

Neutron scattering (and beyond) in Poland

Wojciech Zajac

Institute of Nuclear Physics Polish Academy of Sciences



National Neutron Source – «MARIA » Reactor



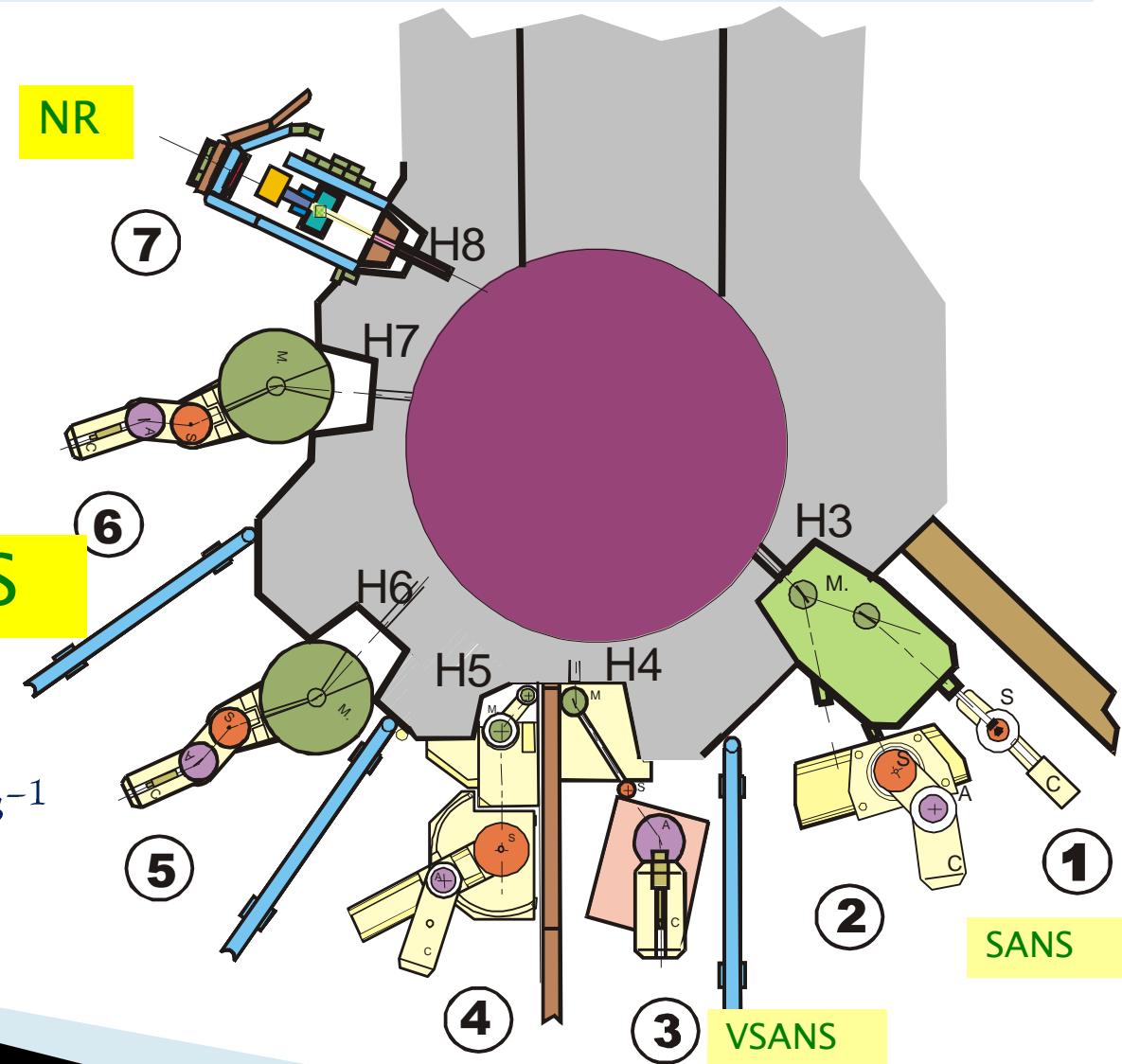
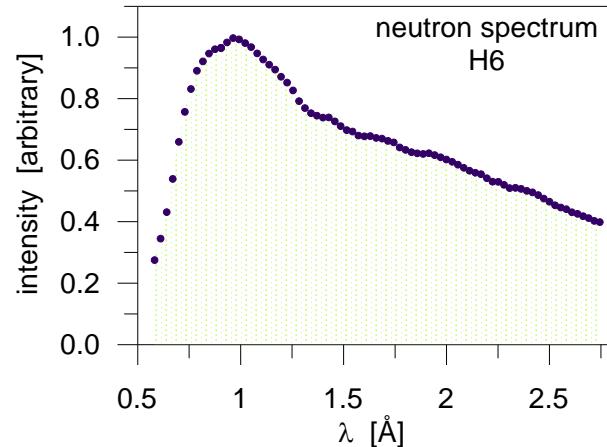
- ▶ Construction started June 1970
- ▶ MARIA went critical December 1974
- ▶ Thermal power: 30 MW
- ▶ Neutron flux in core: $4 \times 10^{14} \text{ n}\cdot\text{cm}^{-2} \cdot \text{s}^{-1}$,
- ▶ Operation: ~4300 h/year

