

Movable cylindrical magnetron sputtering source

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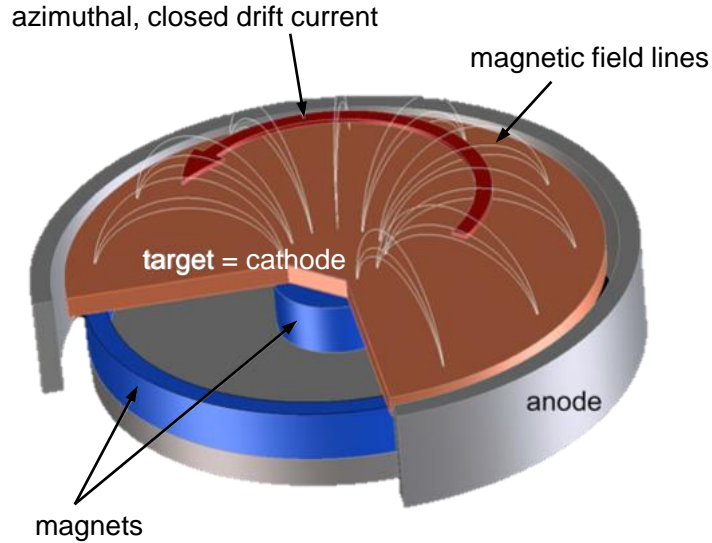
CERN, Geneva, Switzerland



Idea → movable cylindrical magnetron sputtering source

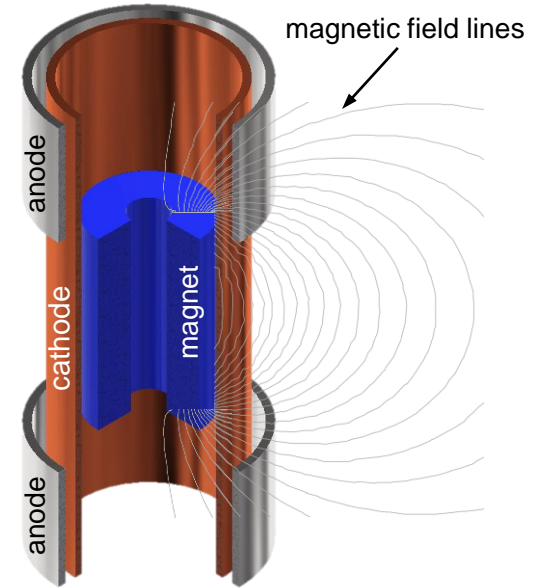
- **Sputtering:** process of bombarding a solid target material with energetic ions to eject atoms from the target and deposit them on a substrate
- **Cylindrical magnetron source:** cathode with integrated anodes at the edges
 - allows the application of a bias voltage to the substrate to enhance the properties of the coating
 - capable of 360° sputtering distribution inside cylindrical geometries (tube, cavity, etc.)
- **Movable:** vacuum translation stage to move inside the substrate to coat

Idea → planar vs. cylindrical magnetron sputtering source



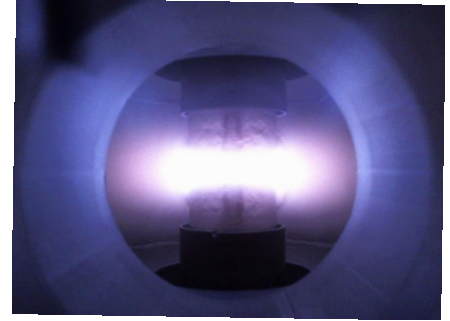
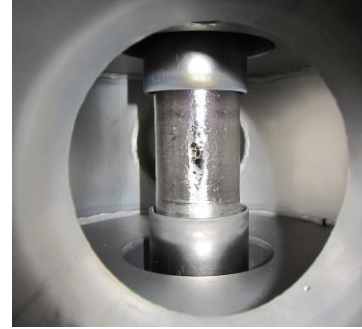
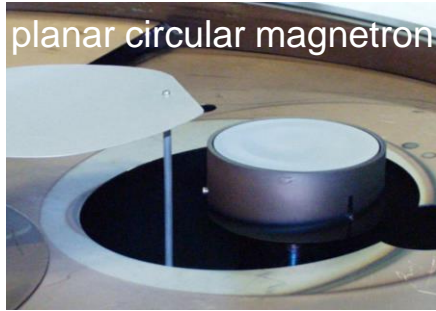
Planar circular magnetron

