

S-DALINAC

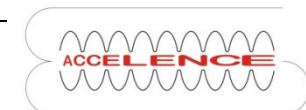


TECHNISCHE
UNIVERSITÄT
DARMSTADT

Nuclear Laboratories and Experiment

Norbert Pietralla

- **Recent upgrade**
 - 3rd recirculation
 - Energy-Recovery LINAC mode
- **Experimental sites and capabilities**
 - Low-energy high-intensity bremsstrahlung site
 - Photon tagger
 - Electron spectrometry
- **Conclusion**

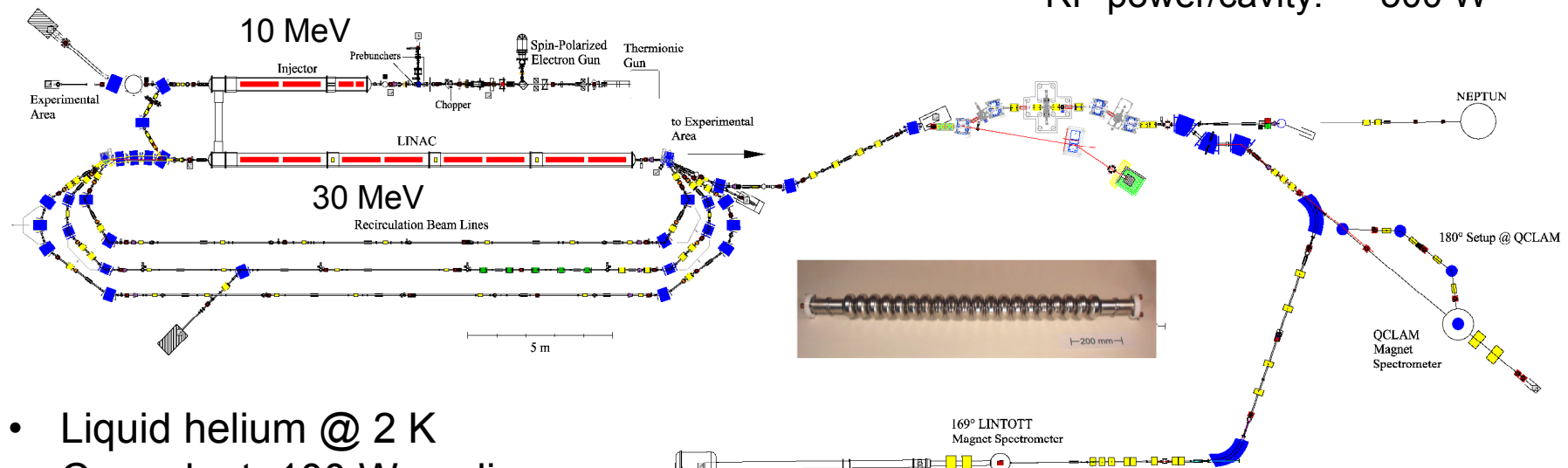


S-DALINAC (since 2016)

- Built in the 1980s
- First beam in 1987
- 1991 first recirculated beam
- 3rd recirculation in 2016

