



LEETCHI: Drive Beam Electron Source

Kévin Pepitone



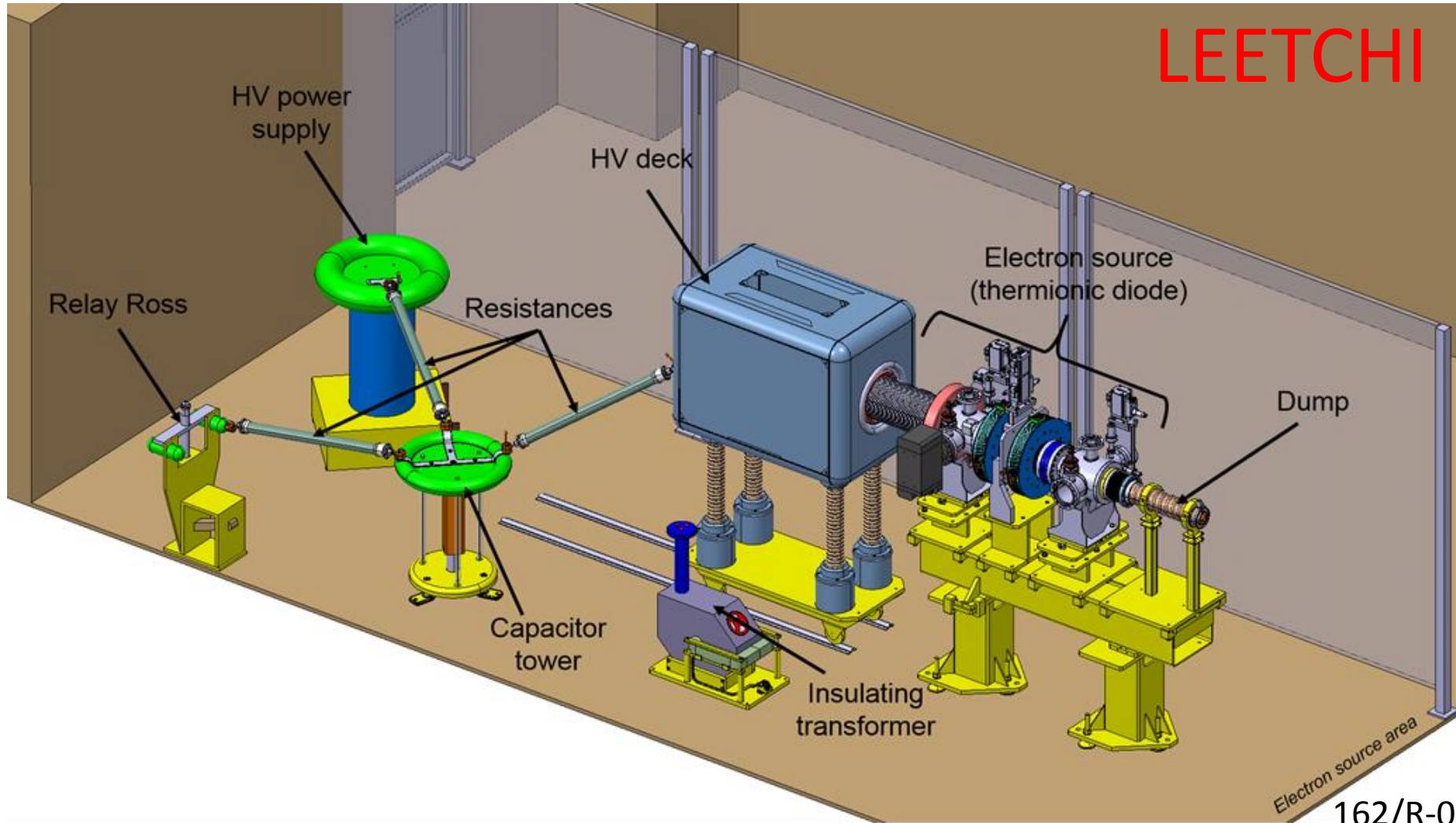
Outline



- Introduction and electron beam parameters
- Integration: experimental area, HV deck and cathode connector
- Diagnostics: electrical and optical diagnostics
- Simulations
- Perspectives: modulator
- Conclusions

- Drive beam electron source automation control (Danish Ali Nawaz)

Introduction



162/R-008

Electron beam parameters

Parameters	Baseline
Beam energy	140 keV
Beam current	5 to 7 A
Pulse length	140 μs
Emittance (RMS)	< 20 mm mrad
Repetition rate	50 Hz
Beam power	4,9 to 6,9 kW
Shot to shot charge variation	0.1 %
Flat top charge variation	0.1 % after correction