A. Anders, Surf. Coat. Technol. 205, S1 (2011)



Cylindrical magnetron

What for? → cylindrical substrate coating

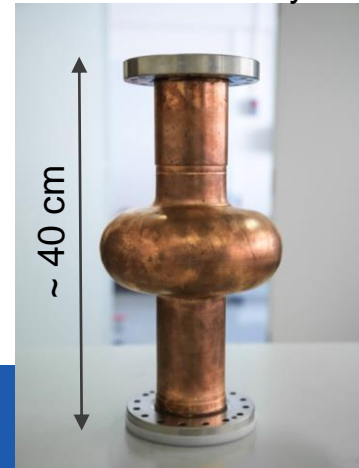


flat sample coating



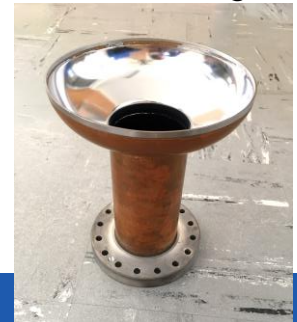
rotating sample coating

1.3 GHz cavity

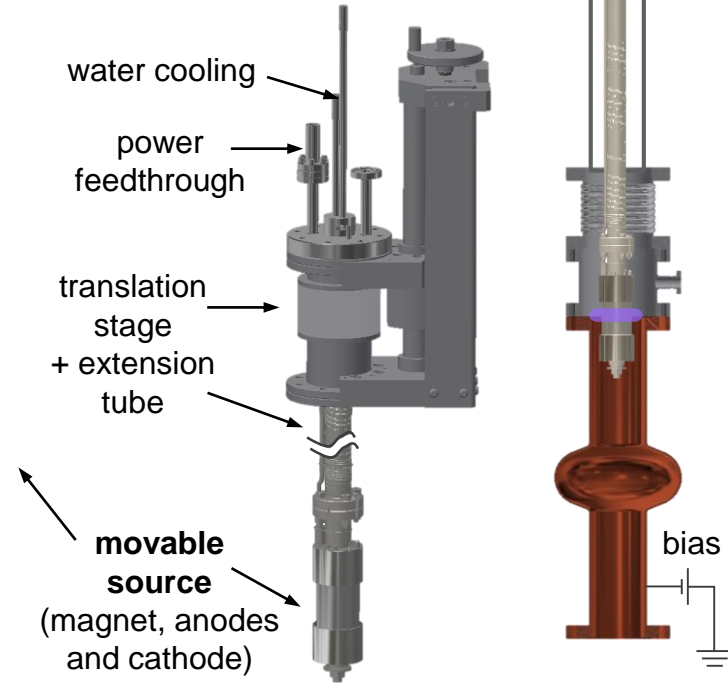
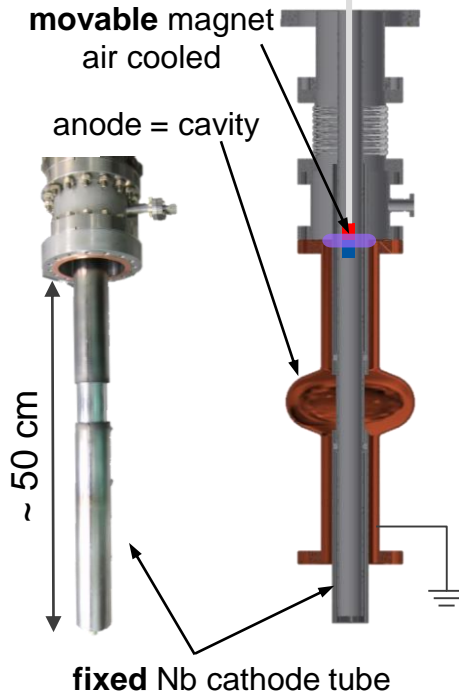


~ 40 cm

half cavity after
Nb coating



What for? → 1.3 GHz cavity Nb coating example



Application → sputtering source for thin films deposition

- Inner coating of hollow substrates without the need of an additional anode
- i.e. functional coatings (anti-corrosive, hard coatings, etc.) in tubes...
- Flexible design:
 - setup can be miniaturized
 - magnetic configuration can be tuned (balanced/unbalanced)
 - gas injection could be implemented
 - stroke/length is adjustable to the needs using proper translation stage and extension tubes
 - conditioning and storage of the source under vacuum is possible

