

README for code:

“Experimental demonstration of corrugated nanolaminate films as reflective light sails”

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System requirements and installation guide

Any computer running MATLAB R2024 or later should be able to run the MATLAB scripts (we have tested this version only but anticipate that future releases will be compatible). The “Symbolic Math” Toolbox is also required for two scripts to solve a simple nonlinear problem. No non-standard hardware is required. combinations tested. No installation, except that of MATLAB itself, is needed to run the scripts.

Demonstration and instructions for use

All files should be placed in the same directory and the MATLAB scripts can be run directly. The scripts output data to the software’s command window, produce figures, and output *.CSV files. Most of the scripts run within a few seconds. The exception is the thickness optimization script, which can take several hours depending on the number of thicknesses tested.

Software license

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MATLAB code and required data files:

- Acceleration length
 - calcAccelLengthThisStudy.m
 - octoberAvgPlusMinusWithWL.csv
- Blackbody curves for SI figure
 - calcBBradiance.m
- Emissivity calculations
 - calcEmissivityFromJason.m
 - BrewerAngleDependentAbs_withMunkhbat.xlsx
 - Chang.xlsx
 - Experimental.xlsx
 - Ilic.xlsx
 - Lien.xlsx
 - Optimized_newDesign.xlsx
 - Salary.xlsx
 - Santi.xlsx
 - Taghavi.xlsx
- BetaMax calculation code
 - calcMaxSpeedV2.m
 - FresnelMat.m
 - octoberAvgPlusMinusWithWL.csv
 - optimizedSpectrumFull_literatureNK.csv
 - Brewer2022reflectivity.csv
 - Chang2023exptRcalib.csv
 - Ilic2018reflectivityDesignA11_usingRodriguez_de_Marcos.csv

- Lien2022reflectivity.csv
- Salary2019reflectivity.csv
- Santi2022reflectivityTiO2SiO2TiO2_usingRodriguez_de_Marcos.csv
- Taghavi2022reflectivity.csv
- Simulation of Reflection/Absorption/Transmission for fabricated prototype and optimized design
 - calcRATofStarshotFilmActual_VarWavelengthV2.m
 - Al2O3nkFromJasonJan2024.csv
 - MoS2nkFromJasonApril2024.csv
 - calcRATofStarshotFilmOptimized_VarWavelengthV2.m
 - Kischkat2012_Al2O3nk.csv
 - Munkhbat2022MoS2nk.csv
 - FresnelMat.m
- Absorptivity estimations
 - estimateAbsorptivityValuesDiffKappaV2.m
 - Poruba 2000 fig5b data.csv
 - Rodriguez_de_Marcos_2016_SiO2_nk.csv
 - Kischkat2012SiNnk.csv
 - Kischkat2012TiO2nk.csv
 - Kischkat2012_Al2O3nk.csv
 - Munkhbat2022MoS2nk.csv
- Optimizing thicknesses for improved design
 - optimizingThicknessesV2.m
 - Munkhbat2022MoS2nk.csv
 - Kischkat2012_Al2O3nk.csv
 - FresnelMat.m
- Temperature calculation for optimized sail design
 - calcThermalBalanceV2.m
 - Lingart1981_T2_data.csv
 - Lingart1981_T4_data.csv
 - Query1985-eo-complexRefIndData.csv
 - Munkhbat2022MoS2nk.csv
 - MunkhbatExpansionLong.csv
- Travel time to Jupiter
 - calcTravelToJupiter.m
 - octoberAvgPlusMinusWithWL.csv
- Bending and tensile property calculations for hexagonal films
 - hexagonBendingCalculationsMixtureRuleV2.m
- Ilic 2018 reflectivity calculation
 - calcIlic2018ReflectV2.m
 - Rodriguez_de_Marcos_2016_SiO2_nk.csv
 - FresnelMat.m
- Santi 2022 reflectivity calculation
 - calcSanti2022reflectAbsV2.m
 - Rodriguez_de_Marcos_2016_SiO2_nk.csv
 - Kischkat2012TiO2nk.csv
 - FresnelMat.m