Status of the HV Electron Cooler Project for NICA Collider

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Electron Cooler Parameters

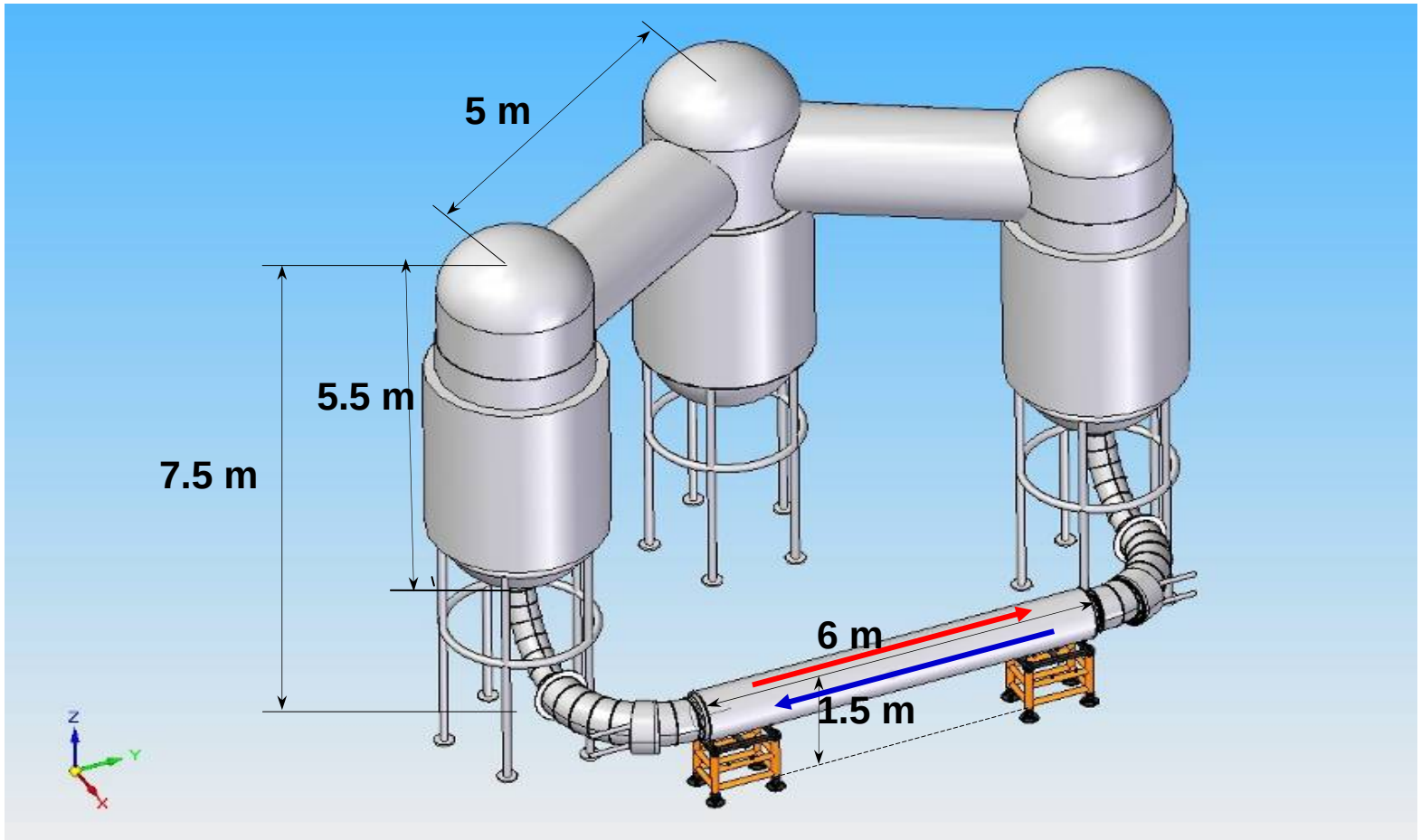
Electron energy, MeV	**0.5 ÷ 2.5**
Electron beam current , A	**0.5 ÷ 1.0**
Electron beam diameter, cm	**1.0**
SC solenoid magnetic field, T	**0.1 ÷ 0.2**
HV PS current, mA	**1.0**
Collector PS, kW	**2×2.0**
HV PS stability	**$1 \cdot 10^{-4}$**
SF6 gas pressure, at	**5 ÷ 8**

