



STATUS OF THE TARGET DEVELOPMENT **AND TARGET MONITORING AT SHIP**

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Status of the Target Development and Target Monitoring at SHIP

- Compound Targets
- Temperature Simulation
- Testing Possibilities
- Target Analysis
- Thickness Monitoring
- Cooling and Temperature Monitoring



Compound Targets

Pb 327°C (600 K)

PbS 1112°C (1385 K)



Already successfully
synthesized and irradiated

Bi 271°C (544 K)

BiF₃ 727°C (1000 K)

Bi₂O₃ 824°C (1097 K)

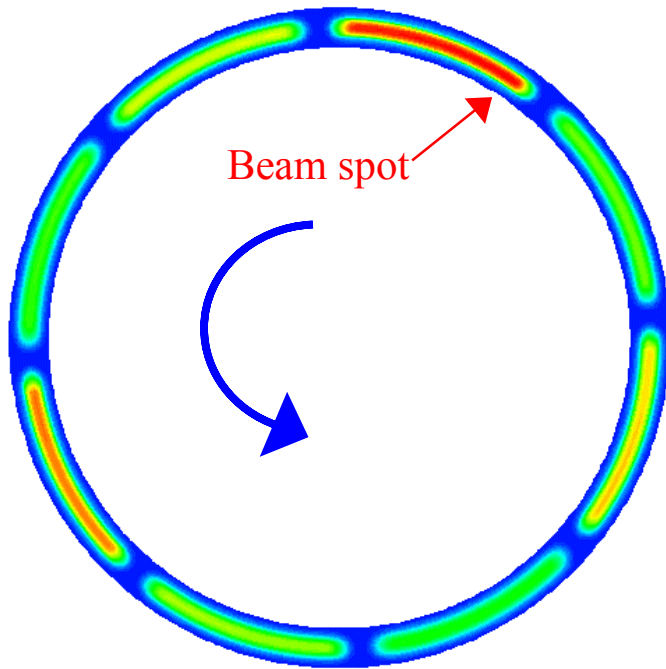


Already successfully
synthesized and irradiated
for Fluoride (Ta? → Pt)

