



III. Physikalisches
Institut B

RWTHAACHEN
UNIVERSITY



Electrostatic deflector development at RWTH Aachen

13.03.2017

EDM kick-off meeting @ CERN

Kirill Grigoryev / Forschungszentrum Jülich

Test stands for electrodes

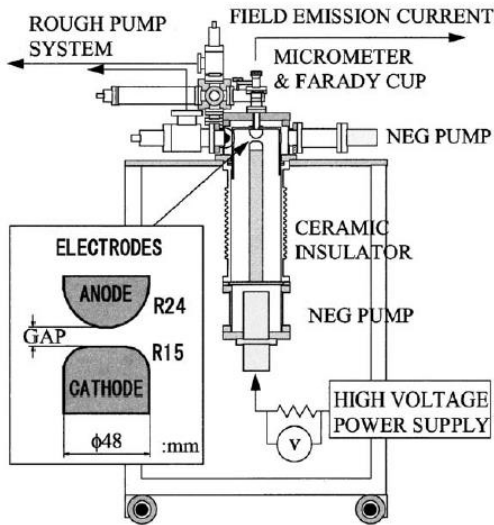


Fig. 1. Schematic of test stand for dark current study.

Vacuum of 10^{-11} mbar

Field gradient up to 170 MV/m

Electrodes separation ~ 0.5 mm
Experimental voltage ~ 85 kV

F. Furuta et al., NIM A 538, 33 (2005)



Tevatron electrostatic separator
in the vacuum chamber

Vacuum of 10^{-10} mbar

Field gradient up to 6 MV/m

Electrodes separation ~ 30 -50mm
Experimental voltage ~ 180 kV



DC high voltage field emission test stand

Vacuum of 10^{-12} mbar

Field gradient up to 20 MV/m

Electrodes separation ~ 20 -50mm
Experimental voltage ~ 225 kV

M. BastaniNejad et al., Phys. Rev.
ST Accel. Beams 15, 083502 (2012)

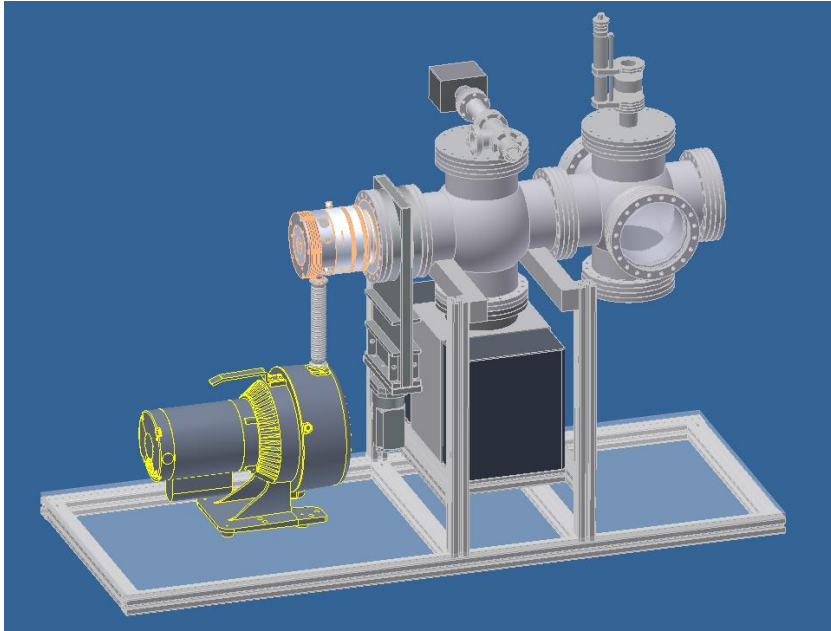
Clean room



Clean room class ISO 7 (10.000)
special floor for a clean room
frame structure of the walls
antistatic curtain, furniture



