

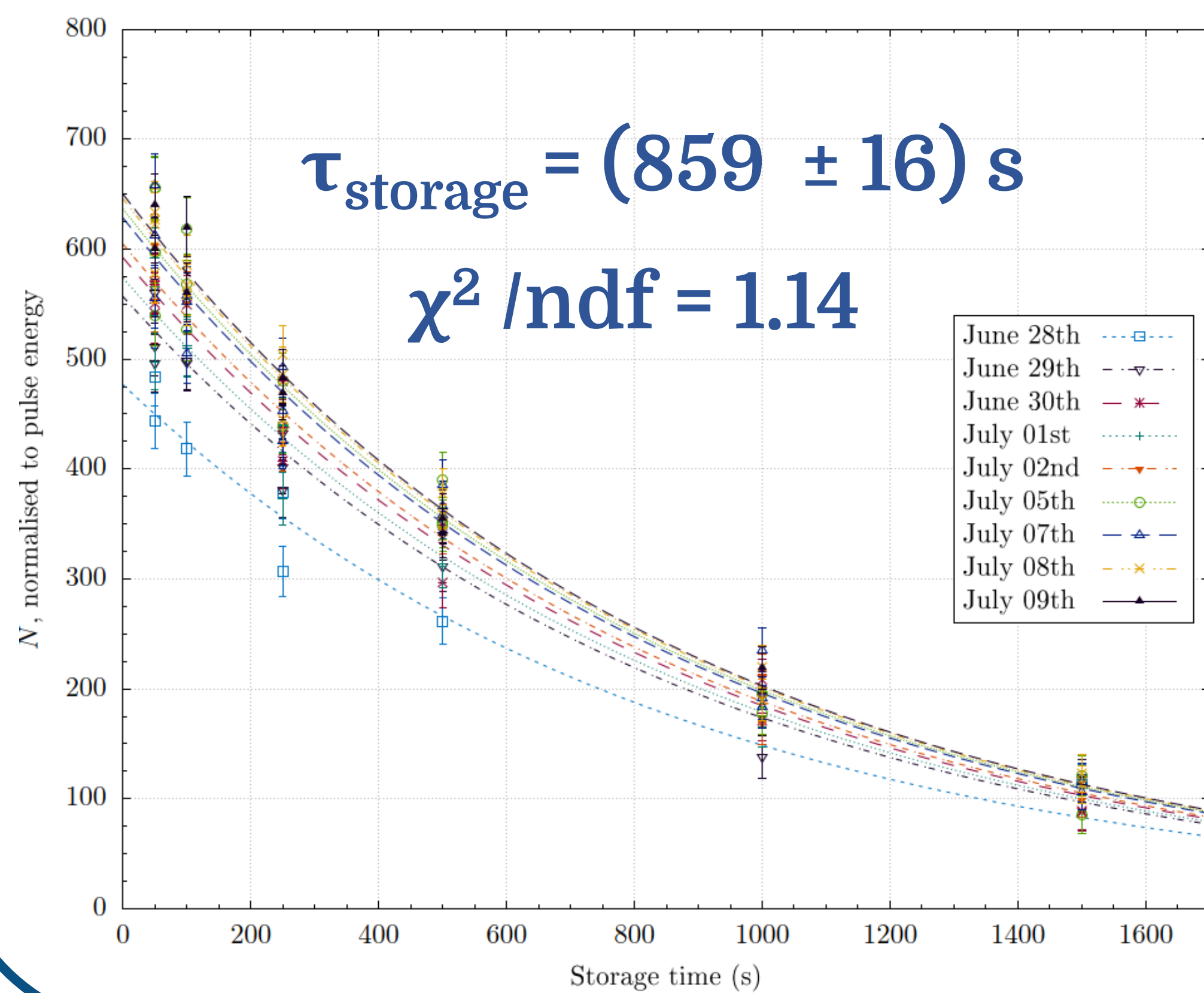
Measuring the free neutron lifetime with τ SPECT

E. Adamek¹, J. Auler¹, P. Blümner¹, M. Engler², V. Ermuth, M. Fertl¹, K. Franz²,
W. Heil¹, S. Kaufmann¹, N. Pfeifer¹, D. Ries², A. Tsvetkov², N. Yazdandoost²