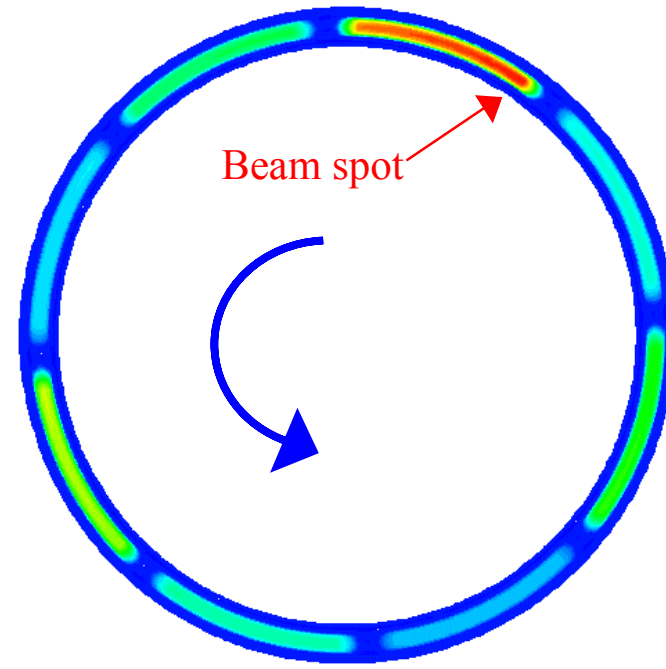
Temperature Simulation



C-Pb-C : 1.4×10^{13} particles/s
 T_{\max} 560 K – T_{\min} 420 K



C-PbS: 2.3×10^{13} particles/s
 T_{\max} 590 K – T_{\min} 350 K

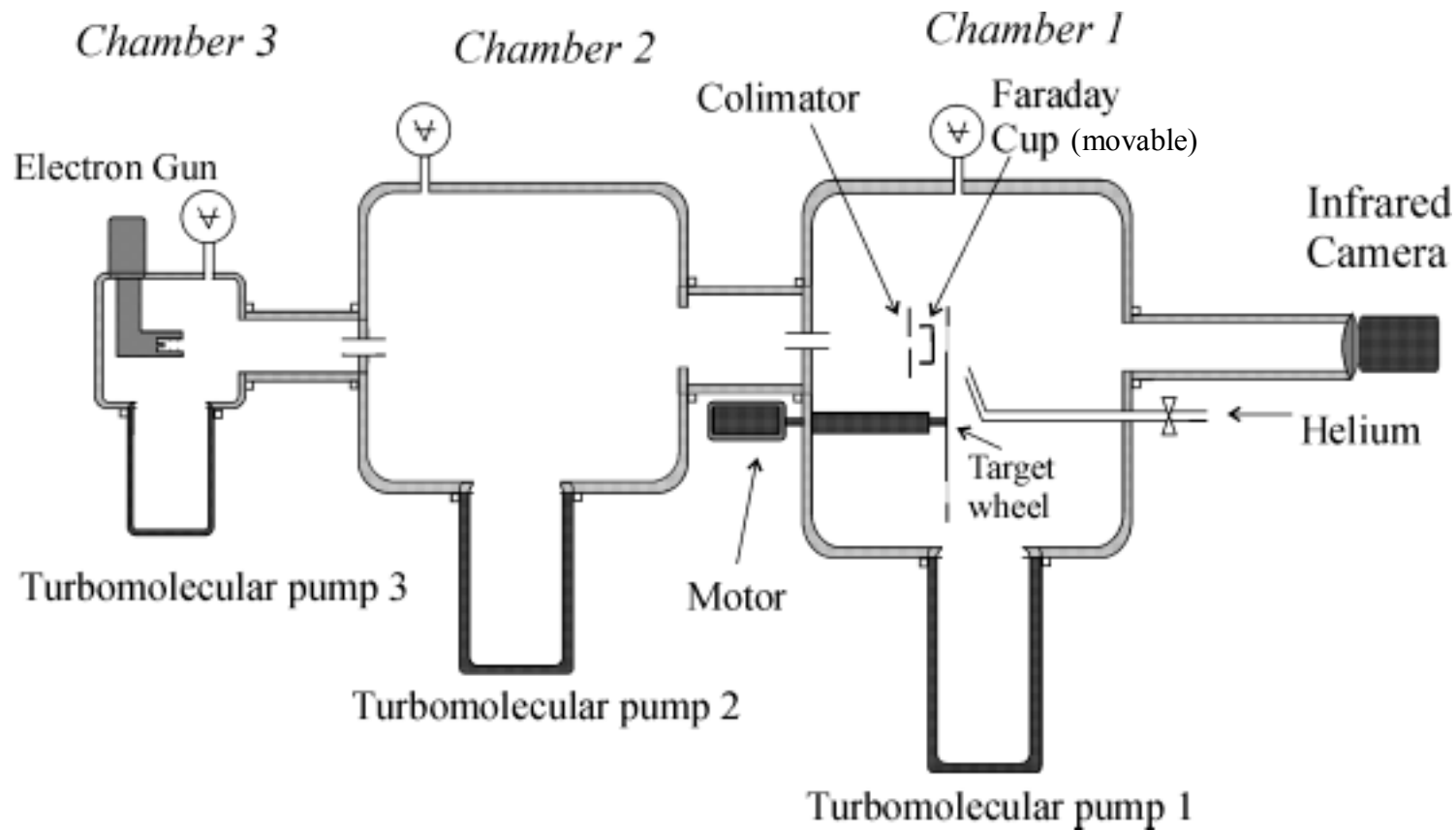


Temperature distribution in equilibrium for rotating target wheel with 1125 tpm irradiated with ^{40}Ar (5 MeV/u). Duty cycle 13.4 ms off / 6.6 ms on.