National Neutron Source – «MARIA » Reactor

- ▶ Production of radioisotopes,
- ▶ Testing fuel and structural materials for nuclear power engineering,
- ▶ Neutron transmutation doping of silicon,
- ▶ Neutron modification of materials,
- ▶ Research in neutron and condensed matter physics,
- ▶ Neutron radiography,
- ▶ Neutron activation analysis,
- ▶ Neutron beams for medicine,
- ▶ Training in the field of reactor physics & technology.



National Neutron Source – «MARIA » Reactor

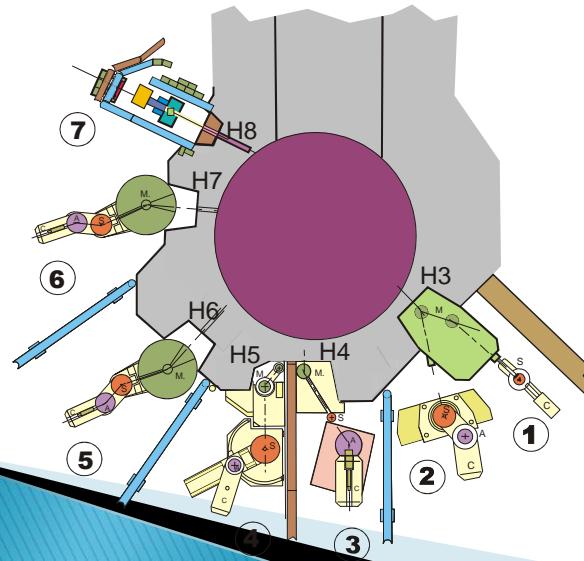


- ▶ Neutron flux at sample position: $\sim 5 \times 10^5 \text{ cm}^{-2} \text{ s}^{-1}$