¹ Institute of Physics, Johannes Gutenberg University Mainz

² Department of Chemistry TRIGA site, Johannes Gutenberg University Mainz

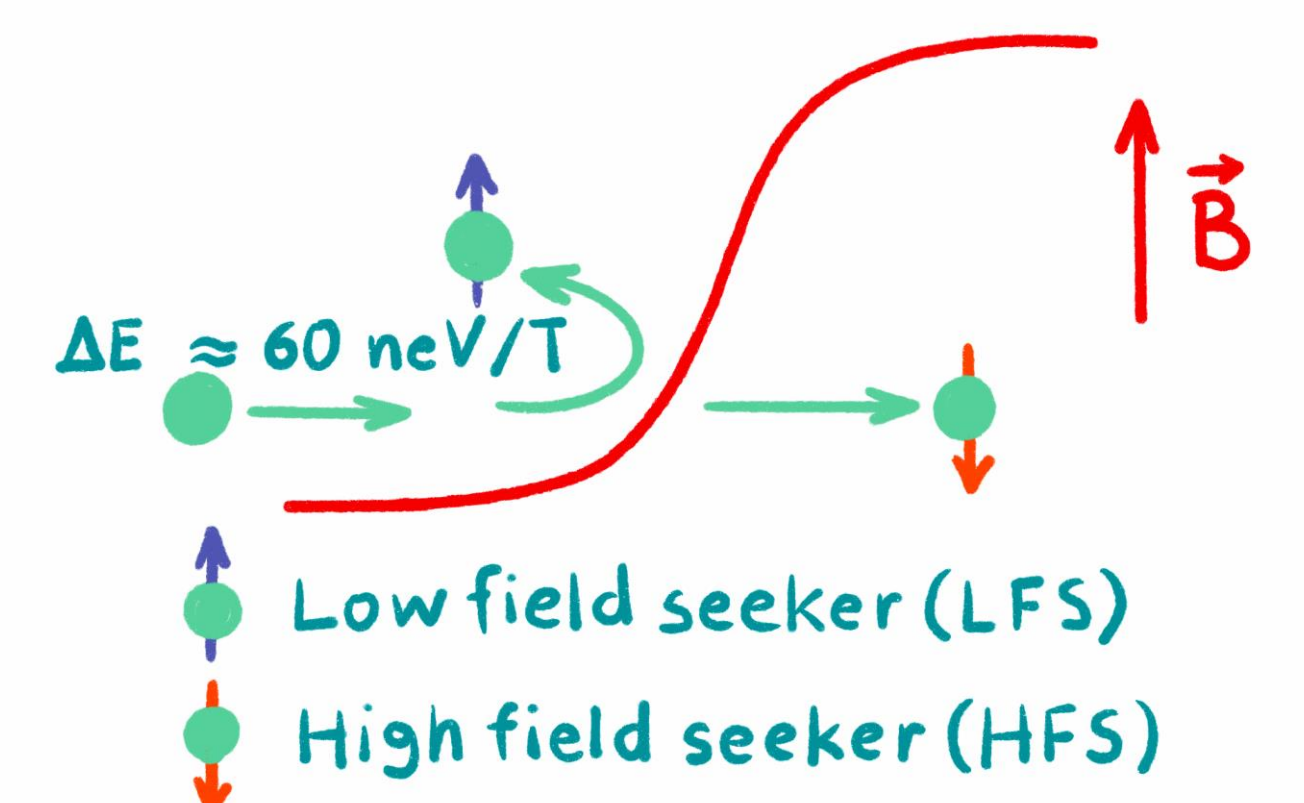
Storage curve 2021



- Double spin-flip loading of trap demonstrated
 - In-situ detection scheme verified
 - UCN source induced run-to-run fluctuations
- Currently limited by UCN source performance