Working Design of the Cooler

The General View

Electron energy 0.5 ÷ 2.5 MeV

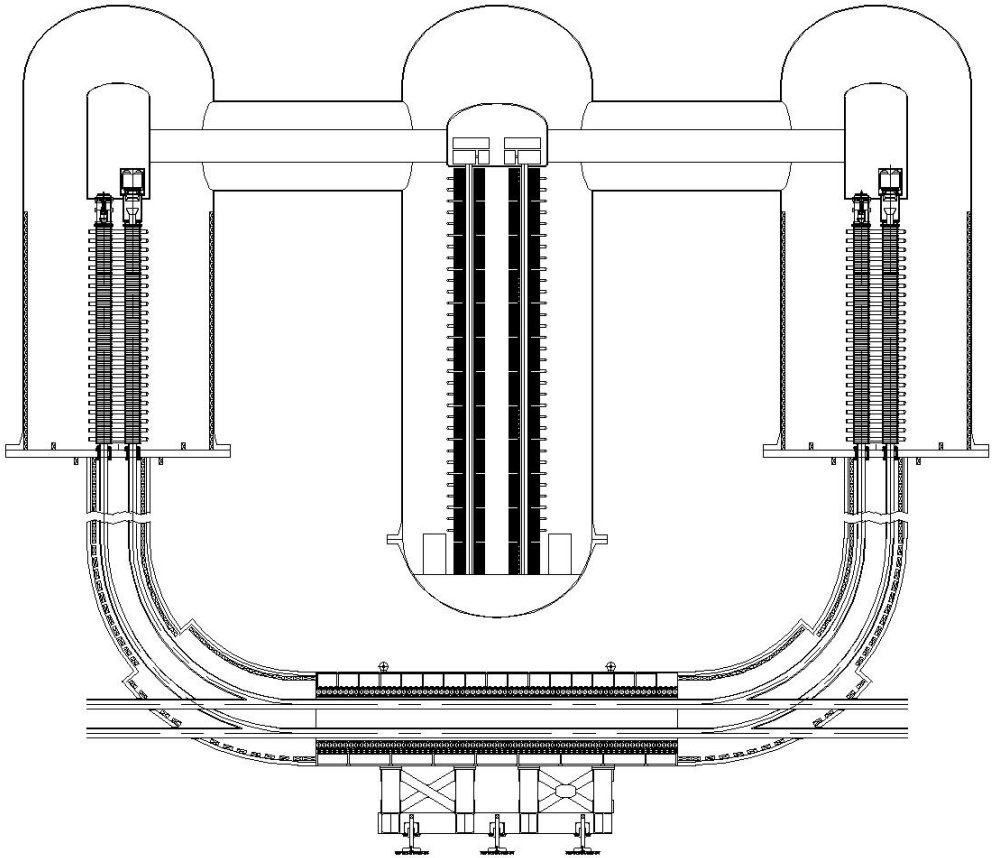
Electron beam current 0.5 ÷ 1 A



Working design of the cooler (contnd)

V.I.Shokin (JINR)

The General View



Working design of the cooler (contnd)

