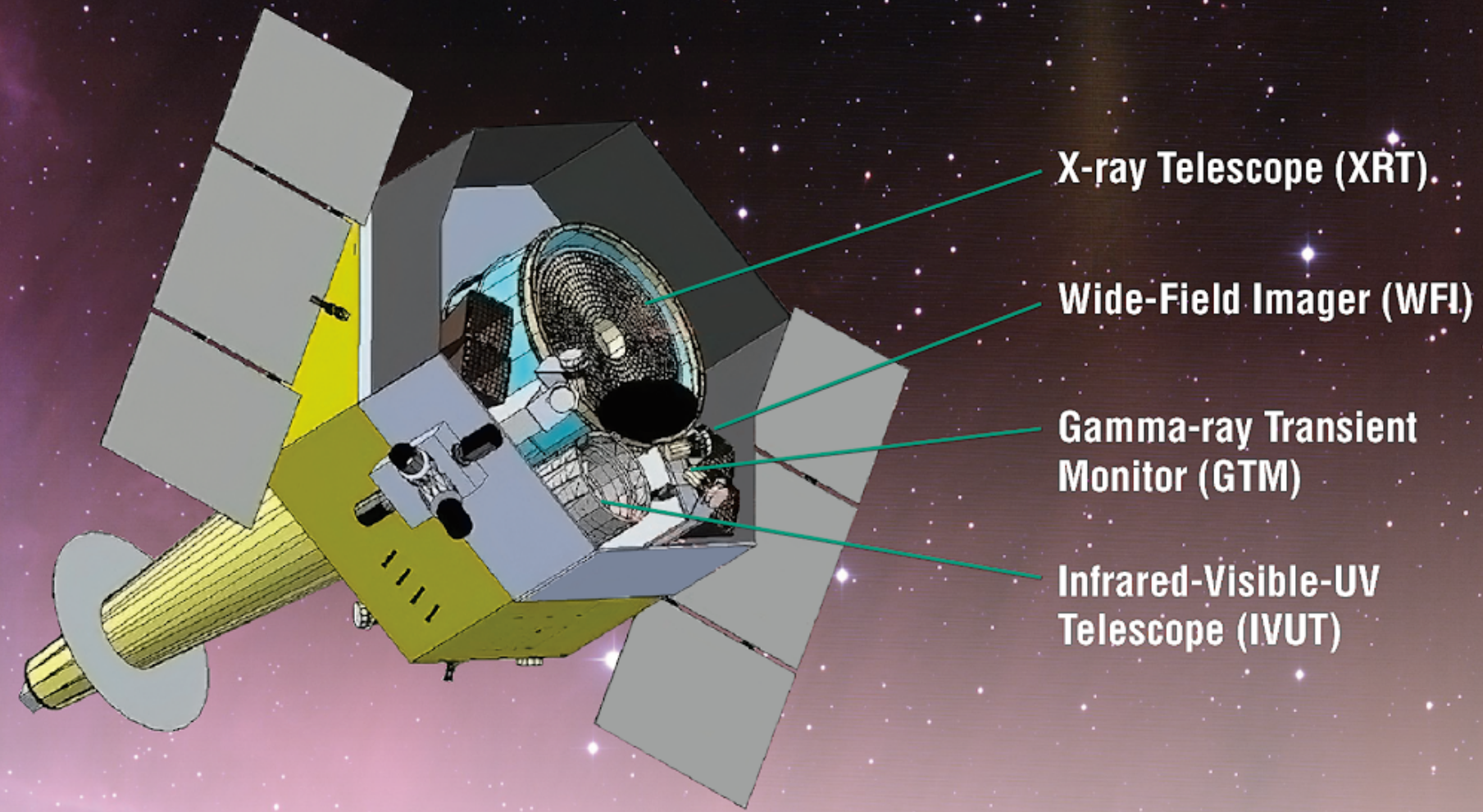
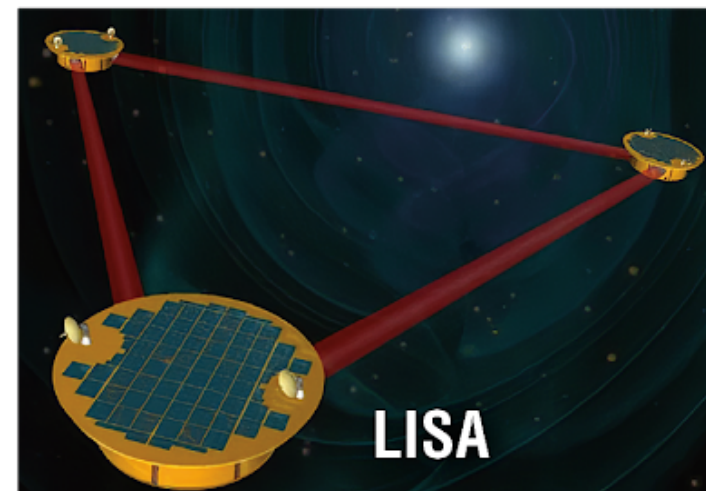