From a thermionic cathode

Integration – Experimental area



150 kV/150 kV
150 kV/150 kV
150 kV/150 kV
150 kV/150 kV



Integration – HV deck

PLC

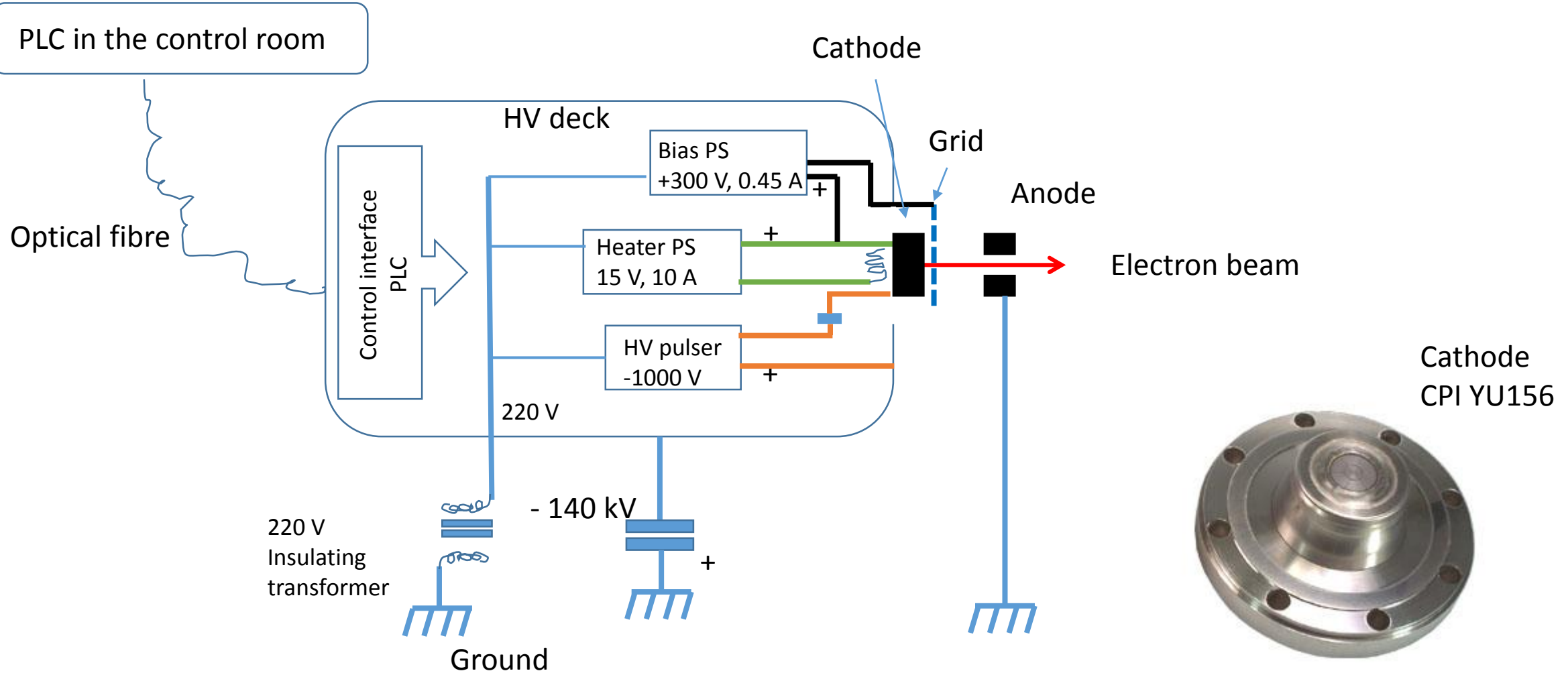
Heater power supply
15 V / 10 A

Bias power supply
300 V / 450 mA

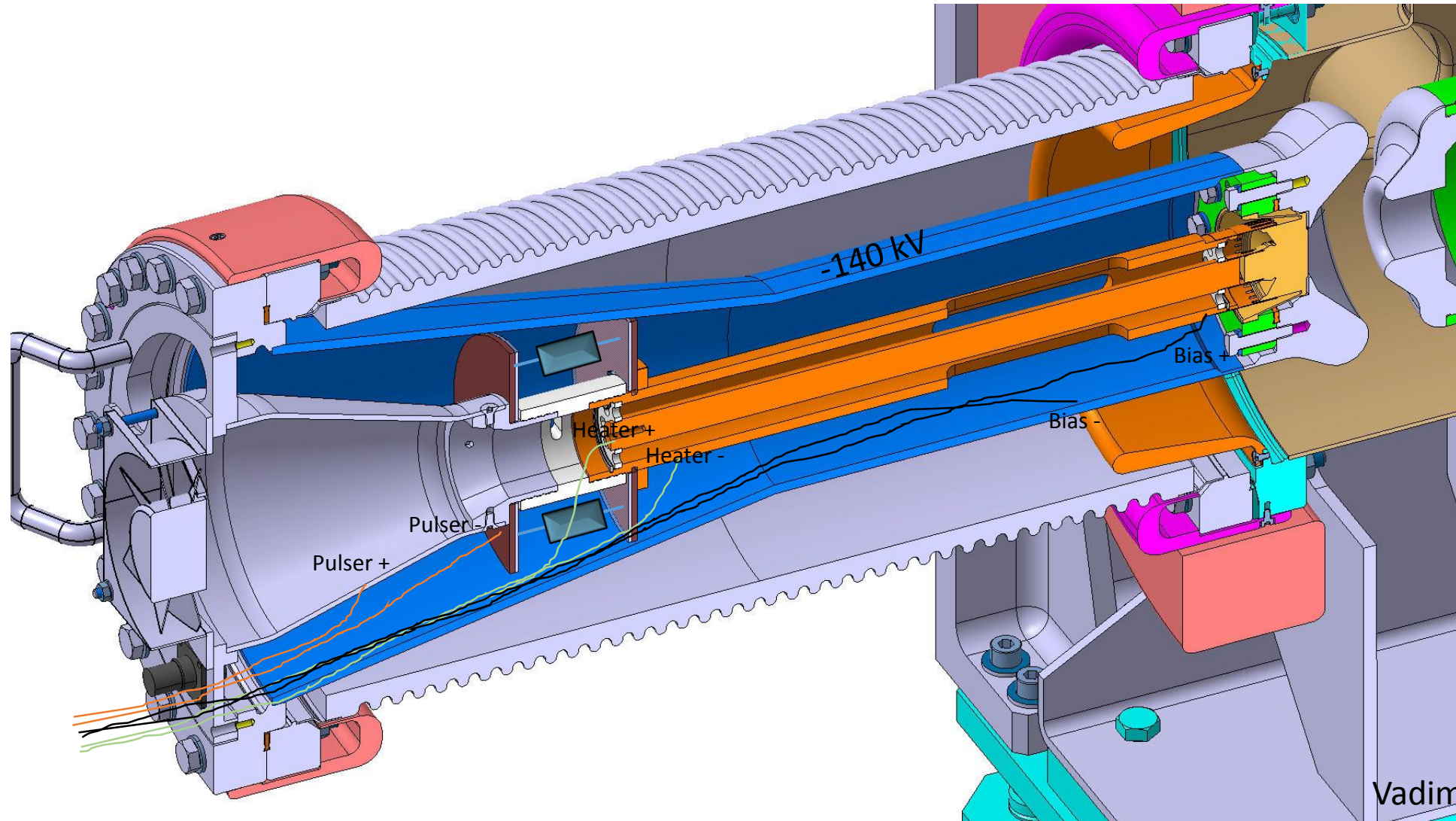
Pulsar power supply
-1000 V at repetition
rates up to 1 kHz



