NASA/GSFC Status Update

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NASA/GSFC

INTEGRAL @ the HEASARC

Current INTEGRAL Activities at the HEASARC

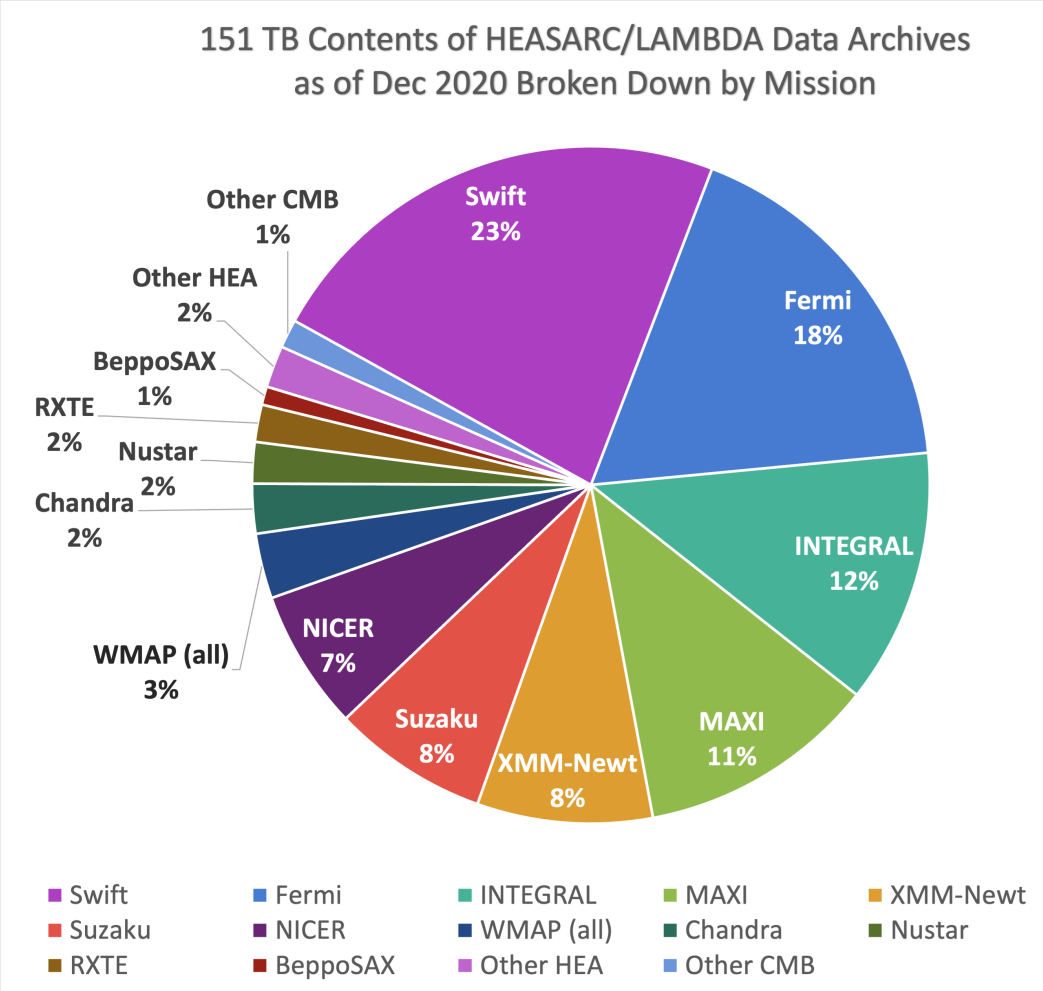
- The HEASARC maintains 19 searchable INTEGRAL catalogs including catalogs published in the literature.

- It contains an up-to-date mirror to the INTEGRAL data archive containing all public data (downloaded from the ISDC).
  - The HEASARC archive includes all public data as it becomes available as well as up-to-date housekeeping data.
  - The HEASARC does not support the download of proprietary GO data.

- The HEASARC maintains the INTEGRAL GOF webpages including links to INTEGRAL news (including RSS feeds) and an INTEGRAL help desk.