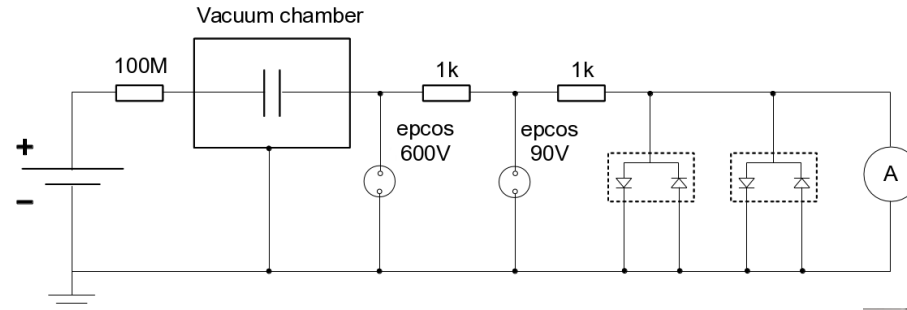
Vacuum setup



Atmosphere	-> 10^{-2} mbar	Scroll fore pump
10^{-2} mbar	-> 10^{-9} mbar	Turbo-molecular pump
10^{-9} mbar	-> 10^{-12} mbar	Ion getter pump



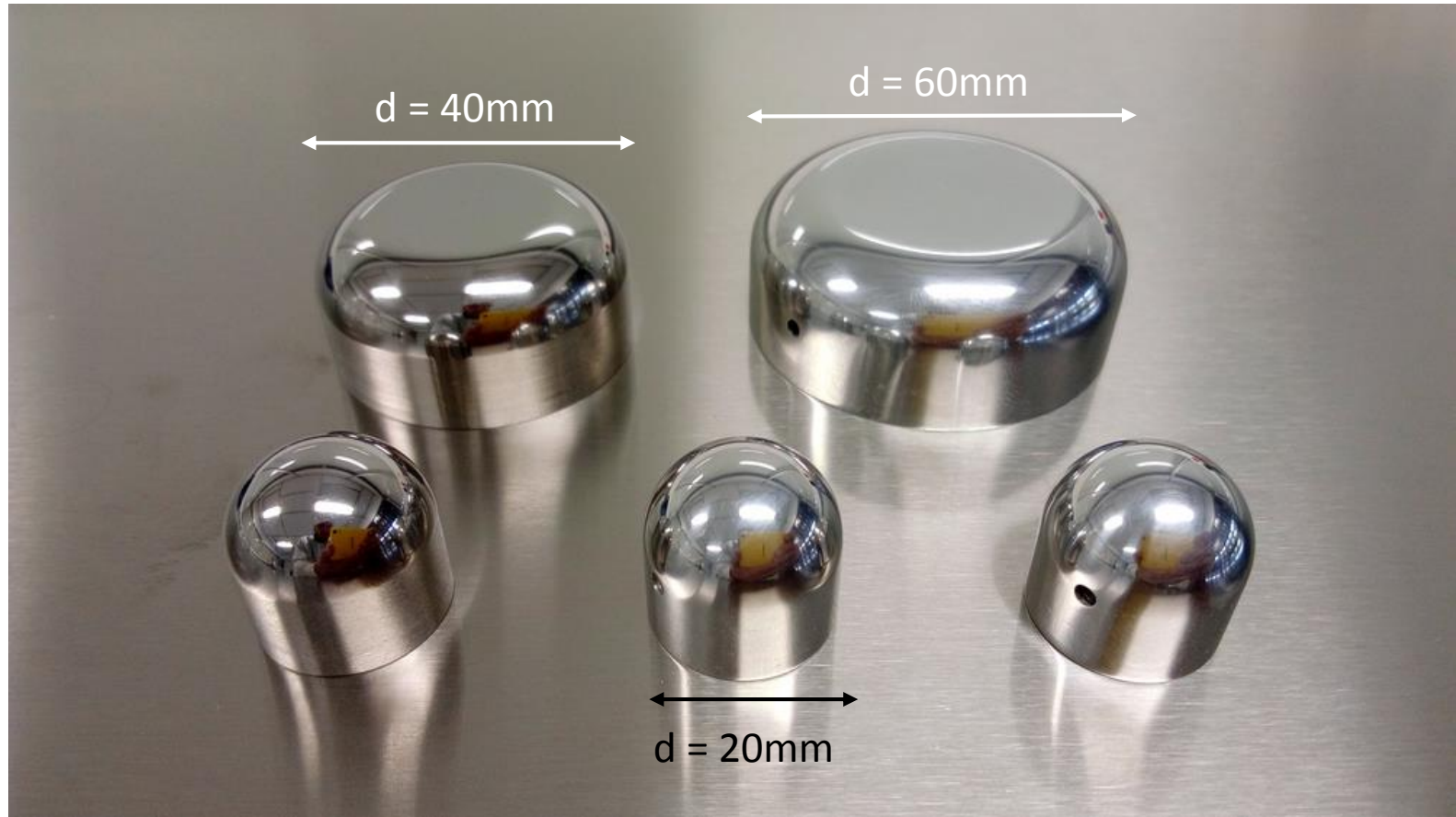
High voltage setup



- 30kV power supply with fast discharge
- Manual polarity reversion
- ARC-detection
- Rapid discharge circuit