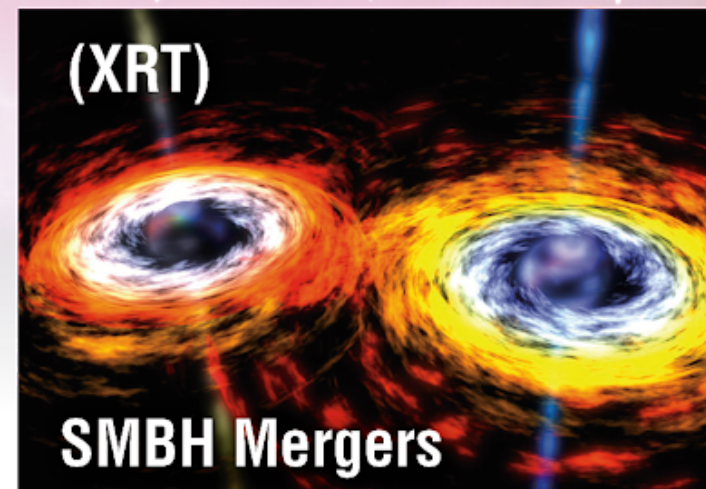
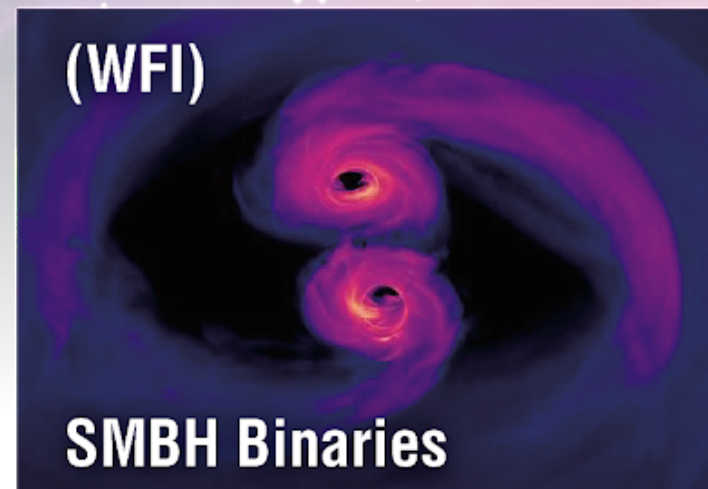