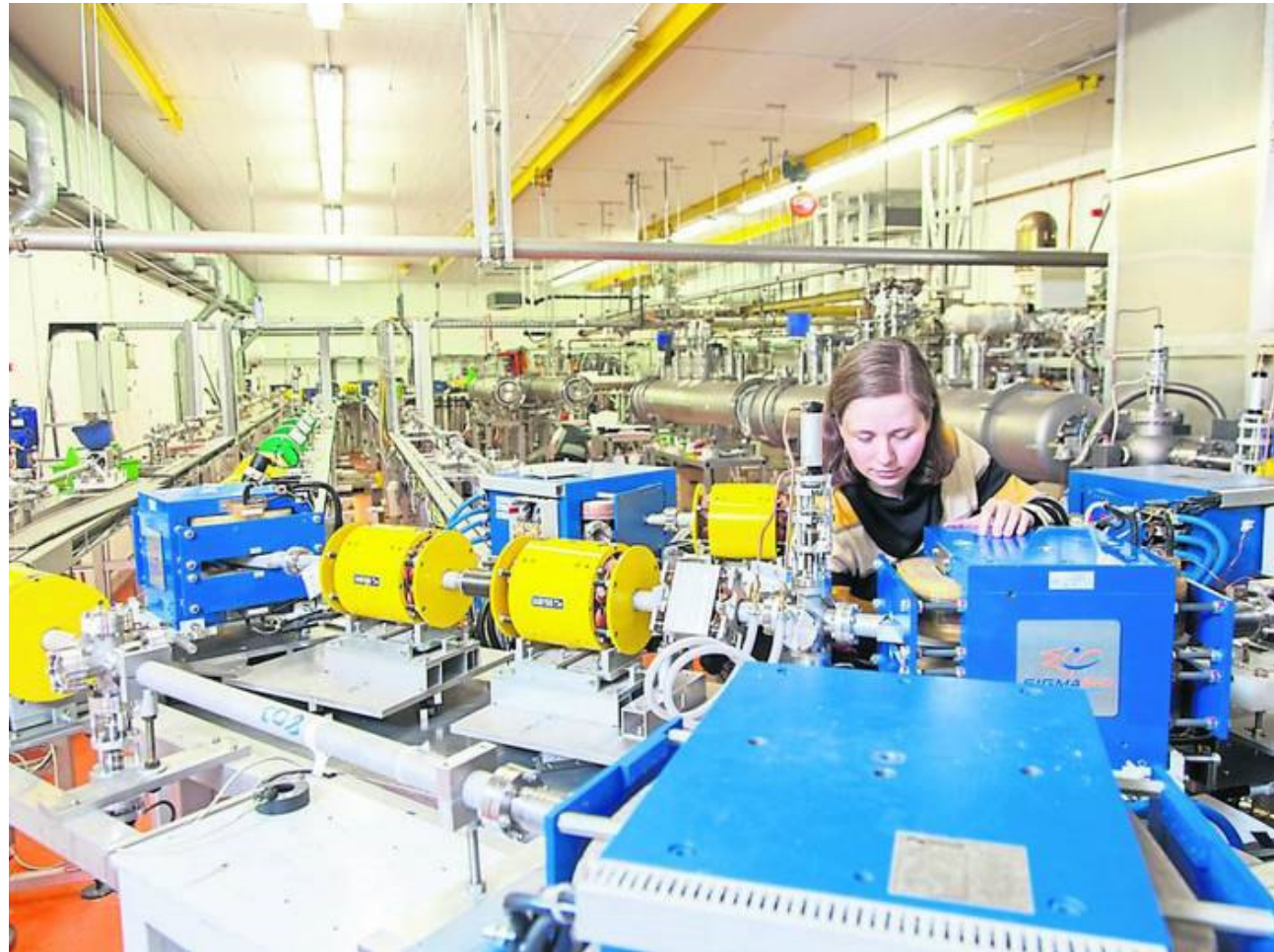
Parameters:

Max. Energy:	130 MeV
Beam Current:	20 μ A
Duty cycle:	cw
Frequency:	3 GHz
RF-power/cavity:	500 W



- Liquid helium @ 2 K
- Cryo-plant: 100 W cooling power
- 12 SRF Cavities, $\lambda = 0.1$ m

S-DALINAC (in 2016)