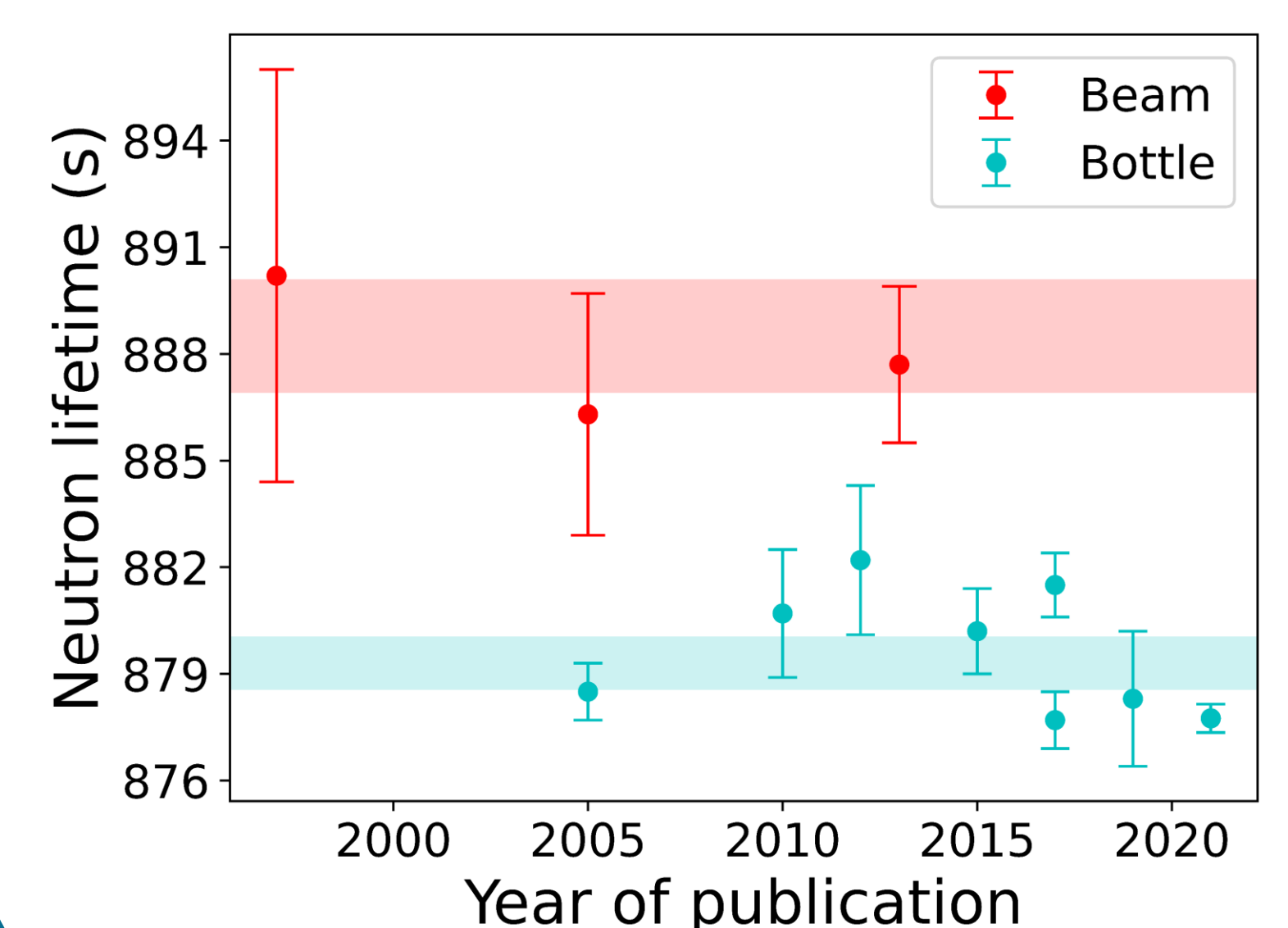
Ultra-cold Neutrons (UCN)