Transient Astrophysics Probe



TAP Counterparts & Gravitational Wave Telescopes



TAP

A Probe Mission Concept

Judy Racusin (NASA/GSFC)
on behalf of the TAP Team

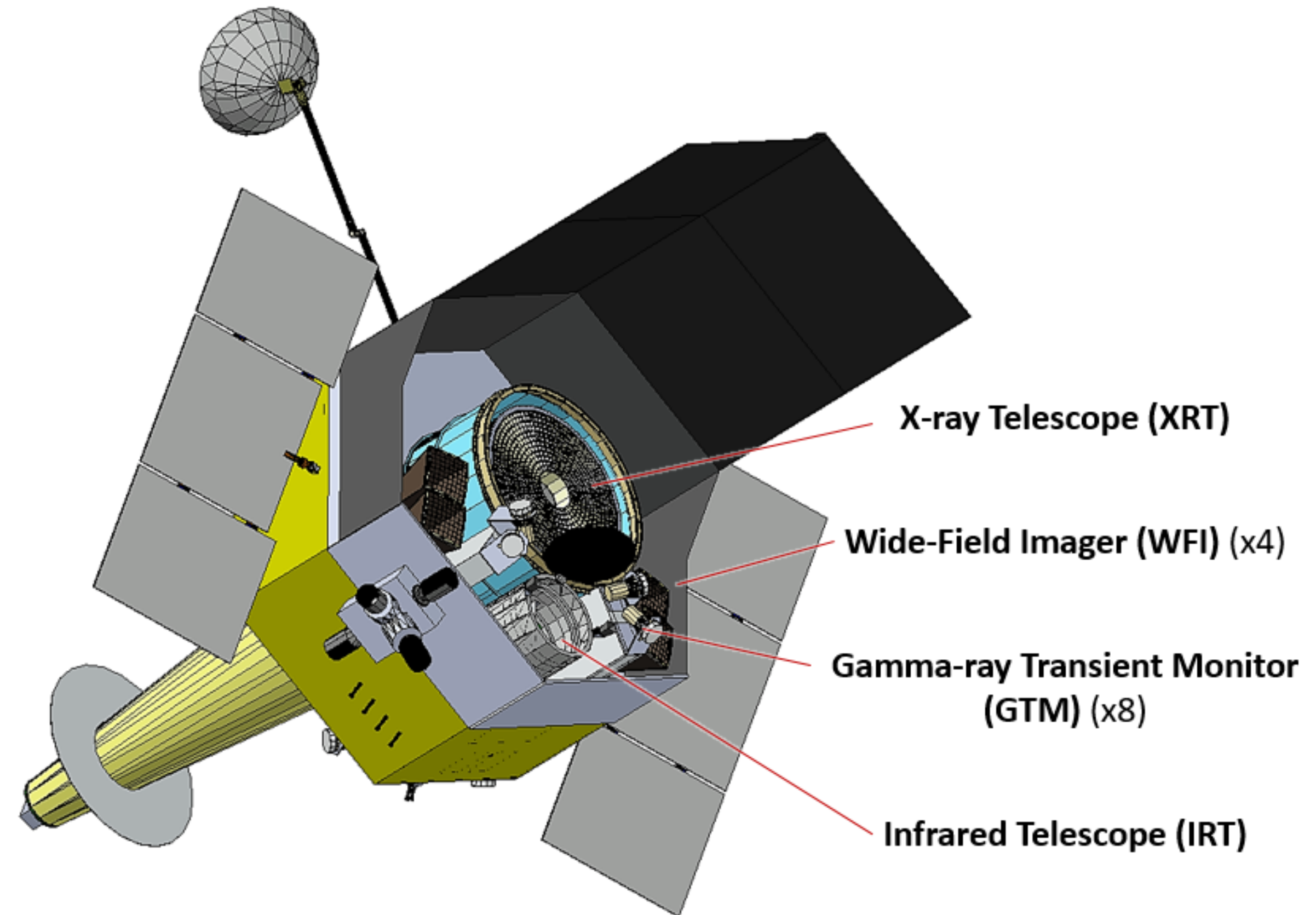
More info:
<https://asd.gsfc.nasa.gov/tap/>

