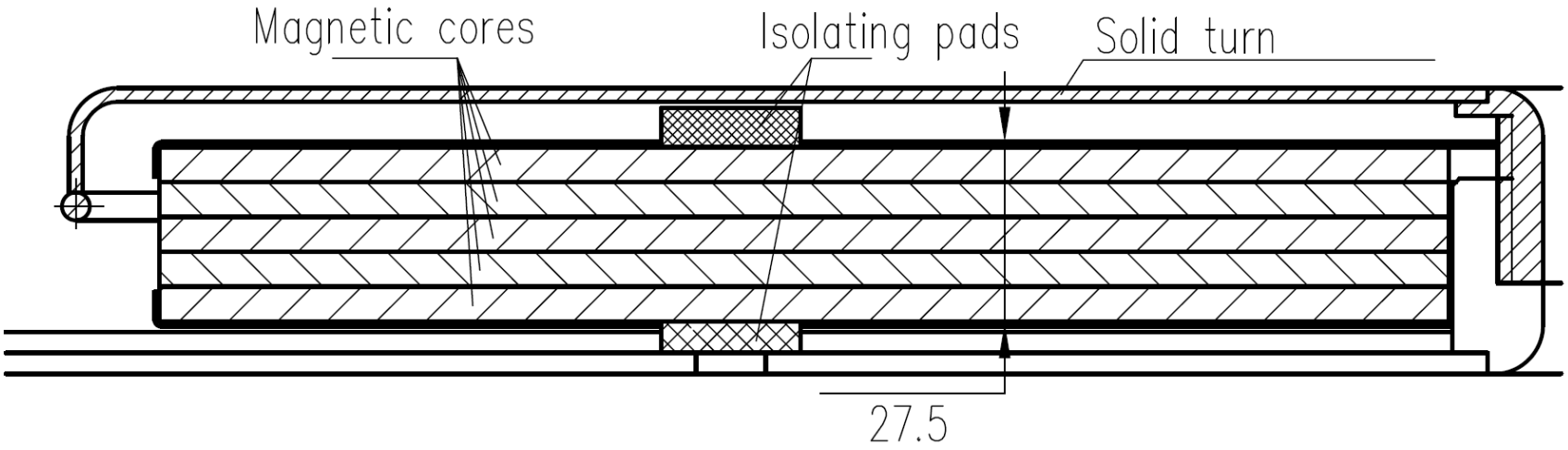
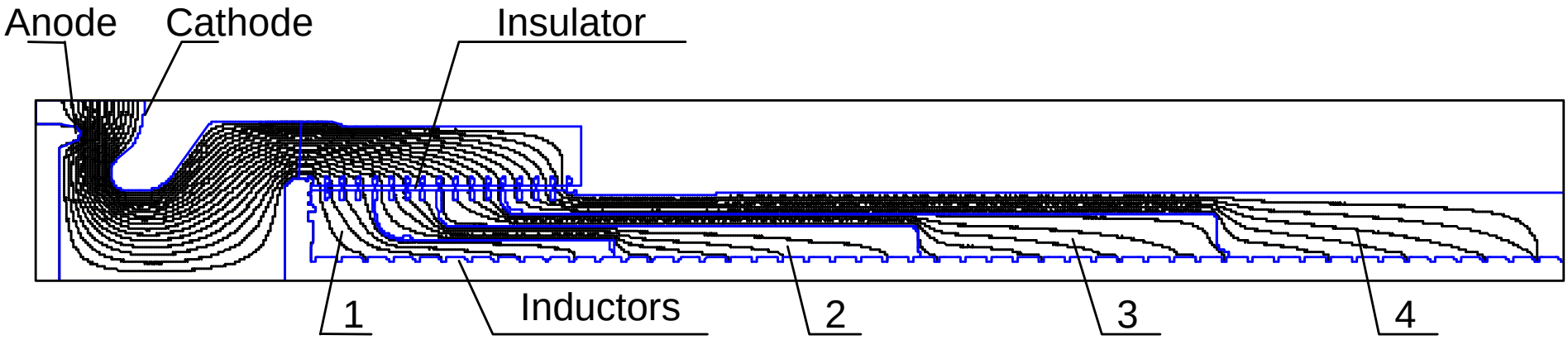
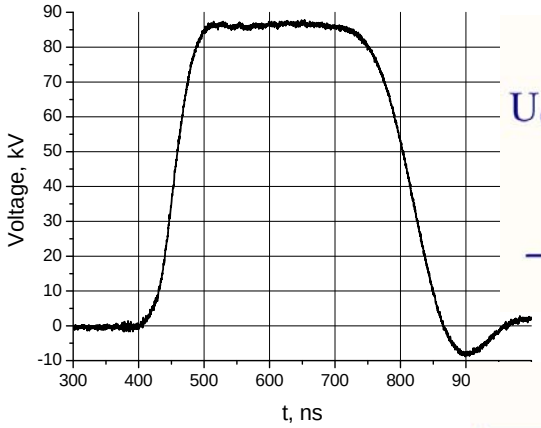
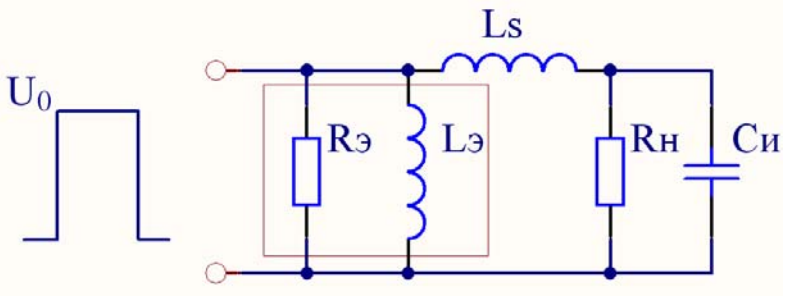
Inductor inner structure.