Electromagnetic interaction
Spin state dependent potential

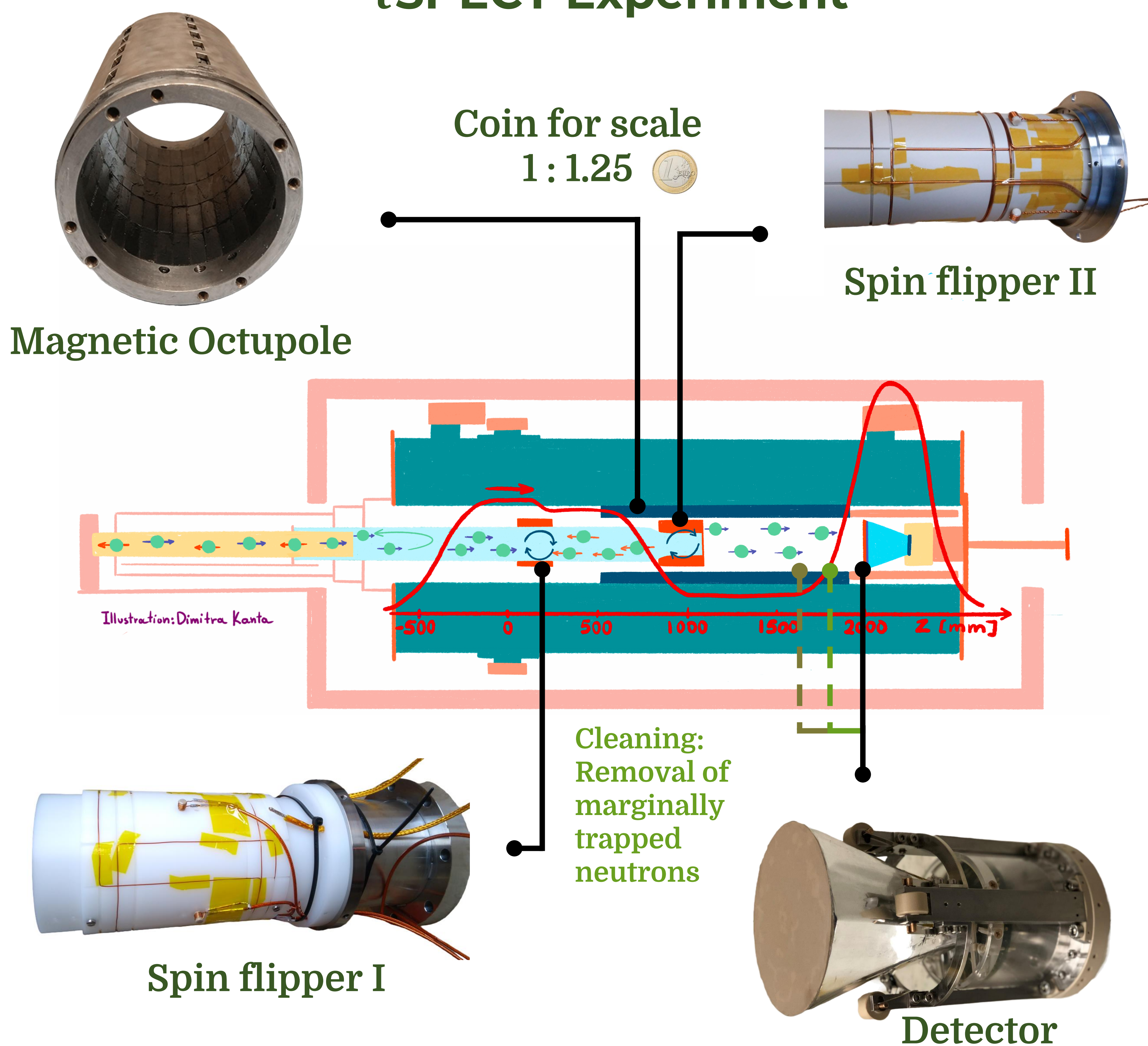


Motivation to measure the neutron lifetime

- Sensitive probe of the Standard Model of particle physics
- Simulations of the early stages of the universe
- Neutron lifetime still puzzling



τ SPECT Experiment



Fill τ SPECT with UCN using spin flippers

Remove spin flippers from storage volume

Move detector to counting position

Wait X min

Move detector to cleaning position for 200 s

Funding & further information

This work is supported by the Cluster of Excellence "Precision Physics, Fundamental Interactions, and Structure of Matter" • (PRISMA+ EXC 2118/1) funded by the German Research Foundation (DFG) within the German Excellence Strategy (Project ID 39083149). Special thanks to Dimitra Kanta for the illustration.

