

POSTER ABSTRACT

Designing a Compact ExB Spectrometer Using SolidEdge™ STL files with Simion™ and 3-D Plastic Prototype Printer

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A prototype compact electrostatic and magnetic sector mass spectrometer was constructed based on the Diaz and Gentry crossed field concepts using Simion™ ion modeling and Solid Edge™ CAD 3D software. Assembly of the parts was facilitated by using a 3-D printer driven from the CAD software. The ion source was a miniature design taken from a Mass Sensor R8 spectrometer. Based on Simion models that used STL files that were created from the CAD rendering of the ion source, the ion source was mounted on a polycarbonate part that was designed using SolidEdge™ and then printed using a 3-D plastic prototype printer. The plastic part oriented the ion source against square neodymium boride magnets and detector assembly. Different field strengths and sizes of magnets were tested. Magnets up to 50 mm square and 12 mm thick were used. Instead of an exit slit and conventional detector, a Burle ion imaging detector system provided a fluorescent image of the ion emissions. This innovative detector allowed multiple ion focal points to be detected simultaneously and optimum orientation of the detector versus physical boundary limitations could be made. Movies of the ions during scanning were obtained. The following presentation will discuss the design concepts, the potential for low cost mass spectrometry, and some of the performance parameters involving the prototype plastic parts. The system was designed for atmospheric gas monitoring and other applications requiring measurement of low masses.

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