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

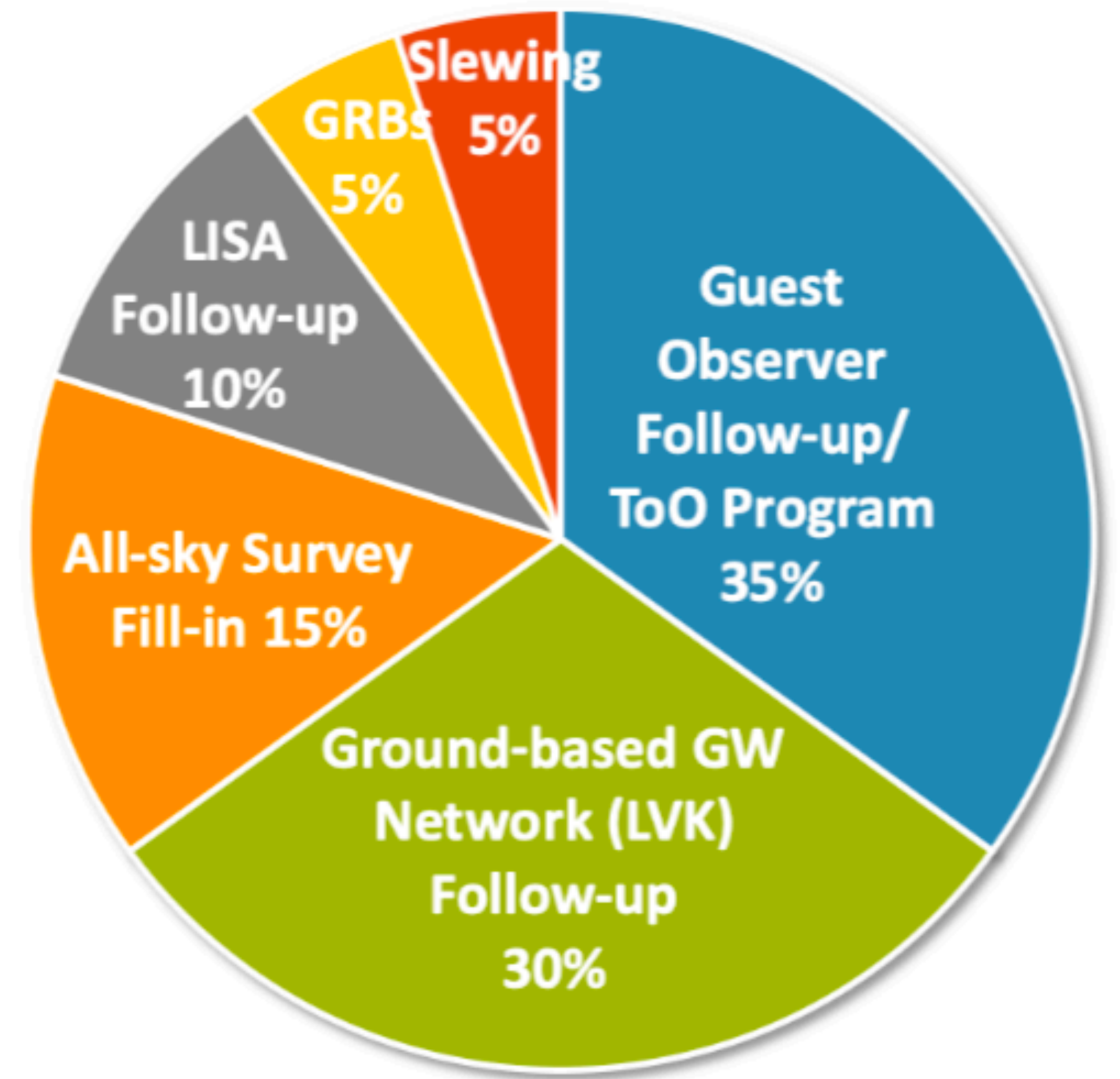
TAP Instrument Suite

- **Wide Field Imager (WFI)**
 - 4 Micro-channel plate Lobster modules
 - 0.3-5 keV
 - 1400 deg² FoV, 1 arcmin localization
 - 2×10^{-11} erg/cm²/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 deg² FoV, 1 arcsec localizations
 - 23 mag in 300 sec
- **X-ray Telescope (XRT)**
 - single crystal silicon mirrors
 - 1 deg² FoV, 5 arcsec localizations
 - 3×10^{-15} erg/cm²/s in 3000 sec
- **Gamma-ray Transient Monitor (GTM)**
 - 8 scintillator detectors
 - 10 - 1000 keV
 - 4π FoV



