

# **Novel Sensor for Magnetic Measuring Based on Magneto-thermal Effect**

**Jialun Li<sup>1</sup>, Yue Li<sup>1</sup>, Shejuan Xie<sup>1</sup>, Zhenmao Chen<sup>1</sup>**

<sup>1</sup>School of Aerospace Engineering, Xi'an Jiaotong University, China

Magnetic field has been playing an important role in many key fields. The measurement of magnetic is an important tool for the study of physical phenomena related to magnetic phenomena, and magnetic field measurement sensors are important components, transforming invisible information about the measured magnetic field into visual information. The demand for magnetic field measurement is gradually transitioning from single point measurement to measurement of the distribution and flexibility of magnetic field measurement sensors is concerned. For the bottleneck problem of the current magnetic field measurement sensor, in this study, we designed a new patch sensor composed of Fe<sub>3</sub>O<sub>4</sub> magnetic nanoparticles and flexible substrate based on Neel relaxation. By taking the temperature rise rate of the sensing unit to characterize the magnetic field intensity, we used the sensor to measure the magnetic field intensity distribution of alternating magnetic fields, converting invisible magnetic field information into visible infrared temperature images. The effectiveness of the sensor was also verified through simulation calculations and comparative experiments using a magnetic field measurement coil based on electromagnetic induction. We found that the proposed new magnetic field sensor based on the magneto-thermal effect can be flexible, arrayed, passive and wireless, and it breaks through the measurement of high frequency magnetic field.