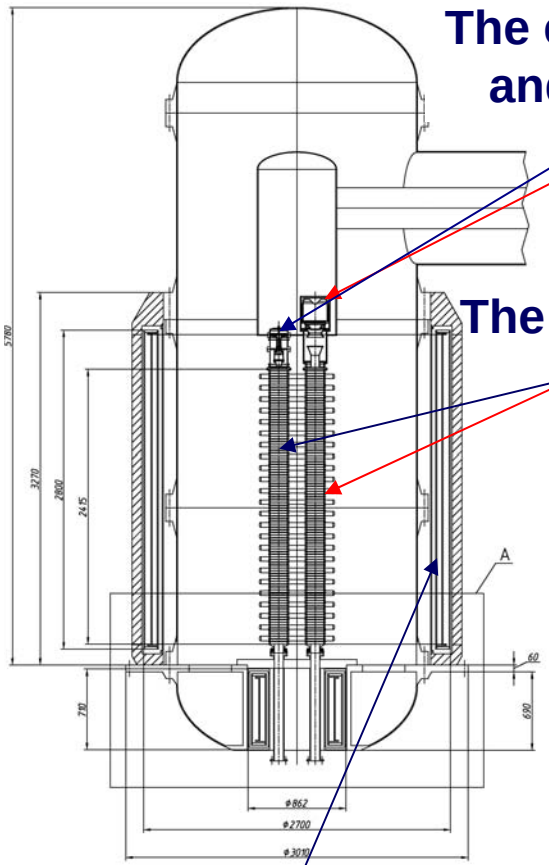
The electron cooler elements

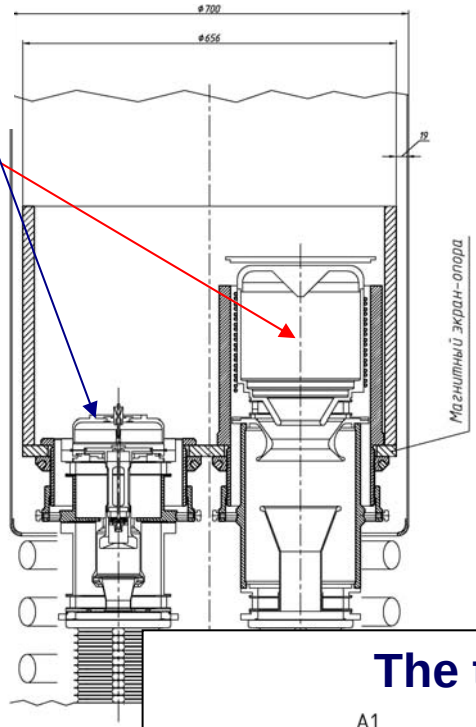
The electron beam tank

HV Terminal

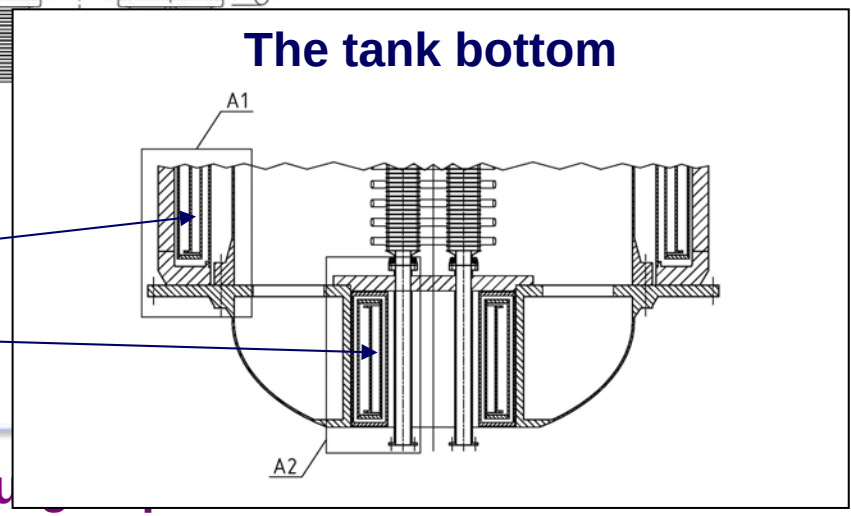
The electron gun and colllector

The acceleration tubes





