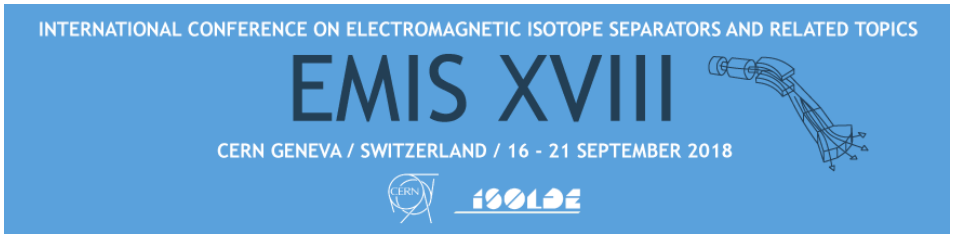

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Nuclear spectroscopy of r-process nuclei using KEK isotope separation system

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The study of the β-decay half-lives of waiting-point nuclei with $N = 126$ is crucial to understand the explosive astrophysical environment for the formation of the third peak in the observed solar abundance pattern, which is produced by a rapid neutron capture process (r-process). However, the half-life measurements of the waiting-point nuclei remain impracticable due to the difficulty in the production of the nuclei. Therefore, accurate theoretical predictions for the half-lives are required for investigations of astrophysical environments. In order to improve and establish nuclear theoretical models, it is essential to perform nuclear spectroscopy for investigating β-decay schemes including spin-parity values, nuclear wave-functions and interactions, and nuclear masses in this heavy region.

For the nuclear spectroscopy, we have developed KEK Isotope Separation System (KISS), which is an argon-gas-cell-based laser ion source combined with an on-line isotope separator, installed in the RIKEN Nishina center [1-2]. The nuclei around $N = 126$ are produced by multi-nucleon transfer reactions (MNT) [3] of ^{136}Xe beam (10.75 MeV/A) impinging upon a ^{198}Pt target. Thanks to newly developed doughnut-shaped gas cell [2], the extraction yields of the reaction products increased by more than one order of magnitude. This enabled us to successfully perform in-gas-cell laser ionization spectroscopy of ^{199g,199m}Pt [4] and ^{196,197,198}Ir for evaluating the magnetic moments and the trend of the charge-radii (deformation parameters), and β-γ spectroscopy of ^{195,196,197,198}Os for the half-life measurements and study of β-decay schemes.

For further nuclear spectroscopy, we have been developing a new narrow-band laser system for the precise in-gas-jet laser ionization spectroscopy, an MR-TOF system for mass measurement, and high-efficiency and low-background 3D tracking gas counters for β-decay spectroscopy.

In the presentation, we will report the present status of KISS, experimental results of nuclear spectroscopy in the heavy region, and future plan of KISS activities.
[1] Y. Hirayama et al., Nucl. Instrum. Methods B 353 (2015) 4.; B 376 (2016) 52.
[2] Y. Hirayama et al., Nucl. Instrum. Methods Phys. Res. B 412 (2017) 11.
[3] Y.X. Watanabe et al., Phys. Rev. Lett. 115 (2015) 172503.
[4] Y. Hirayama et al., Phys. Rev. C 96 (2017) 014307.

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