

# **Ferromagnetic resonance and the linewidth in spherical samples – revision of the standard measurement techniques**

J. Krupka,<sup>1</sup> P. Aleshkevych,<sup>2</sup> B. Salski,<sup>1</sup> P. Kopyt,<sup>1</sup> and A. Pacewicz<sup>1</sup>

<sup>1</sup>*Warsaw University of Technology, Warsaw, 00662, Poland*

<sup>2</sup>*Institute of Physics, Polish Academy of Sciences, Warsaw, 02668, Poland*

Our recent findings revealed that, despite common understanding, the fundamental resonance, often called the mode of uniform precession, observed in experiments with magnetized YIG spheres performed at microwave frequencies is not located at static magnetic field corresponding to the ferromagnetic resonance. In fact, the fundamental resonance occurs at the frequency where the real part of the effective permeability for the clockwise circularly polarized RF magnetic field is negative and close to -2. This is characteristic feature of the magnetic plasmon resonance. However, that novel finding has prompted a lot of fundamental questions, such as those related to the meaning of the ferromagnetic linewidth which we now realize is not measured at the ferromagnetic resonance but at the magnetic plasmon resonance. We have performed rigorous theoretical and experimental study of the relationship between the quality factor of the magnetic plasmon resonance and the ferromagnetic linewidth, indicating essential aspects of the nature of electromagnetic losses in the resonance structures containing magnetized ferromagnetic spheres.