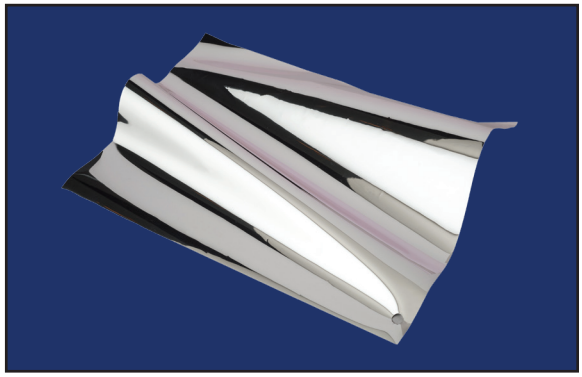
DEPOSITION SCIENCES, INC.

A LOCKHEED MARTIN COMPANY

SUNSHADE® THERMAL CONTROL MATERIAL

Technical Data Sheet



PROCESS/PRODUCT DESCRIPTION

DSI has more than twenty years of production history for Sunshade, a thermal control material consisting of a multi-layer dielectric thin-film stack deposited onto Kapton™ film. Our customers have a similar record of successful use in LEO, MEO, and GEO applications.

DSI Sunshade was originally developed in collaboration with satellite engineers looking for improved thermal control using RF-transmissive materials with added electro-static discharge (ESD) properties. Sunshade's continuous coating is distinct from patterned grid films in that no metallic materials are used in its construction.

Sunshade supports modern high-data-rate communications systems in L, S, C, X, Ku, K, Ka, and V bands.

We currently offer four types of Sunshade: -1001 RF Grade High Reflectance, -1002 Thermal Control Grade High Reflectance, -2001 RF Grade (Next Gen) High Reflectance, and -2002 (Next Gen) Thermal Control Grade.

The four types are offered at different price points to accommodate a wide range of needs.

APPLICATION

Satellite chassis, antenna covers, and apertures for thermal control and ESD control

BENEFITS

- Manages solar heat gain and loss of satellite communications equipment and components
- Broad-spectrum RF transmittance with low insertion loss
- Manufactured using space-qualified materials
- Tuned for Air Mass Zero (AM0) solar irradiation
- Resistant to oxidation in Atomic Oxygen (AO) rich environments

FEATURES

- Lightweight – area factor of ~45 ft^2/lb
- Flexible and conformable film can be cut, perforated, folded, and stitched
- Panel sizes 30” x 60” are available
- A proprietary combination of low insertion loss materials provides low RF attenuation
- Space-qualified and flight-proven
- Performance is resistant to degradation due to temperature cycling
- Both surfaces accept typical space-qualified adhesive and tape systems

RF PROPERTIES

- Low RF attenuation from below 1 GHz through 69 GHz
- Suitable for use in L, S, C, X, Ku, K, Ka, and V bands

THERMAL PROPERTIES

	Sunshade -1001,-1002, -2001, -2002
Solar Reflectivity, 250-2500 nm	≥ 86%
Solar Transmissivity, 250-2500 nm	≤ 2%
Hemispherical 300K Emissivity, Side 1	≥ 0.72
Hemispherical 300K Emissivity, Side 2	≥ 0.40

FUNCTIONAL PROPERTIES

- External surface provides ESD with sheet resistance of 2.5E5 to 1.0E9 Ohm/square
- RF insertion loss ≤ 0.5 dB from 1 GHz — 69 GHz

SURVIVABILITY

- Tested under environmental conditions including particulate radiation, atomic oxygen, solar UV/VIS/NIR and thermal cycling to simulate service in LEO, Polar, and GEO environments
- Retains properties through testing to simulate end-of-life at:
  - 15 years for GEO particle irradiation + insolation
  - 8 years for LEO atomic oxygen
  - 1000 equivalent-hours for solar UV+VIS
- All component materials have long service histories as well as validation in space simulation

CUSTOMIZATION

DSI’s standard Sunshade is tuned for AM0. Spectral properties can be customized in the VIS, NIR and MWIR ranges. DSI closely collaborates with customers to meet special and proprietary requirements.

Pressure Sensitive Adhesive (PSA) lamination and fabrication available upon request.

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