Cathode and connector

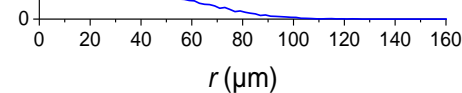
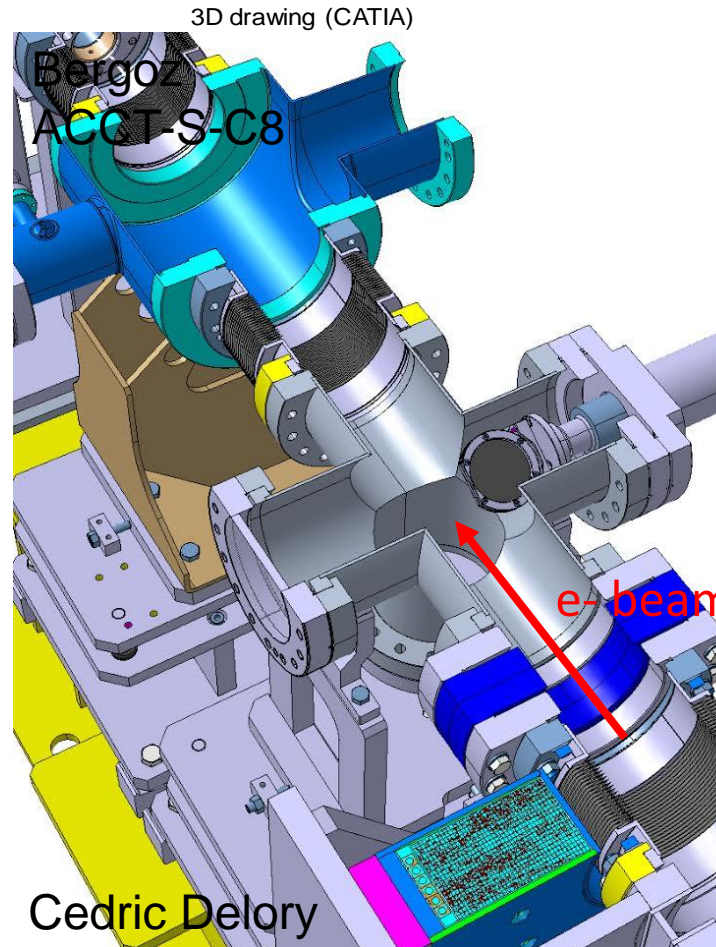
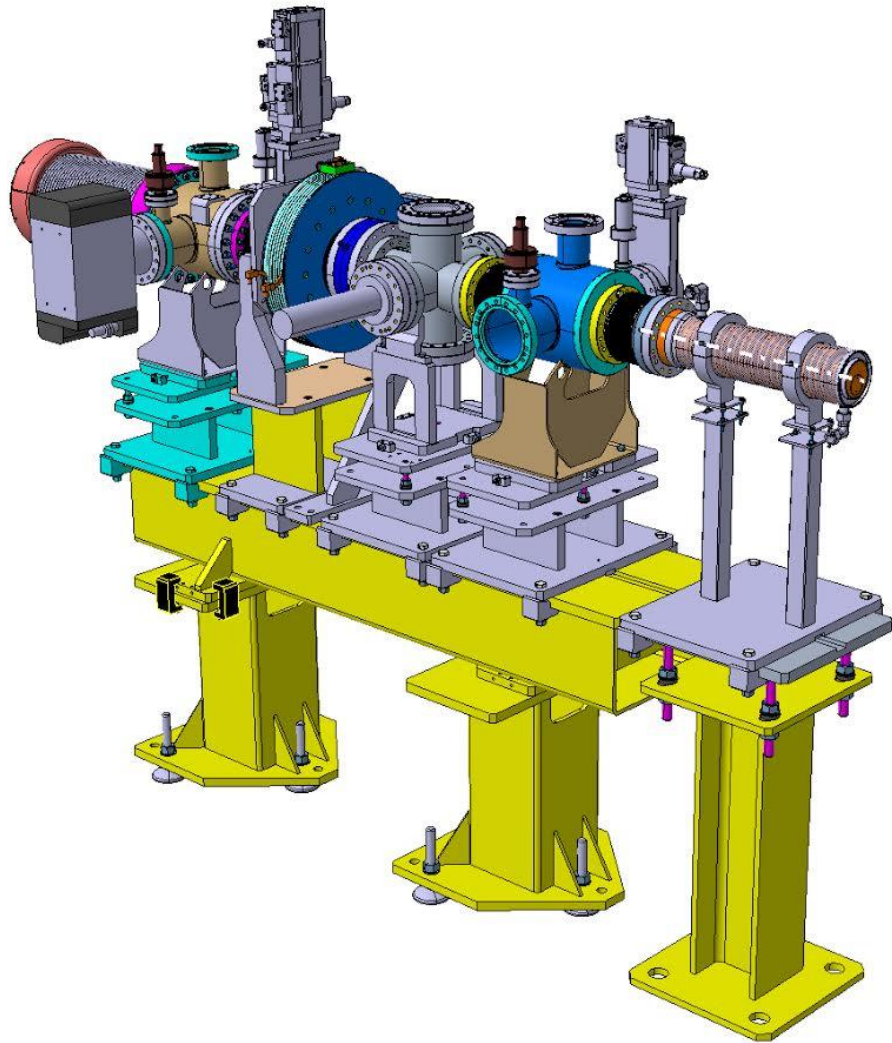