- Common ground
- Current protection scheme
- Dark current measurements with picoammeter



Test electrodes



Material : Stainless Steel Aluminum

Treatment : Mechanical polishing and cleaning

Test electrodes result

Material : Stainless steel, Aluminum
Mechanically polished and clean

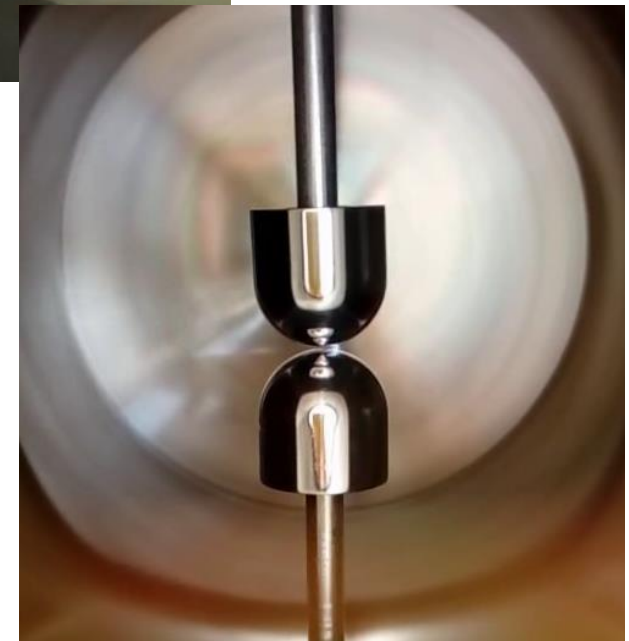
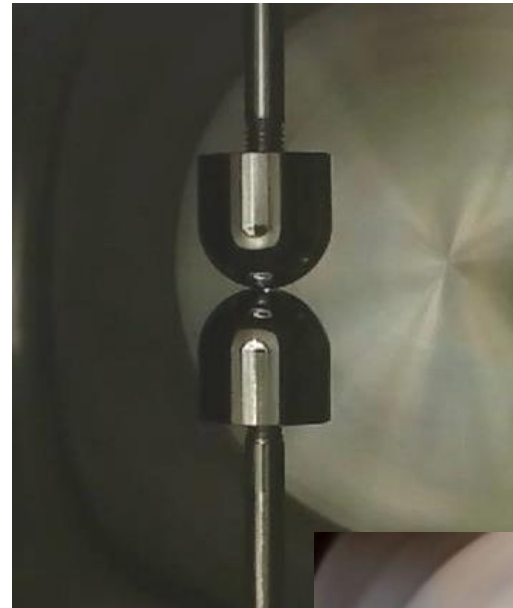
Stainless steel

