
Status of the Rossendorf SRF-Gun Project

Jochen Teichert

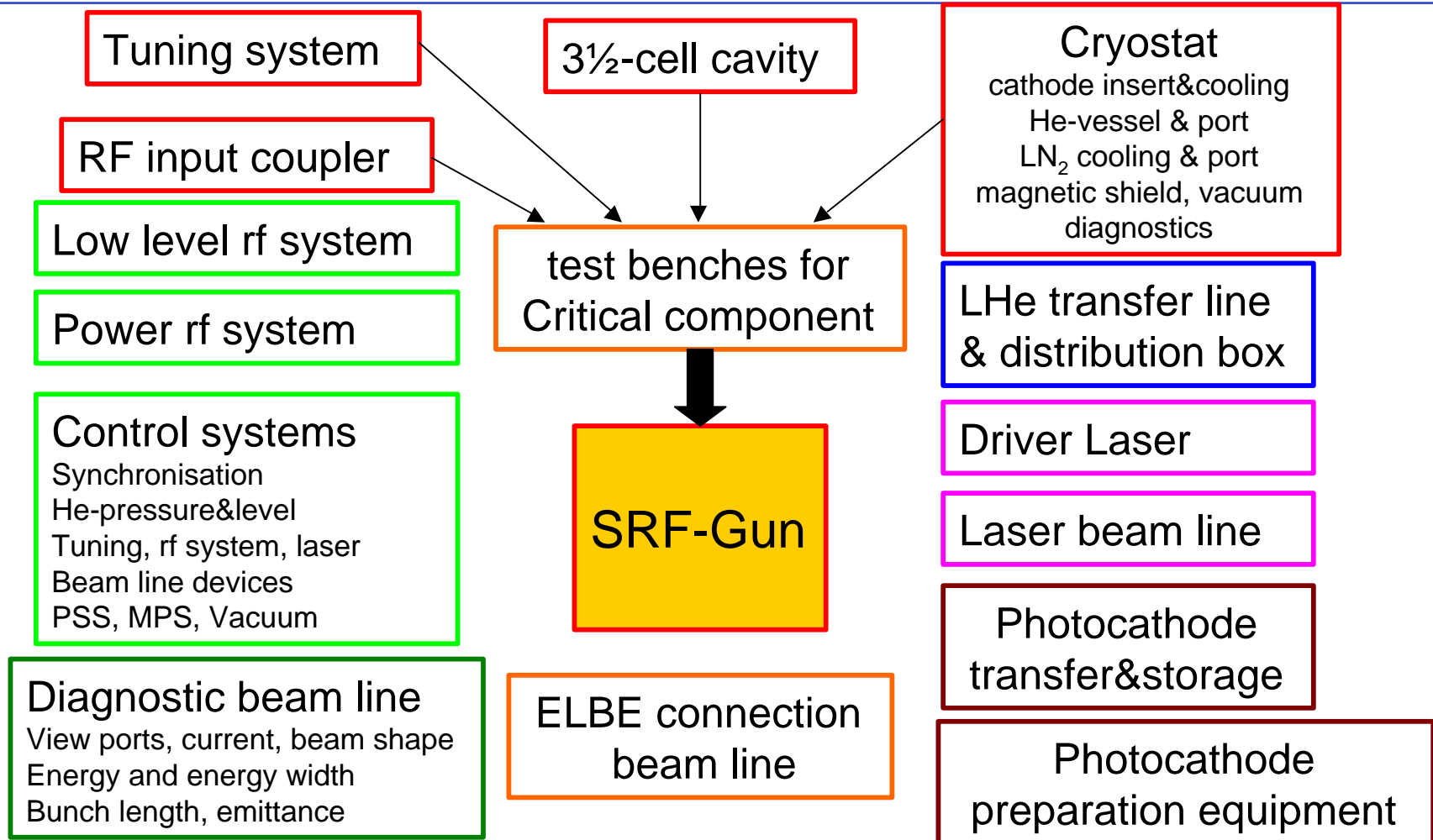
Forschungszentrum Rossendorf
Zentralabteilung Strahlungsquelle ELBE
PF 510119, 01314 Dresden
J.Teichert@fz-rossendorf.de