Cathode and connector



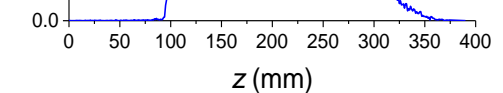
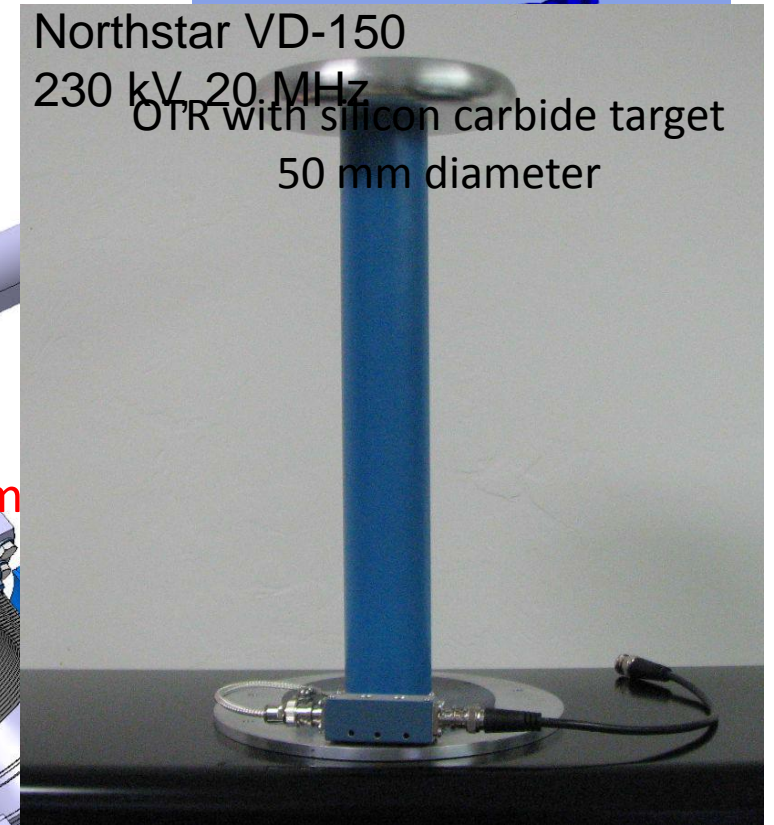
Vadim Soldatov

Dump and Diagnostics



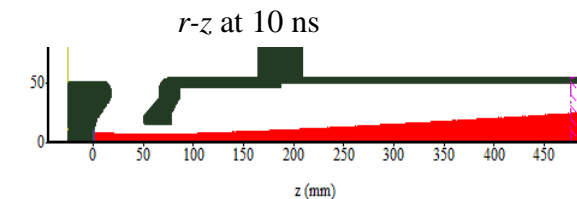
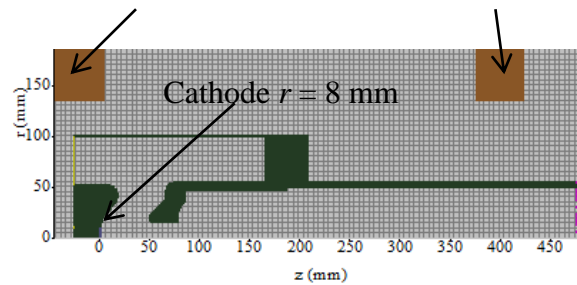
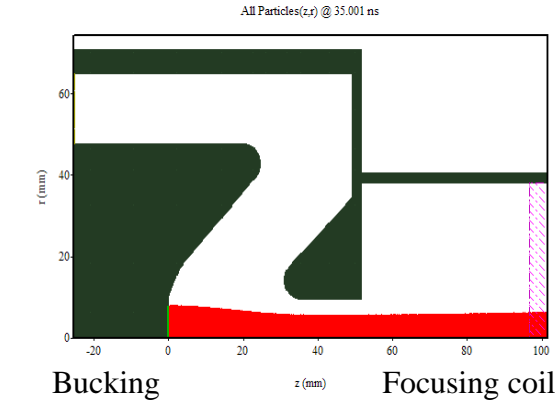
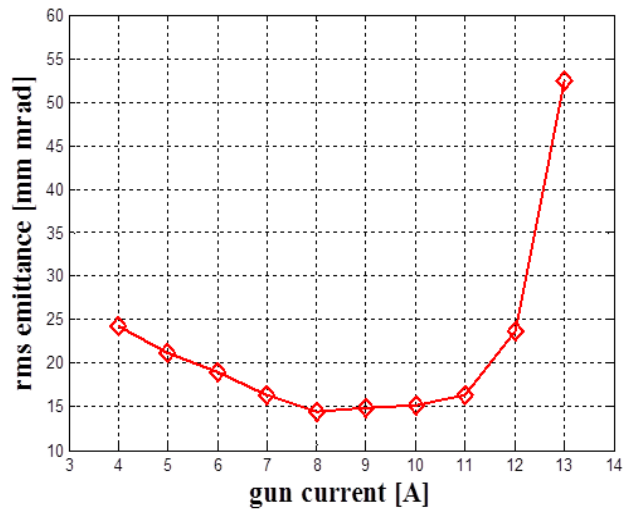
3D thermal analysis (ANSYS)

