IAF SPACE OPERATIONS SYMPOSIUM (B6)
Ground Operations - Systems and Solutions (1)

Author: Dr. Giancarlo Santilli
Italian Space Agency (ASI), Italy

Mr. Massimo Calabrese
Italian Space Agency (ASI), Italy
Dr. Elisabetta Cavazzuti
Agenzia Spaziale Italiana (ASI), Italy
Dr. Valerio D'Elia
Italian Space Agency (ASI), Italy
Dr. Francesco Fenu
Italian Space Agency (ASI), Italy
Dr. Munzer Jahjah
Italian Space Agency (ASI), Italy
Dr. Gianluca Polenta
Italian Space Agency (ASI), Italy
Dr. John Tomsick
University of California, Berkeley, United States
Dr. Bryce Unruh
University of California, Berkeley, United States
Dr. Andreas Zoglauer
University of California, Berkeley, United States
Dr. John McDonald
University of California, Berkeley, United States

THE ASI-NASA COSI MISSION AND ITS SCIENTIFIC AND OPERATIONAL GROUND SEGMENT ARCHITECTURE

Abstract

The Compton Spectrometer and Imager (COSI) mission is a wide field of view -ray Compton telescope that uses germanium detectors to obtain high spectral resolution from 0.2 to 5 MeV. COSI's sensitivity for narrow line imaging and spectroscopy is an order of magnitude better than legacy MeV missions. COSI's sensitivity coupled with its daily, full sky coverage will both revolutionize our understanding of the cycle of creation and destruction of matter in our Galaxy and open this window for further exciting new discoveries. COSI will resolve the glow of antimatter annihilation in the Galactic center and allow a deeper understanding of the positron life cycle and of the conditions of the interstellar medium where such particles annihilate.

COSI will map radioactive Al with unprecedented sensitivity and angular resolution and will make the first map of Fe. COSI's Ti map will uncover young, hidden supernova remnants. COSI will shed light on the extreme environments of black holes, pulsars, and -ray bursts (GRBs). COSI will pioneer MeV polarization measurements of these extremely energetic sources and contribute to multimessenger astrophysics by studying short GRBs produced by merging neutron stars.

The mission is a collaboration between UCB's Space Sciences Laboratory, Northrop Grumman, the Naval Research Laboratory, and NASA's Goddard Space Flight Center. The Italian Space Agency (ASI)

participates in the mission by providing scientific and operational support through its ground station (MLD) at the Luigi Broglio Malindi Space Center (LBMSC) in Kenya. The ASI ground segment network (ASINET) has the purpose to enable telemetry routes and phone lines. The network is already configured to meet COSI requirements. The low inclination (<2 degrees) of the COSI orbit provides visibility from MLD during every orbit. Seven ground station contacts per day are planned, but this could increase in the future if needed to allow for faster transient alerts.

ASI and the Space Science Data Center (SSDC) will also provide scientific support to the mission. In particular, ASI is in charge of the development of the automatic pipeline that will search and classify slow transients (e.g., long GRB, blazar flare, novae). Moreover, ASI will contribute to the modelling of the expected background and to the implementation of the model in the COSI data pipeline. ASI will furthermore contribute to the classification (source vs. background) of the events with Artificial Intelligence methods. SSDC plans to maintain a mirror for the COSI data in Rome.