Testing Possibilities

- * Temperature monitoring (heating with e-gun!)
- * Changes in emissivity upon heating
- * Cooling in He-gas and with He-jet
- * Rotation speed
- * Differential pumping and apertures



Offline Target Analysis



● Qualitative Analysis:

- Optical microscopy
- Scanning Electron Microscopy (SEM)

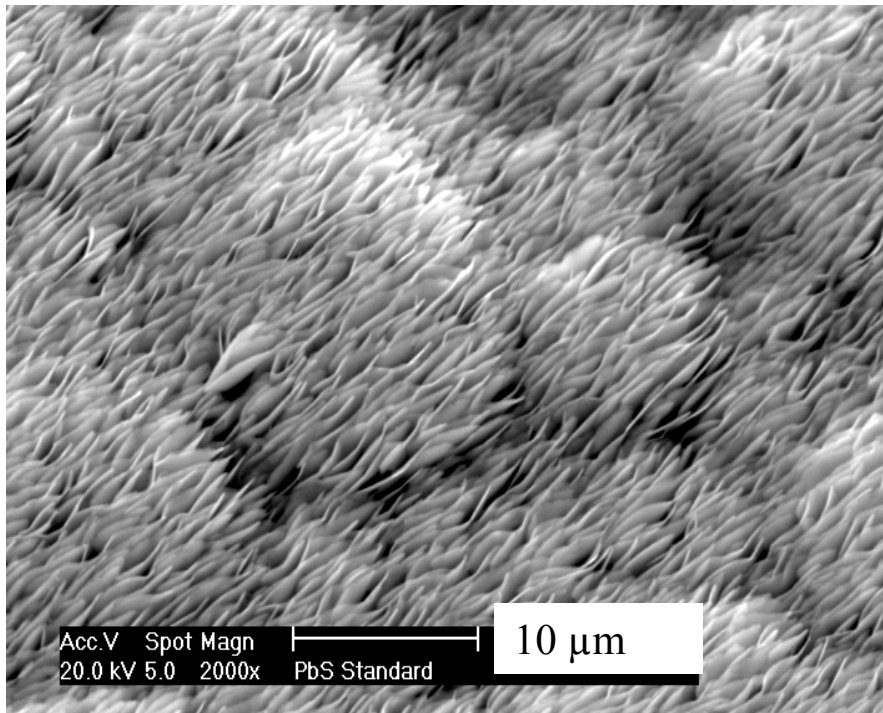
● Quantitative Analysis:

- Weighing
- Energydispersive X-ray analysis (EDX)
- Electron scattering

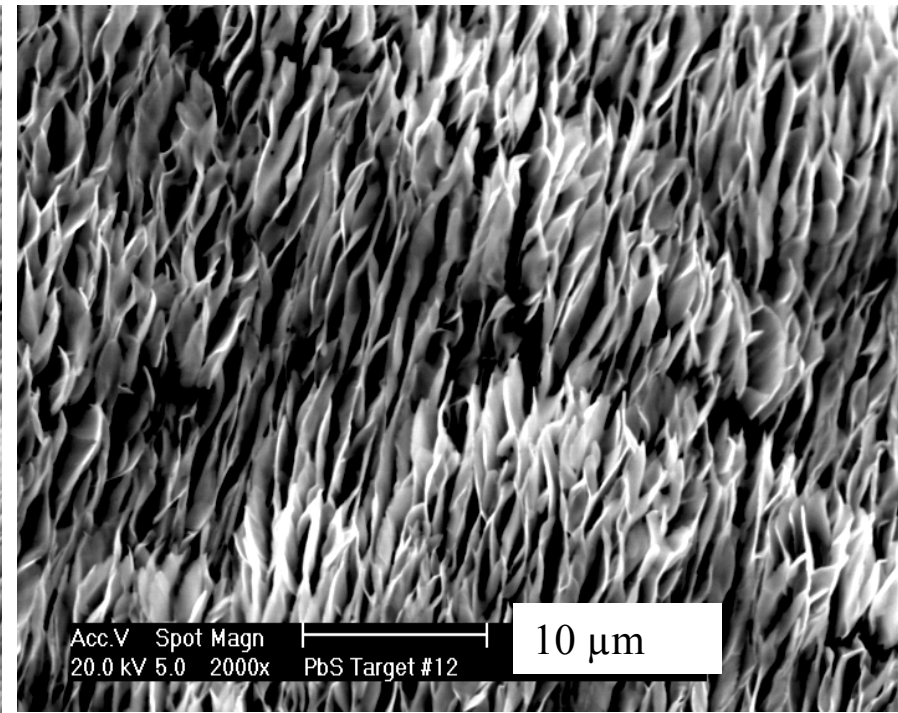
Scanning electron microscope (SEM) of PbS



