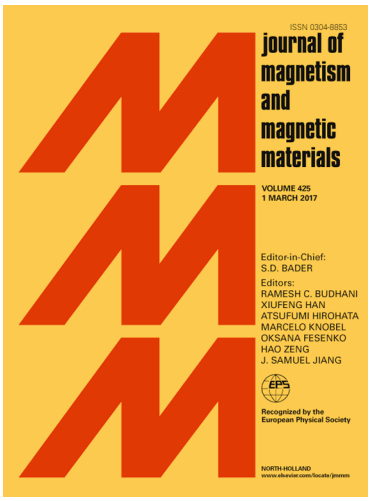

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The Quantum Field Of A Magnet Shown By A Nanomagnetic Ferrolens

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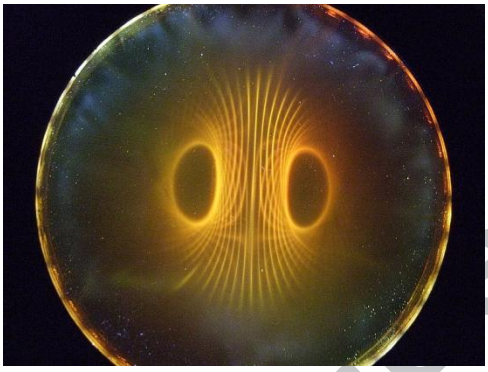
Highlights:

- Direct Observation Nanomagnetic Visualization Method for Magnetostatic Fields
- Quantum Field 3D Euclidian Geometry of Dipole Magnet Revealed (breakthrough discovery)
- Experimental Results and Theoretical Analysis

ABSTRACT



Graphical Abstract

It has been more than two hundred years since the first iron filings experiment, showing us the 2D macroscopic magnetic imprint of the field of a permanent magnet. However, latest developments in modern nanomagnetic passive direct observation devices reveal in real-time and color a more intriguing 3D dynamic and detailed image of the field of a magnet, with surprising new findings, that can change our perspective for dipole magnetism forever and lead to new research.

This research is a continuation of our previous work, *"Markoulakis, E., Rigakis, I., Chatzakis, J., Konstantaras, A., Antonidakis, E. Real time visualization of dynamic magnetic fields with a nanomagnetic ferrolens(2018) Journal of Magnetism and Magnetic Materials, 451, pp. 741-748.DOI: 10.1016/j.jmmm.2017.12.023"* that is using a ferrolens apparatus for showing the dynamic magnetic field on a transmitting radio antenna, while this time the magnetostatic fields were under our scope and examined with the aid of the ferrolens. We are presenting experimental and photographical evidence, demonstrating the true complex 3D Euclidian geometry of the quantum field of permanent magnets that have never been seen before and the classic iron filings experiment, apart of its 2D limitations, fails to depict. An analysis of why and what these iron filings inherent limitations are, giving us an incomplete and also in some degree misguiding image of the magnetic field of a magnet is carried out, whereas, as we prove the ferrolens is free of these limitations and its far more advanced visualization capabilities is allowing it to show the quantum image with depth of field information, of the dipole field of a permanent magnet.

For the first time the domain wall (i.e. Bloch or Neel wall) region of the field of a magnet is clearly made visible by the ferrolens along with what phenomenon is actually taking place there, leading to the inescapable conclusion, novel observation and experimental evidence that the field of any dipole magnet actually consists of two distinct and separate toroidal shaped 3D magnetic bubbles, each located at either side of the dipole around the exact spatial regions where the two poles of the magnet reside.

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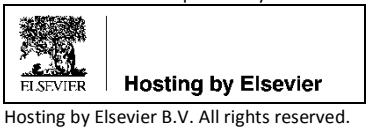

doi:

Hyperlinks:
1. Video1 demonstration link: https://tinyurl.com/yctntnjc
2. Video2 demonstration link: https://tinyurl.com/y78mgd7a
3. Fluxscope photo: https://tinyurl.com/ycdyfher
4. Raw photo of fig.8: https://tinyurl.com/ycnrqgrw
5. Graph data of fig.11: https://tinyurl.com/y9dvxr9a
6. Three-axis magnetometer data: https://tinyurl.com/yapq8o8u