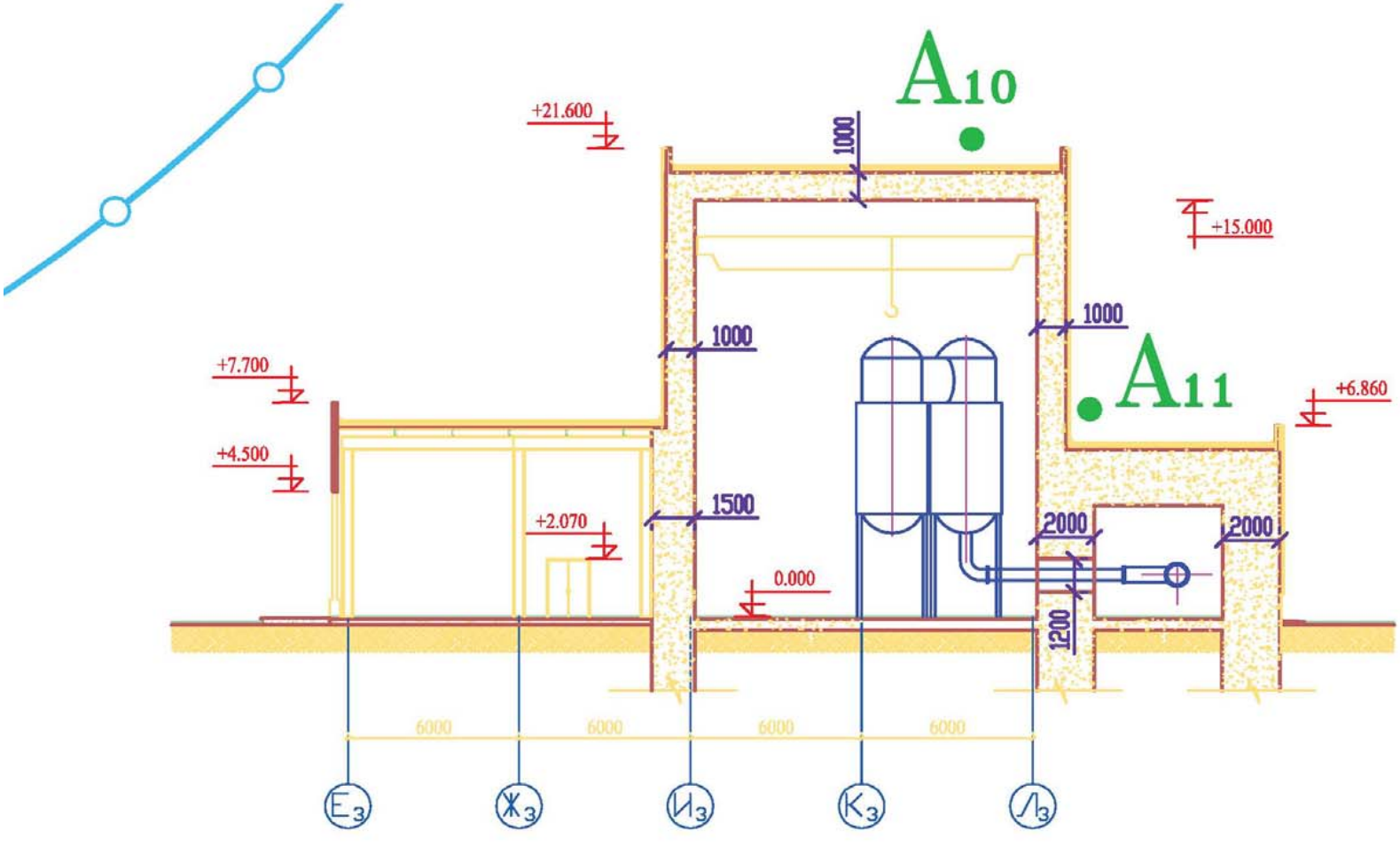
The tank bottom



The SC solenoids in cryostats with iron shields

Working design of the cooler (contnd)

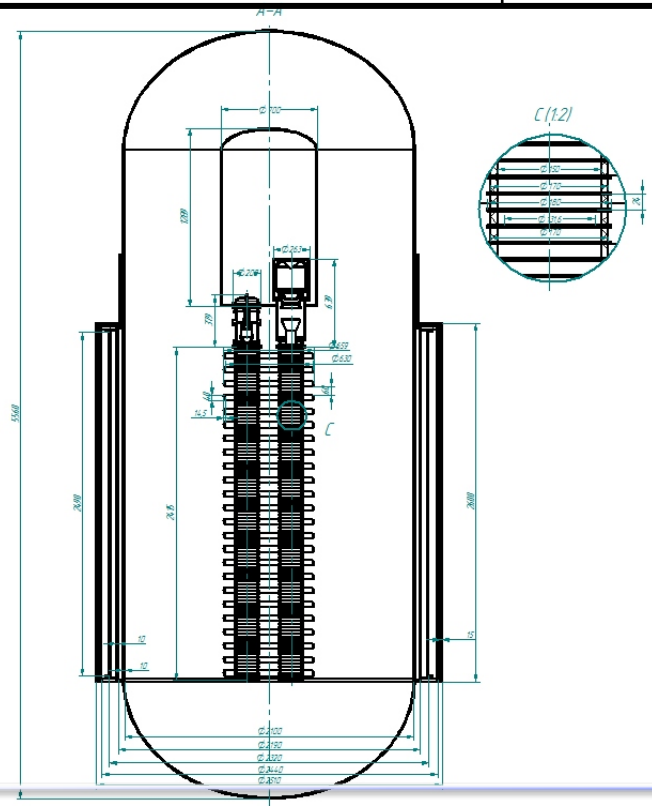
The cooler location in the collider tunnel