Two small half-spheres (R = 10mm)
17kV at 1mm distance → **17 MV/m**

Half-sphere vs. flat surface
12kV at 0.05mm distance → **240 MV/m**

Aluminum

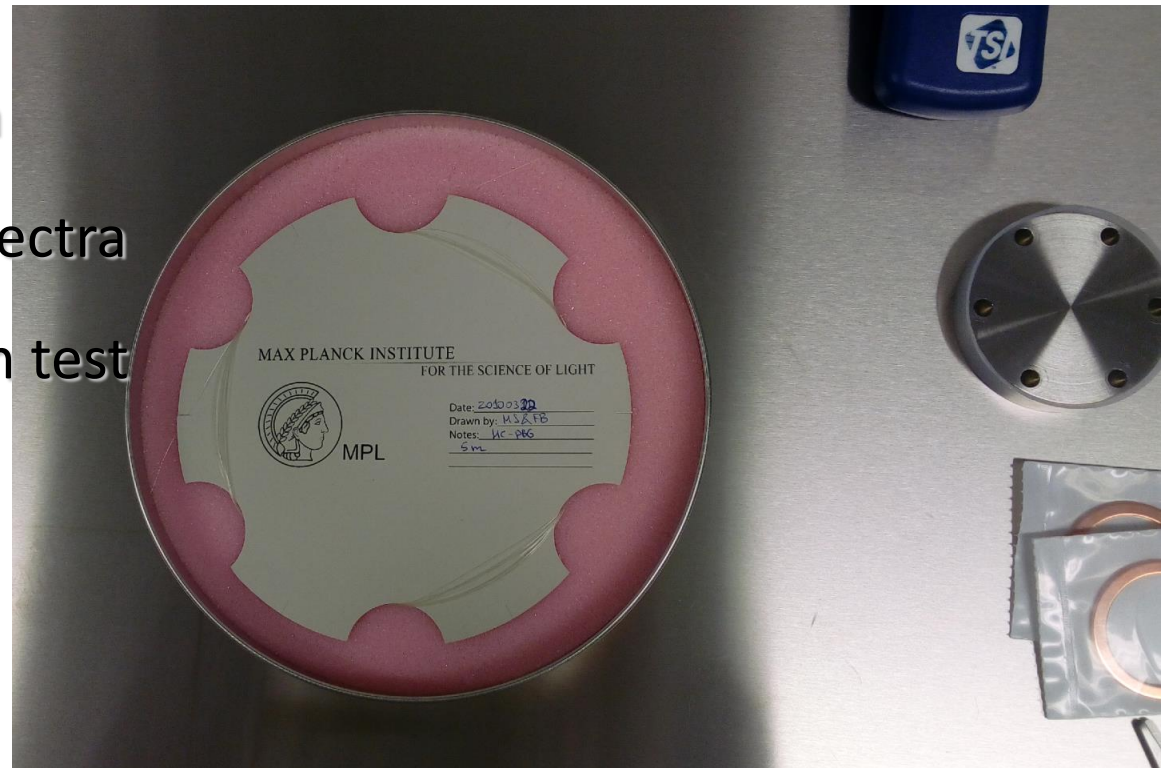
Two small half-spheres (R = 10mm)
3kV at 0.1mm distance → **30 MV/m**