→ KT to sputtering sources, sputtering tools, thin film coating companies

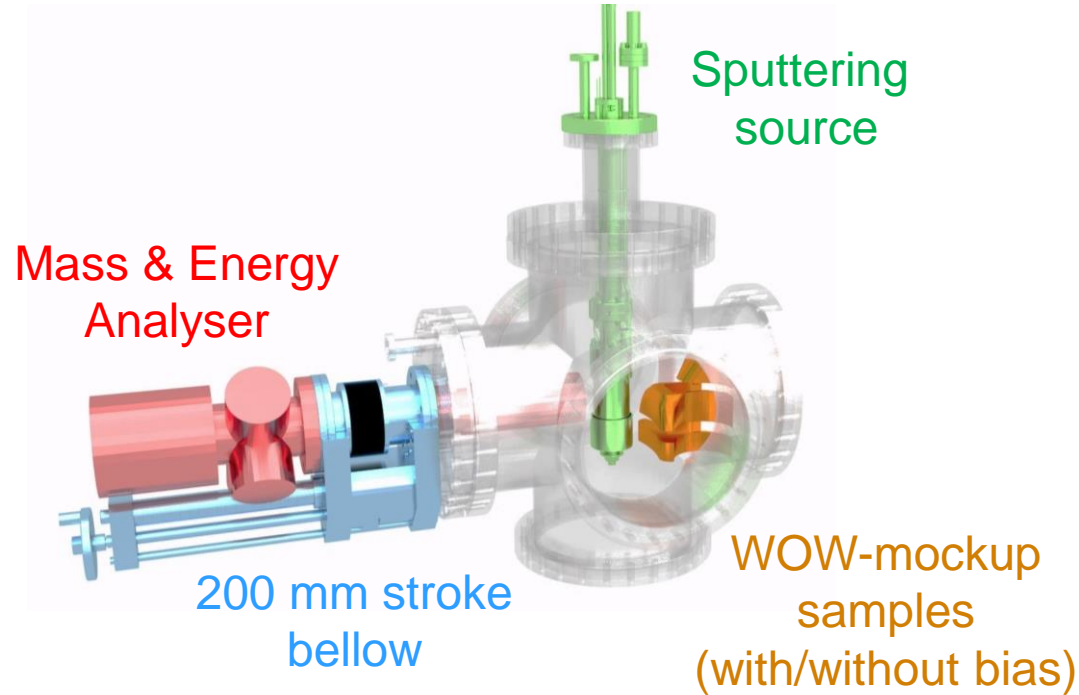
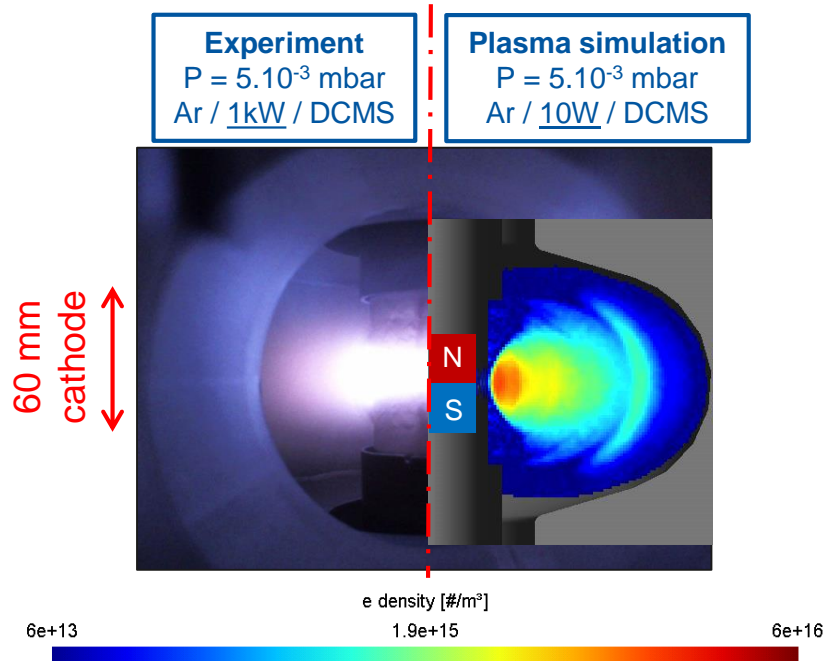
Development → internal to CERN

- Original idea from Guillaume Rosaz in 2016 → improve fixed cathode setup for HiPIMS coating of a whole 1.3 GHz cavity with bias
- Possible sputtering source for the WOW cavity coating (Nb/Cu Crab cavity for FCC)
- Designed (2017) and fabricated (2018) at CERN (first prototype) with technical support of EN/MME and financial support from FCC SRF (Superconducting RF) work package
- Submitted for potential patent application to KT group in March 2017

Next steps

- Plasma and sputtered atoms transport simulations (ongoing)
- Finalization, cleaning and assembly of the first prototype (November 2018)
- Commissioning with plasma diagnostics and material characterization (this winter)
- Feedback to KT for source specification and further patent process (beginning 2019)
- Upscale for WOW cavity coating?

Next steps → simulations and experimental commissioning



Thank you for your attention