

Characterization of the aerogels for the RICH of the AMS experiment

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Abstract

The Alpha Magnetic Spectrometer (AMS) is a particle detector for the International Space Station(ISS). It will be equipped with a Ring Imaging Cherenkov (RICH) detector, in order to measure the electric charge and velocity of the charged cosmic particles. In this report, it is described the two tests that we have made to the aerogel tiles that are going to be used as the radiator of the AMS RICH. This work was done at the LPSC of Grenoble, France.

1 Introduction

The AMS RICH counter design has to meet a set of specific constraints imposed by the launch and flight conditions, one of this being the volume and shape of the payload, which imposes constraints on the geometry and size of its components as well. It is important to control the quality of these components, and therefore is necessary to test them. In this case, we test the aerogel tiles of the AMS RICH. The two tests were the following.

2 Metrology Test

This is to study the shape of the aerogel surface, as well as side measurements to check the dimensions of each tile. This work was done in collaboration with another HELEN grant-holder, Antonio Ortiz, during the first period of my grant as described in the mid-term report. This test was done to 54 aerogel tiles, in order to study if they fulfill the requirements of the detector design.

During the second period of the grant in collaboration with Dr. Ernesto Belmont, another HELEN grant holder, we developed a program that taking as input the results of the metrology test, extrapolates the thickness on both sides of the aerogel at points that were not measured. The data are written in a file, that can be used as an input in another program, for example, in a simulation of the detector that takes into account the variation of the thickness at each point of the aerogel. For this part, I had to learn the basics of programming in C++, and of the ROOT software.

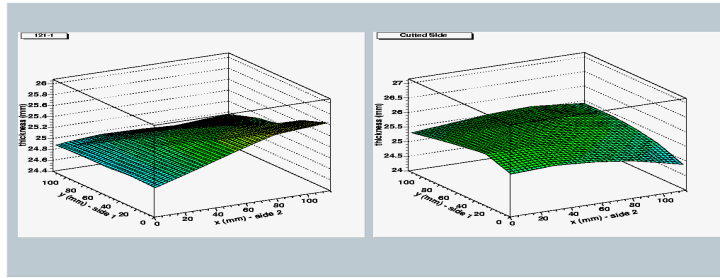


Figure 1: Example of the reconstructed surfaces of the aerogel tiles.

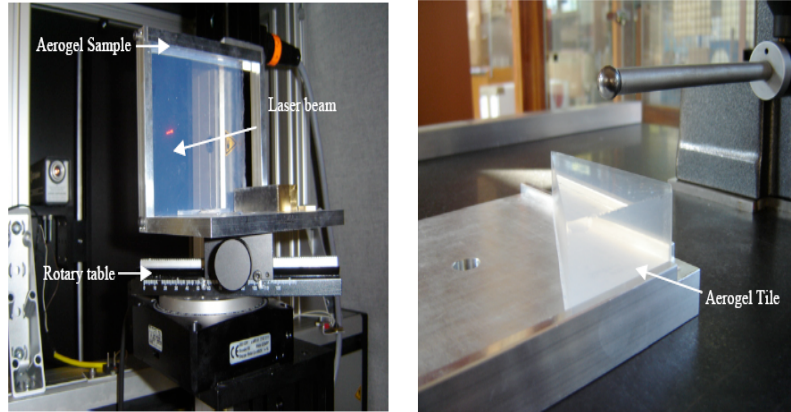


Figure 2: Left:Set-up for the optical test.Right:Set-up for the metrology test .

3 Optical Test

The determination of the refractive index gradient on each tile is done with a laser deviation method, as explained in the mid-term report. During the second month of my stay, I finished these measurements for the remaining tiles, that were the ones with a geometry different from a square. The measurements for the 54 tiles available are finished. The analysis of the data obtained with this test is still to be done.

4 Acknowledgment

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