Northstar VD-150
230 kV, 20 MHz
OTR with silicon carbide target
50 mm diameter

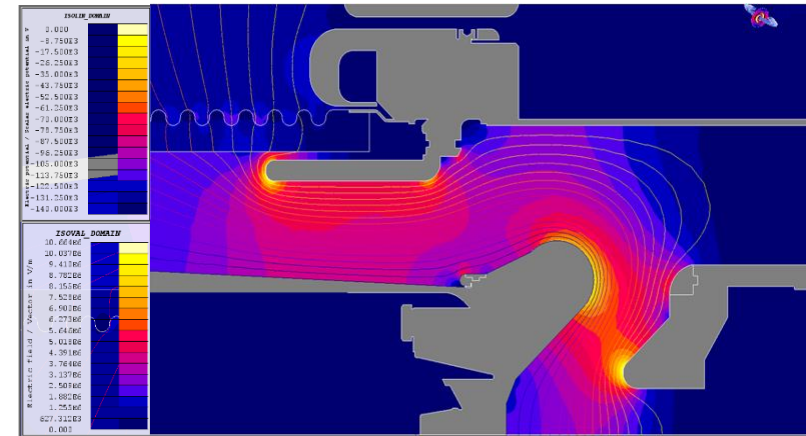


MAGIC simulation example of the electron gun

Current dependence of the emittance for the 8 mm cathode (EGUN)



Electrical field simulations in the cathode region to check possible breakdown locations (Flux2D).
Maximum surface field 14 kV/cm



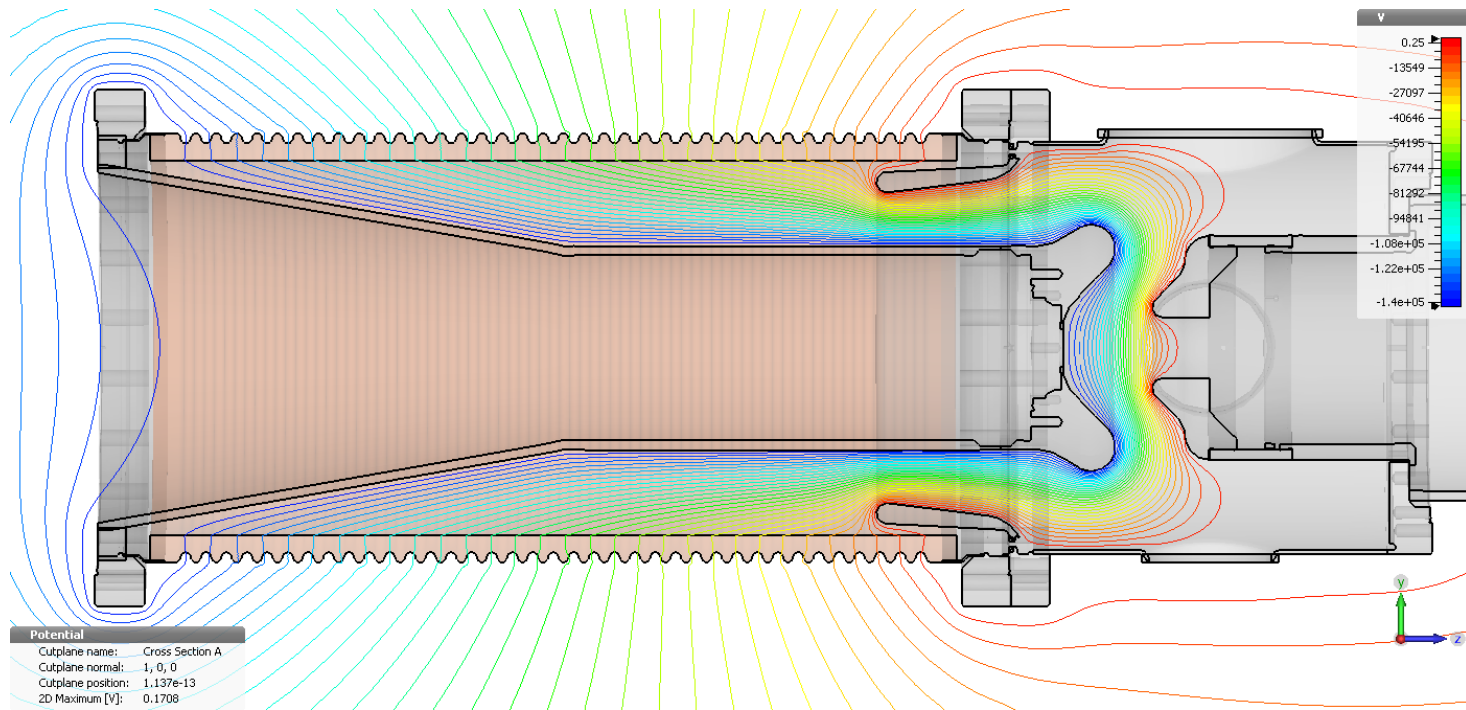
Jacques Gardelle, CEA
Bruno Cassany, CEA
Romain Pecquois, CEA
Steffen Doebert

