

IAF MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Specialized Technologies, Including Nanotechnology (8)

Author: Mr. Vittorio Netti
Sasakawa International Center for Space Architecture, Italy

Ms. Alessia Gloder
Technische Universität Dresden (DTU), Germany

Mr. Davide Vittori
Politecnico di Bari, Italy
Mr. Alessandro Buscicchio

Italy
Dr. Andrea Troise
Politecnico di Bari, Italy

EMBEDDING ELECTRONICS WITH TEXTILE BASED SOFT-GOODS USING FRET
TECHNOLOGY**Abstract**

Soft goods have a large number of applications in the space sector: spacesuits, CTBs, Inflatable modules, and thermal blankets are just some of them. As they are often made of textile materials, those systems are subject to wear and tear. Therefore, they could benefit from embedded sensors and electronics not only for mechanical stress monitoring but also to enhance the capabilities of the material itself.

Astradyne SRL invented a novel technology called FRET, an industrial process which bonds rigid-flex electronics with textile material and that can be used to seamlessly integrated advanced sensing capabilities into soft goods of the space industry.

While rigid-flex electronics is a commonly used technology, it is usually not suitable for space applications due to the fragility of the polyamide flex connections. Astradyne originally designed FRET technology as an enabler of origami-foldable structures in the design of space hardware, for which the embedding of textile materials could ease the mechanical stresses on the flex components of the electronics. Reversing the problem, the same technology can be successfully used to integrate complex electronics, sensors, and batteries inside textile-based hardware, while ensuring high resistance to mechanical stress. In inflatable modules, FRET technology can be used to embed a network of impact sensors to s to embed distributed health monitoring sensors to assess astronaut's real-time conditions.

This paper describes how FRET technology could be used for this purpose to upgrade existing and future space hardware in a range of common use cases across the space sector.