Instruments to be moved BER II → MARIA

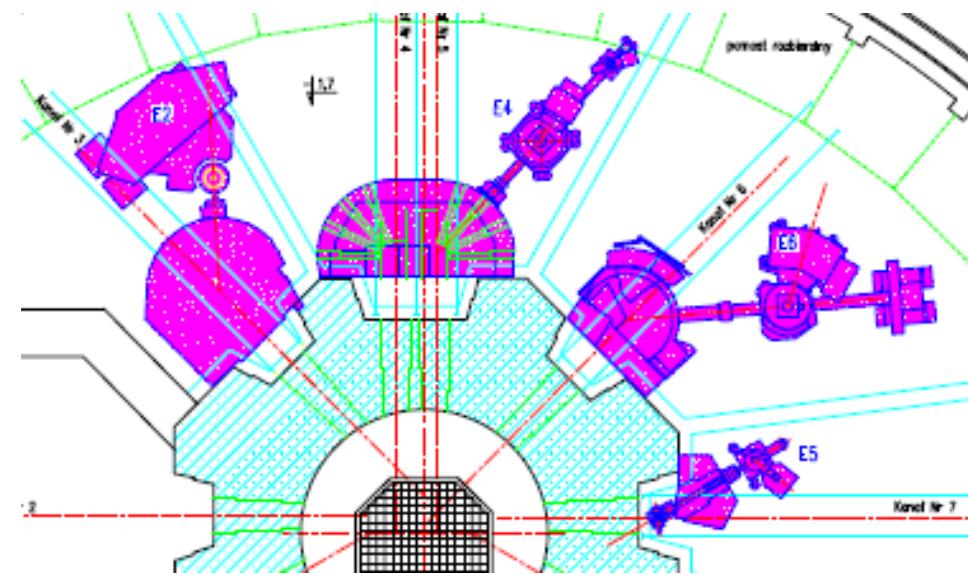
► *Agreement signed*

- **E1** Spectrometer
- **E4** Powder diffractometer
- **E5** single crystal diffractometer
- **E6** Powder diffractometer



► *Available after 2019*

- **E2** Diffractometer
- **E3** Residual stress diffractometer
- **E9** High resolution diffractometer



Large Scale Facilities Used



- ▶ Diffraction
- ▶ Inelastic /QENS
- ▶ SANS
- ▶ Reflectometry
- ▶ Diffuse scatt.
- ▶ Residual stress



- ▶ Diffraction – in-situ hydration



- ▶ Diffraction
- ▶ Inelastic
- ▶ SANS
- ▶ Reflectometry



- ▶ Diffraction – magnetic excitations by polarized neutrons
- ▶ Inelastic / QENS



- ▶ Compton scattering
- ▶ Diffraction
- ▶ Inelastic/QENS
- ▶ SANS
- ▶ Liquid/amorph.

Neutron Scattering – Scientific Partnership



- ▶ Scientific membership since 2006, discontinued twice
- ▶ Level of involvement: ~0.5%
- ▶ PhD. Students, summer practices, other forms of long term students involvement



- ▶ Poland a (founding) member country,
- ▶ 2% involvement at the construction stage