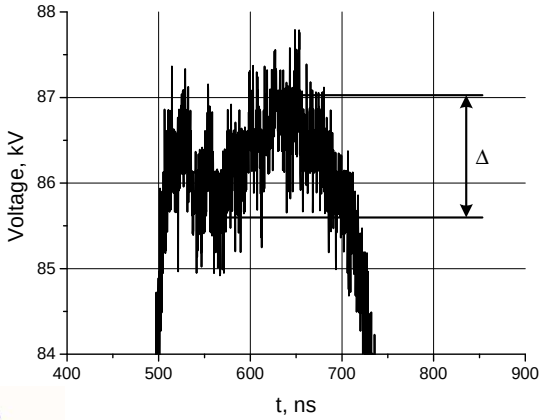


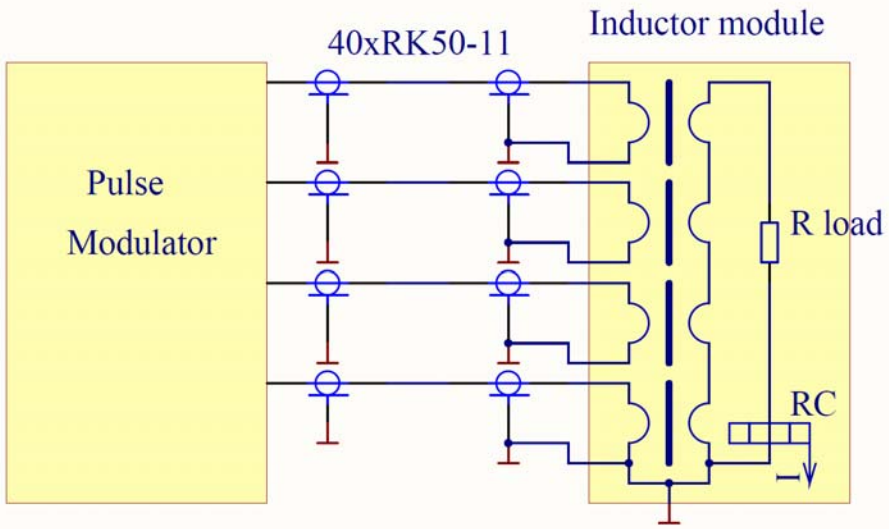
Equipotential lines distribution in diode high voltage system.