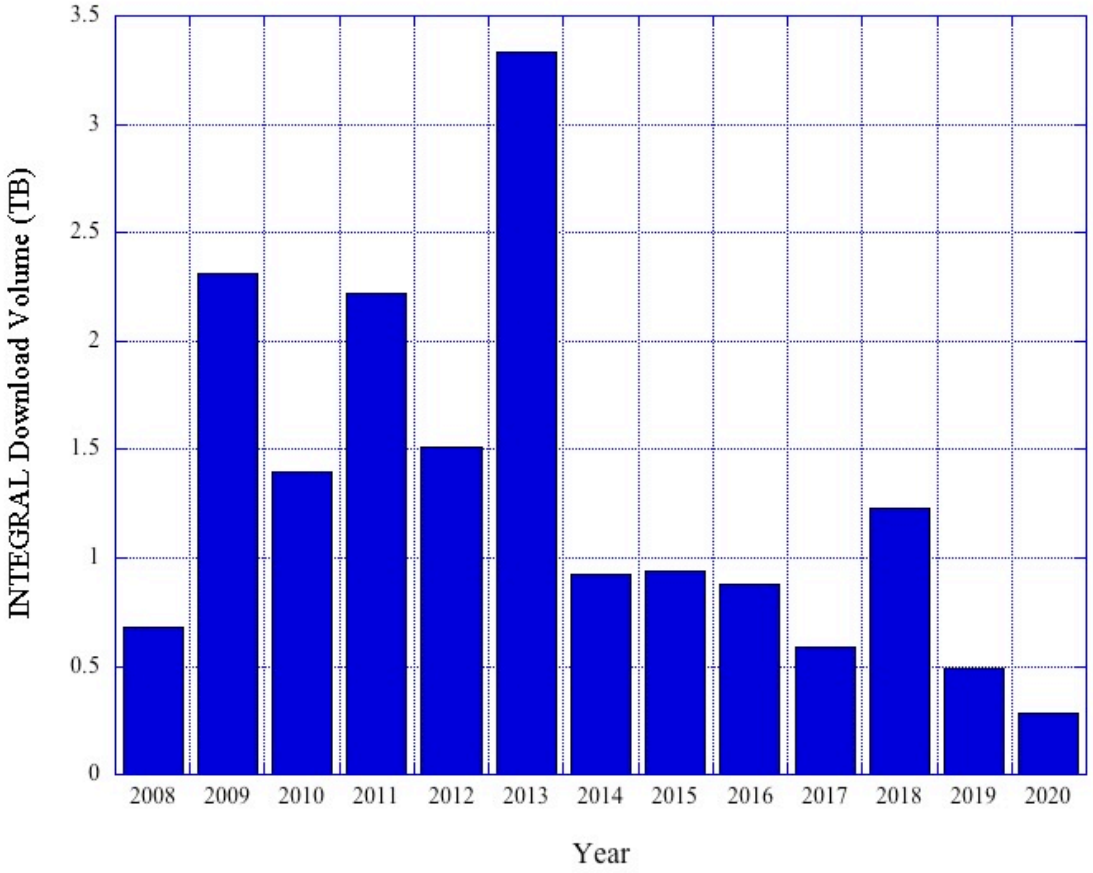
- HEASARC personnel remain a point of contact between ESA and NASA.

HEASARC Archive Holdings



- The INTEGRAL archive at the HEASARC is the third largest mission archive behind Swift and Fermi.

HEASARC Data Download Volumes



- Keep in mind that the HEASARC does not support the download of proprietary data.

INTEGRAL Research in the US

- The ESA-INTEGRAL webpage lists 92 INTEGRAL-related refereed publications thus far in 2021.

- 46% of these papers have US authors and 20% have a US first author.

- Many of these papers represent collaborative multi-wavelength and multi-messenger science utilizing data from other observatories such as LIGO, NICER, Fermi, Swift, NuStar, Chandra, and XMM-Newton.