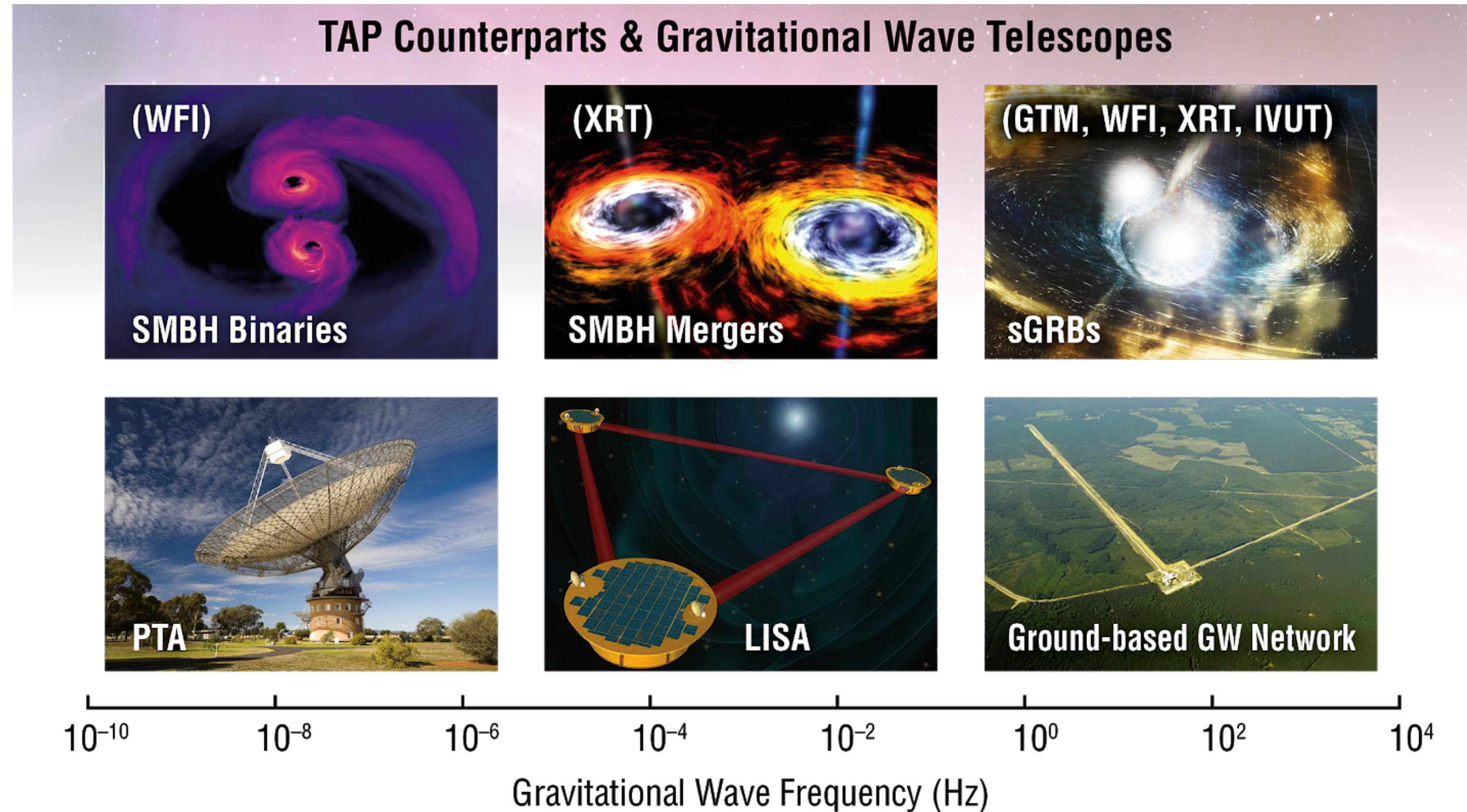
TAP Science Program

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



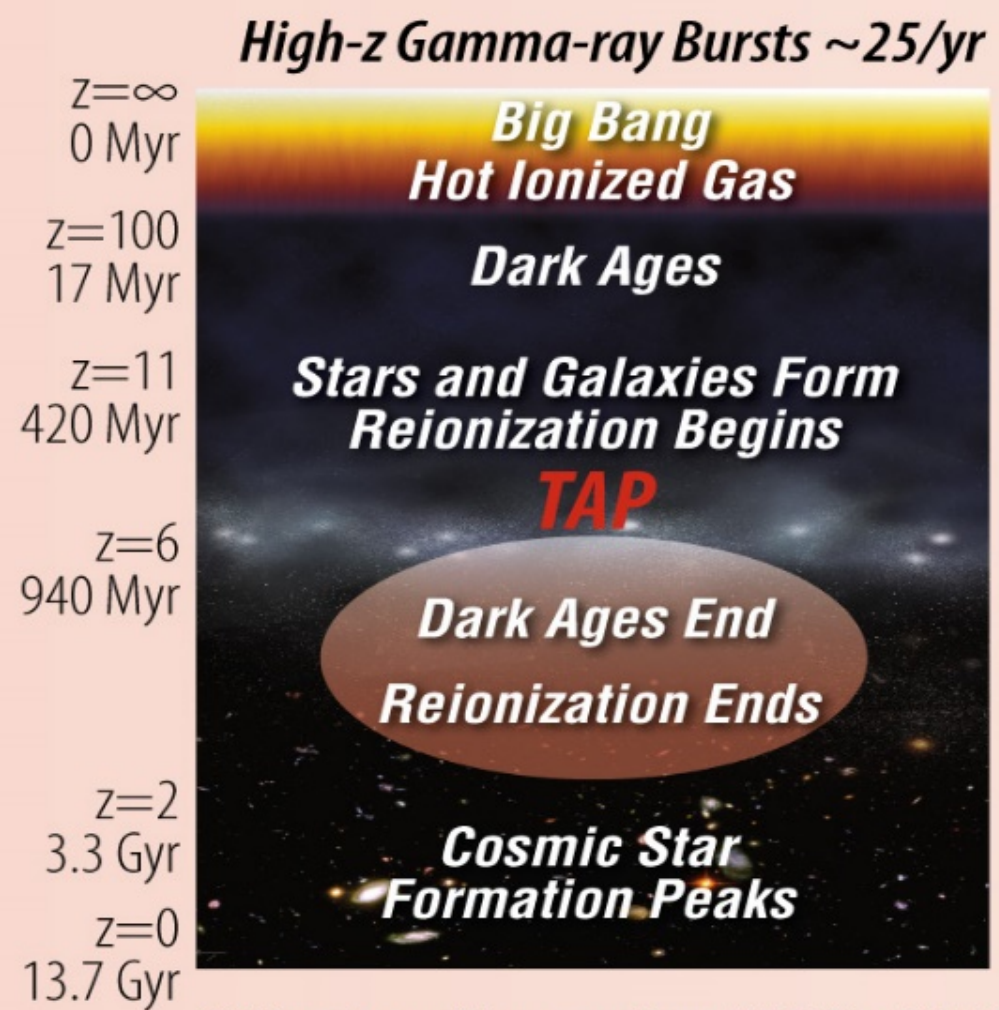
Gravitational Wave Counterparts

- 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