As evaporated



Irradiated with $\sim 10^{11}$ p/s of ^{86}Kr



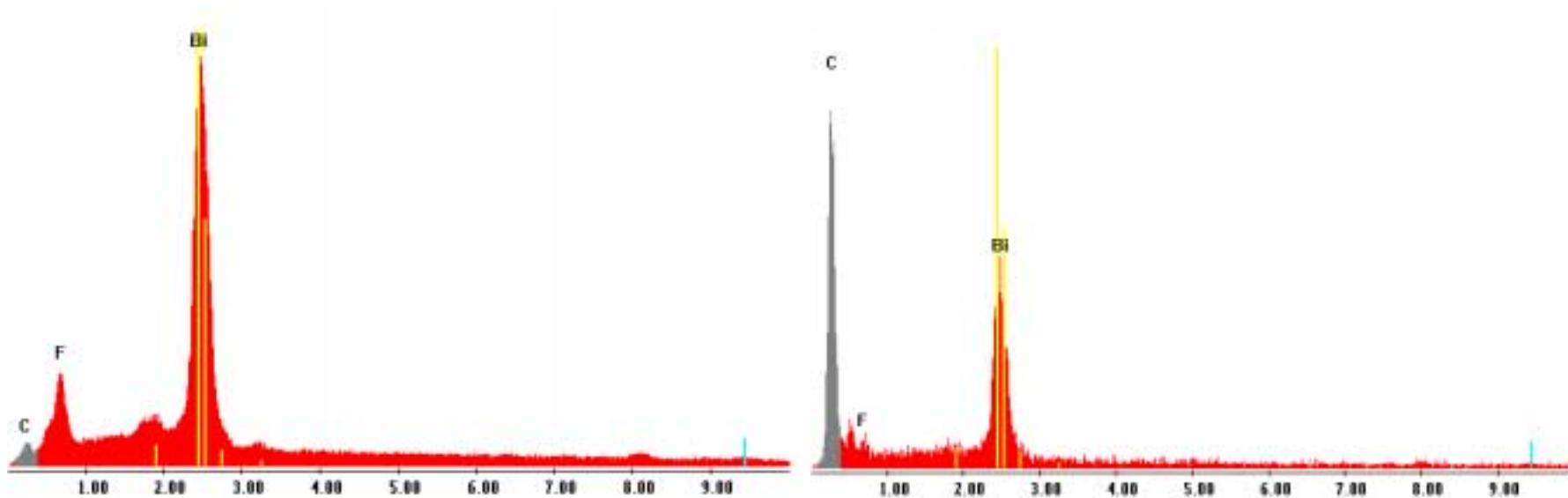
No observable material loss, but the structure changes!