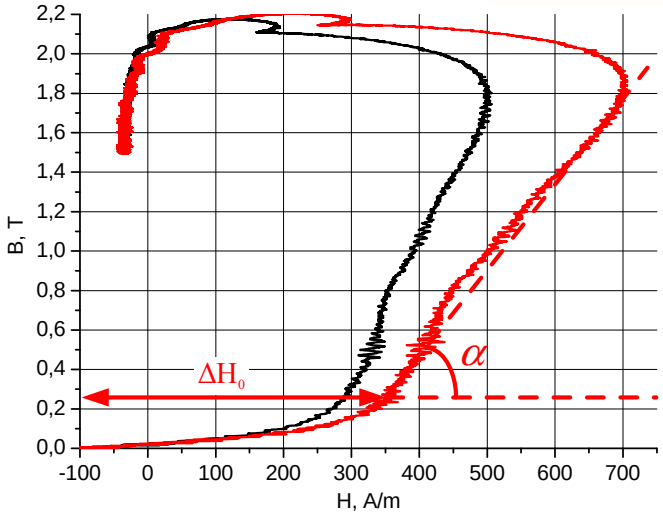


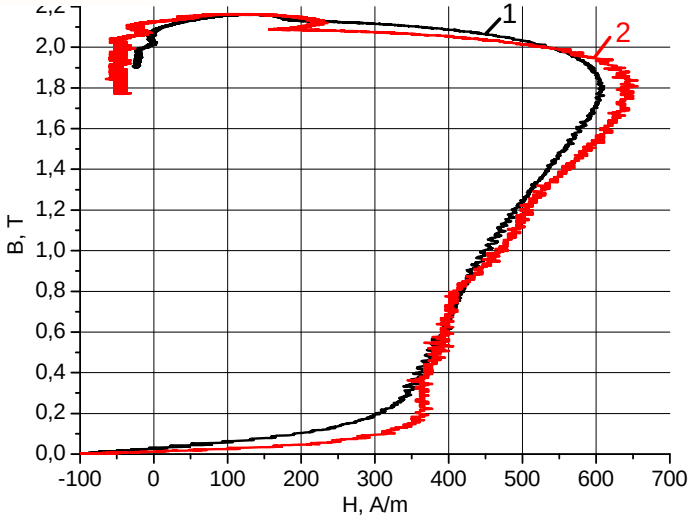

Voltage, kV
t, ns

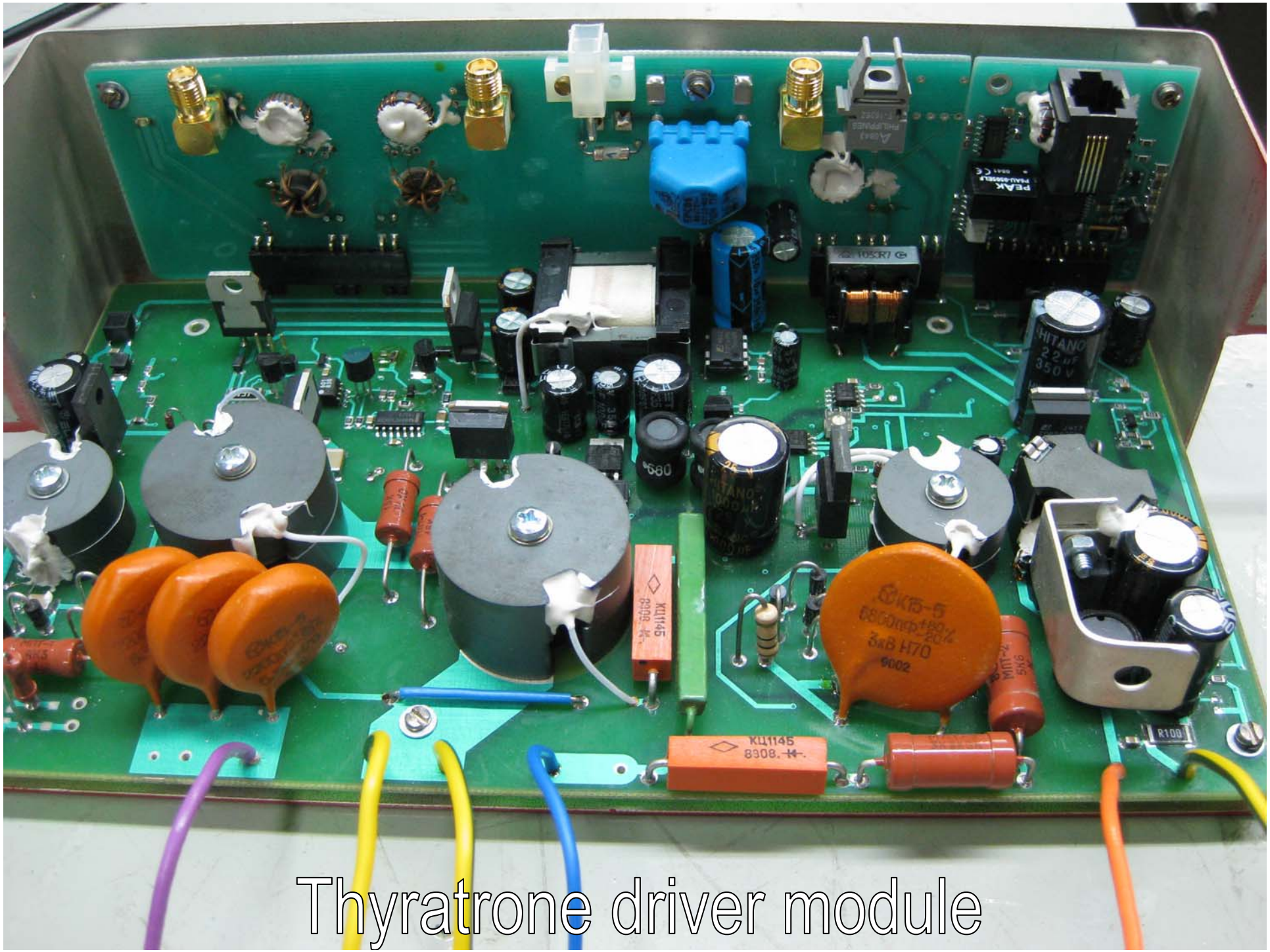

U0
Ls
Rэ
Lэ
Rн
Си