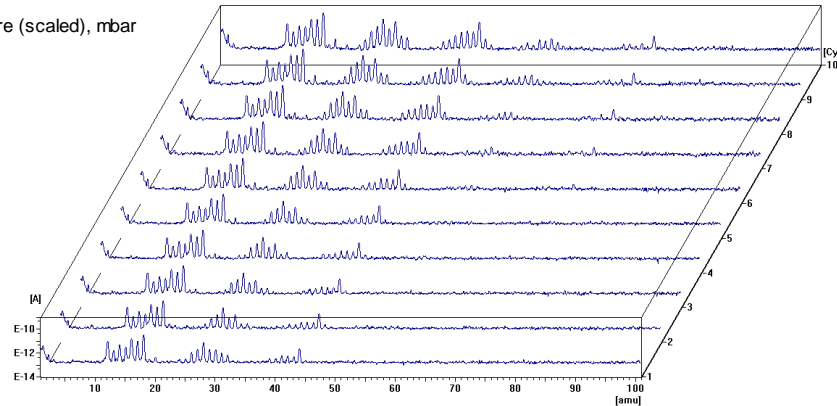
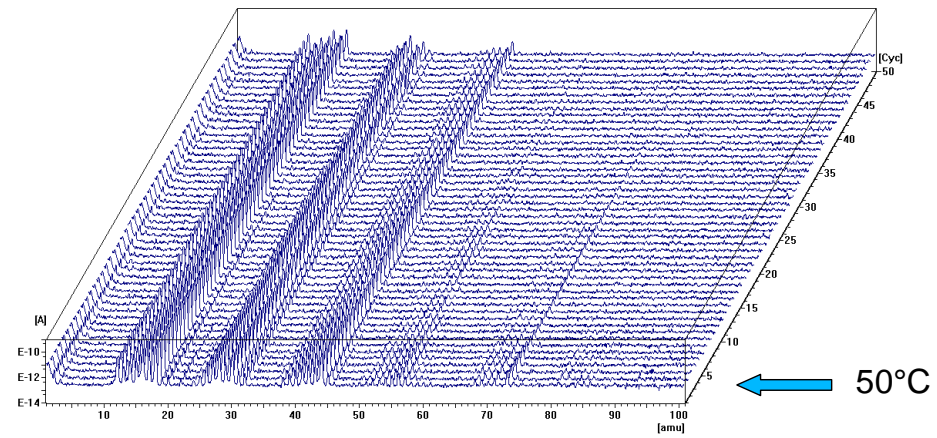
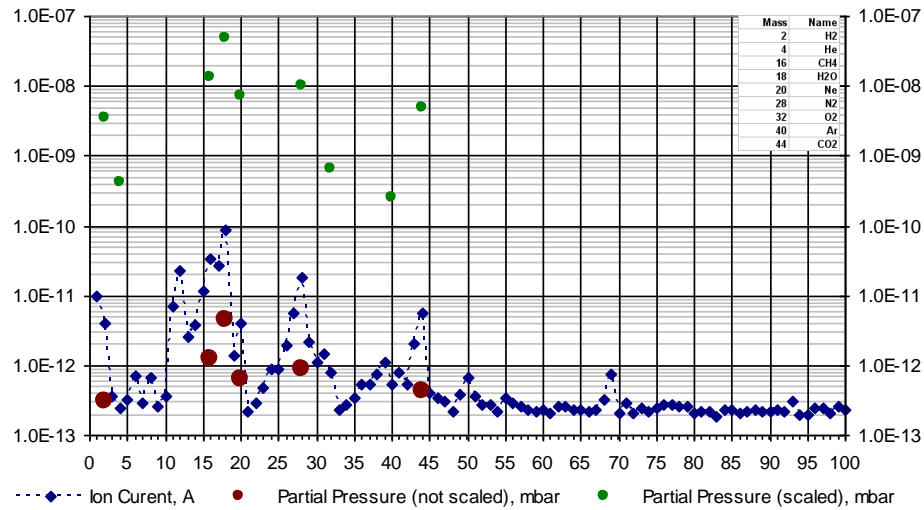
Flying particle sensors in hollow-core photonic crystal fibre

