

Abstract: We present a portable test setup used as a ground support equipment for the Solar Ultra Violet (SUVI) instrument on GOES-R series of satellites. The test setup is used as part of “remove before flight” or to package optical components for “install before flight”. The portable setup utilizes an optically transparent thermo-plastic film that provides excellent barrier for moisture and debris. In addition to providing Foreign Object Debris (FOD) mitigation, this thermo-plastic film exhibits 1/10th wave optical performance. Most precision optical testing of instruments or subsystems can occur without exposing the systems to the environment

Introduction

Substantial amount of time goes into preventing and reducing Foreign Object Debris (FOD) from ruining or compromising flight optical systems. Several clean room qualified materials are now available to prevent these FOD, such as tool bits or lint or other objects that do not belong in the optical system. Most of these materials - nylon, mylar, llumaloy, polyethylene, are not transparent for visible inspection or optical testing. Thus, the assemblies must be unwrapped during testing increasing the hazard.

An optically transparent film was used for nonflight assemblies during the development of the Solar Ultra-Violet Imager program at Lockheed Martin Advanced Technology Center. The transparent material suggested its application in inspection and optical testing of the instrument assembly.



Material Testing

A concern with any new material is outgassing, especially with extreme UV and UV optical systems. Manufacturer was not able to provide data relative to outgassing, temperature tolerance, and residual contamination. Thus, a set of tests were conducted.

We temperature cycled film samples from +75°C to LN2 (-195°C) temperatures and compared to control samples to test the use of the film for thermal vacuum testing.

At room temperature the film is insensitive to common solvents such as water, methanol, iso-propyl, and acetone. Long term exposure to the solvents and high temperatures were not studied.

Potential Uses

- Optical alignment and tests can be conducted with a small frame holding the special film to expose the optics and alignment cubes.
- Component level packaging, e.g. CCD containers,. The transparent film allows detailed inspection of the components,
- Visible filter containers. Transmission measurements of filters without opening shipping containers for receiving inspection.



Zygo measurements for the different stressed samples were < 1/10 wave

Summary

- At Lockheed Martin Advanced Technology Center, we have identified a remarkably useful cleanroom compatible film.
- Materials testing show that this material has outgassing properties comparable to other common cleanroom films such as nylon, mylar, llumaloy, polyethylene.
- The film can withstand typical thermal vacuum environments -195C/+75C, and does not show diminished performance due to thermal cycling.
- If 1/10 wave distortion is tolerable, this material would be an excellent choice to allow optical performance testing while maintaining the FOD barrier.
- **Caveat:** Since some of these films are non-conductive plastic, use will pose an ESD hazard. Caution should be exercised when using such material near ESD sensitive electronic components.