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Low energy magnetic radiation (LEMAR)

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A pronounced spike at low energy in the strength function for magnetic radiation (LEMAR) is found by means of Shell Model calculations, which explains the experimentally observed enhancement of the dipole strength at transition energies around 1 MeV. LEMAR originates from statistical low-energy M1-transitions between many excited complex states. Re-coupling of the proton and neutron high-l orbitals generates the strong magnetic radiation. The observation of LEMAR in various nuclei and its absence in other will be reviewed and possible theoretical explanations for its occurrence and absence presented. LEMAR is predicted for nuclides participating in the r-process, and its impact on element synthesis will be discussed. The statistical analysis of the Shell Model B(M1) values reveals unexpected behavior. An exponential decrease of the strength function, close to a Bose-Einstein distribution and a power law for the size distribution of the B(M1) values are found. which strongly deviate from the ones of the GOE of random matrices, commonly used to represent complex compound states.