NASA Updates

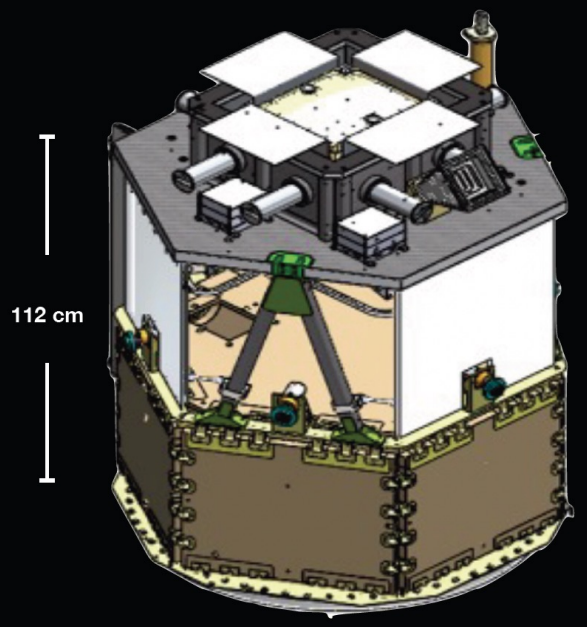
COSI Selected as next NASA SMEX!

The Compton Spectrometer and Imager

COSI is **optimized for line sensitivity** to enable full-Galaxy and all-sky images at 511 keV and nucleosynthesis lines

COSI also provides significant improvements in continuum sensitivity while covering the whole sky **enabling exciting serendipitous discoveries**

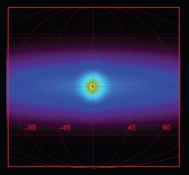
Parameter	Requirements
Energy Range	0.2-5 MeV
Sky Coverage	100% per day
Energy Resolution	0.4% FWHM @ 1.8 MeV
Angular Resolution	2.0° FWHM @ 1.8 MeV
Localization	<1.0° for GRBs



COSI payload and spacecraft

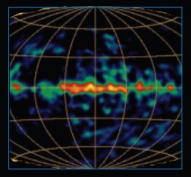
COSI Synergies with INTEGRAL

COSI will revolutionize our understanding of creation and destruction of matter in our Galaxy



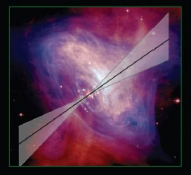
Uncover the origin of Galactic positrons

COSI will build upon INTEGRAL/SPI legacy to constrain the 511 keV Galactic emission with excellent energy resolution, a large FOV, and all-sky imaging



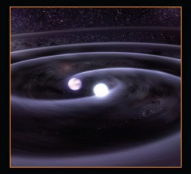
Reveal the dynamics of element formation

COSI will create Galactic maps of ^{26}Al, ^{60}Fe, and ^{44}Ti nucleosynthesis products tracing SN in individual star-forming regions



Gain insight into extreme environments with polarization

With a compact Compton-telescope design, COSI will provide polarization measurements for GRBs, AGN, and BH transients



Probe the physics of multi-messenger events

The COSI CsI anti-coincidence shield detectors will provide near-all-sky-coverage for transients synergistically with the INTEGRAL/SPI-ACS

