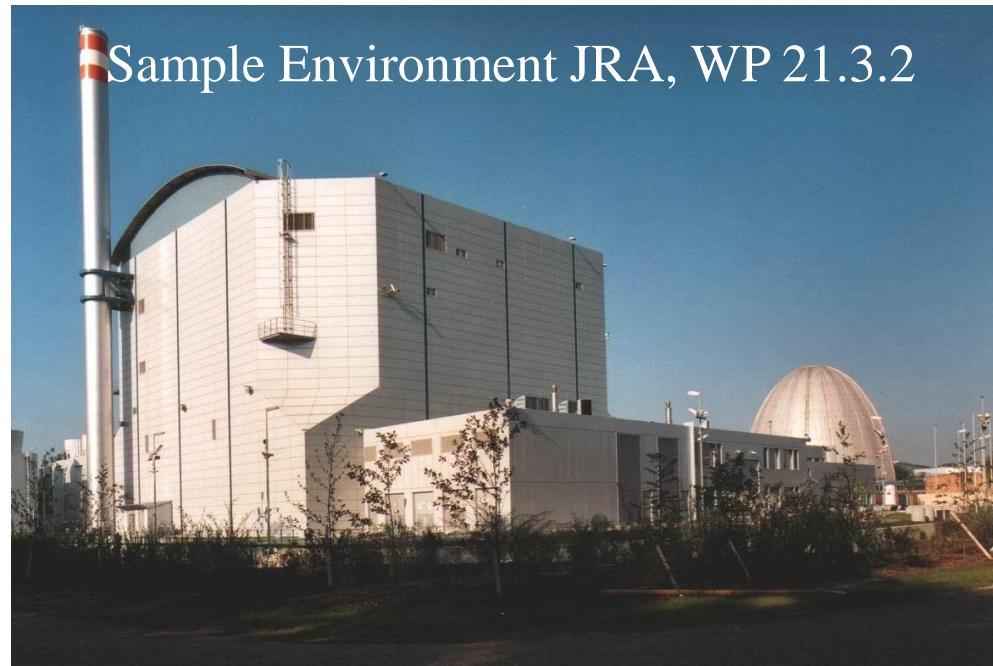


Forschungsneutronenquelle Heinz Maier-Leibnitz
(FRM II)



T. Kordel, F. König, D. Holland-Moritz, A. Meyer
Institut für Materialphysik im Weltraum,
Deutsches Zentrum für Luft- und Raumfahrt (DLR)





Forschungsneutronenquelle Heinz Maier-Leibnitz (FRM II)



Institut für Materialphysik im Weltraum, Deutsches
Zentrum für Luft- und Raumfahrt (DLR)

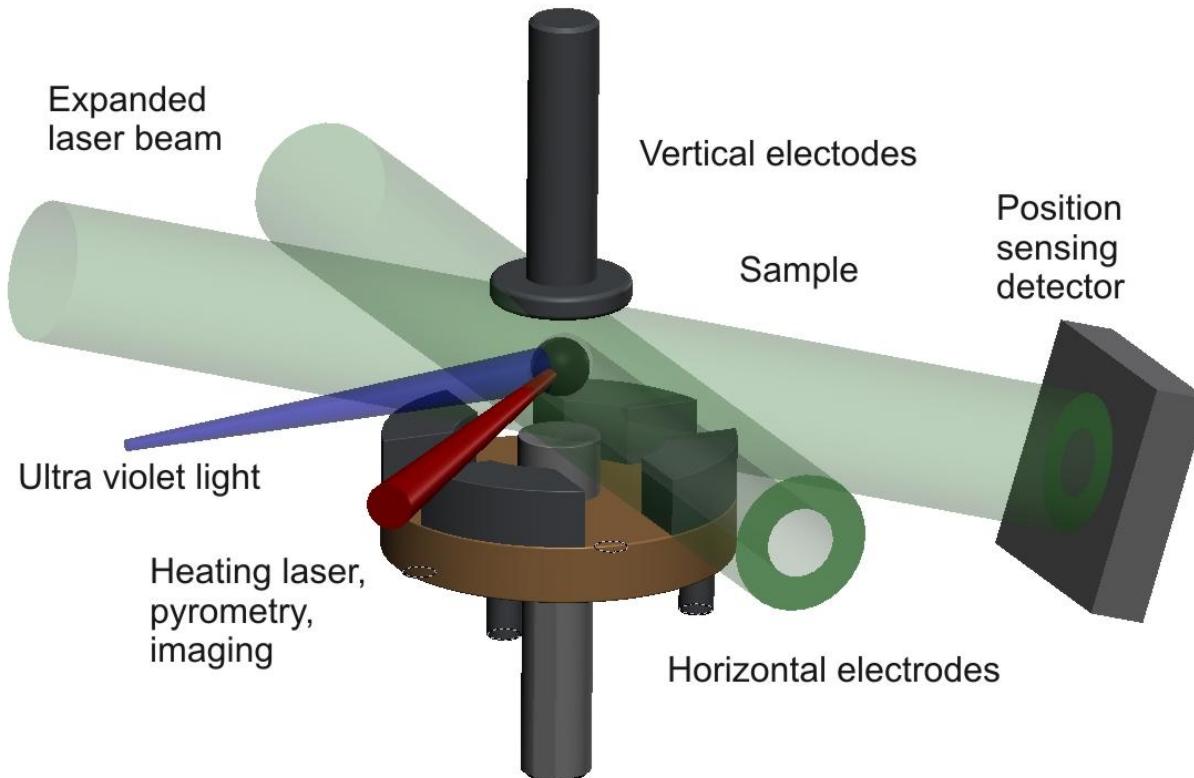
WP2.: Sample Environment, Task 21.3.2 Electrostatic Levitation (ESL), 2nd. Report