SRF-Photogun – Basic Design

Normal-conducting cathode inside SC cavity

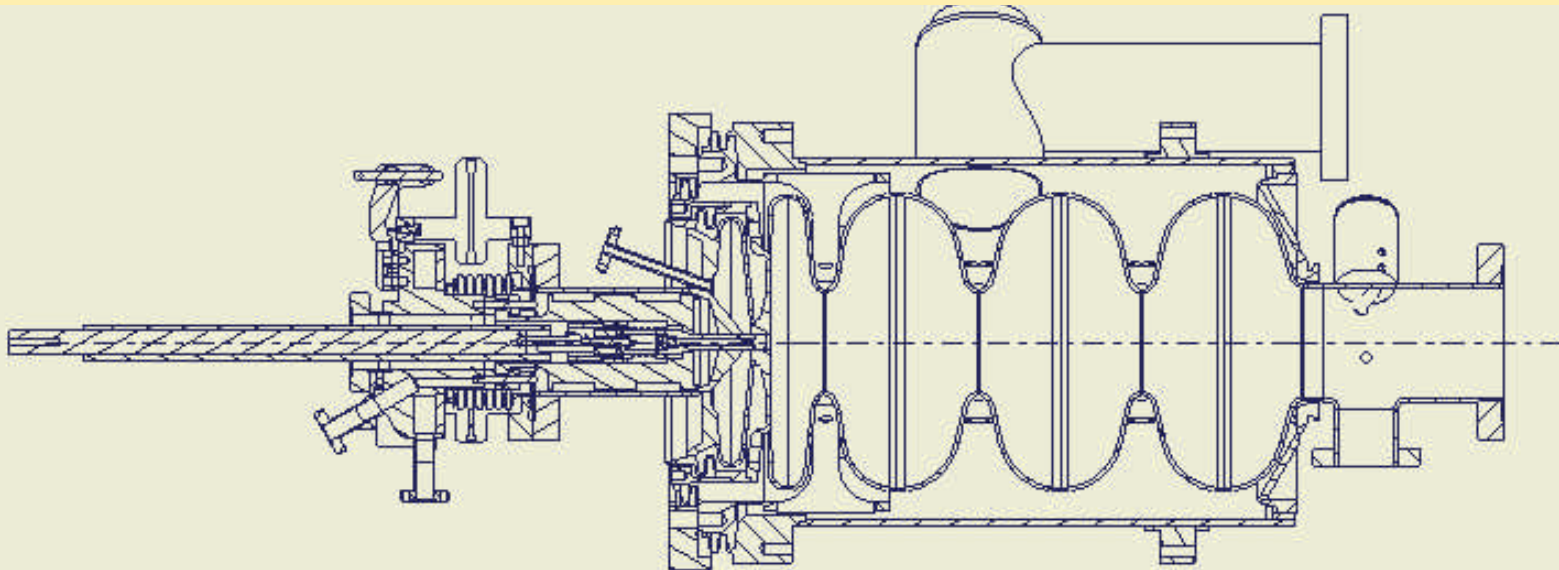
Cavity:	Niobium 3+1/2 cell (TESLA Geometry)
	Choke filter
Operation:	T = 1.8 K
Frequency:	1.3 GHz
HF power:	10 kW
Electron energy:	10 MeV
Average current:	1 mA
Cathode:	Cs ₂ Te
	thermally insulated, LN ₂ cooled
Laser:	262 nm, 1W
Pulse frequency:	13 MHz & < 1 MHz
Bunch charge:	77 pC & 1 nC

Main Components of the ELBE SRF-Photogun



SRF-Photogun Cavity Fabrication

Status: Design was finished in Spring 2004
Fabrication of 2 (RRR 40 & 300) cavities at ACCEL GmbH
e-beam welding has still to be done
Delivery December 2004
Third cavity (Chinese RRR 150 Nb) by Peking University



SRF-Photogun Cavity Treatment

Planning of the cavity treatment in 2005 after delivery:

Main steps

Warm (static) tuning with respect to frequency and field profile
at FZR, needed of a special bead-pull machine

Wet chemical etching of choke cell surfaces
at DESY, (low field area)

100 μm electropolishing of gun half-cell
and TESLA cells, (high field area)
in collaboration with the company
HENKEL Pickling and Electropolishing Ltd.