- ▶ Scientific membership,
- ▶ Various forms of common research programs

National Consortium



INSTYTUT FIZYKI JĄDROWEJ
im. Henryka Niewodniczańskiego
Polskiej Akademii Nauk



AGH
AKADEMIA GÓRNICZO-HUTNICZA
IM. STANISŁAWA STASZICA
W KRAKOWIE



UNIVERSITAS
JAGELLONICA
CRACOVIENSIS



UNIVERSITAS
VARSOVIENSIS



Politechnika Krakowska
im. Tadeusza Kościuszki



UNIWERSYTET ŚLĄSKI
W KATOWICACH



UNIWERSYTET
IM. ADAMA MICKIEWICZA
W POZNANIU

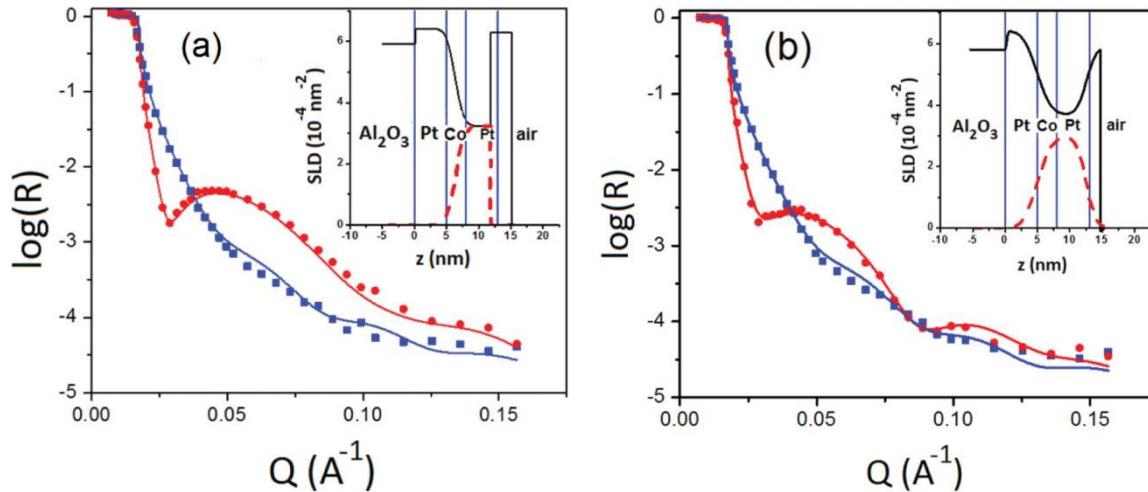


POLSKIE Towarzystwo
ROZPRASZANIA NEUTRONÓW



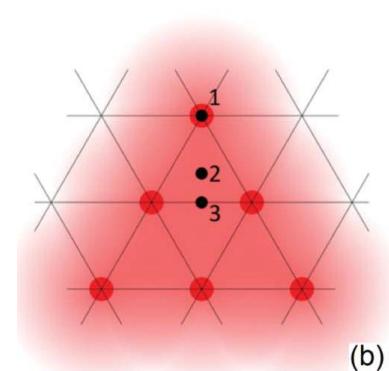
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POLSKIEJ AKADEMII NAUK

Research Highlights

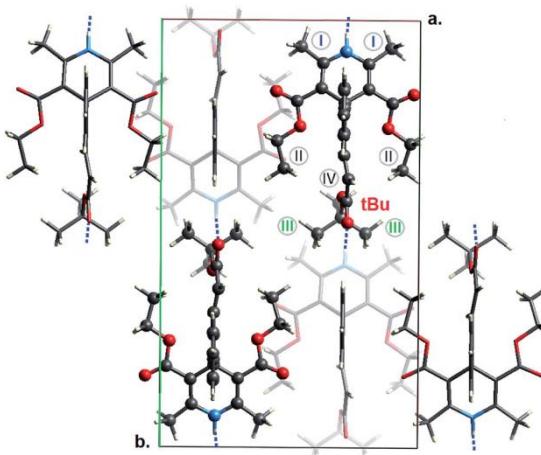
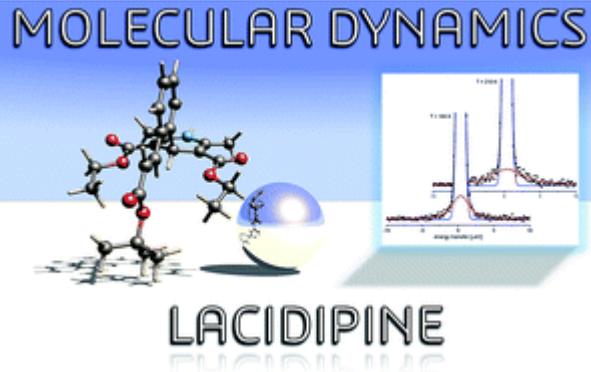


Polarized neutron reflectivity and X-ray scattering to study properties of Pt/Co/Pt ultrathin layers irradiated by femtosecond laser pulses. W. Suszkiewicz et al., Phase Trans. **89**, 4, 328–340, 2016

As-prepared films exhibit magnetization in-plane, but after laser irradiation, the direction of magnetization becomes out-of-plane. (PNR, XRD, XRR, PMOKE in polar configuration)

