

# **Space Interferometry Mission System Testbed 3: External Metrology**

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## **Abstract**

The Space Interferometry Mission (SIM) System Testbed-3 (STB-3) has been integrated in JPL's new Optical & Interferometry Development Laboratory. The testbed consists of a three baseline astrometric interferometer whose optical layout is functionally equal to SIM's current flight layout. The main testbed objective is to demonstrate nanometer class stability of fringes in the science interferometer while using path length & angle feed-forward control, and while the instrument is integrated atop a flight-like structure. The path length & angle feed-forward control signal is synthesized using data from two guide interferometers and the external metrology system. The external metrology system is used to monitor changes in the length & direction of the science baseline vector. The instrument is mounted on a structure similar in scale and dynamic response to the SIM flight article, which creates the need for monitoring changes in the science interferometer baseline vector. This paper describes the external metrology system in STB-3, its mathematical representation, limitations, and method for estimating the length & attitude of the science baseline vector. Simulations, implementation issues and preliminary testbed results are discussed.