Contribution ID: **73** Type: **Talk**

Advancements in Axion Haloscope Sensitivity: CAPP-MAX with High-Temperature Superconducting Cavities

Thursday, 19 September 2024 14:35 (20 minutes)

The axion haloscope is a highly sensitive detector that converts axions into photons within a resonant cavity immersed in a strong magnetic field. The experiment's sensitivity is significantly influenced by the cavity's characteristics, including volume, form factor, physical temperature, and the Q-factor. A higher Q-factor extends the duration of axion signals within the cavity, expediting axion searches and reducing thermal dissipation. However, the intense magnetic field within the haloscope system renders conventional superconducting cavities ineffective for achieving a high Q-factor. To overcome this challenge, CAPP has utilized high-temperature superconducting (HTS) materials, specifically rare-earth barium copper oxide (ReBCO), to construct superconducting haloscope cavities. The flexibility of the ReBCO film allowed us to create HTS cavities in any 3D shape by affixing well-biaxially textured ReBCO film to the cavity's inner wall. This innovative approach led to a world-record Q-factor exceeding 10^7 at 5.4 GHz, even under an 8T magnetic field. Currently, we are applying this technology to large-scale cavities (>30 liters) for CAPP's Main Axion Experiment (CAPP-MAX), the world's most sensitive haloscope, which utilizes 12 Tesla magnetic fields and quantum noise-limited amplifiers. Detailed results will be presented at the workshop.

Primary author: KWON, Ohjoon (Institute for Basic Science / Center for Axions and Precision Physics research)

Co-authors: AHN, Danho; YOUM, Dojun (KAIST); Dr KIM, Jinsu (IBS-CAPP); Mr JIWON, Lee (KAIST); PARK, Seongtae (CAPP/IBS); CHUNG, Woohyun (IBS-CAPP); Prof. SEMERTZIDIS, Yannis (KAIST and IBS)

Presenter: KWON, Ohjoon (Institute for Basic Science / Center for Axions and Precision Physics research)

Session Classification: Afternoon 4