ABSTRACT TITLE: METROLOGY FOR SPATIAL INTERFEROMETRY IV

AUTHOR: Yekta Gursel

CORRESPONDENCE: Jet Propulsion Laboratory, California Institute of Technology, Mail Stop 306-388, 4800 Oak Grove Drive, Pasadena, CA 91109. Telephone: (818) 354-3645 Fax: (818) 393-9471

E-MAIL ADDRESS: Yekta.Gursel@jpl.nasa.gov

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ABSTRACT:

Very high resolution spatial interferometry requires picometer level one-dimensional metrology, three-dimensional metrology and surface metrology. The absolute distance measurements have to be performed only to 1 part in a million level due to the careful design of the instrument.

We have developed a 3 dimensional gauge that monitors the position of the corner of a corner cube in vacuum. Our goal is to monitor the changes in the position of the corner with an accuracy of 10 picometers in vacuum. The gauge is functioning inside a vacuum chamber, currently at atmospheric pressure. We have verified the operation of the auto alignment feature of the gauge that is essential for accurate three dimensional relative position measurements.

The in-air results will be combined into 3 dimensional relative position measurements and the chamber will be evacuated. The results of these measurements in air and in vacuum will be presented.

The addition of the absolute distance measurement capability to the relative 3 dimensional metrology gauge is progress. Due to our design, this addition does not require any modifications of the gauge heads.

The absolute calibration of the surface metrology gauge we have developed is continuing. The results of these calibrations as well as results of white light operation will be presented.

The research described is performed at the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.

KEY WORDS: Spaceborne interferometry, high precision metrology, picometer metrology

BRIEF BIOGRAPHY:

The author is a member of the technical staff in the Interferometry Technology group of the Microwave, Lidar and Interferometer Technology section at JPL. After getting his Ph. D. from Caltech, he has worked in the Gravitational Physics Group at Caltech, in the Artificial Intelligence Laboratory at MIT and in the LIGO Project at Caltech as a Staff Scientist.