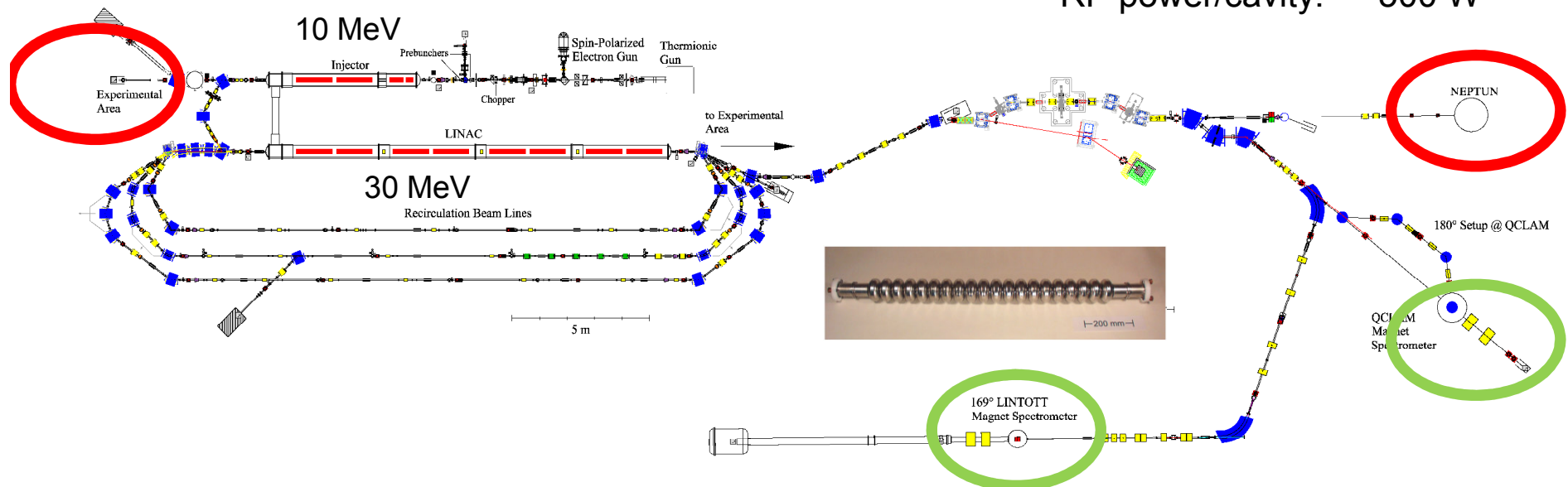


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Photonuclear Reactions

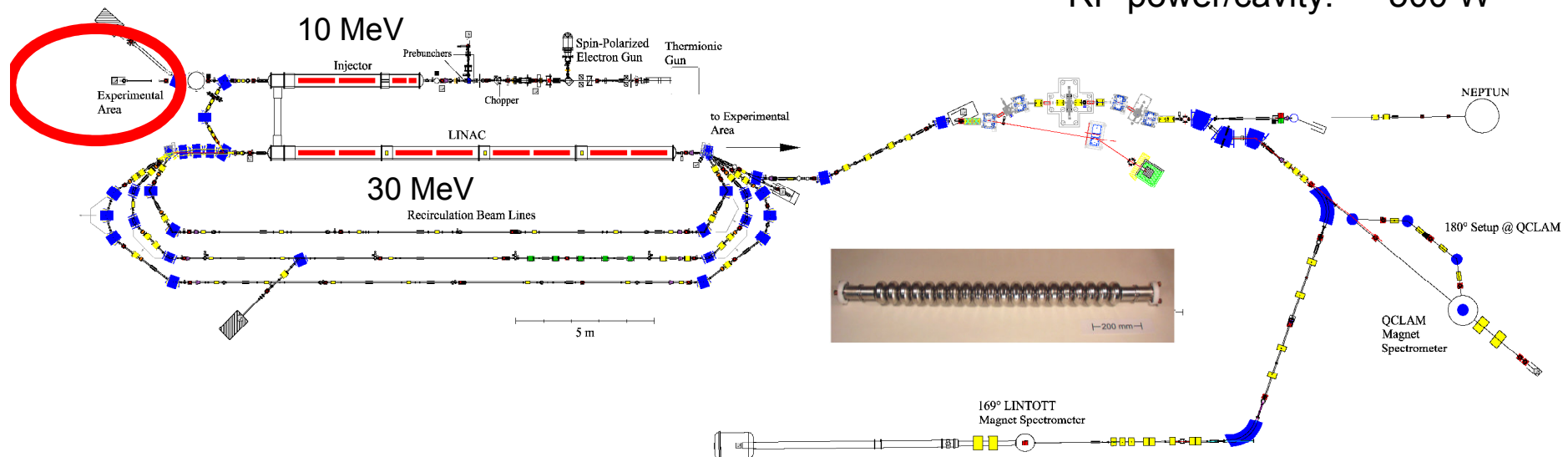
Electronuclear Reactions

