ALISEO ON MIOSAT: AN AEROSPACE IMAGING INTERFEROMETER FOR EARTH OBSERVATION

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1. INTRODUCTION

In this paper we describe a new instrument named ALISEO (Aerospace Leap-frog Imaging Stationary Interferometer for Earth Observation), which belongs to the class of the “stationary interferometers”. ALISEO has been selected as the main payload for a novel Italian Space Agency (ASI) optical mission based on a micro-satellite (MIOSat) with steering capability. The mission is constituted by a micro-satellite equipped with advanced payloads, among which there are an extensible telescope, a high-resolution panchromatic camera, a Mach-Zehnder MEMS punctual interferometer, and ALISEO. MIOSat is expected to provide the scientific community with the technological demonstration of this new remote sensing technology.

A valuable advantage of imaging interferometers is their ability to change the sampled spectral range and their resolving power by simply adjusting the sensor sampling step and the instrument Field-Of-View (FOV) [1], [2]. An additional advantage is avoiding the adoption of any input slit, which strongly reduces the radiant power admitted in dispersive spectrometers. Critical points are associated with the heavy data pre-processing necessary for compensating the instrument response and possible acquisition artefacts [3]. Moreover, due to the nature of the acquired interferogram it is crucial adopting detectors with high digitalisation accuracy [4] (Sellar, 2003) .

2. ALISEO INSTRUMENT CONCEPT

ALISEO operates in the common-path Sagnac triangular configuration, and it does not employ any moving part to generate phase delay between the two allowed ray paths. The sensor acquires target images modulated by a pattern of autocorrelation functions of the energy coming from each scene pixel, a fringe pattern that is fixed with respect to the instrument’s field of view. The complete interferogram of each target location is retrieved introducing relative source-observer motion, which allows any image pixels to be observed under different phase delays.

In this paper some laboratory measurements performed with an ALISEO prototype will be presented and discussed. A set of measurements have been carried out using both standard reflectance tiles and samples of different volcanic rocks. An algorithm for raw data pre-processing aimed at retrieving the at-sensor radiance spectrum, including exploiting the issues of dark signal subtraction, spectral instrument response compensation, effects of vignetting, and Fourier back-transform algorithm will be discussed. Finally, reflectance spectra for several samples utilised during laboratory measurements will be shown.

3. REFERENCES

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Keywords: Fourier transform imaging spectrometers, Sagnac interferometer, Optical calibration procedure, Remote sensing.