Simulations

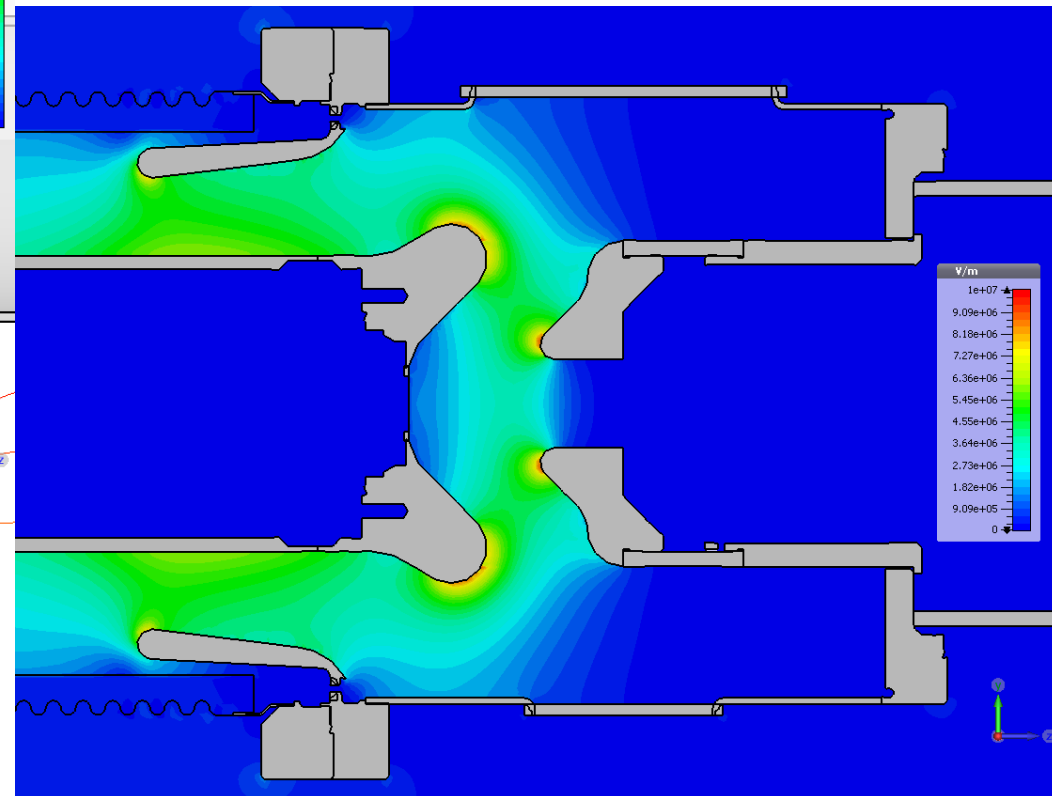
CST studio Tracking solver



Potential



E-field

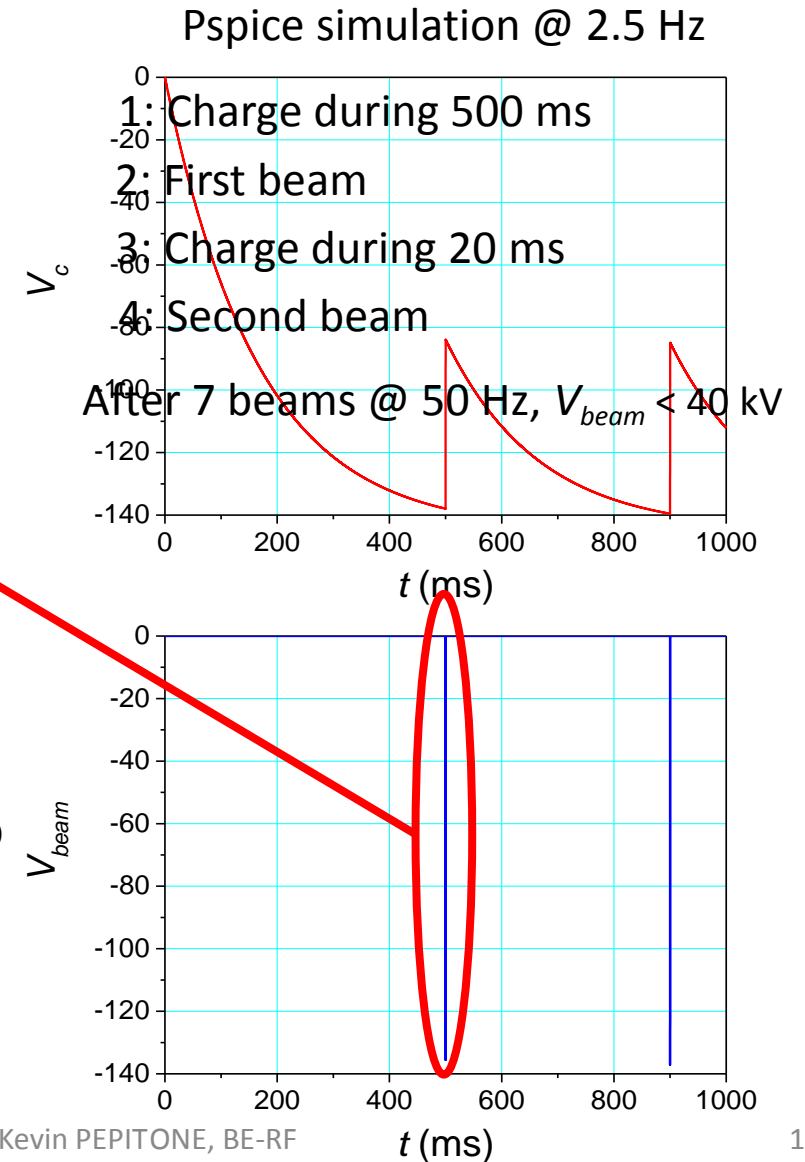
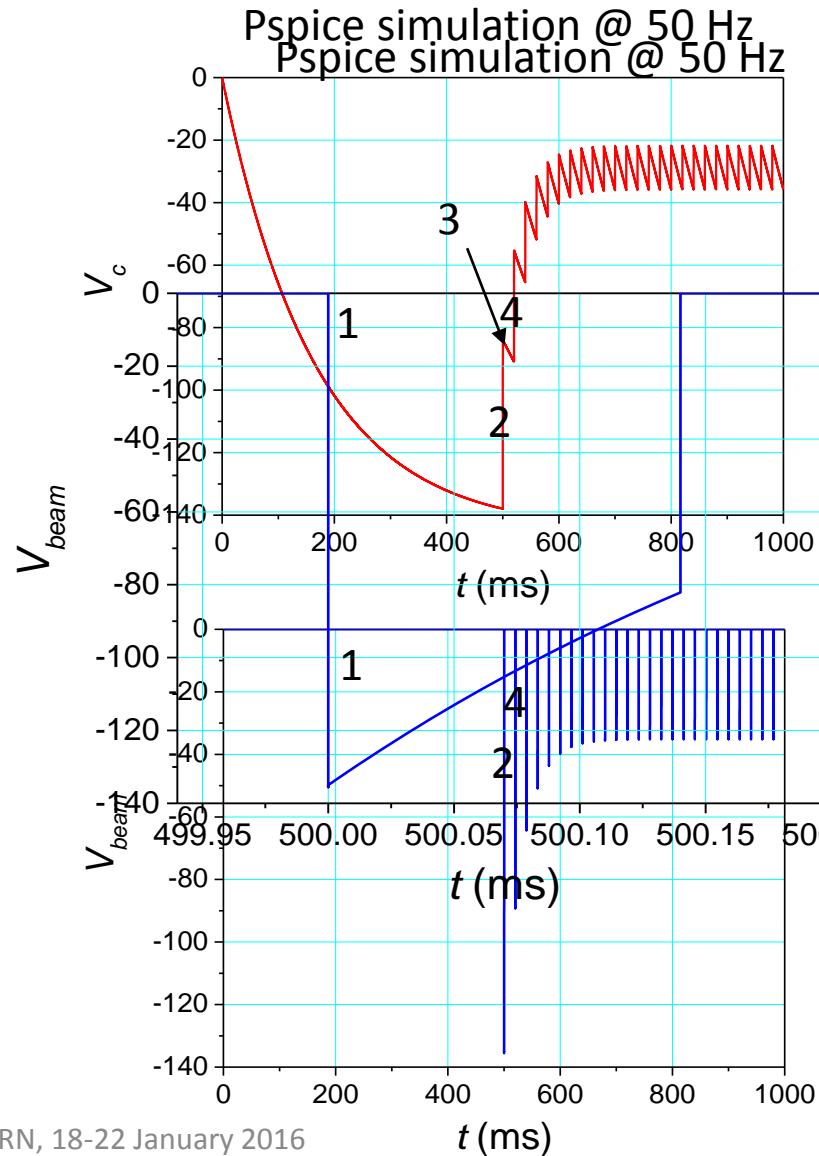
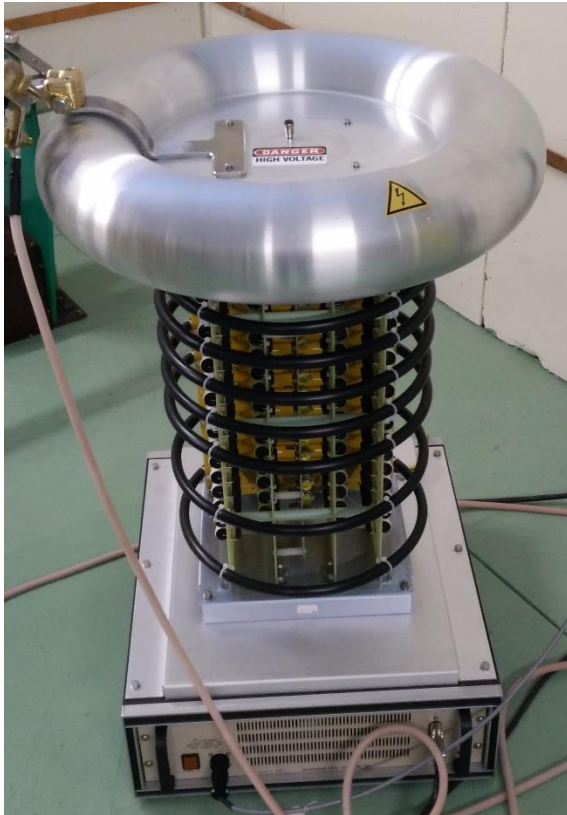