Energydispersive Xray-Analysis of BiF₃



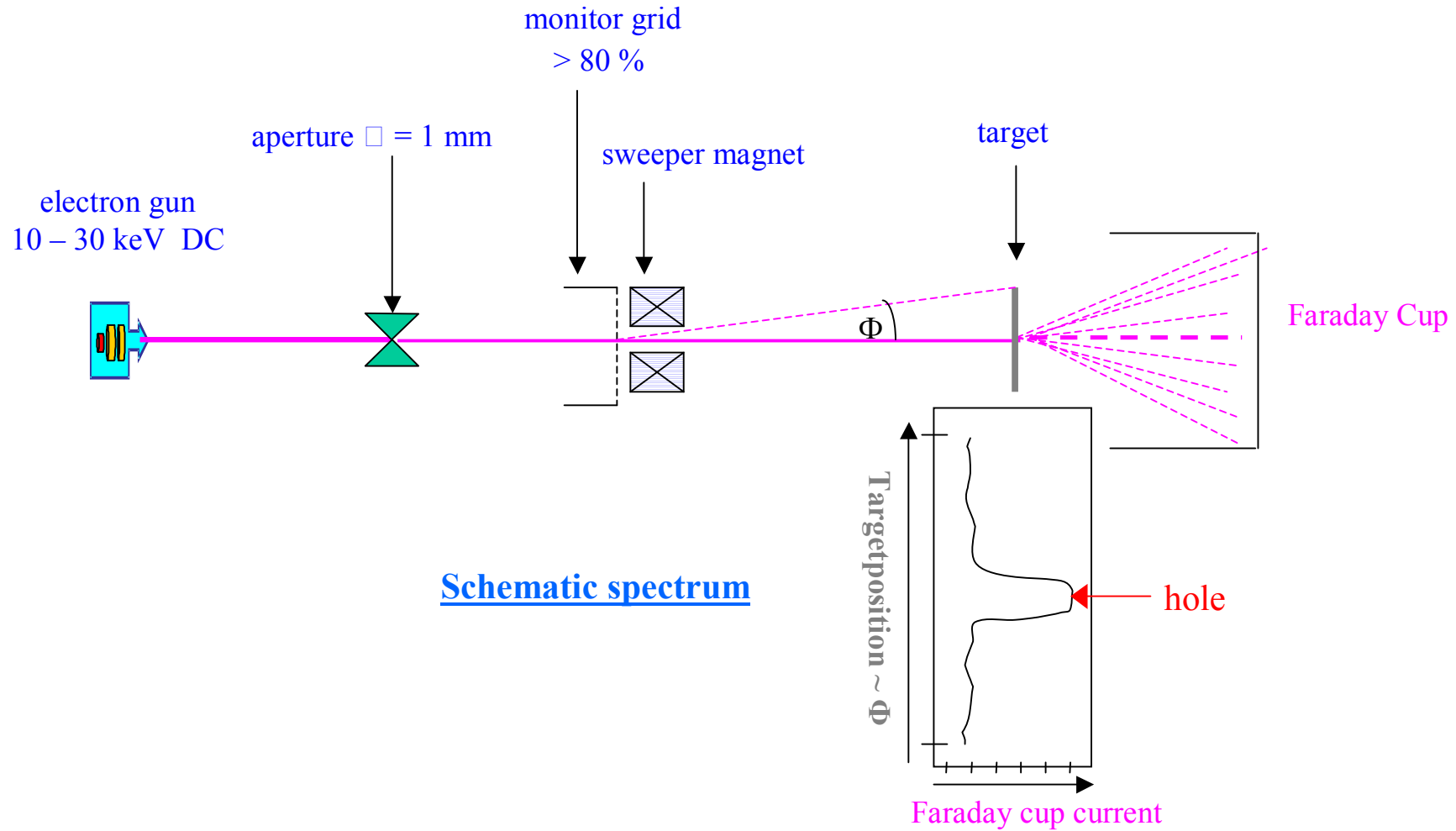
Non-irradiated BiF₃-target
as standard
5000 counts in C-Peak