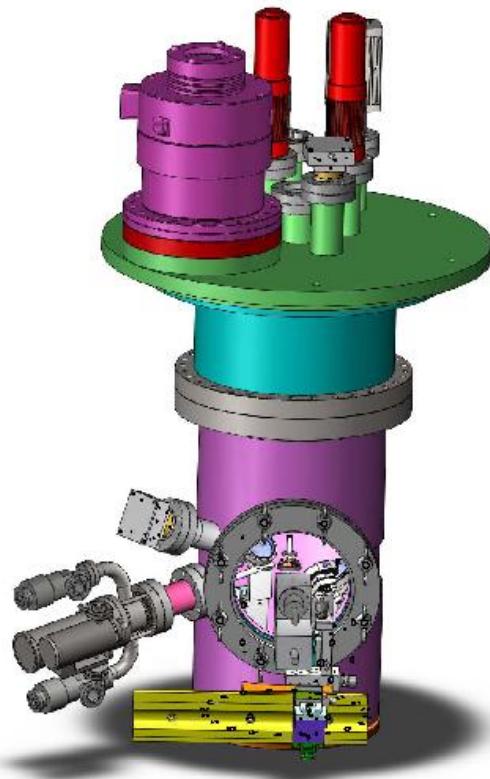
The study of structure and dynamics in liquid metals or dielectric materials is often prevented by a chemical reaction of the high temperature melt with its sample holder.

This can be overcome by the use of an electromagnetic (EML) or electrostatic levitation apparatus (ESL) that allows for a containerless processing of (electrically conducting) samples

Institut für Materialphysik im Weltraum, Deutsches
Zentrum für Luft- und Raumfahrt (DLR)

Electrostatic levitation





Study of structure and atomic dynamics in melts
by means of Neutron scattering

- Chemically reactive melts
- Nonconductive material
- High purity conditions: Ultra high vacuum
- Broad temperature range
- Reduced background scattering