D. S. Bykov*, O. A. Schmidt, T. G. Euser* and P. St. J. Russell

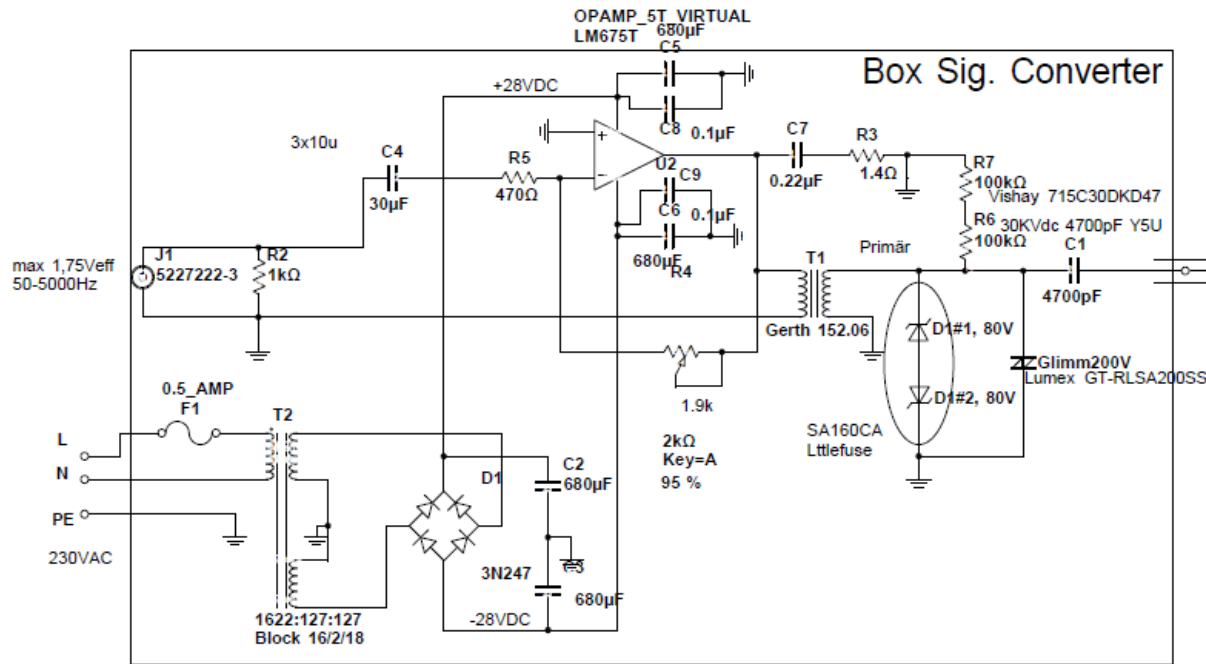
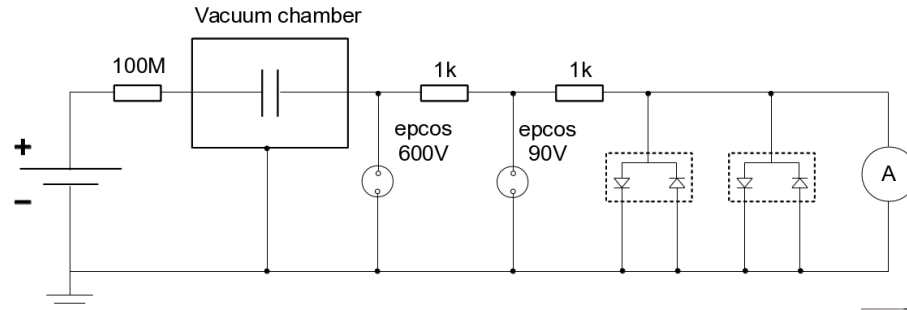
- Setup modification
- Empty chamber spectra
- UHV epoxy vacuum test
- Fibre vacuum test
- Heating test