Magnetic system

Solenoids: General Parameters
Magnetic field = 2 kG

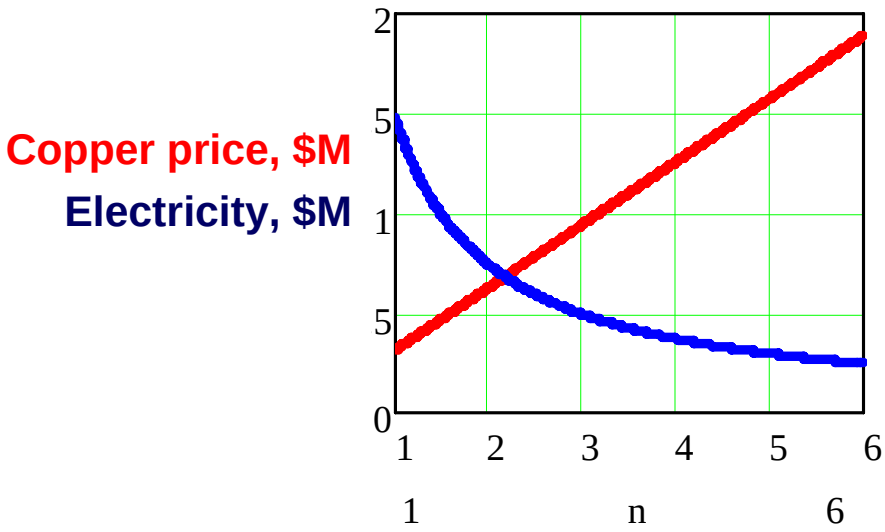
Linear current density, kA/cm	1.6
Solenoid height, mm	2500
Tank diameter, mm	2100



Magnetic system (contnd)

Warm Solenoids: Parameters, Power Consumption, Cost
Magnetic field = 2 kG

Layers number	2	4	6
Copper tube weight, ton	20.7	41.4	62.1
Copper price, $M	0.63	1.26	1.89
El. power consumption, MW	1.31	0.655	0.437
Electricity cost per 5000 hours, $M	0.74	0.37	0.247



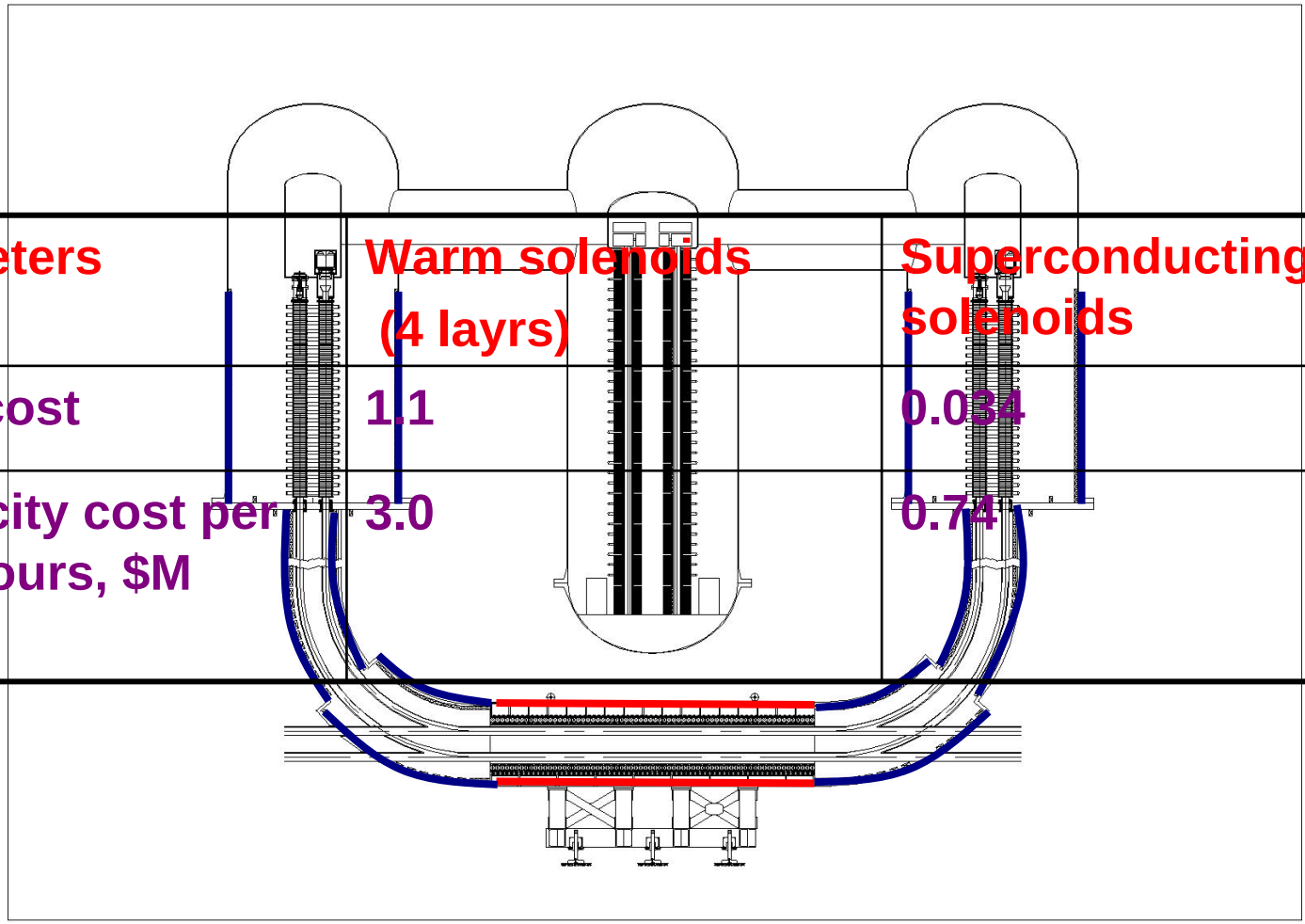
Magnetic system (contnd)

