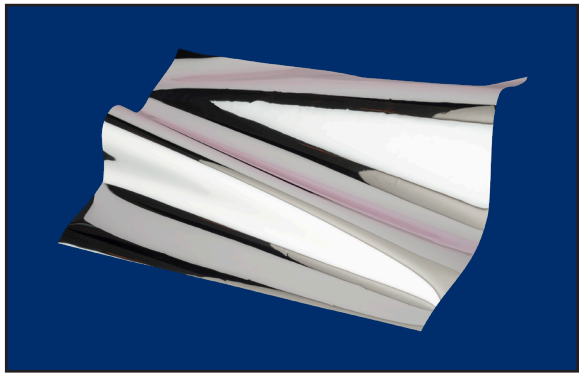
**DEPOSITION SCIENCES, INC.**
A LOCKHEED MARTIN COMPANY

# SUNSHADE®

# THERMAL CONTROL MATERIAL

**Technical Data Sheet**



## PRODUCT DESCRIPTION

Sunshade is a cutting-edge thermal control material consisting of a multi-layer dielectric thin-film stack deposited onto flexible Kapton™ film. It allows RF transmission and rejects solar energy, while also having electro-static discharge (ESD) properties.

With over 20 years of successful multi-orbital use in Low Earth Orbit (LEO), Medium Earth Orbit (MEO), and Geostationary Earth Orbit (GEO) applications, our customers have trusted Sunshade for their space material needs. The material is an excellent candidate for a variety of orbits, exhibiting impressive resistance to proton & electron radiation, high fluence atomic oxygen, UV exposure, thermal cycling, and electron charging. In the face of these challenging environmental conditions, it maintains broad-spectrum RF transmission, spectral reflectance and absorbance.

Sunshade supports modern ultra-high data-rate communications systems in the L, S, C, X, Ku, K, Ka, and V bands. Its continuous thin film coating is unique in that it uses no metallic materials in its construction.

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
- -2002 (Next Gen) Thermal Control Grade High Reflectance

Each type is available at different price points to meet a wide range of needs

## APPLICATIONS

Satellite and spacecraft buses, radiators, radomes, antenna covers, and apertures

## BENEFITS

- Manages solar heat gain and signal 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 an Atomic Oxygen (AO) rich environment

## FEATURES

- Lightweight – area factor of ~45 ft2/lb
- Thickness: Free Film: 0.0021”, Tape: 0.0045”
- Flexible and conformable film can be cut, perforated, folded, and stitched
- A proprietary combination of non-metallic, low insertion loss materials provides negligible RF attenuation
- Space-qualified and flight-proven for over 22 years
- Performance is resistant to degradation due to temperature cycling
- Both surfaces accept typical space-qualified adhesive and tape systems

## THERMAL PROPERTIES

| | Sunshade |
|---|---|
| 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 |

*unmounted

## FUNCTIONAL PROPERTIES

- External surface provides ESD with sheet resistance of 2.5E5 to 1.0E9 Ohm/square
- RF insertion loss is negligible 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
- All materials used have long service histories as well as validation in space environments

## 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 to make into tape form and form factor fabrication available upon request.



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