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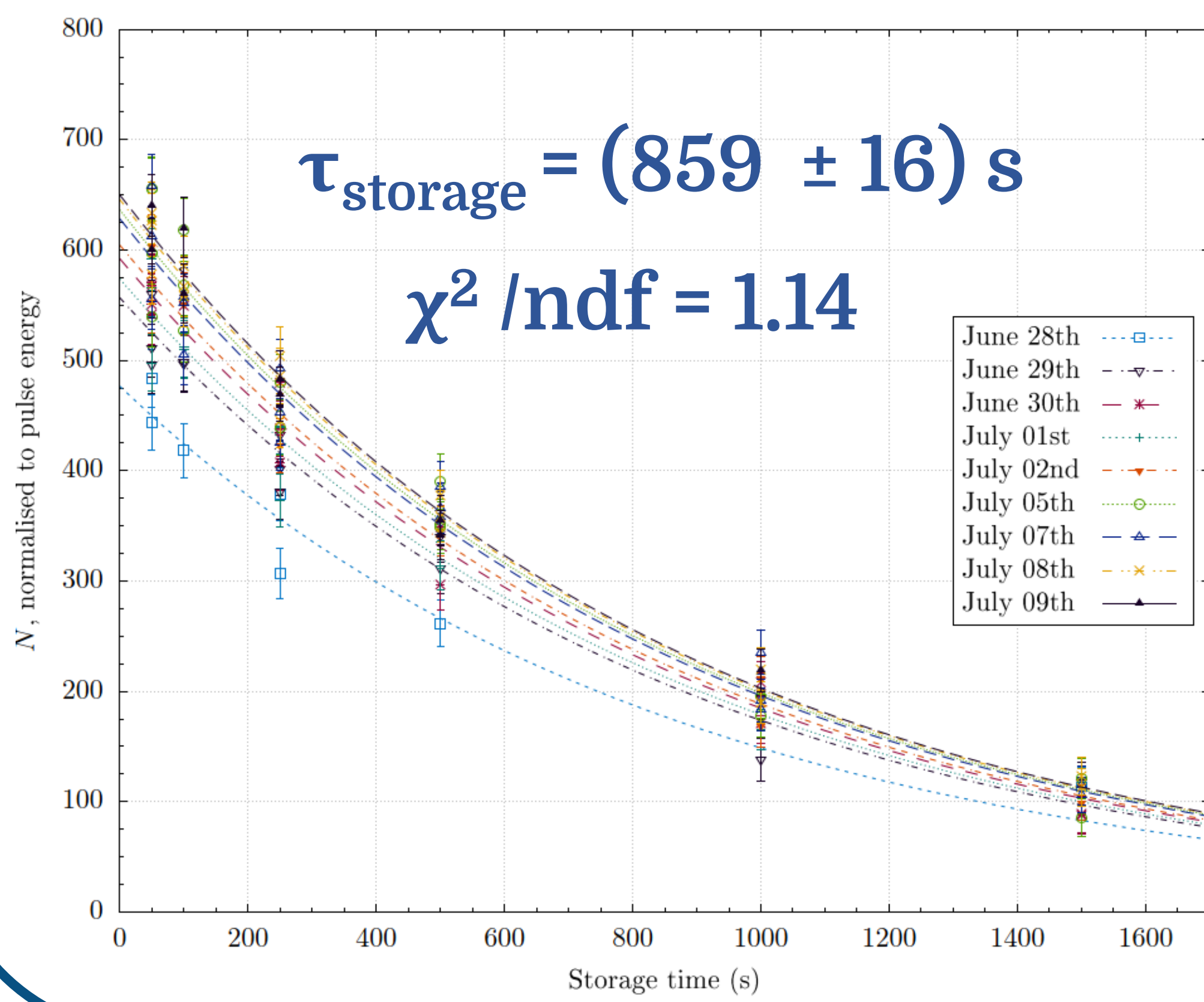
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