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Design, optimization and commission of a multi-reflection time-of-flight mass analyzer at IMP/CAS

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A multi-reflection time-of-flight mass analyzer is being constructed for isobaric separation and mass measurement at IMP/CAS (Institute of Modern Physics, Chinese Academy Science). A new method including two sub-procedures, global search and local refinement, has been developed for the design of MRTOF mass analyzer. The method can be used to optimize the parameters of MRTOF-MS both operating in mirror-switching mode and in-trap-lift mode. By using this method, an MRTOF mass analyzer, in which each mirror consists of five cylindrical electrodes, has been designed. In the mirror-switching mode, the maximal mass resolving power has been achieved to be 1.3×10^5 with a total time-of-flight of 6.5 ms for the ion species of $^{40}\text{Ar}^{1+}$ [1], and in the in-trap-lift mode, it is 1.6×10^5 with a total time-of-flight of 6.4 ms [2]. 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.

This MRTOF-MS has been constructed and is being commissioning now. The preliminary test results show that it works [2].

In this conference, we will present the design details, optimization method and the test results obtained.

References:

- [1] Y.L. Tian, Y.S. Wang, J.Y. Wang, et al., Int. J. Mass Spectrom. 408, 28–32 (2016).
- [2] Jun-Ying Wang, Yu-Lin Tian, Yong-Sheng Wang, et al., Nucl. Instrum. Meth. B, (2019).

e-mail: yswang629@impcas.ac.cn

Primary author(s) : Mr WANG, Yongsheng (Institute of Modern Physics, Chinese Academy Science)

Co-author(s) : Prof. HUANG, Wenxue (Institute of Modern Physics, Chinese Academy Science); Dr TIAN, Yulin (Institute of Modern Physics, Chinese Academy Science); Mrs WANG, Junying (Institute of Modern Physics, Chinese Academy Science); Prof. ZHOU, Xiaohong (Institute of Modern Physics, Chinese Academy Science); Prof. XU, Hushan (Institute of Modern Physics, Chinese Academy Science)

Presenter(s) : Mr WANG, Yongsheng (Institute of Modern Physics, Chinese Academy Science)