2020 Decadal Survey Released!

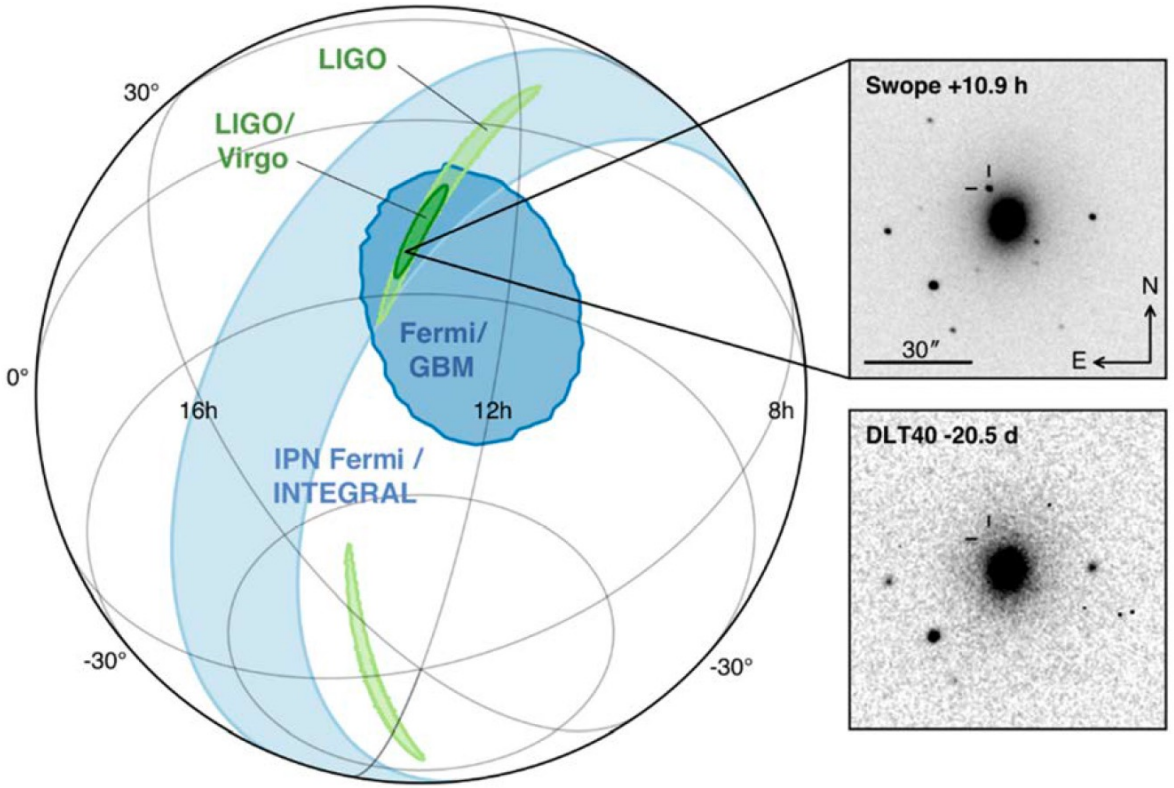


FIGURE 4.6 The multi-messenger nature of the detection of the kilonova 170817, first detected in gravitational waves and gamma ray bursts, and shortly thereafter in many other wavelengths. In the left panel, green contours indicate location determination from gravitational wave detectors (LIGO in light green, LIGO-Virgo in dark green); light blue contours delineate likely regions using triangulation from time delays between gamma-ray satellites Fermi and the INTErnational Gamma-Ray Astrophysics Laboratory (INTEGRAL); and dark blue contours trace the Fermi Gamma-ray Burst Monitor localization. The insets on the right show optical images of the host galaxy NGC 4993 10.9 hours after the merger taken with the Swope telescope (*top right*) and a DLT40 pre-discovery image 20.5 days prior to the merger (*bottom right*). SOURCE: B. P. Abbott et al. 2017, "Multi-messenger Observations of a Binary Neutron Star Merger," *The Astrophysical Journal Letters*, 848 L12. doi:10.3847/2041-8213/aa91c9.

2020 Decadal Survey Recommendations

Time Domain Astrophysics Program (Highest Priority Sustaining Activity for Space)

Exploring the cosmos in the multi-messenger and time domains is a key scientific priority for the coming decade, with new capabilities for discovery on the horizon with the Rubin Observatory, Roman, LIGO/Virgo and the Kamioka Gravitational Wave Detector (KAGRA), and IceCube. To advance this science, it is essential to maintain and expand space-based time-domain and follow up facilities in space. Many of the necessary observational capabilities can be realized on Explorer-scale platforms, or possibly somewhat larger. As the international landscape and health of NASA assets change, it will be important for NASA to seek regular advice over the coming decade on needed capabilities and to ensure their development. The open Explorer program calls have reached a healthy funding level, and as noted in Section 6.2.1.1.3, maintaining the current cadence of open calls is a condition for new initiatives. This time-domain program is therefore recommended as an augmentation to those levels, and would be executed through competed calls in broad, identified areas.

2022 Senior Review

- Both *Swift* and *Fermi* up for Senior Review (renewed operational funding) in 2022, covers FY23-FY25 (+FY26-FY27)
- Both will highlight multi-messenger and time-domain astronomy opportunities in coming years
- Strong endorsement from Decadal survey gives some optimism for outlook