HESSI

High Energy Spectroscopic Imager (HESSI)
Imager Field-of-View Materials Requirements

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Document Revision Record

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A	1998-Oct-12	Preliminary Draft	-

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1. Introduction

This document keeps track of the total amount of material in the HESSI x-ray path exclusive of grids and shutters. This accounting is used to determine the low energy efficiency (3<E<10 keV) of the detector system which is must be maximized to obtain several scientific goals for HESSI. The goals are the observation of the spectrum to below 4 keV, the imaging of hotter active regions, and the detection of microflares with unprecedented sensitivity.

The Mission Requirements has established 26 mils of polymer as the maximum amount to be allowed in the X-ray path. Here we take that to mean that the attenuation shouldn't be greater than given by that amount of material at any energy below 10 keV. This allocation of polymer is over an above the 40 mils of Beryllium windows in the X-ray path used within the cryostat. There should be no other materials in the imager field of view for the detector front segments.

This document will also provide some control on the orientation of the netting which is used as a spacer between the mylar or kapton films. The orientation requirement will be held to only about 10 degrees and will be specified later by Gordon Hurford.

Concurrence on this document is required between Dave Curtis, Richard Schwartz, Dave Pankow, Paul Turin, Rob Boyle, David Smith, and Gordon Hurford.

2. Blankets

For materials other than kapton, mylar, or other similar carbon/oxygen polymers, the x-ray equivalence is established by the ratio of the cross-section at two energies, 4 and 6 keV. At those energies the attenuation of mylar is 0.5/mil and 0.14/mil.

At the October 1, 1998 spectrometer team meeting these were the inventoried materials:

Material	**Equivalent Thickness, mils**
Top Imager Cap:	
3 mil mylar	3
Top Imager Blankets:	
5 layers 0.25 mil mylar	1.25
4 layers netting, x-ray equivalent 0.3 mil mylar per netting sheet	1.2
Bottom Imager Cap:	
3 mil mylar	3
Bottom Imager Blankets:	
5 layers 0.25 mil mylar	1.25
4 layers netting, x-ray equivalent 0.3 mil mylar per sheet netting	1.2

Outer Cryostat Blankets:	
15 layers 0.25 mil mylar	3.75
14 layers netting, x-ray equivalent 0.3 mil mylar per sheet netting	4.2
Inner Cryostat blankets:	
5 layers 0.25 mil mylar/kapton	1.25
4 layers netting, x-ray equivalent 0.3(?) mil mylar per sheet netting	1.2
TOTAL	**21.30**

Current open questions are:

- The thickness of the ITO, Indium-Tin-Oxide, durability coating on the Imager upper blanket. A simple calculation of a thickness of 1 micron of Tin shows an X-ray equivalence of 0.5 mil polymer at 4 keV and 3 mil polymer at 6 keV. The increase between 4 and 6 is due to an edge in the Tin cross-section around 5 keV.
- The spacer material within the inner cryostat. If that is a fiberglass netting, which would be composed of silicon, it may be a substantial (>2) increase in the polymer equivalent and may take us over the budget.

It should also be stated that while 26 mils X-ray equivalent of polymer has been set as an upper limit, the aforementioned science goals are enhanced by having significantly less total grammage.

3. Beryllium Windows

There are four Beryllium widows in the Spectrometer covering the Imager Field of View with a total thickness of 40 mils.

Location	Thickness, mils
Cryostat Exterior	20
Outer Shield	5
Inner Shield	5
Detector Module	10
TOTAL	**40.00**