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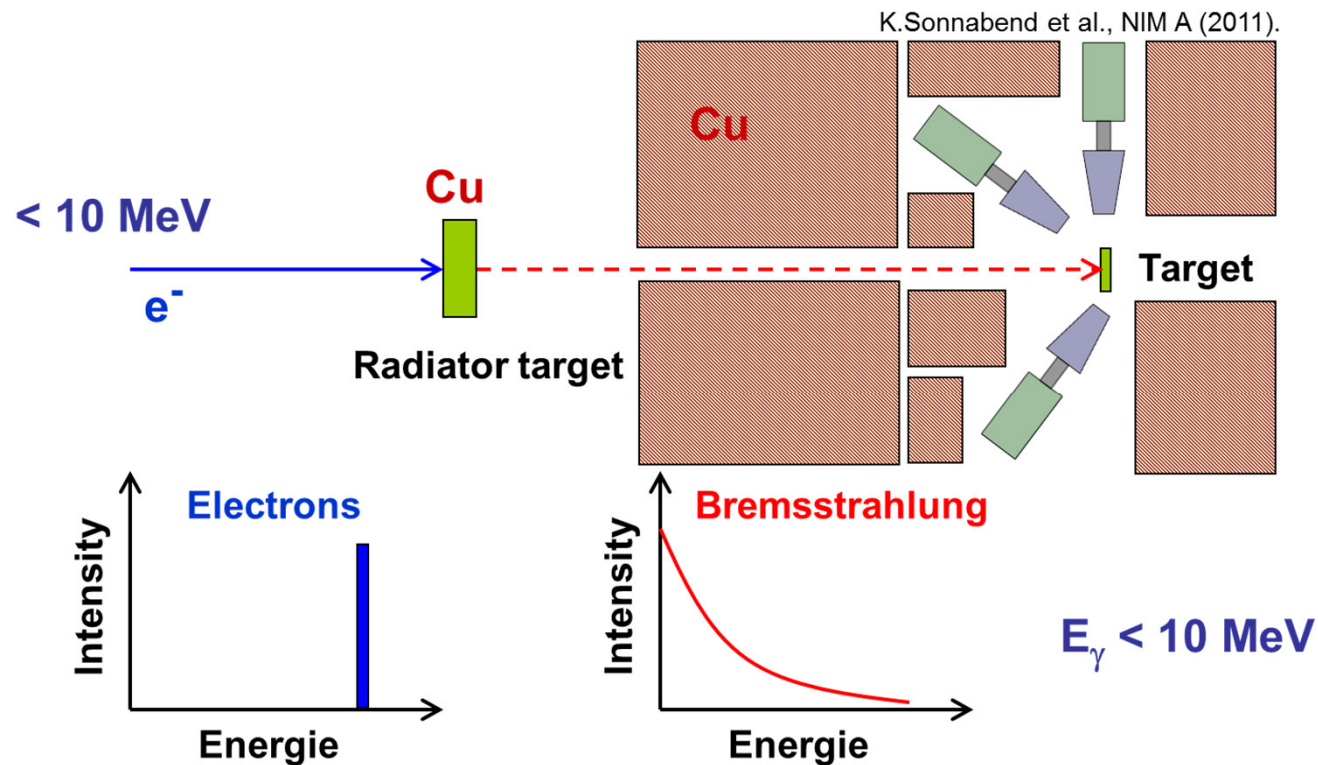
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Photonuclear Reactions

Darmstadt High-Intensity Photon Setup (DHIPS)