Perspectives

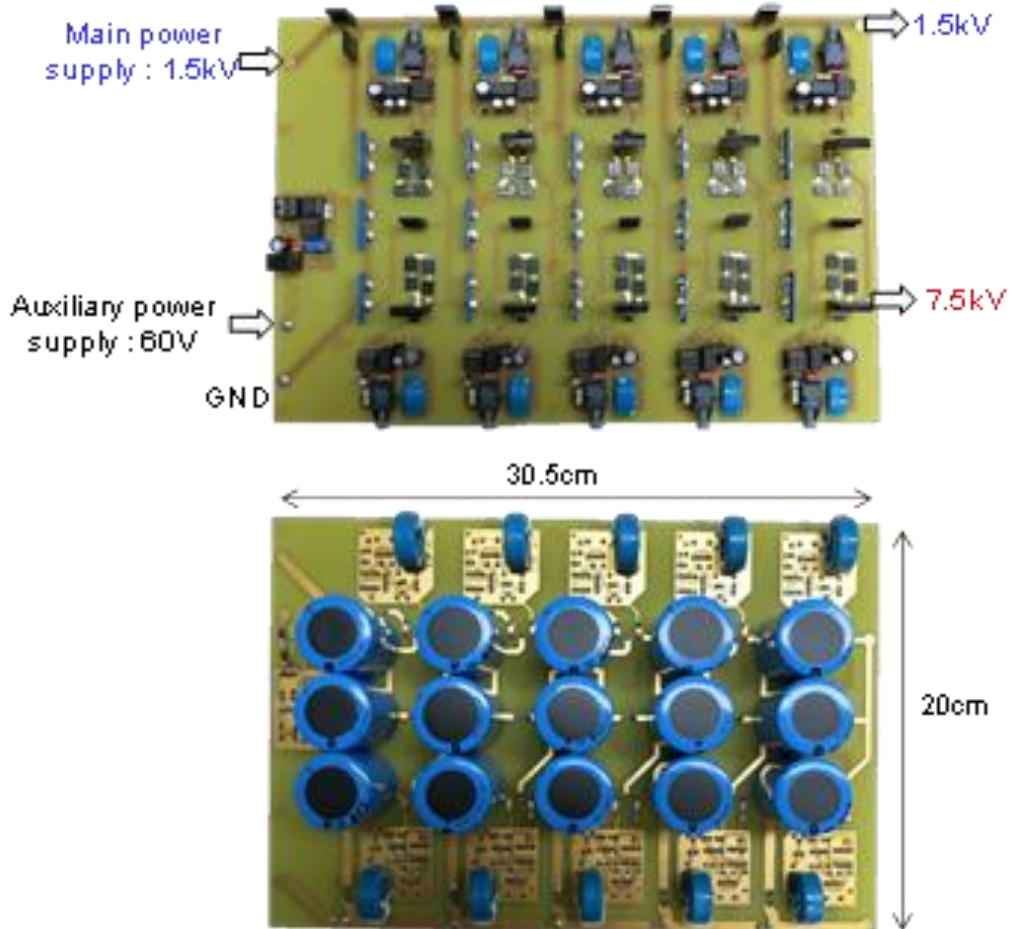
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Perspectives