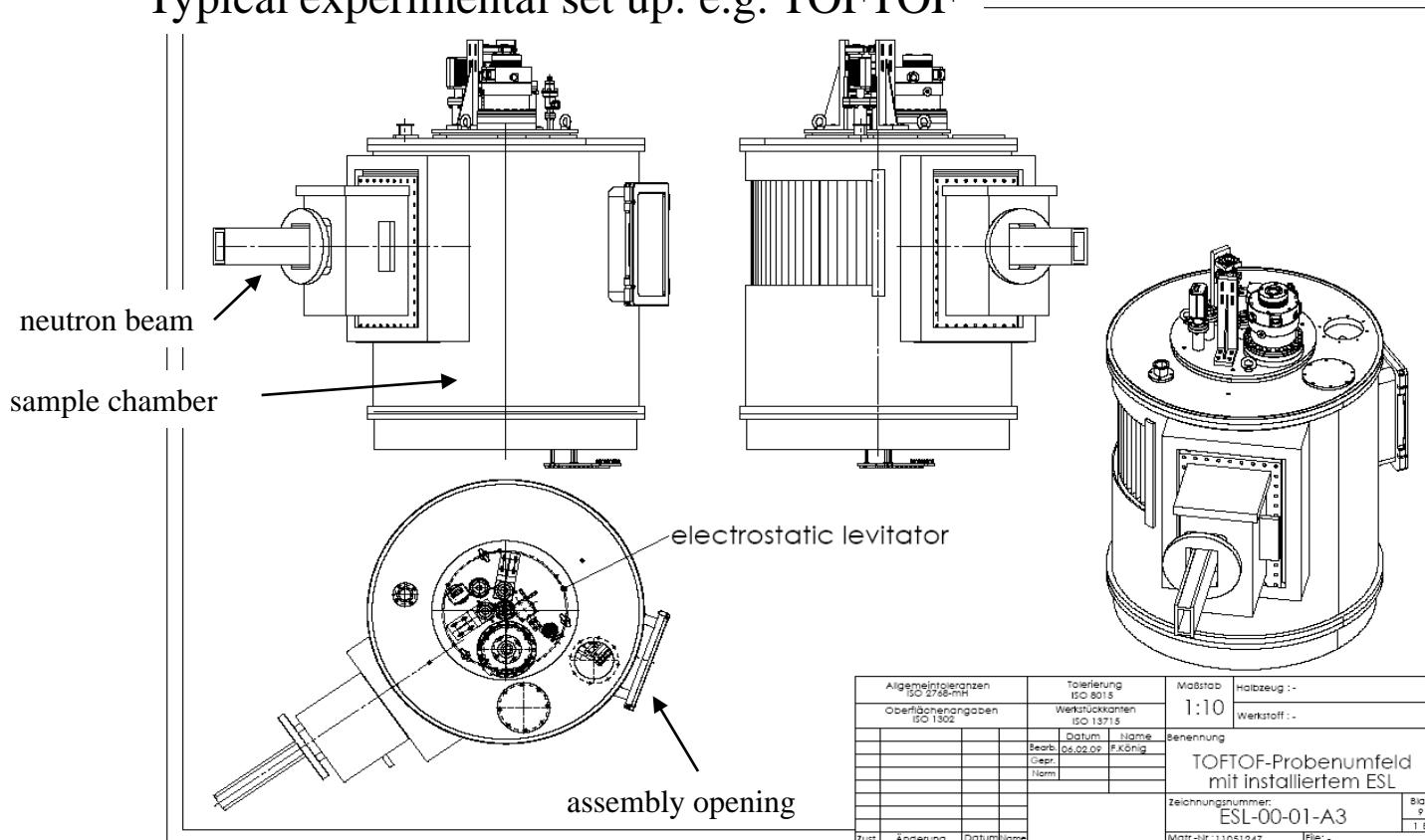
→ Electrostatic levitation adapted to neutron scattering constraints

Forschungsneutronenquelle Heinz Maier-Leibnitz (FRM II)



Institut für Materialphysik im Weltraum, Deutsches
Zentrum für Luft- und Raumfahrt (DLR)