Photoresponse

- dipole strength
- level densities
- statistical model

Photofission

- fission modes
- fission isomers

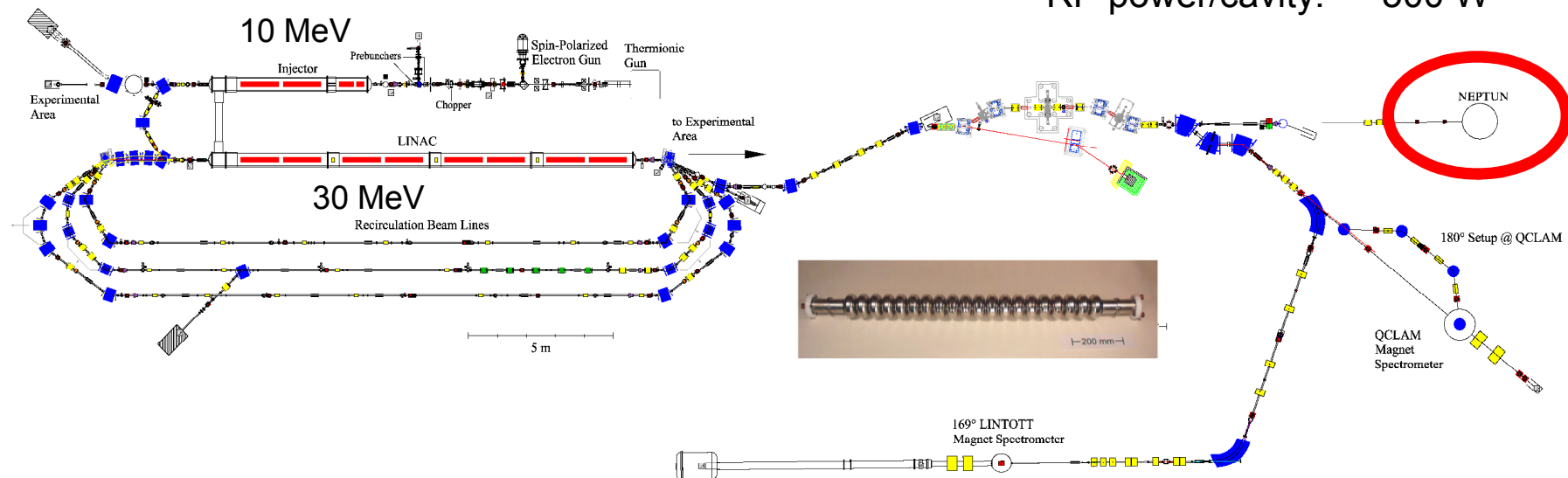
Photoactivation

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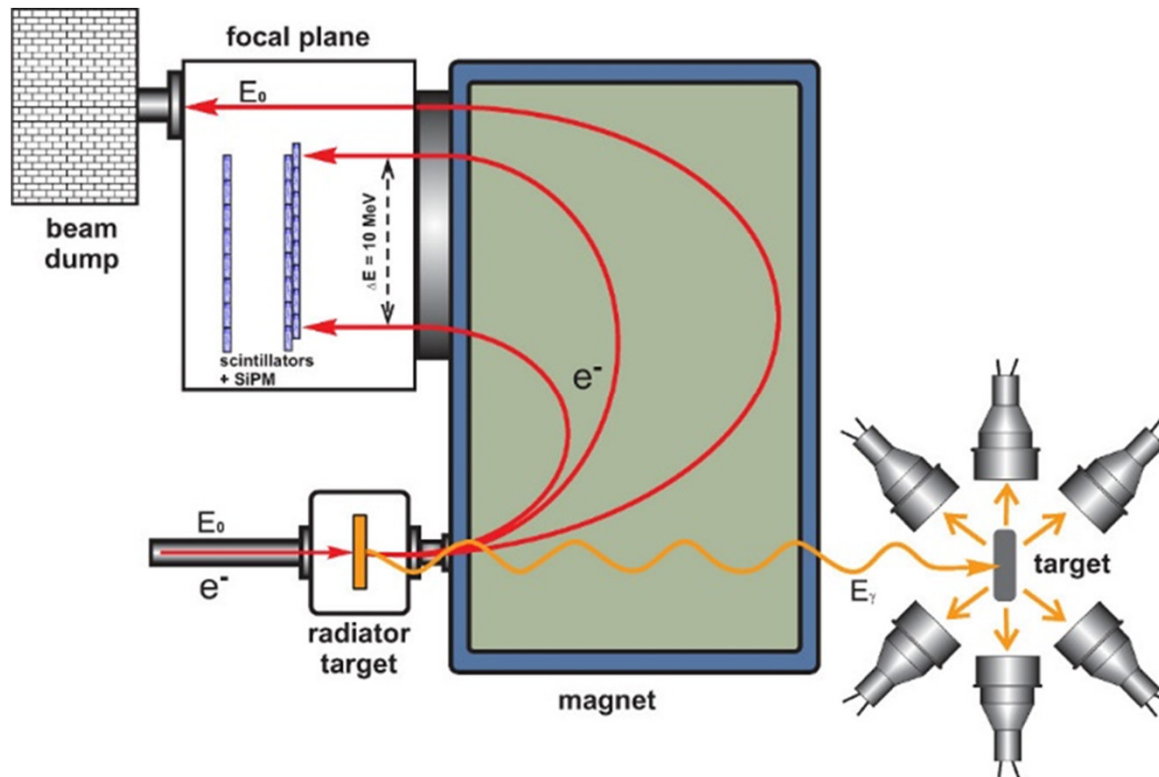
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Photonuclear Reactions

New Photon Tagger of Unprecedented Resolution (NEPTUN)