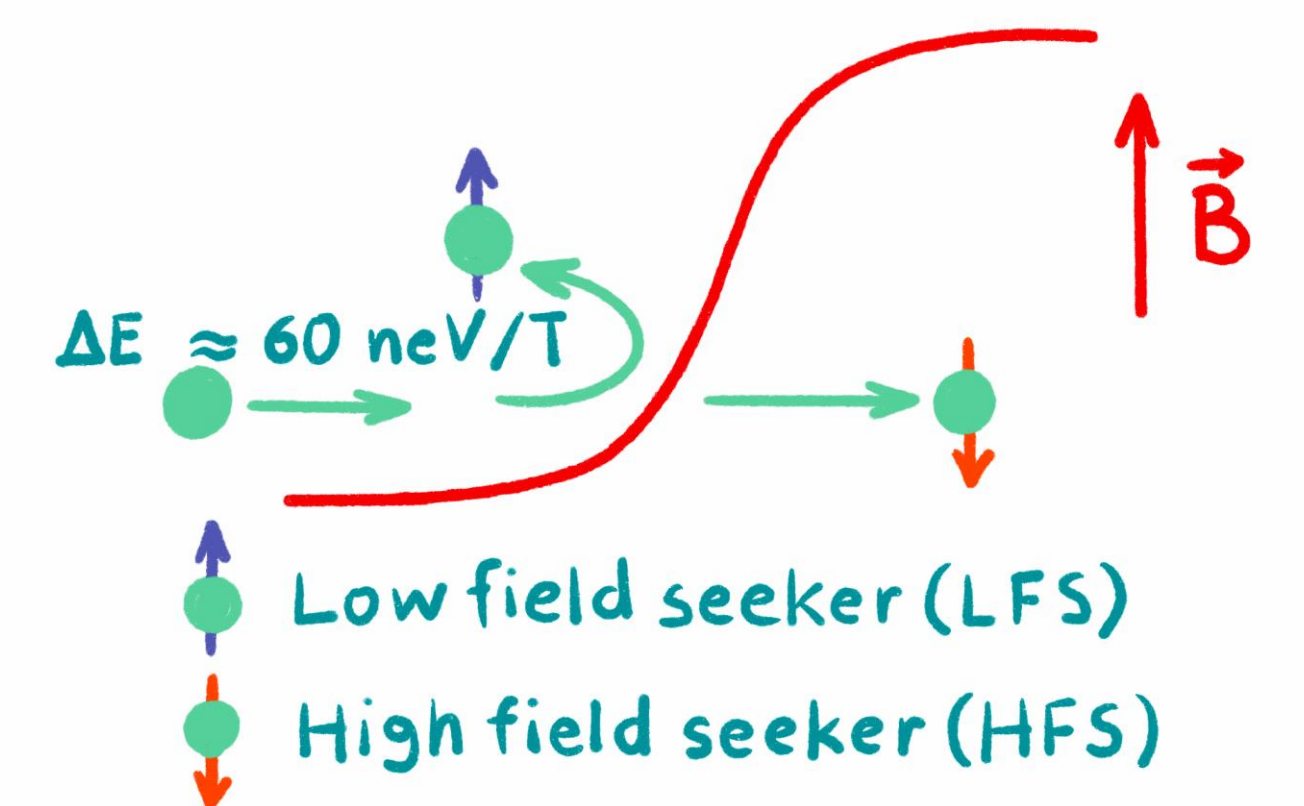
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