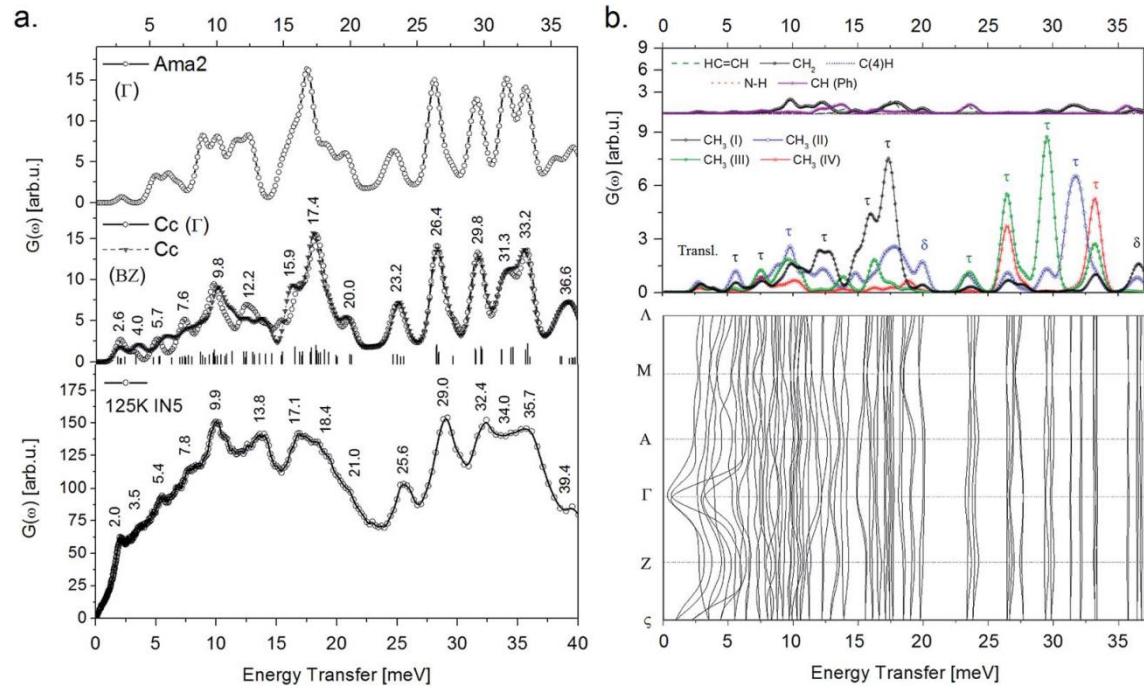


Research Highlights



Molecular dynamics in long-acting calcium channel blocker lacidipine: solid-state NMR, neutron scattering and periodic DFT study. A. Pajzderska et al., RSC Adv, 2016, 6, 66617

Contrary to the dynamically averaged ^{13}C CP/MAS NMR response, neutron vibrational spectroscopy confirms previous findings on the thermodynamically stable structure.





European Research Laboratory for New Materials



Joint European Laboratory for Advanced Materials Research is a national **Scientific and Industrial Consortium**,
founded 18th March 2014.

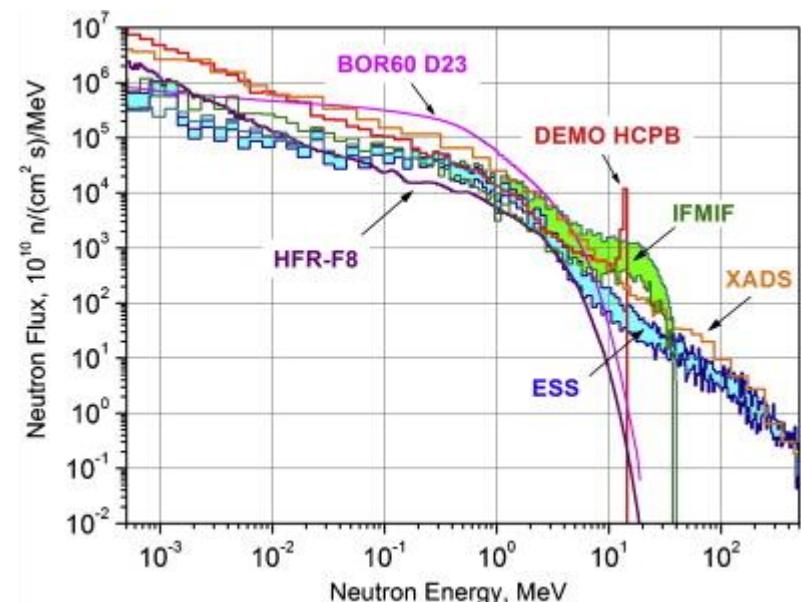
IFMIF



International Fusion Materials Irradiation Facility

The **International Fusion Materials Irradiation Facility**, also known as IFMIF, is a projected materials test facility in which candidate materials for the use in an energy producing fusion reactor can be fully qualified. IFMIF is an accelerator-based neutron source that produces, using deuterium-lithium nuclear reactions, a large neutron flux with a spectrum similar to that expected at the first wall of a fusion reactor.

