TAP
A Probe Mission Concept

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More info:
https://asd.gsfc.nasa.gov/tap/

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TAP Mission

- Probe mission concept (cost ~$1B)
- Submitted to Astro2020 Decadal
- Rapid-response multiwavelength observatory

- Operations
  - L2 Halo orbit - provides instantaneous FoR of 85% of the sky
  - Communications via 3 dedicated ground station antennae - provides ability to uplink ToOs, downlink triggers rapidly
- Launch 2029
TAP Instrument Suite

- **Wide Field Imager (WFI)**
  - 4 Micro-channel plate Lobster modules
  - 0.3-5 keV
  - 1400 deg$^2$ FoV, 1 arcmin localization
  - $2 \times 10^{-11}$ erg/cm$^2$/s in 2000 sec

- **Infrared Visual Ultraviolet Telescope (IVUT)**
  - 0.2 – 2.5 micron, 70 cm diameter
  - 4 photometric bands, low-res slit spectrometer
  - 1 deg$^2$ FoV, 1 arcsec localizations
  - 23 mag in 300 sec

- **X-ray Telescope (XRT)**
  - single crystal silicon mirrors
  - 1 deg$^2$ FoV, 5 arcsec localizations
  - $3 \times 10^{-15}$ erg/cm$^2$/s in 3000 sec

- **Gamma-ray Transient Monitor (GTM)**
  - 8 scintillator detectors
  - 10 - 1000 keV
  - $4\pi$ FoV
TAP Science Program

- Characterize electromagnetic (EM) counterparts to Gravitational Wave (GW) sources involving mass scales from neutron stars (NS) to $10^9 \text{ M}_\odot$ Supermassive Black Hole (SMBH) Binaries
- Target a broad range of time-domain astrophysical phenomena involving compact objects
- Broadband sky survey
- Guest Observer facility
Gravitational Wave Counterparts

- **PTA**
  - Long baseline regular TAP-WFI monitoring of AGN could reveal nearby high-mass binary SMBH systems with orbital periods of ~months-year

- **LISA**
  - TAP-XRT follow-up of inspiring lower-mass SMBH binaries may produce X-rays

- **LIGO/Virgo/KAGRA**
  - GRB coincidence detection with TAP-GTM
  - Kilonovae follow up with IVUT
  - On-axis (TAP-WFI) and off-axis (TAP-XRT) afterglows
Time Domain Survey

Time-Domain Survey of the Transient Multi-Wavelength Sky: Probing Astrophysics of Extreme Gravity

High-z Gamma-ray Bursts ~25/yr

Supernova Shock Breakouts ~20/yr
Debris short bright X-ray flares signaling SNe explosions.

BNS merger counterparts ~100/yr
Provide insight into both their progenitors and the dynamics of strong gravity.

Tidal Disruption Events ~150/yr
Elucidating stellar dynamics, and providing super massive black hole demographics.

10^4 Galactic Nuclei
Monitored weekly to search efficiently for modulated X-ray flux associated with the circumbinary disk of inspiralling supermassive black hole binaries.

GRB locations will be passed from ISS-TAO to JWST, for early universe investigations.

Multi-wavelength followup
of transient facilities
More Information on TAP

• TAP NASA Concept Study Report

• TAP Decadal White Paper

• TAP RFI
  • To be posted soon at https://asd.gsfc.nasa.gov/tap/documents.html