Photoresponse to quasi-monochromatic beam

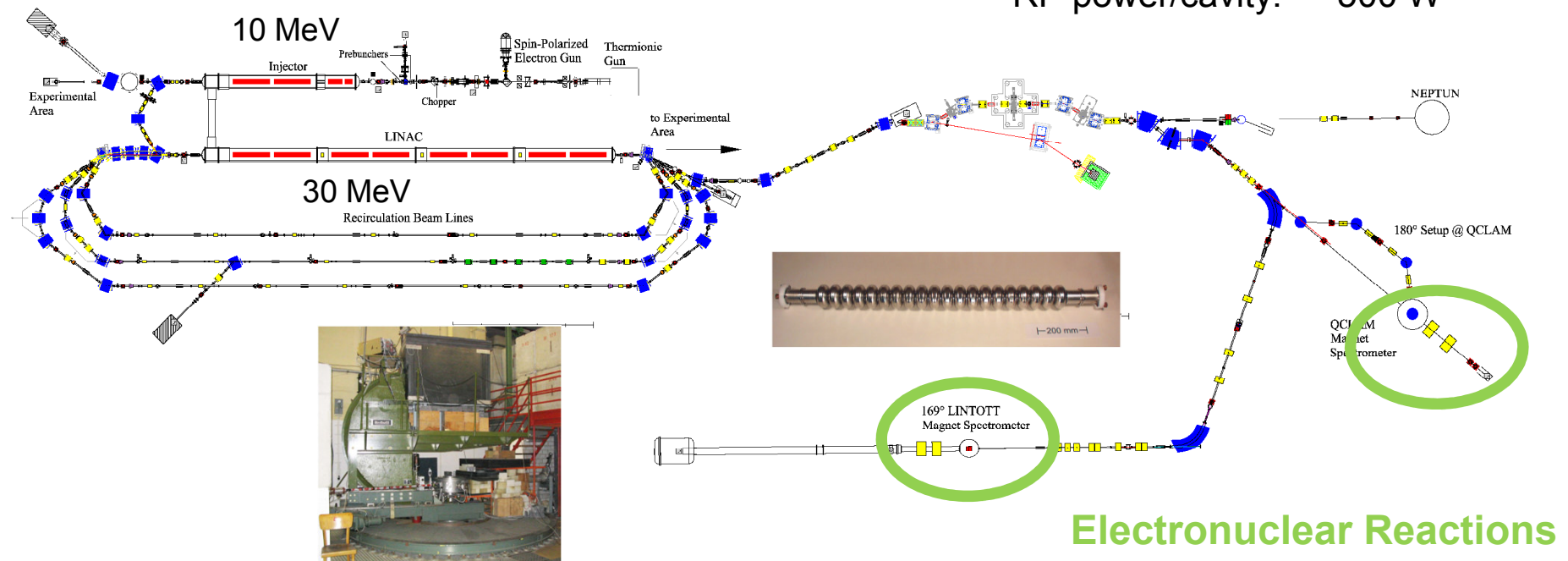
- pygmy dipole resonance
- below and above threshold
- $\gamma\gamma$ -cascades
- dipole polarizability
- nuclear EoS

S-DALINAC

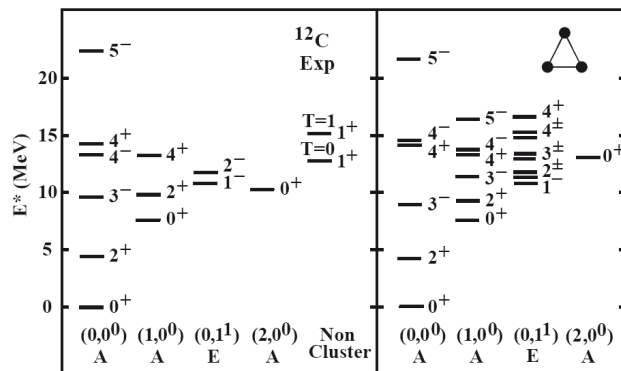
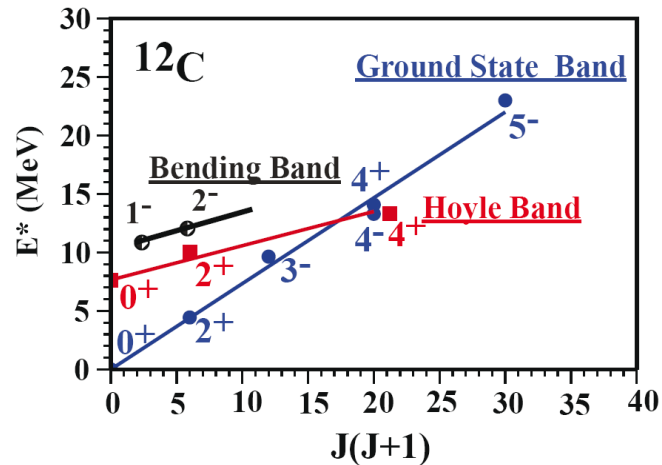
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Electron-spectrometry @ S-DALINAC