Superconducting Solenoid for the NICA collider ECS: Parameters, Power Consumption, Cost

Magnetic field, T	0.2
Operating current, A	200
Solenoid height, mm	2500
Solenoid inner diameter, mm	2300
Number of layers	2
Number of turns	2000
Inductance, H	8.35
Mass of superconductor, kg	50
Superconductor cost, M$	0.07
Cryostat, mandrel, current leads etc, M$	0.47
Power consumption, MW	0.03
Electricity cost per 5000 hours, $M	0.017

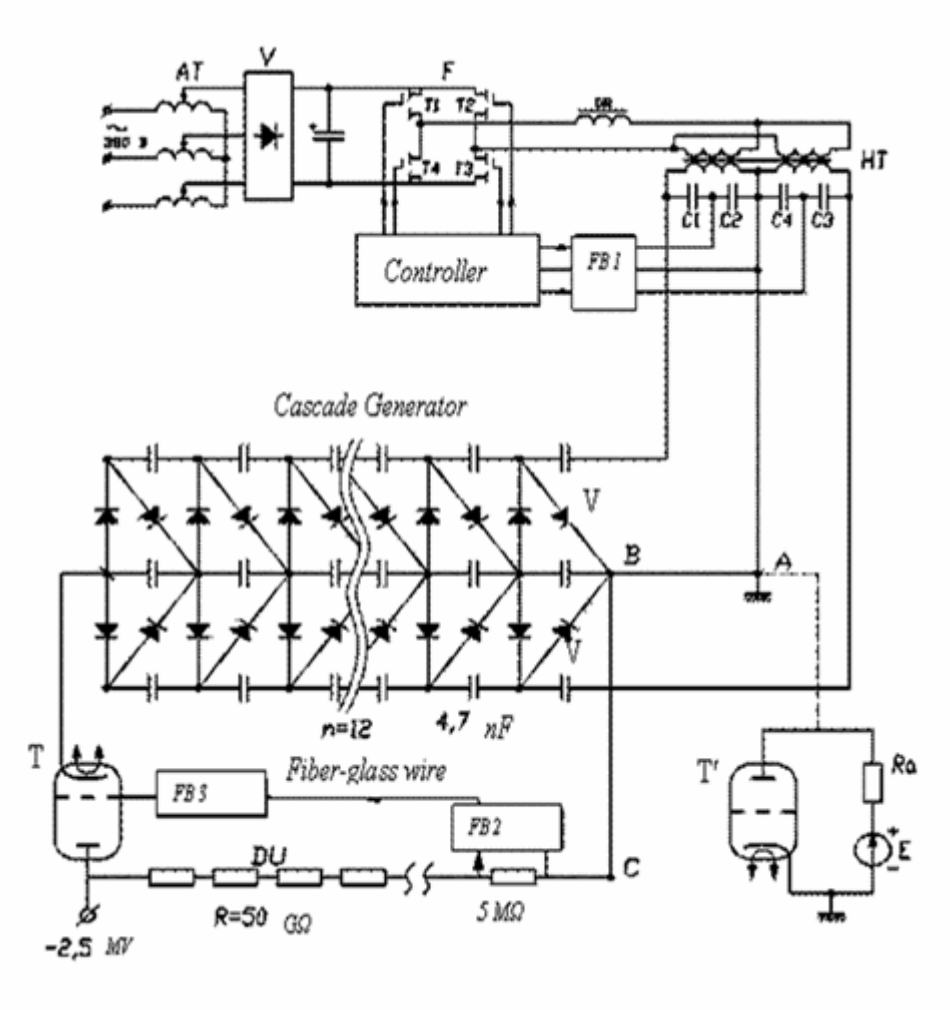
Magnetic system (contnd)