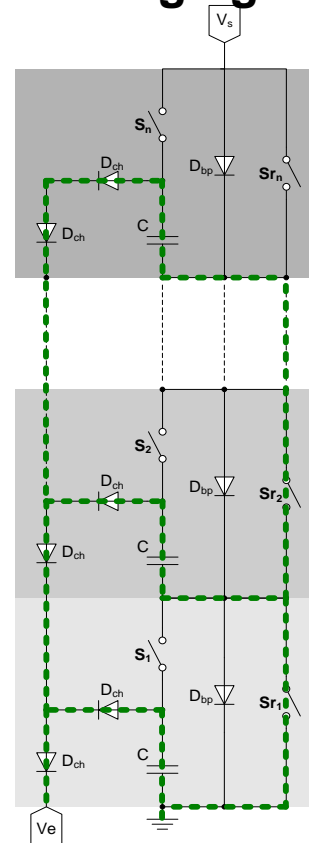
10 mA power supply



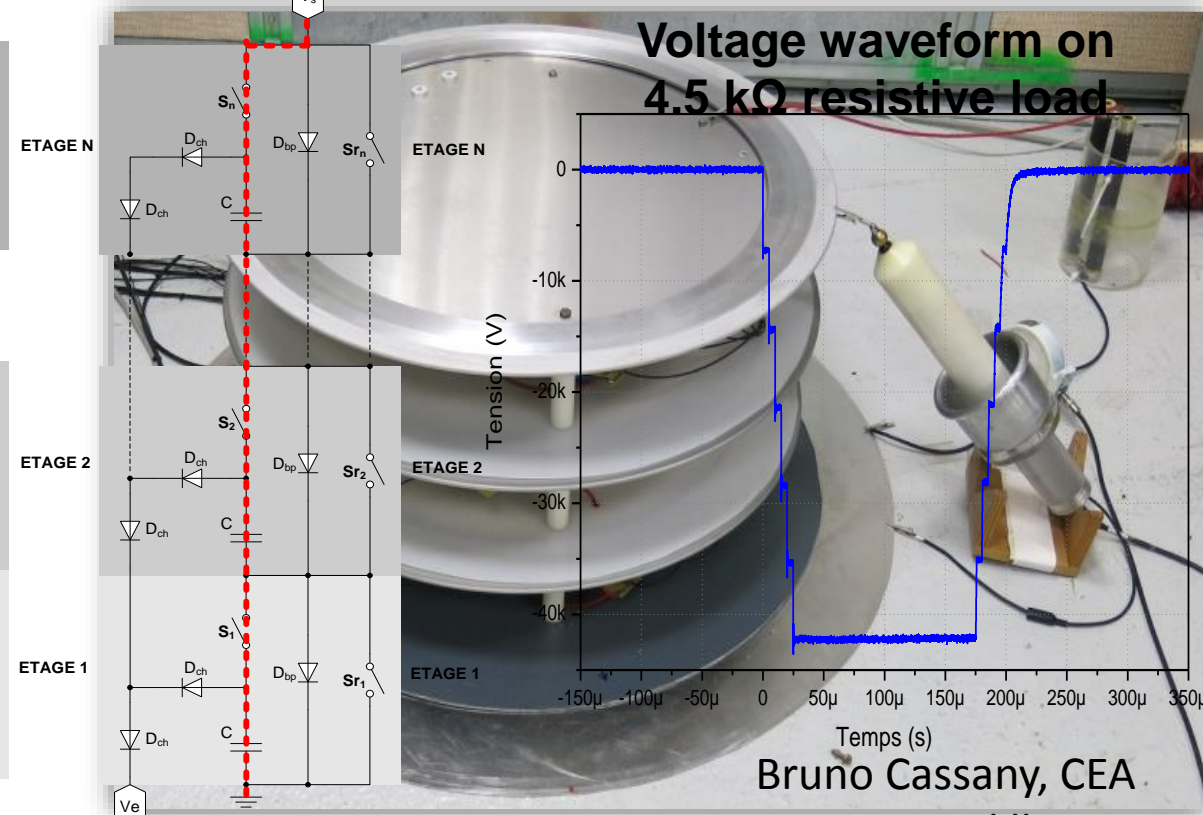
Modular 7.5 kV board



Schematic of the modulator during charging and discharging



Prototype of the modulator during HV tests



Conclusions

- Integration and installation of the gun in the area are completed
- Vacuum is good
- New components are expected:
 - ❖ Optical diagnostic
 - ❖ Dump
 - ❖ Connector
- The first tests with short pulses beams will be performed in 2016
- The tests with long pulses at 50 Hz should be performed in 2016



Thank you for your attention