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Science Goals and Drivers for Future Exoplanet, Space Astronomy, Physics, and Outer Solar System Science Missions (2)

Author: Ms. Greta De Marco
SCISYS Deutschland GmbH, Italy, gretadema@gmail.com

Ms. Elise Wright Knutsen
National Aeronautics and Space Administration (NASA), United States, elisewrightknutsen@gmail.com
Mr. Carles Bolart
Spain, cbolart@gmail.com
Mr. Mischa Breuhaus
Max Planck Institute, Germany, mischa.breuhaus@mpi-hd.mpg.de
Mr. Luis Estanqueiro
University of Beira Interior, Portugal, luisestanqueiro@gmail.com
Mr. Cristoph Fröhlich
Vienna University of Technology, Austria, cristoph.froehlich@spaceteam.at
Mr. Maxim Guyot
Thales AVS France, France, maximeguyot@me.com
Mr. Béla Hegyesi
Budapest University of Technology and Economics, Hungary, bela.hegyesi@gmail.com
Mr. Verneri Lauksio
Finland, verneri.lauksio@gmail.com
Ms. Selina Howalt Owe
Technical University of Denmark (DTU), Denmark, shoowe@space.dtu.dk
Ms. Olga Pinzon
University of Bern, Switzerland, olga.pinzon@space.unibe.ch
Mr. Oliver Price
University College London (UCL), United Kingdom, oliver.price.15@ucl.ac.uk
Mr. Stefan Wagner
University of Graz, Austria, stefan.s.wagner@gmail.com
Mr. Ivan Zankov
Luleå Technical University, Sweden, ivan.zankov@gmail.com
Ms. Monika Ziebart
University of Cologne, Germany, ziebart@ph1.uni-koeln.de
Ms. Elena López-Contreras
Universitat Politecnica de Catalunya (UPC), Spain, elenalcontreras@gmail.com

FROST, FAR-INFRARED OBSERVATION SPECTROSCOPY TELESCOPE

Abstract

This paper presents the mission concept for Far-infraRed Observation Spectroscopy Telescopes (FROST), a satellite mission dedicated to shedding light on the evolution of protoplanetary disks and planet for-

mation. We target the inner disks around T-Tauri and Herbig Ae/Be stars, similar to the Sun before it reached the main sequence. FROST will be a three-part formation flying interferometer performing far-infrared spectroscopy in the wavelength range 40-200 m. The satellite constellation consists of two light collecting spacecraft and one beam combining spacecraft, where each light collecting spacecraft is equipped with a 2 m mirror. FROST will be equipped with FIR interferometers coupled with a Fourier Transform Infrared spectrometer. From Lagrangian point L2 FROST will observe more than 78 pre-targeted disks with an angular resolution of up to 0.003" and a spectral resolution of R = 1000 in order to detect shifts in silicate features in the disks emission spectra. FROST will provide information about the size distribution, structure and chemical composition of grains radially in the disk as well as dynamics and dust growth mechanisms. This paper explores the difficulties involved in such a concept and demonstrates its feasibility by making science-engineering trade-offs with regards to instrumentation and procedure. FROST is the result of a 16-student team effort at the Alpbach summer school of 2017. The main summer school organizers are FFG and ESA.