Parameters	Warm solenoids (4 layrs)	Superconducting solenoids
Total cost	1.1	0.034
Electricity cost per 5000 hours, $M	3.0	0.74

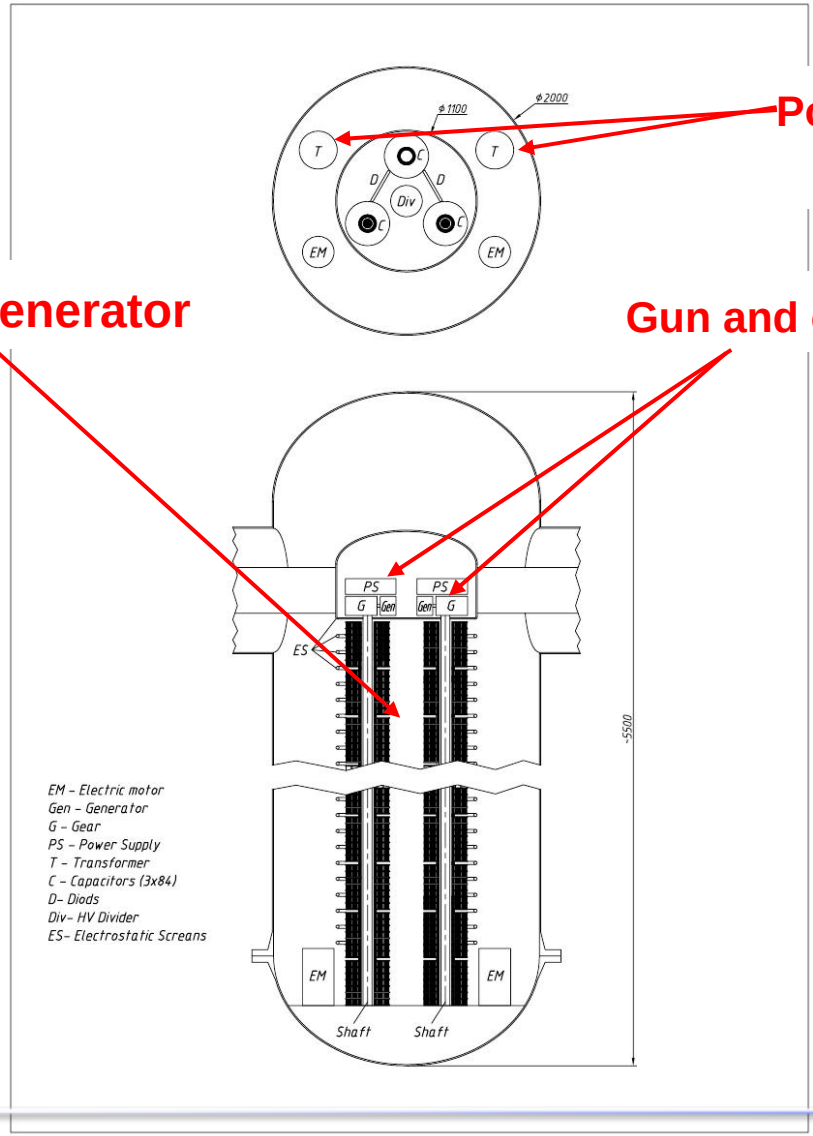


High voltage generator (contnd)

