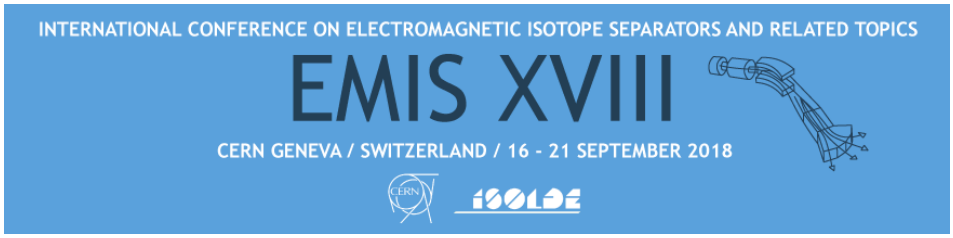


Contribution ID: **17** Type: **Submitted Oral**

# Design, optimization and construction of multi-reflection time-of-flight mass analyzer for Lanzhou Penning Trap

*Thursday, 20 September 2018 10:15 (15 minutes)*

The multi-reflection time-of-flight mass spectrometer (MRTOF-MS) was first proposed by Wollnik and Przewloka. It has been developed as a new device in recent years for nuclear mass spectrometry and isobaric separation with ion bunches with kinetic energies ranged from a few hundreds of electron-Volts to a few kilo-electron-Volts. By extending the flight path using multi-reflection between electrostatic ion mirrors, an MRTOF-MS can reach a very high mass resolving power of >100,000 in a compact structure. Moreover, it also has other unique advantages, such as extremely short measurement time, a large mass range, very high sensitivity and non-scanning operation. Up to now, many MRTOF-MSs for mass measurements and isobaric separations have been commissioned or under construction.

A multi-reflection time-of-flight mass analyzer is being constructed for isobaric separation for the Lanzhou Penning Trap (LPT). A new method including two sub-procedures, global search and local refinement, has been developed for the design of MRTOF-MS. The method can be used to optimize the parameters of MRTOF-MS both operating in mirror-switching mode and in in-trap-lift mode. By using this method, an MRTOF mass analyzer, in which each mirror consists of five cylindrical electrodes, has been designed. The optimal potential parameters of the electrodes have been obtained and compared directly for our MRTOF mass analyzer operating in both modes. In the mirror-switching mode, the maximal resolving power has been achieved $1.3\times10^5$ with a total time-of-flight of 6.5 ms for the ion species of $^{40}Ar^{1+}$, and $7.3\times10^4$ with a total time-of-flight of 4.3 ms in the in-trap-lift mode. The simulation also reveals the relationships between the resolving power and the potentials applied on the mirror electrodes, the lens electrode and the drift tube.

In this conference, we will present the design details, optimization method and the results obtained. The status and progress of MRTOF mass analyzer for LPT will also be reported.

**Primary authors:** Prof. HUANG, Wenxue (Institute of Modern Physics, Chinese Academy of Sciences); Dr TIAN, Yulin (Institute of Modern Physics, Chinese Academy of Sciences); Dr WANG, Yongsheng (Institute of Modern Physics, Chinese Academy of Sciences); Mrs WANG, Junying (Institute of Modern Physics, Chinese Academy of Sciences); Prof. ZHOU, Xiaohong (Institute of Modern Physics, Chinese Academy of Sciences)

**Presenter:** Dr TIAN, Yulin (Institute of Modern Physics, Chinese Academy of Sciences)

**Session Classification:** Session 11 - Storage rings

**Track Classification:** Storage rings