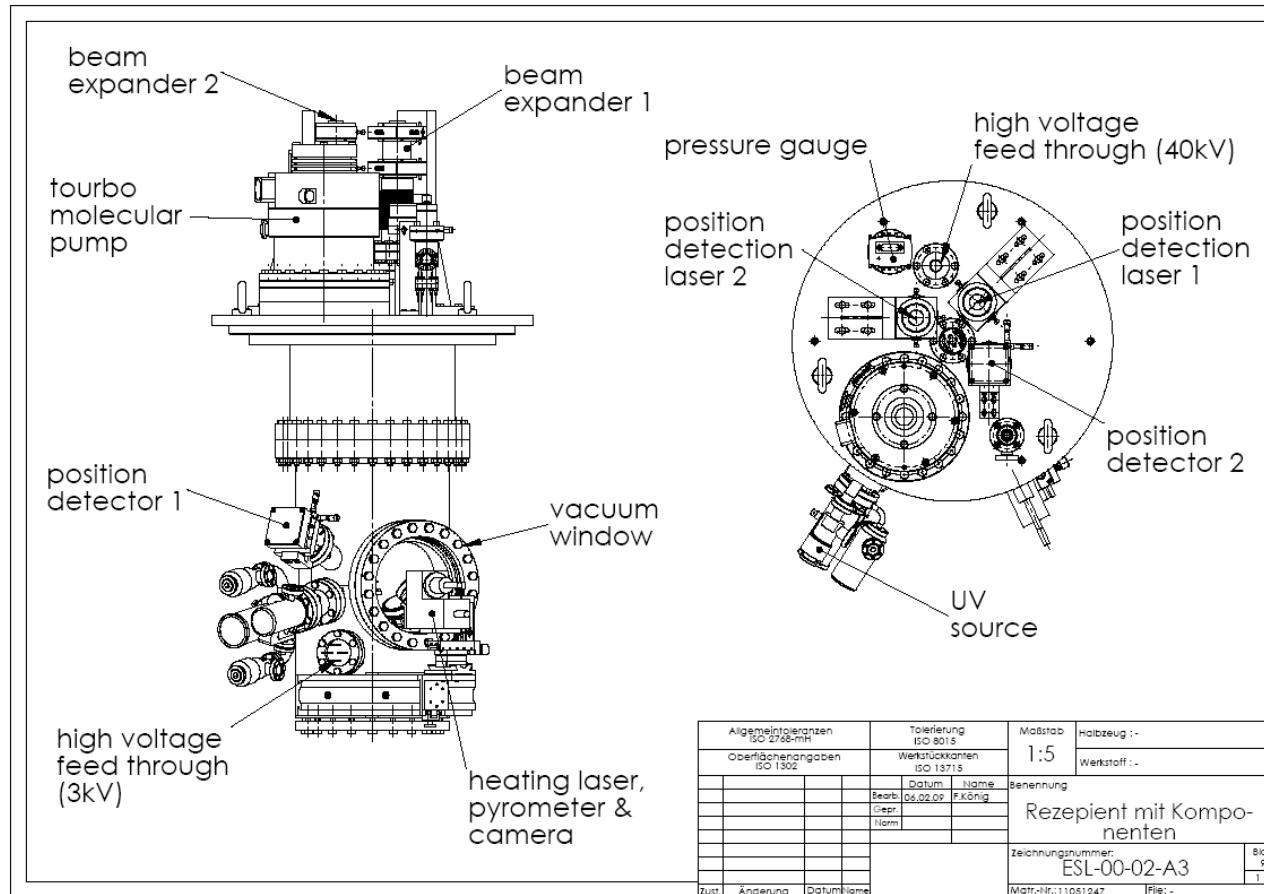
Typical experimental set up: e.g. TOFTOF



Forschungsneutronenquelle Heinz Maier-Leibnitz (FRM II)



Institut für Materialphysik im Weltraum, Deutsches
Zentrum für Luft- und Raumfahrt (DLR)



Institut für Materialphysik im Weltraum, Deutsches
Zentrum für Luft- und Raumfahrt (DLR)