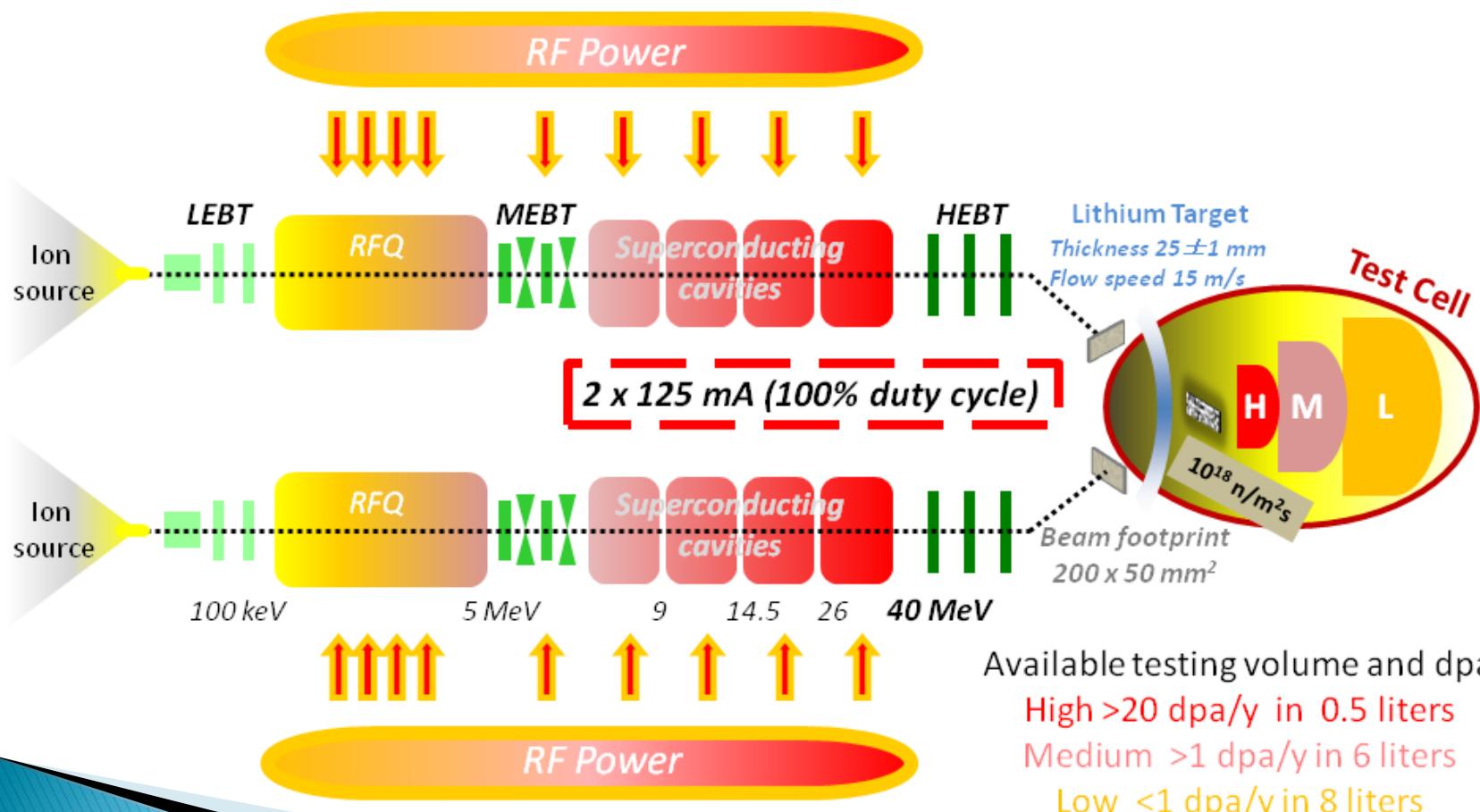
IFMIF-DONES (DEMO-Oriented Neutron Source), kick-off in September 2016.



IFMIF



Schematic View of the IFMIF Irradiation Facility



IFMIF



Schematic View of the IFMIF Irradiation Facility

