Running status of SRF gun II at ELBE radiation center

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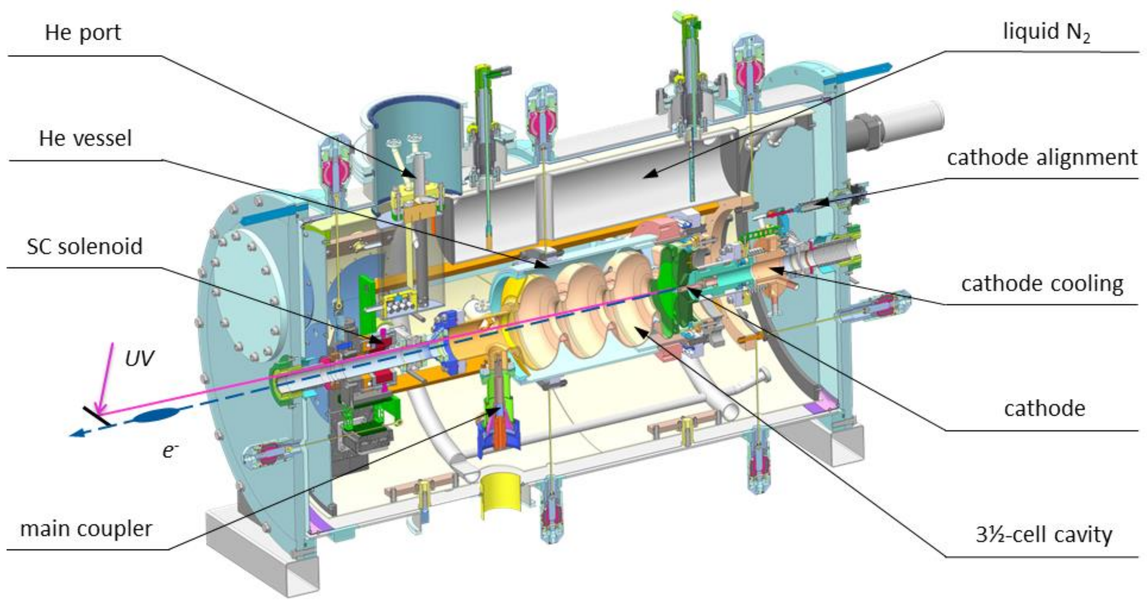
Introduction

As a new electron source with higher brilliance, the second version of the superconducting RF photoinjector (SRF Gun II) has been successfully commissioned at the ELBE Center for High-Power Radiation Sources



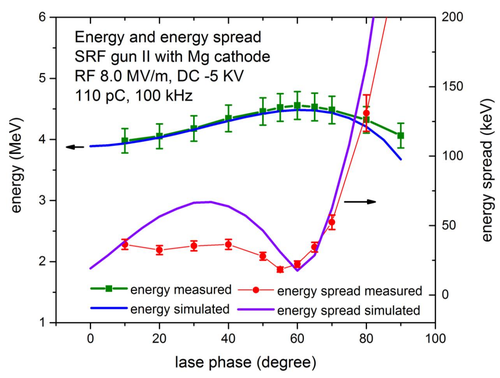
- CW operation 100kHz
- high bunch charge 300 pC
- low emittance, low energy spread
- short pulses (ps)

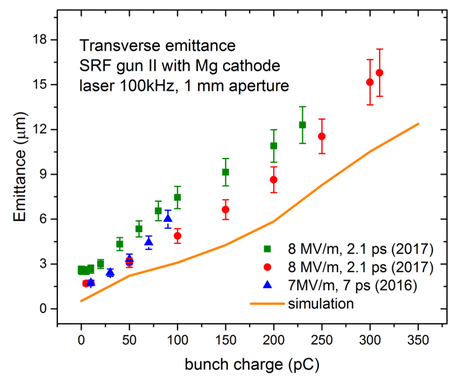
- 1.3 GHz 3+½ cell Nb cavity,
- integrated SC solenoid
- I_{dark} < 50 nA @ 7 MV/m,
- DC bias on cathode

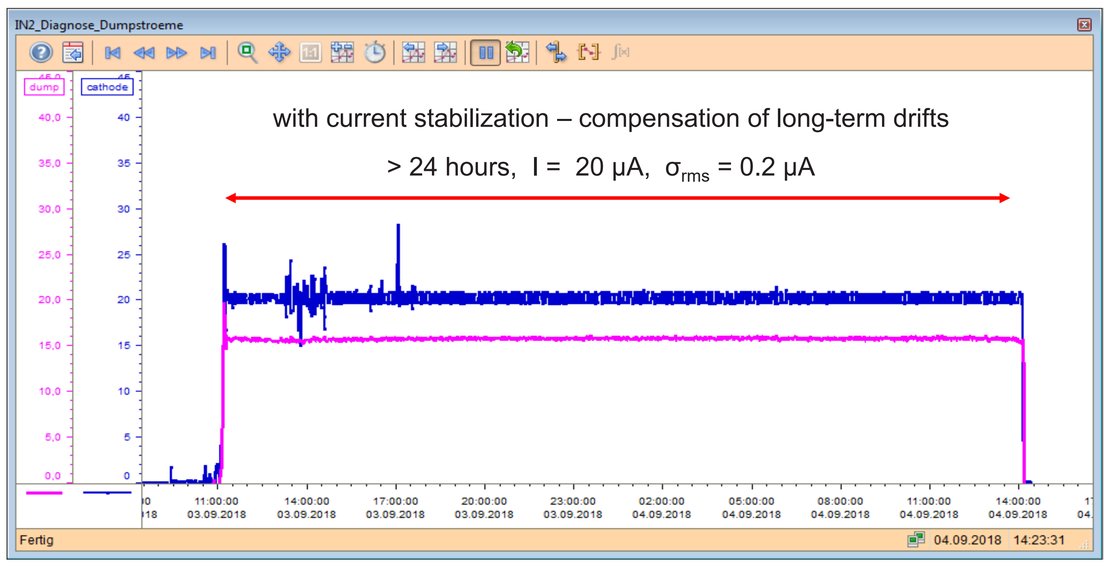
Beam parameters

parameter	SRF gun II
energy	**4.5 MeV**
bunch charge	**0 – 300 pC**
transv. emit.	**2 – 15 µm**
energy spread	**5 – 25 keV**
micro pulse rate	100 – 500 kHz[1)], 13 MHz[2)]
beam current (CW)	30 µA[1)], 200 µA[2)]
dark current	50 nA