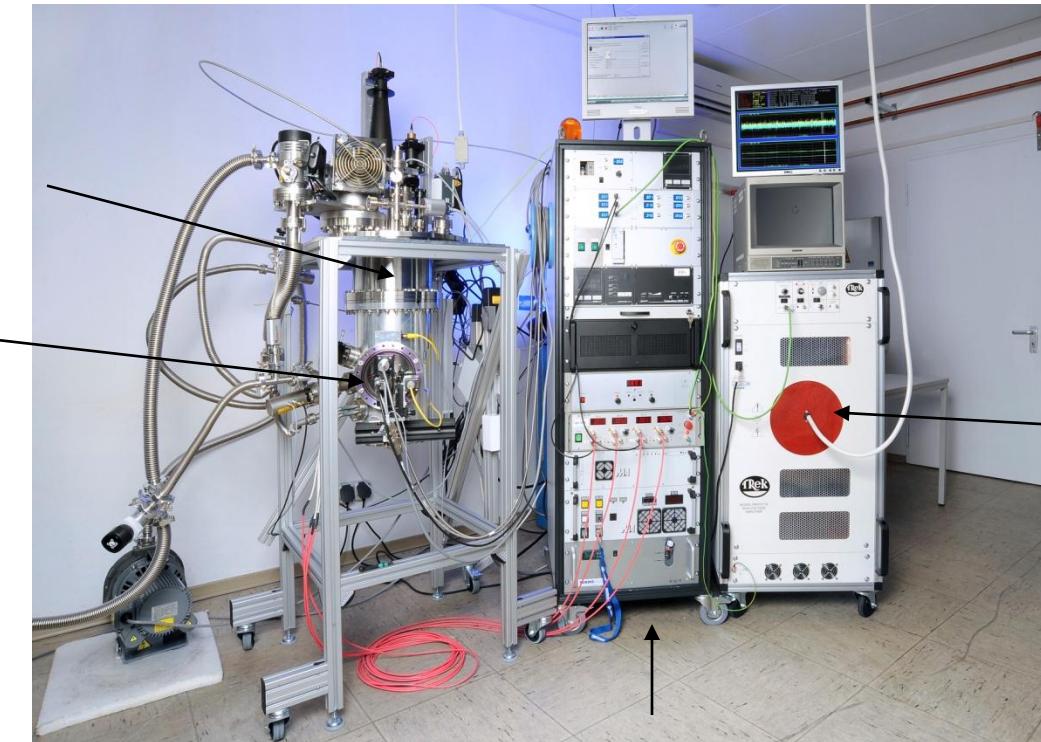
Electrostatic levitator for neutron scattering experiments

vacuum chamber

sample

HV amplifier

rack with control units and power supplies



Electrostatic levitator for neutron scattering

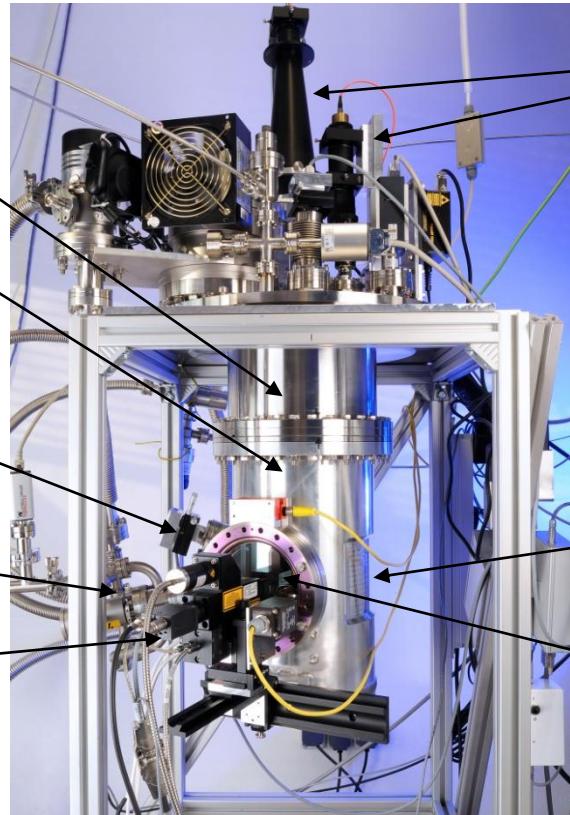
vacuum chamber:

upper part stainless steel,
lower part: aluminum

position detector

UV lamp

heating laser,
Pyrometer,
video camera



laser beam expander

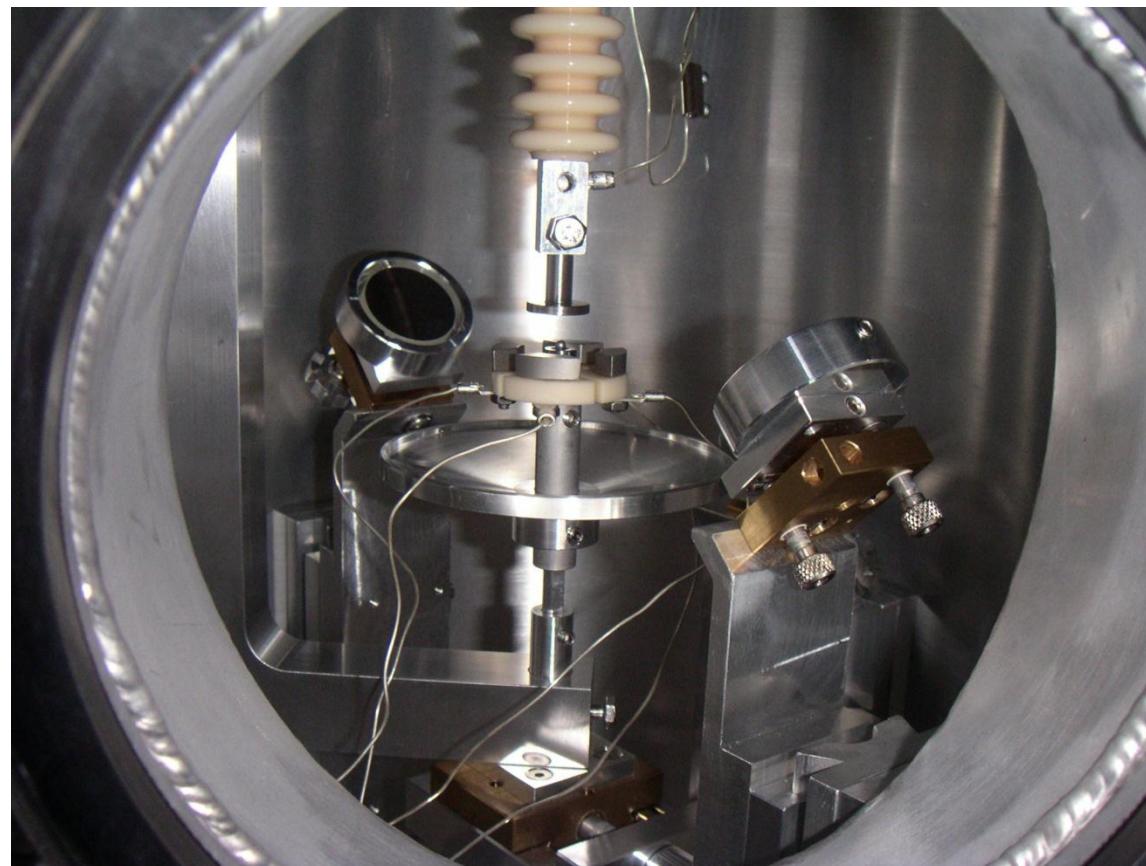
neutron window

sample

Forschungsneutronenquelle Heinz Maier-Leibnitz (FRM II)



Institut für Materialphysik im Weltraum, Deutsches
Zentrum für Luft- und Raumfahrt (DLR)



J.Peters, T. Kordel, 2nd NMI3 General Assembly,
Sample Environment Section, Barcelona, 11th May
2010

Electrostatic levitator Hardware:

- Heating laser incl. pyrometer and camera (75W @ 808 nm)
- Position detection laser (Melles Griot, 22mW @ 660nm)
- High voltage amplifier (Trek PM07071N, 0 to -40kV)
- High voltage amplifier (Highvolt HVA-3B4, \pm 3kV)
- UV-source (SPECS UVS-10/35)

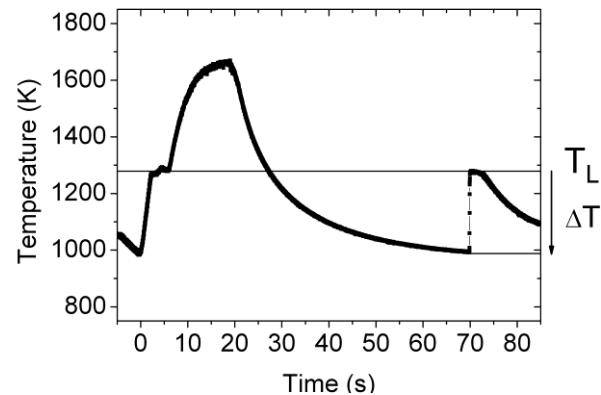
Institut für Materialphysik im Weltraum, Deutsches
Zentrum für Luft- und Raumfahrt (DLR)

Current status:

- All devices delivered and integrated
- First samples levitated
- Masses levitated 0.09g (\varnothing approx. 2mm)

Upcoming challenges:

- For neutron scattering need larger masses (x10)
- New control parameters for heavy samples
- Sparkling between high voltage electrode and isolation
- Sample changer



Levitated ZrNi36 sample,
molten and undercooled