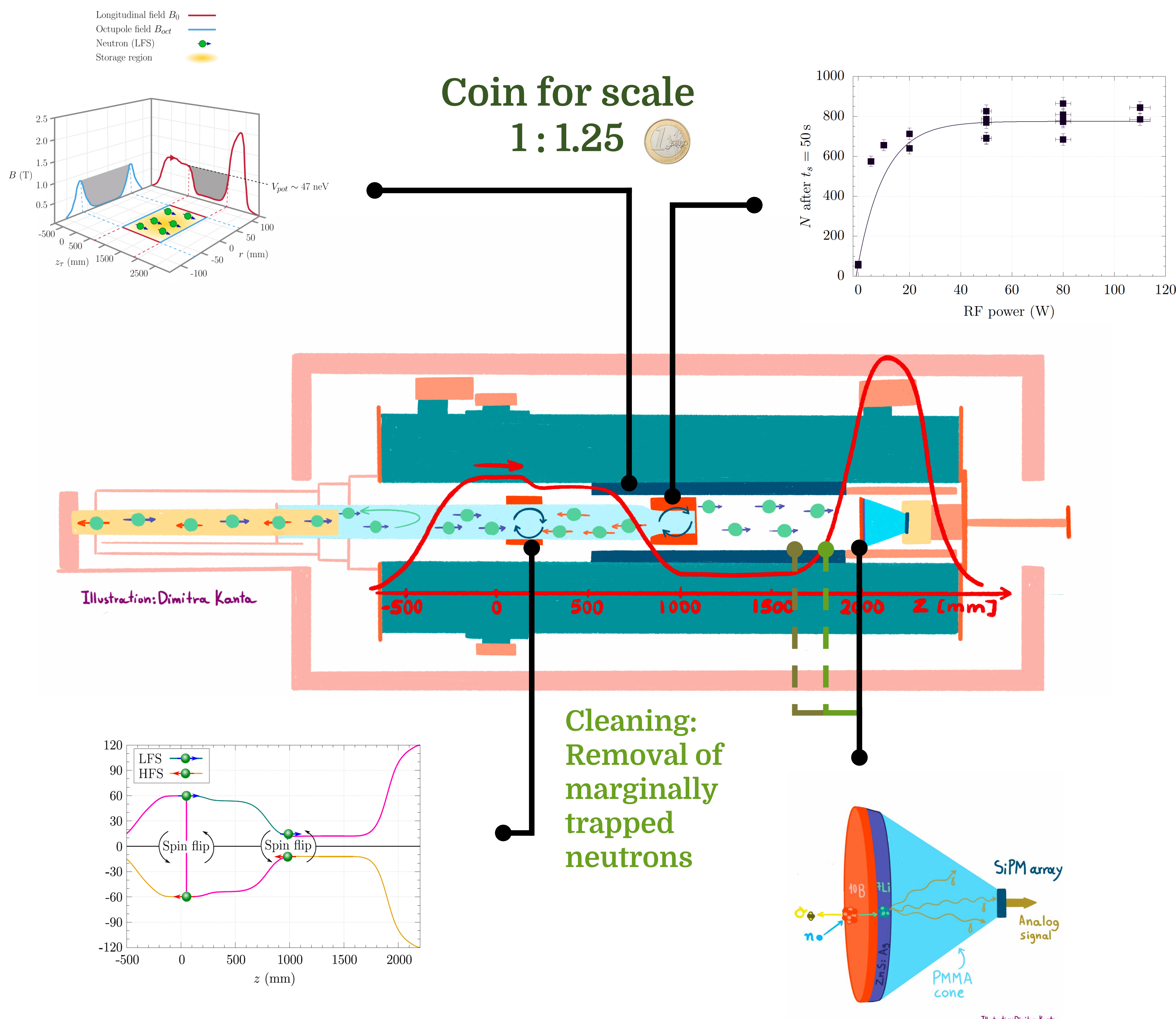
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Ultra-cold Neutrons (UCN)