BiF₃-target irradiated in Run 200
5000 counts in C-Peak

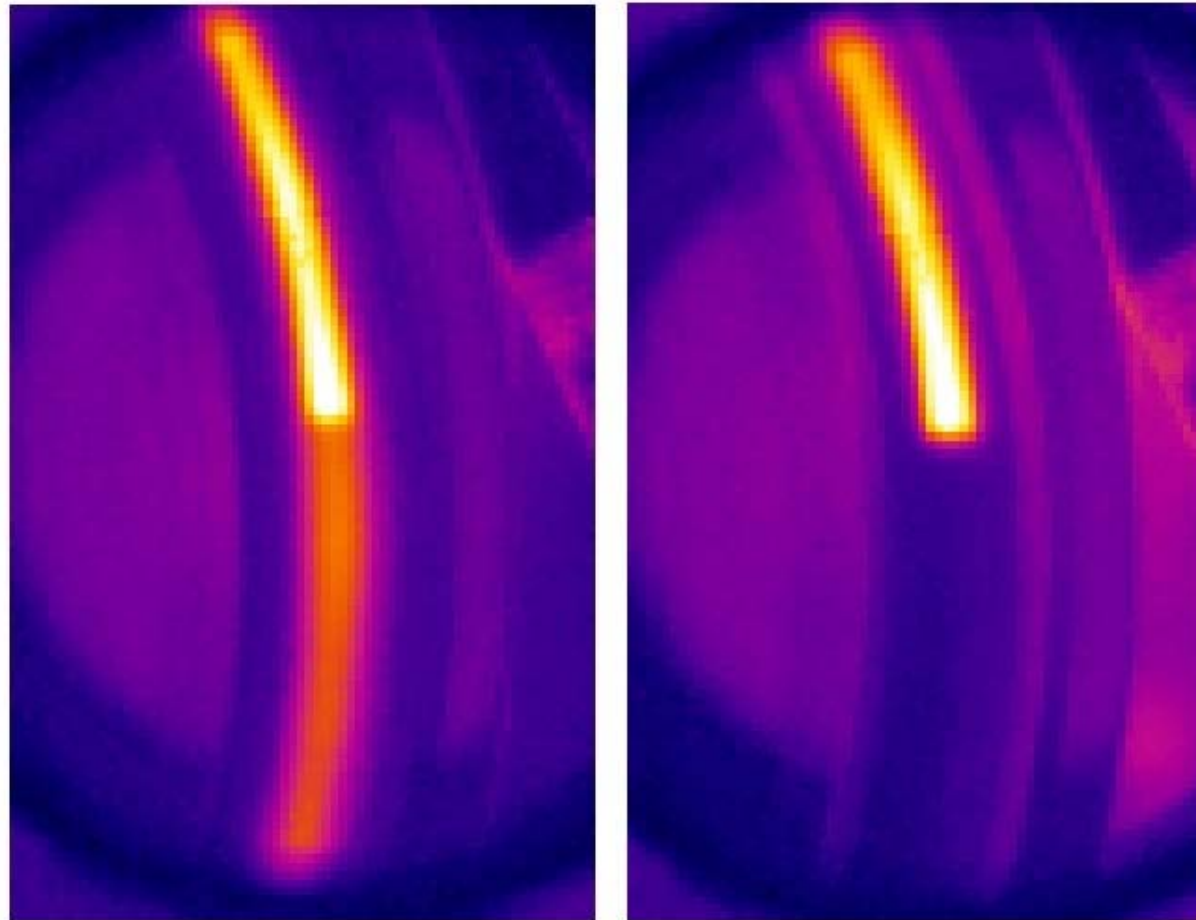


Significant material loss!

Thickness Monitoring (schematic)