SRF-Photogun Cavity Treatment

- 800 °C high temperature heat treatment (stress anneal & H removal) in collaboration with DESY
- Second field profile measurement and warm tuning at FZR
- 40 μm electro polishing at HENKEL
- Final clean room treatment & high pressure rinsing in collaboration with DESY
- Cavity vertical test, for Q-value and maximum field gradient, in collaboration with DESY

DESIGN PARAMETERS

$$E_{\max} = 50 \text{ MV/m (T cells)}$$

$$E_{\max} = 33 \text{ MV/m (1/2 cell)}$$

$$E_{\text{acc}} = 25 \text{ MV/m}$$

$$Q_0 = 10^{10}$$

Field profile unflatness

< 5%

SRF-Photogun Cryomodule

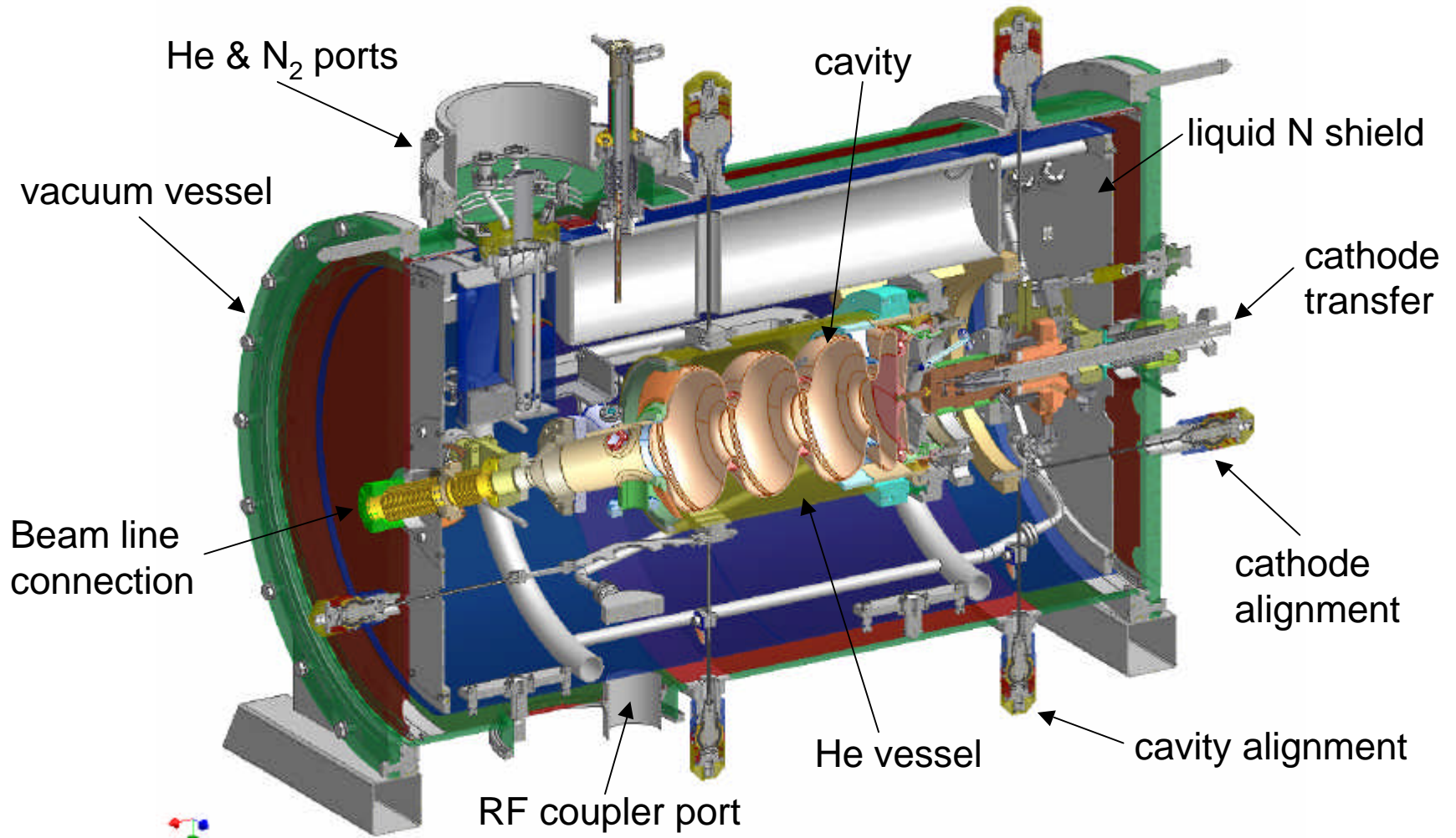
Status:

Design of cryomodule completely finished in July 2004

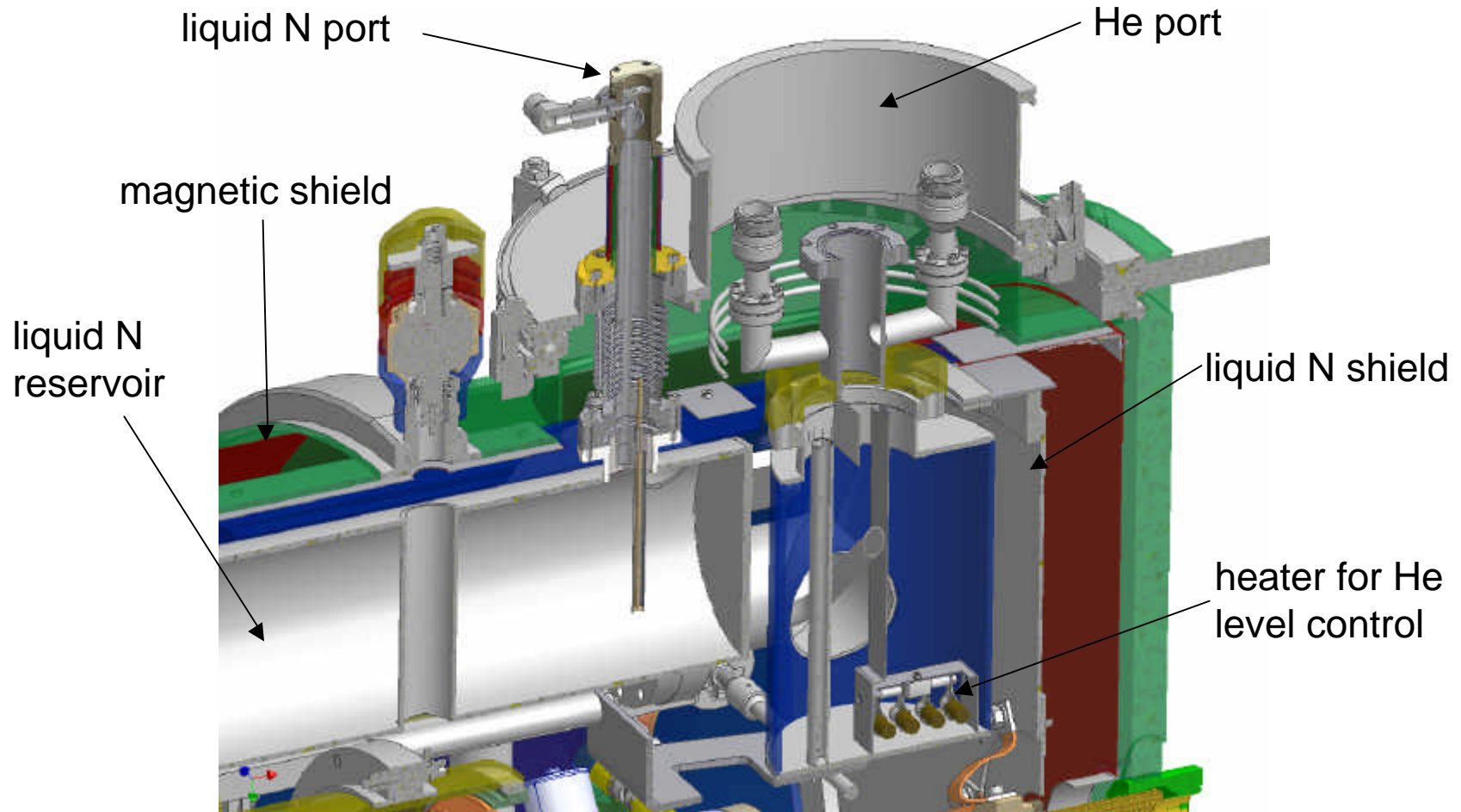
Some of the critical parts in fabrication or ordered
cavity tuners: fabrication finished
cathode cooling system: in fabrication (second)
liquid N₂ shield: ordered