Electromagnetic interaction
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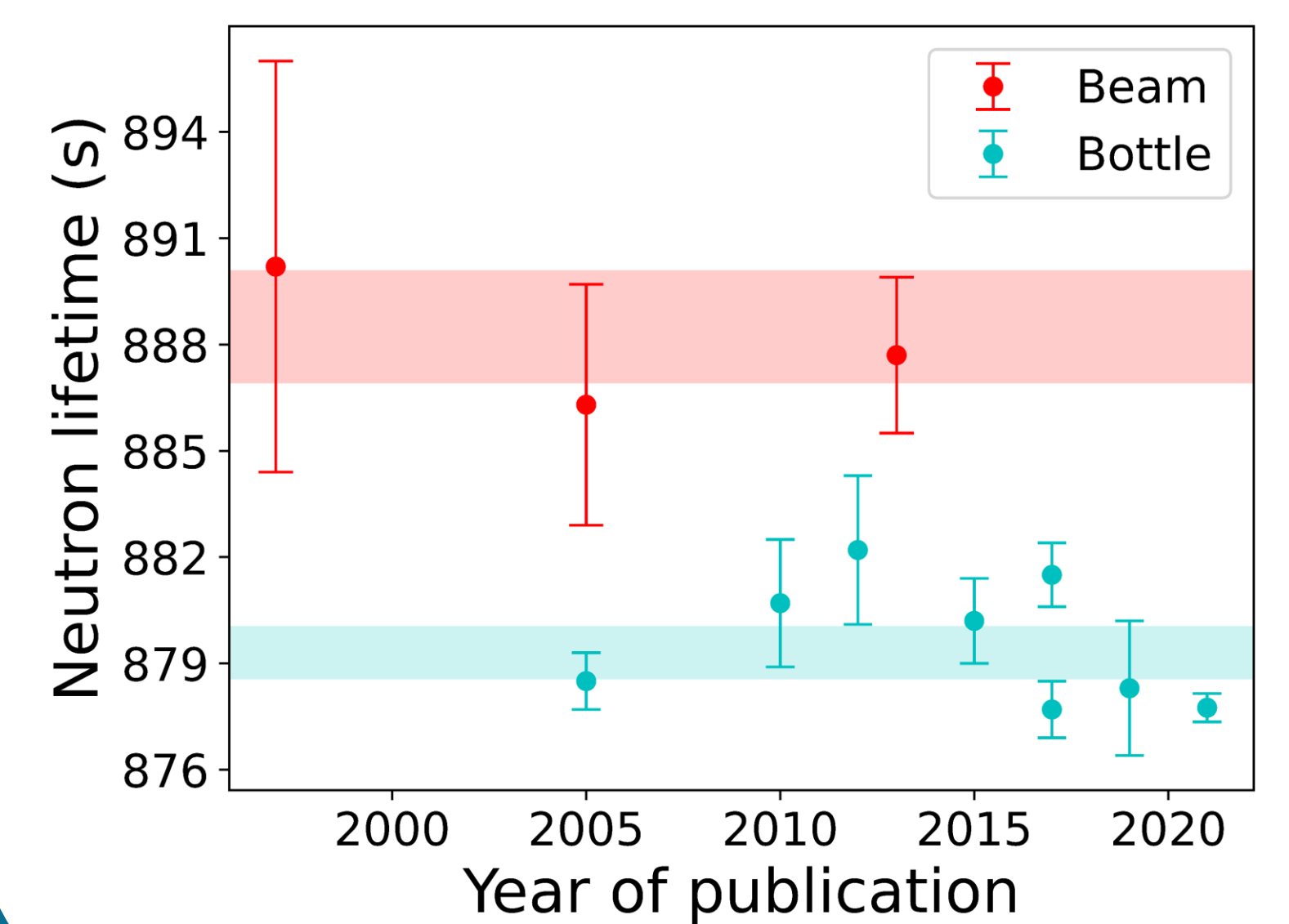


τ SPECT Experiment



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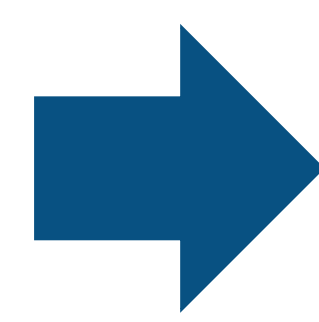
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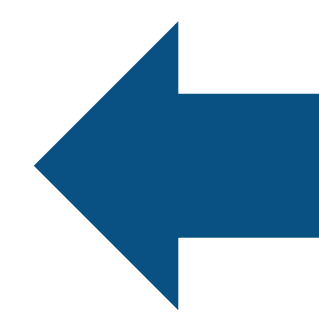
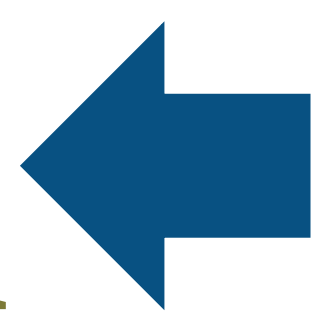
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Move detector to counting position



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