High-resolution electron-spectroscopy

- α -cluster structure of light nuclei
- structure of nuclei for ν - or WIMP detection

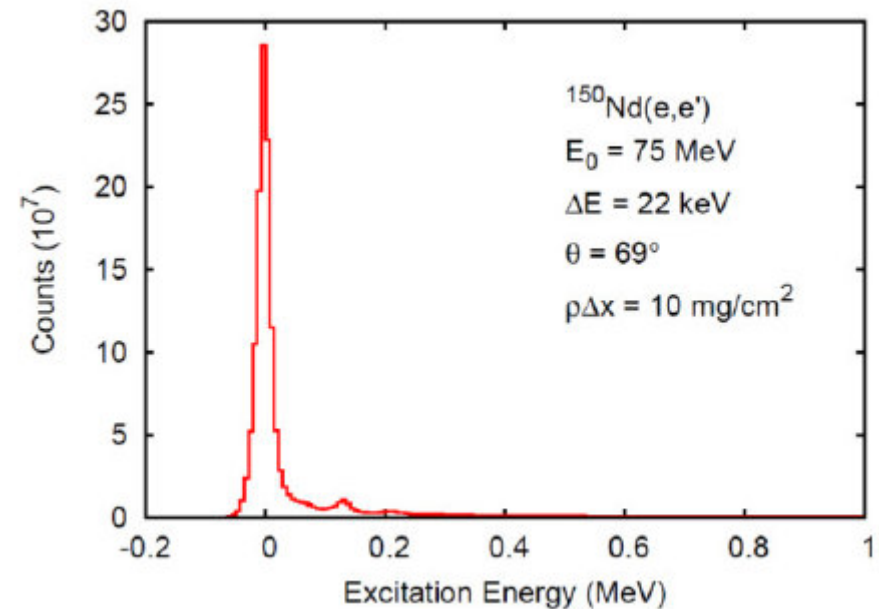
180°-scattering for $M\lambda$ -modes

- EM-analogue of GT-strength
- spin-quenching of higher multipoles

D.J. Marin-Lambarri et al., Phys.Rev.Lett. 113, 012502 (2014)

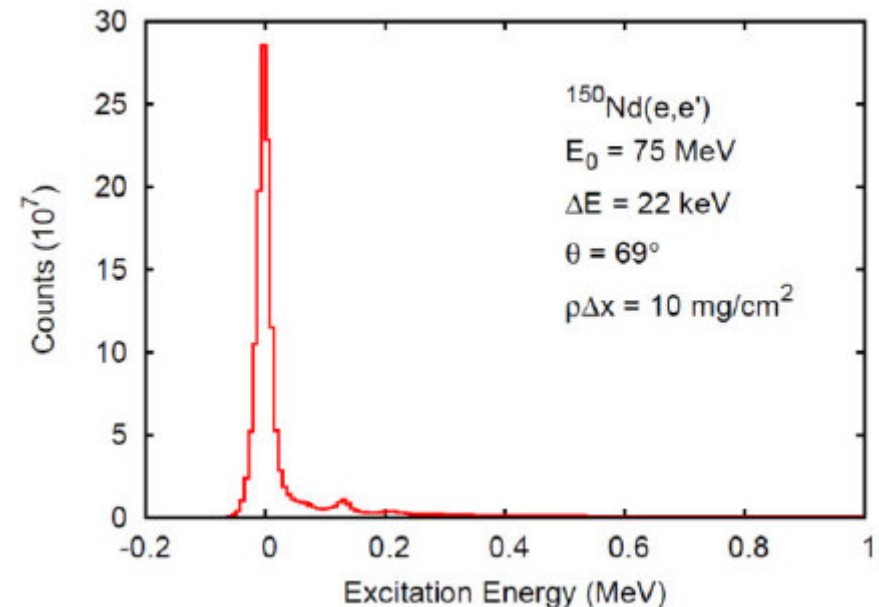
Conclusion

- rich photonuclear program at S-DALINAC
- complementary to „Nuclear Photonics“ at HIγS and ELI-NP
- electron spectroscopy at highest-possible energy resolution
- unique capabilities for research on $M\lambda$ modes of astrophysical relevance



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Thank you for your attention!