Main part of the components will be ordered in 2005
specifications and tenders are under way

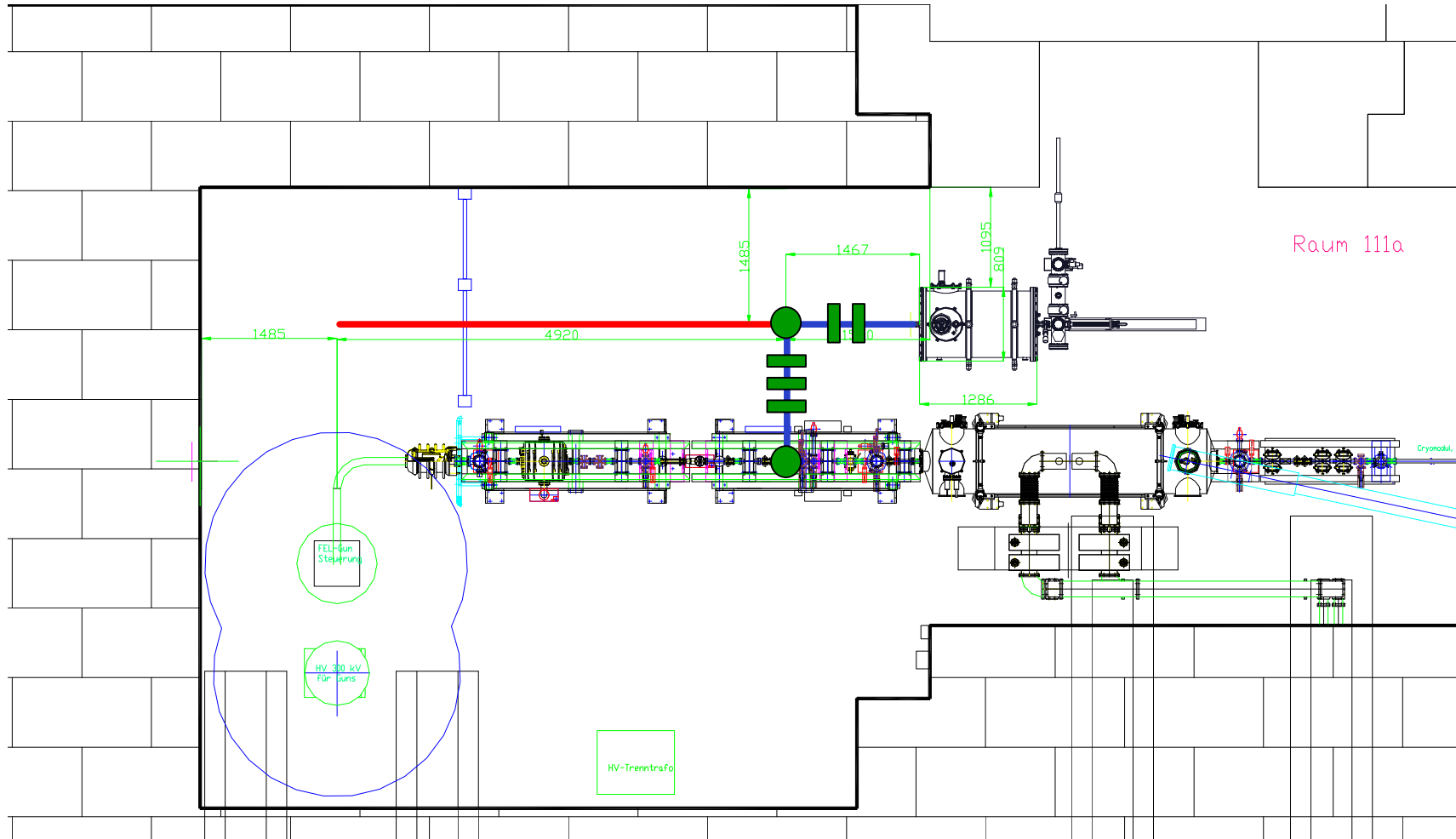
SRF-Photgun Cryomodule



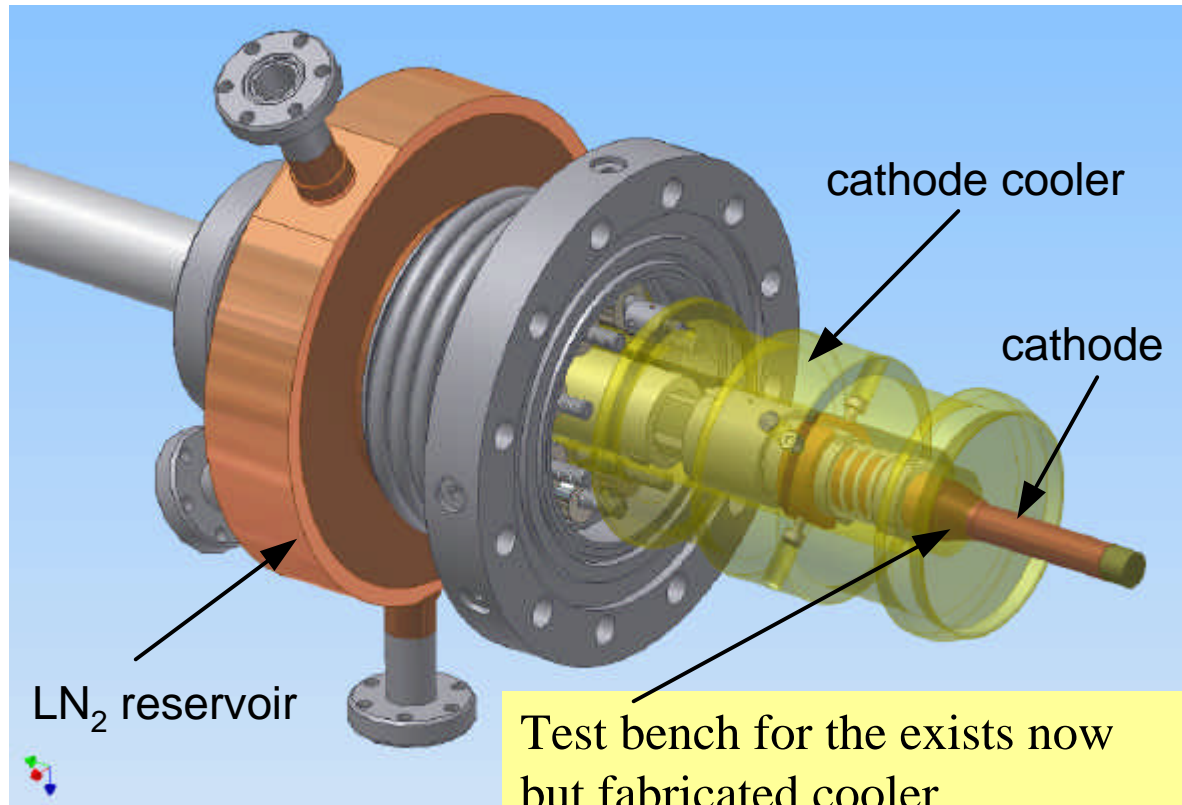
SRF-Photogun Cryomodule



SRF Gun Place and Connection with ELBE accelerator