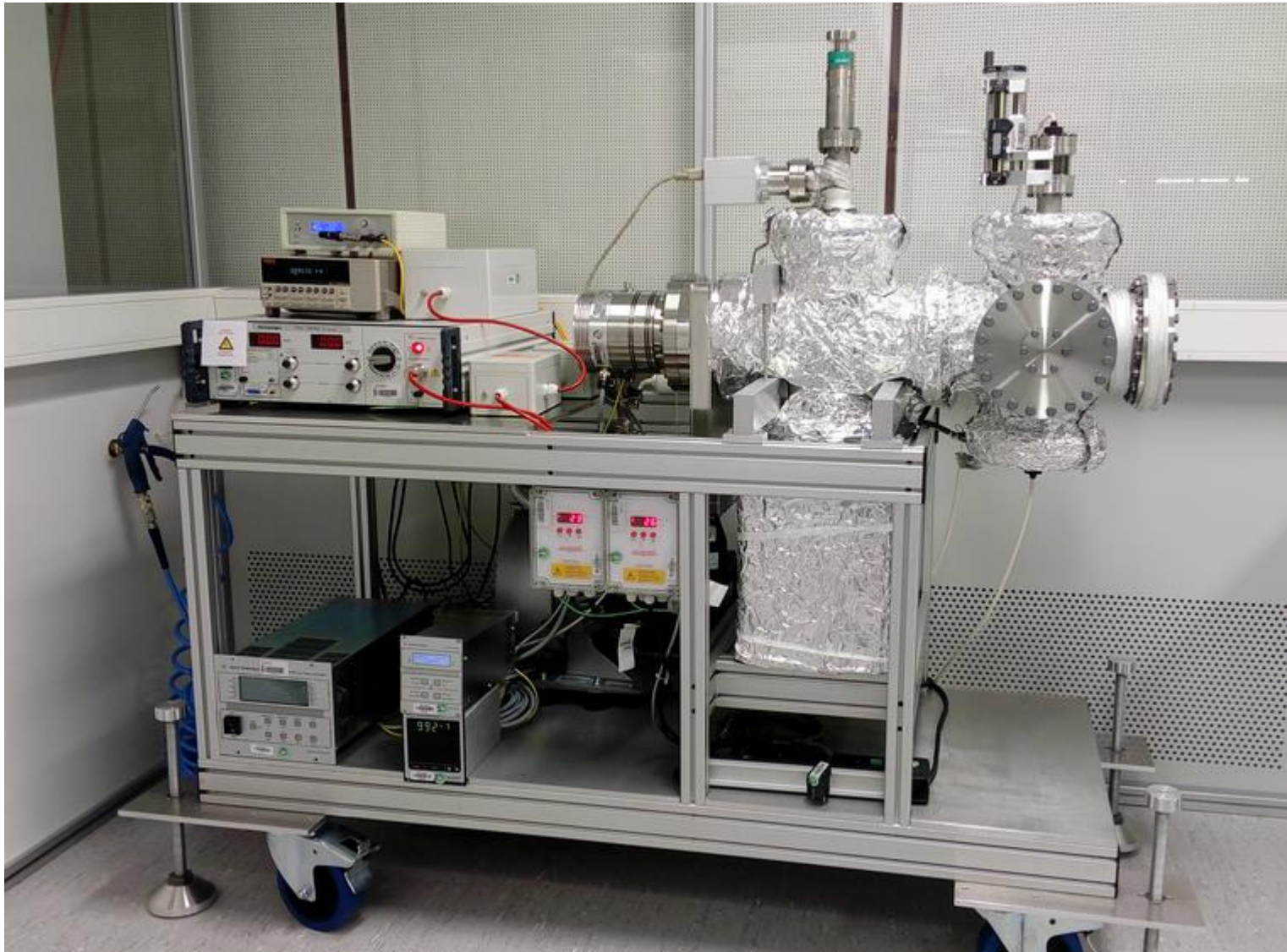
Fibre vacuum tests



New high voltage setup



New test stand



New electrodes



UHV test stand (with baking - $1 \cdot 10^{-10}$ mbar)

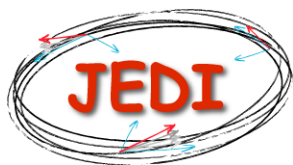
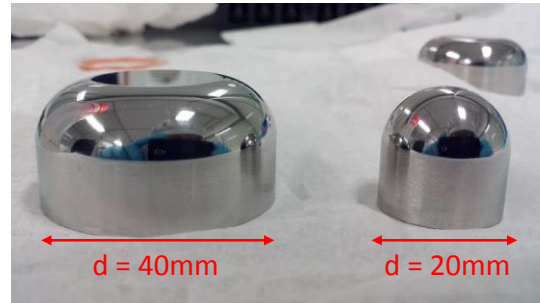
Electronic

Electrodes

Epoxy and fibre

Field strength measurement with laser

Large scale deflectors



May the electrical force be with us!
JEDI collaboration : Jülich Electric Dipole Moment Investigations