Voltage, kV
Δ
t, ns


40xRK50-11
Inductor module
Pulse
Modulator
R load
RC


B, T
H, A/m
ΔH0
α


B, T
H, A/m
1
2



Thyratrone driver module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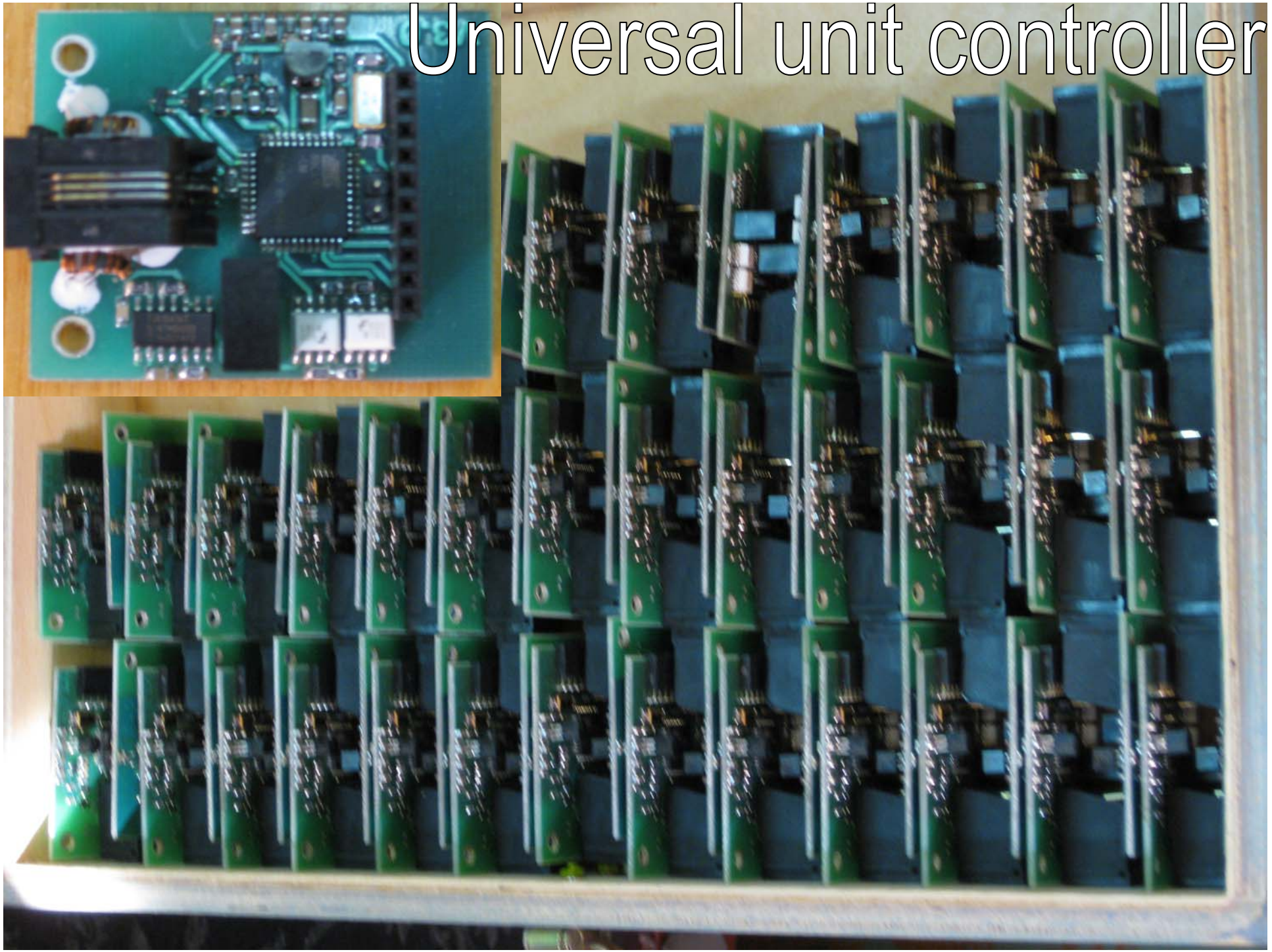
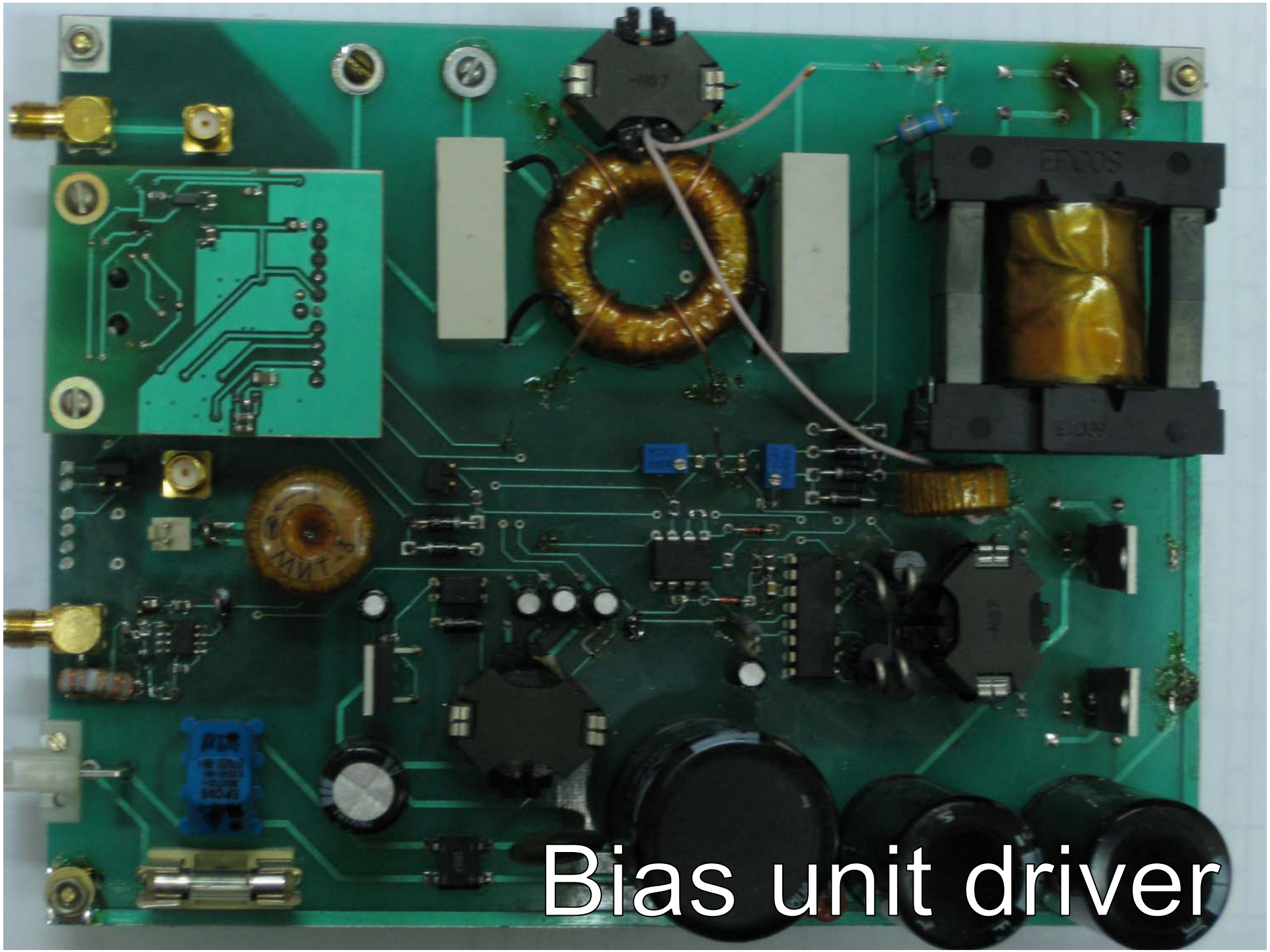
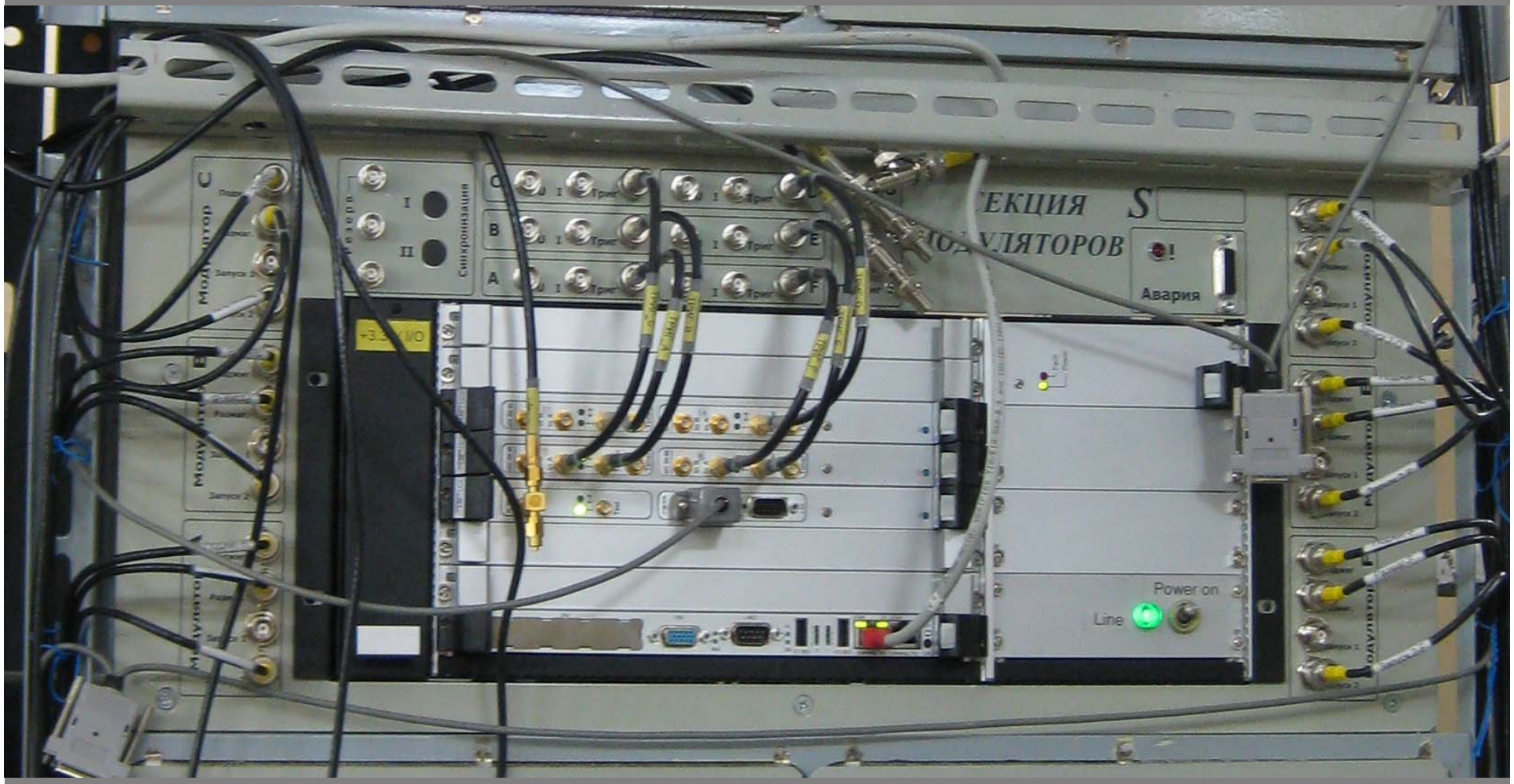
Modulator controllers

Universal unit controller




Bias unit driver

Compact PCI module for modulators control



Power supplies for cathode filament and beam focusing system