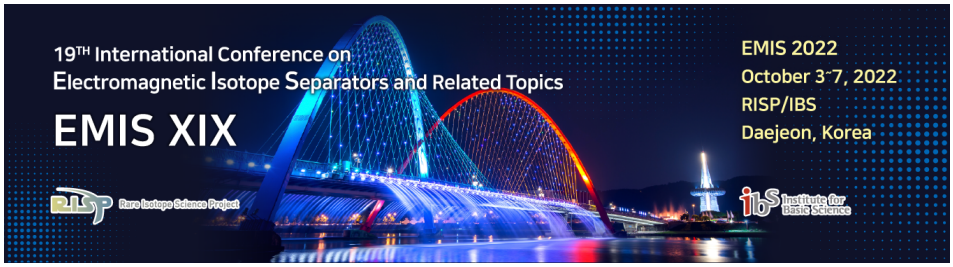

Contribution ID: **36** Type: **Oral Session**

Looking for CP violation in nuclear beta decay: First data-taking of the MORA experiment at JYFL, Finland

Monday, 3 October 2022 16:50 (20 minutes)

The MORA project focuses on ion manipulation in traps and laser orientation methods for the searches for New Physics (NP) in nuclear beta decay, looking for possible hints to explain the matter-antimatter asymmetry observed in the Universe. The JYFL Accelerator Laboratory and more specifically the IGISOL facility provide an ideal environment for the initial phase of the MORA experiment. The precise measurement of the so-called triple D correlation is sensitive to Time reversal violation, and via the CPT theorem, to CP violation. The D correlation parameter is particularly sensitive to the existence of Leptoquarks, which are hypothetical gauge bosons appearing in the first theories of baryogenesis. Leptoquarks are now actively searched for at the LHC, the measurements from which provide competitive and complementary constraints. MORA will use an innovative in-trap laser polarization technique for the precision measurement of the D correlation in the beta decay of 23Mg.

In this regard, the first test experiment with a 23Mg beam has been carried out in the IGISOL facility in Feb 2022. For the initial offline optimization, 23Na+ ions slowed down to 100 eV from the RF cooler buncher could be efficiently tuned for trapping. For 500 ms trapping time, efficiencies of 5 to 50% were achieved. During the beam time, a significant amount of 23Mg could be produced; 105 ions per μA of the primary proton beam. A 90 mW circularly polarized laser beam could be injected and aligned in the trap. Despite these achievements, a large contamination of 23Na and a high RF noise on the recoil ion detectors hindered the recording of β-recoil coincidences.

The next experiment will be performed at the end of May 2022 addressing these issues. New target heads and ion guides have already been prepared to remove the sodium contamination and a new RF generator has been employed to suppress the unwanted high order harmonics. After reducing the contamination of 23Na, we should be able to assess the performance of the innovative in-trap laser polarization technique. Along with the whole description of the project, I will be discussing the proof-of-principle measurement and progresses of the MORA experiment.

Primary author: SINGH, Abhilasha (GANIL)

Presenter: SINGH, Abhilasha (GANIL)

Session Classification: Session 4