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First high-precision measurement of the low-lying isovector M1 strength in Li-6 at the photon point

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Since neither of the hydrogen nor helium nuclei have a particle-bound excited state, Li-6 is the lightest nuclide in the entire nuclear chart for which an excited state decays predominantly by gamma-ray emission. The particle-decay of its 0+ state with isospin T=1 at 3563 keV excitation energy is parity-forbidden, and it decays exclusively by a strong isovector M1 transition to the 1+ ground state with isospin T=0. This decay transition represents the M1 analogue to the GT decay of the ground state of He-6 which has recently been measured with spectacular precision [1]. Although the lifetime of the 0+ state of Li-6 has been measured many times since the 1950s there is a disturbing 3-sigma deviation between the error-weighted mean value of the world-data and the measurement which claimed the highest precision. Moreover, the latter [2] has not been a measurement at the photon point but it was an electron-scattering experiment constraining the B(M1, 0+_3653 -> 1+ gs) value from an, in principle, model-dependent extrapolation of electron-scattering data at finite momentum transfers to the photon point. We have re-measured [3] the electromagnetic decay width of the 0+ state of Li-6 with a statistical uncertainty of only 1% with the technique of Relative nuclear Self-Absorption. The data and the technique will be presented and discussed.

[1] A. Knecht at el., Phys. Rev. Lett. 108, 122502 (2012).
[2] J. Bergstrom et al., Nucl. Phys. A 251, 401 (1975).
[3] U. Gayer et al., in preparation.

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