[1)] Mg cathode [2)] Cs_2Te cathode

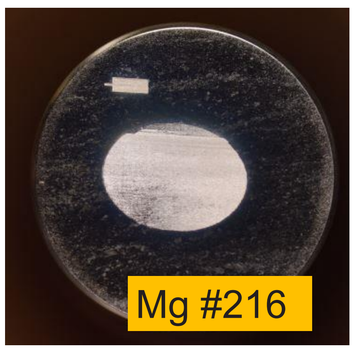


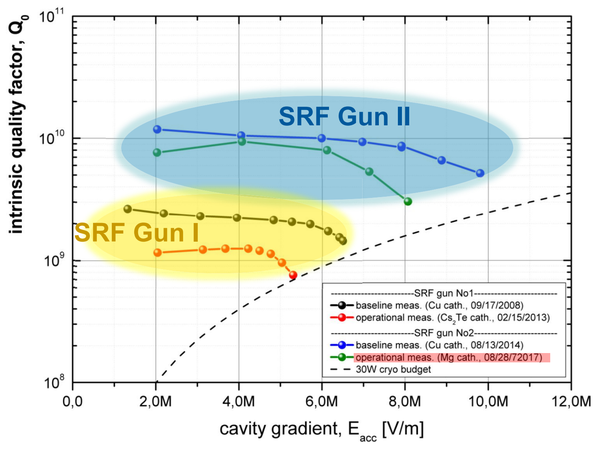


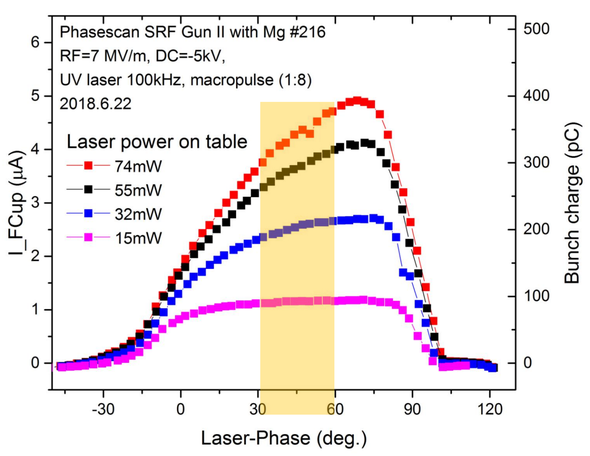


SRF Gun II with Mg photocathode

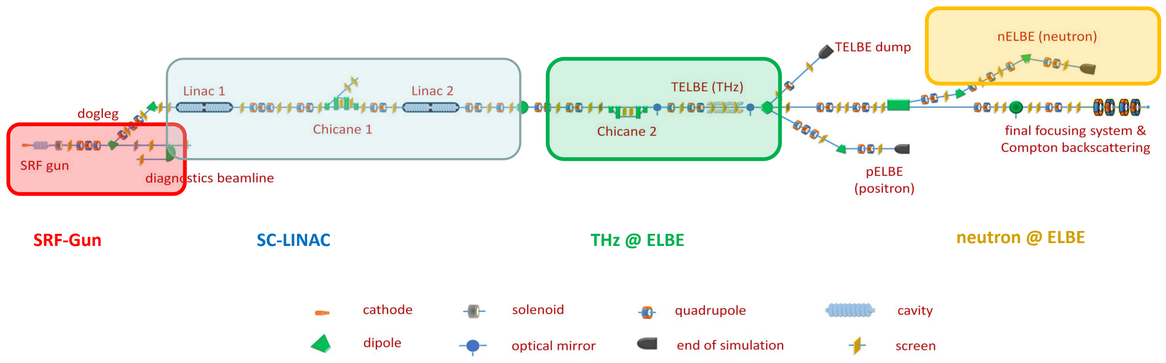
- Mg cathodes QE 0.1%~0.6% @ 258nm
- Mg cleaned with UV laser
- stable, long lifetime in SRF gun
- low dark current
- low thermal emittance
- laser: 258 nm, 100 kHz, 2 ps, Gaussian







User application



SRF Gun II for user shifts with 200 pC[1)] @ 100 kHz :

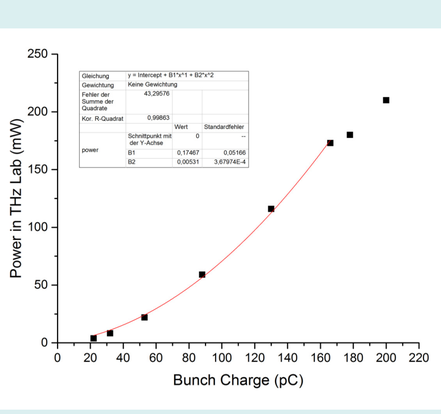
THz production **TELBE**:

>4 times higher THz power

neutron production **nELBE**:

2 times more neutrons

[1)] the previously used thermionic DC gun has a maximum of 80 pC



Acknowledgement

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References

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