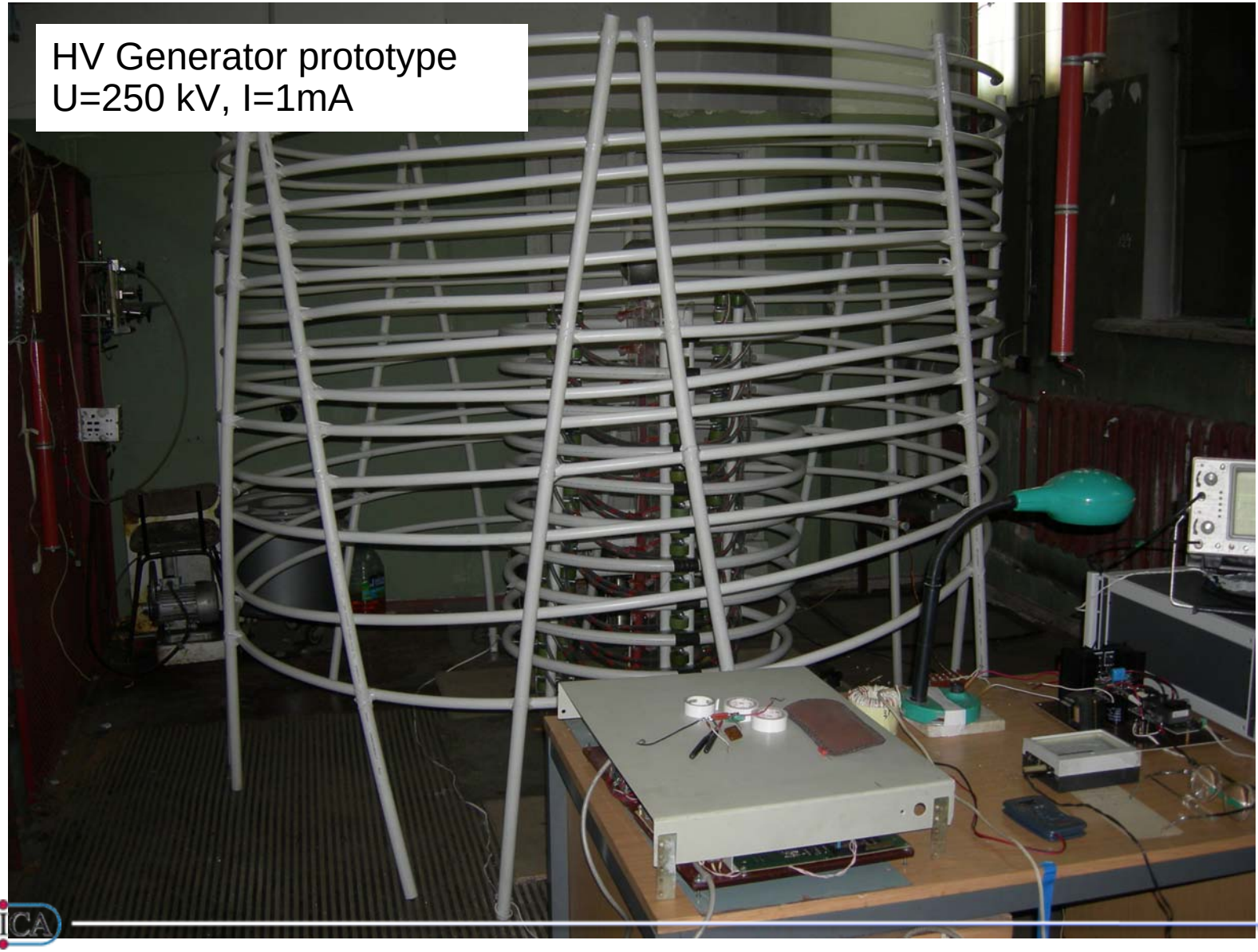
Electric scheme



High voltage generator (contnd)



High voltage generator (contnd)



Conclusion

The development of the HV electron cooler for NICA collider is in progress:

- ✓ **The working design of the HV e-cooler**
- ✓ **Design of magnetic system**
- ✓ **Testing of the HV generator model**
- ✓ **Design and fabrication of HV generator working prototype**