SRF Photogun – Liquid N Cathode Cooling

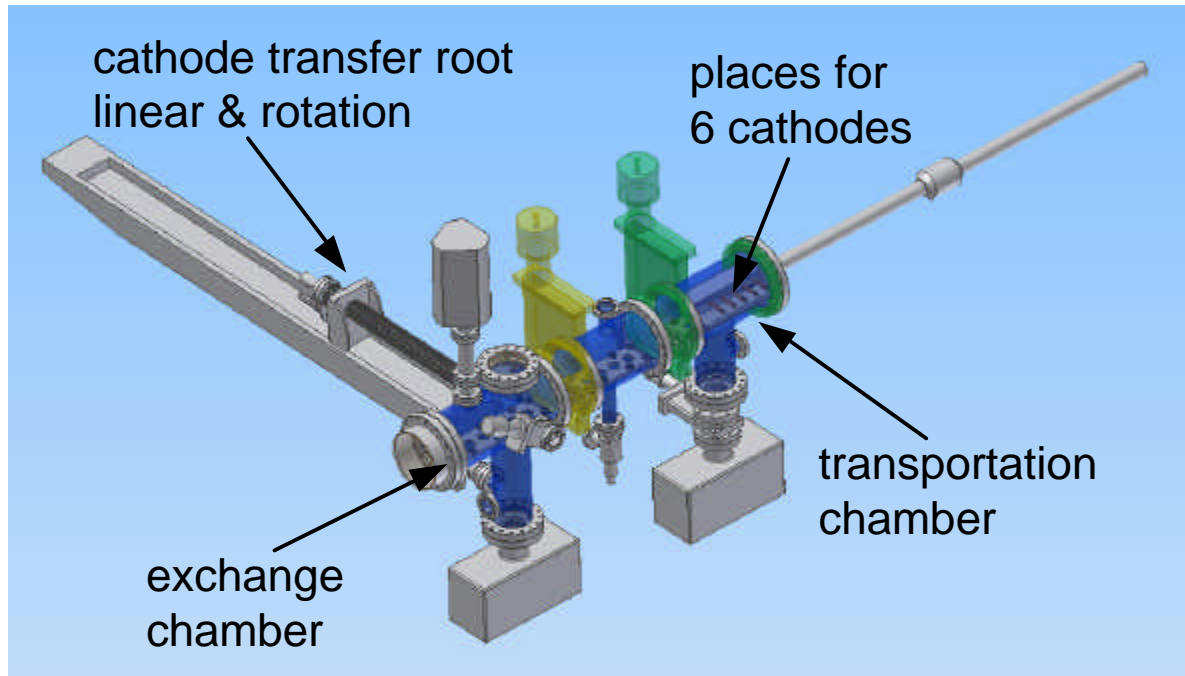


Test bench for the exists now
but fabricated cooler
(incorrect measures after welding)

Test bench

thermal
conductance
measurements,
cathode
temperature?
&
test of the
cathode transfer
system

SRF Photogun – Cathode Exchange & Transport



Design is finished
for one system (preparation chamber)
vacuum parts are ordered, fabrication is started
see also Rong Xiang's talk

2 identical systems

at the SRF-gun
(accelerator hall)
&
at the cathode
preparation
chamber
(preparation lab)

transportation
chambers allow
cathode transport
in UHV