Cooling and Temperature Monitoring



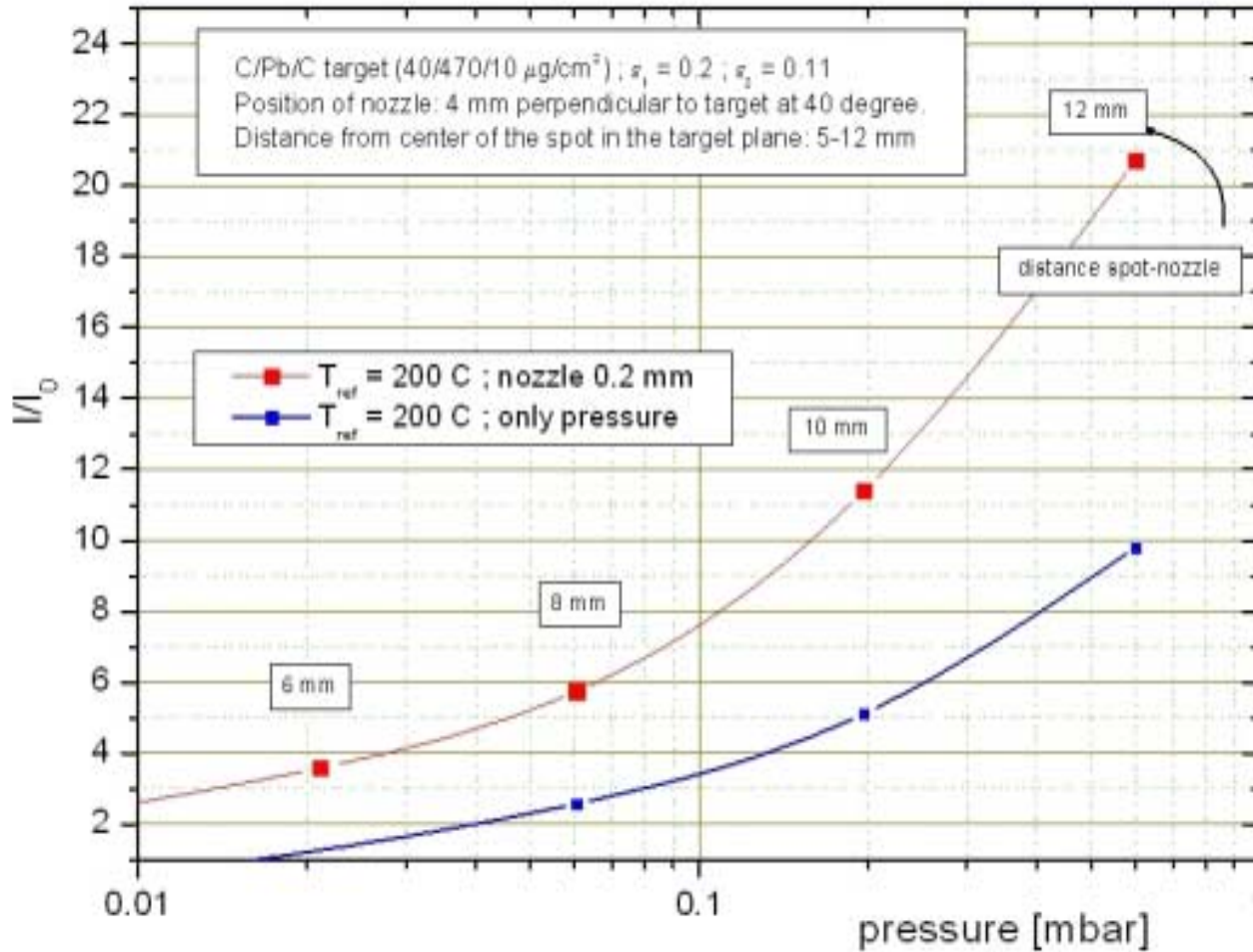
Vacuum:
 T_{\max} 150°C
 T_{\min} 85°C
⇨
 E_{dep} 1.3 W

