

5 - 5 LPT's Multi-reflection Time-of-flight Mass Spectrometer/Separator

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The multi-reflection time-of-flight mass spectrometer/separator (MRTOF-MS) is a recent development in time-of-flight mass analysis^[1]. To be used for mass determination and on-line separation of short-lived nuclei, such an experimental device for Lanzhou Penning Trap (LPT)^[2] is under construction.

A special software package which is called MRTOF-OPT has been developed for the simulation of ion motion in an MRTOF-MS and the optimization of operation parameters^[3]. Using this package, the geometry of an MRTOF-MS can be optimized; the potential distribution under different initial conditions and different number of revolutions can be calculated; and the potential inaccuracy can be determined quantitatively. Fig. 1 shows that the potentials of power supplies needed for the electrodes should be stable to less than 50 ppm or preferably 20 ppm, where M1-M4 and L are the mirror electrodes and the lens electrode of LPT's MRTOF-MS, detailed in Ref. [3].

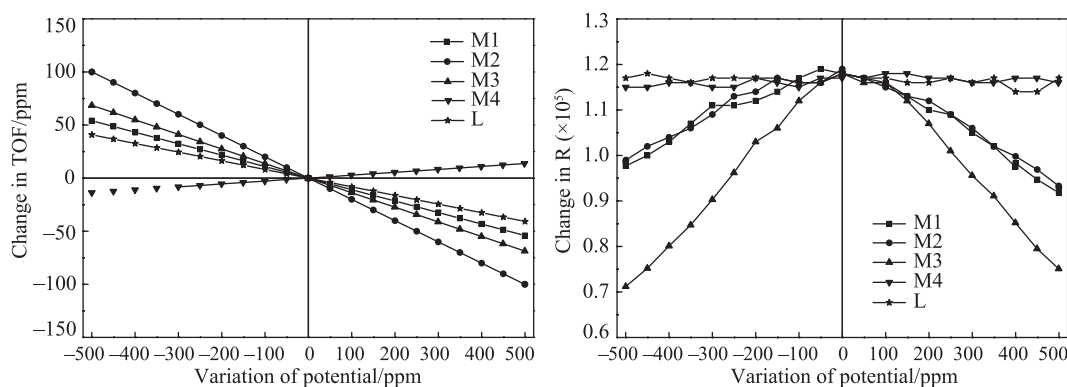


Fig. 1 Calculated relative variation of TOF (left) and mass resolving power R (right) as functions of relative variation of bias potentials as determined by optimization code.

Fig. 2 shows the mechanical drawing of the MRTOF-MS at LPT, where included are the ion source, the analyzer, the beam transportation system, the detection system, and the vacuum system. In addition, an isobaric separation system called Bradbury-Nielsen Gate (BNG) will be added in the near future. The machining and assembly have already been finished.

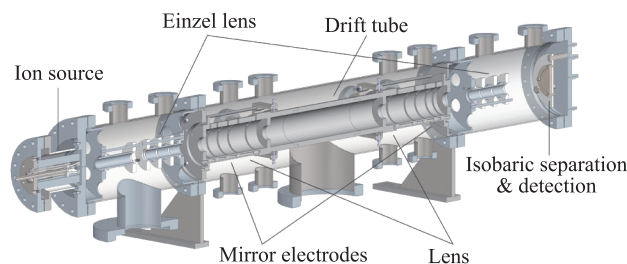


Fig. 2 (color online) Mechanical drawing of the MRTOF-MS at LPT.

References

- [1] T. Dickel, W. R. Plaß, J. Lang, et al., Nucl. Instr. and Meth. B, 317(2013)779.
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- [3] Y. L. Tian, Y. S. Wang, J. Y. Wang, et al., Int. J. Mass Spectrom, 408(2016)28.