0.6 mbar He:
 T_{\max} 150°C
 T_{\min} 35°C
⇨
 E_{dep} 2.7 W

First Results on Target Cooling I



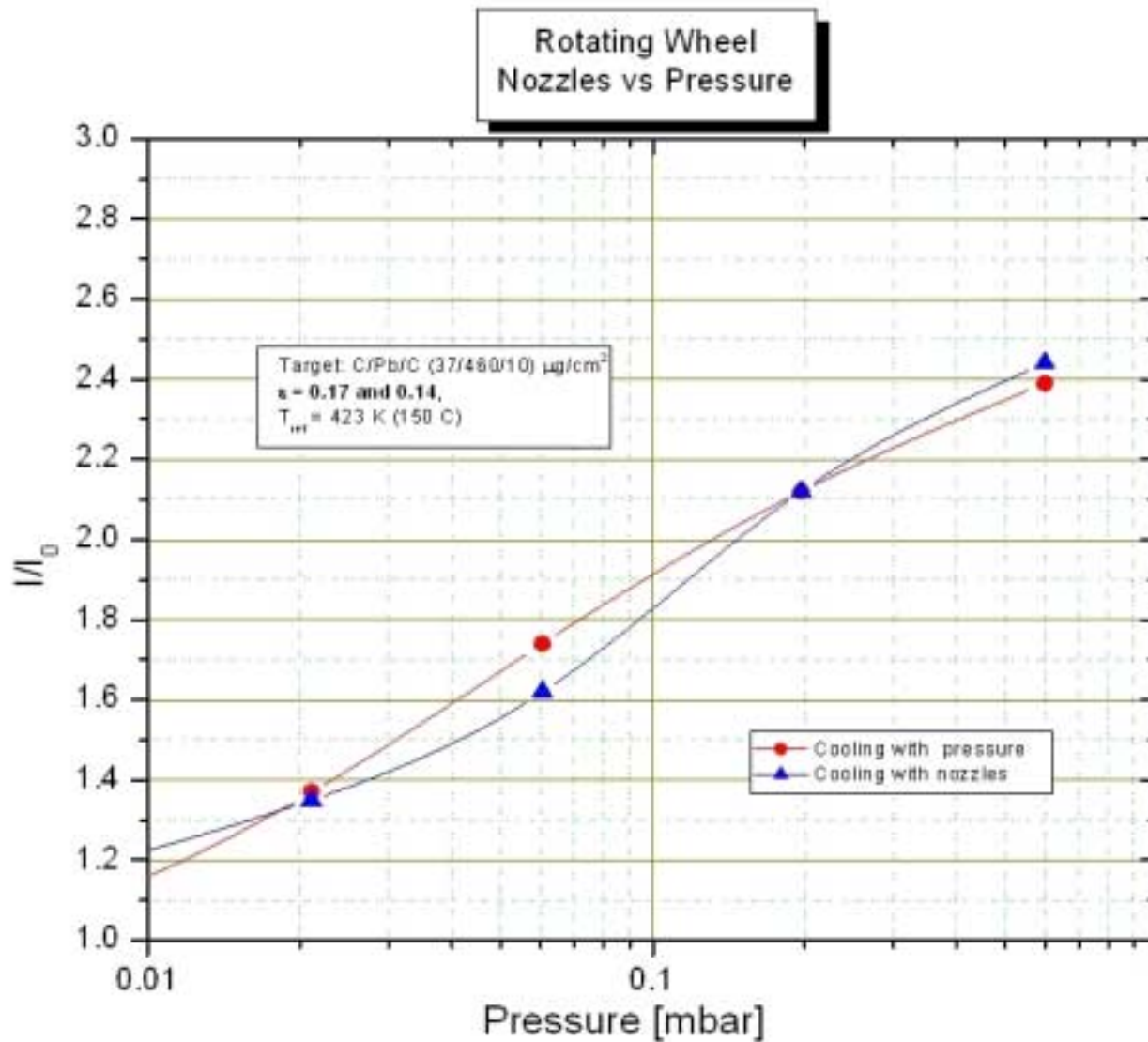
Cooling with He-jet



Significant difference between nozzle and ambient pressure
 ⇨ For a standing target!

I_0 : Initial current needed in vacuum to reach T_{ref}

First Results on Target Cooling II



No significant difference between nozzle and ambient pressure

⇒ For a rotating target at current intensities!

I_0 : Initial current needed in vacuum to reach T_{ref}

Intensity

Target	C-Pb-C	C-Pb-C	C-Pb-C	C-PbS	C-PbS	C-PbS	C-PbS	C-PbS	C-PbS	C-PbS
Beam intensity [part./s]	1.4×10^{13}	2.5×10^{13}	2.9×10^{13}	2.3×10^{13}	3.7×10^{13}	6.1×10^{13}	7.3×10^{13}	5.7×10^{13}	7.6×10^{13}	1.5×10^{14}
Maximal temp. [K]	599	597	600	592	595	730	807	597	594	752
Rotational Velocity [rpm]	1125	1125	2250	1125	2250	2250	2250	1125	2250	2250
regime	pulse	cont.	cont.	pulse	pulse	pulse	pulse	cont.	cont.	cont.