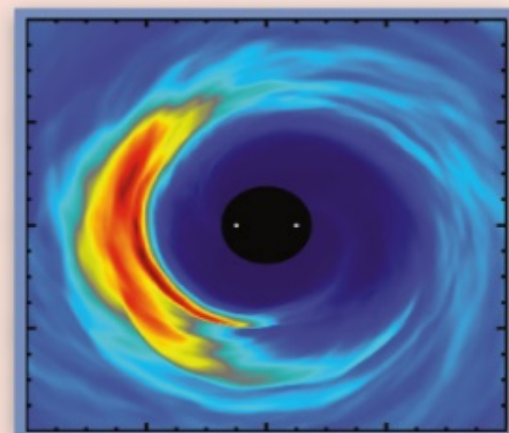
Time Domain Survey

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

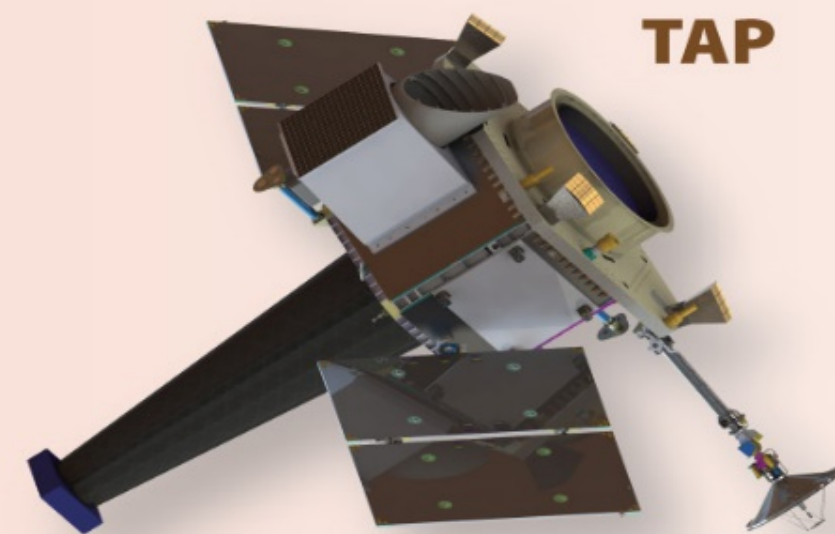


GRB locations will be passed from ISS-TAO to JWST, for early universe investigations.

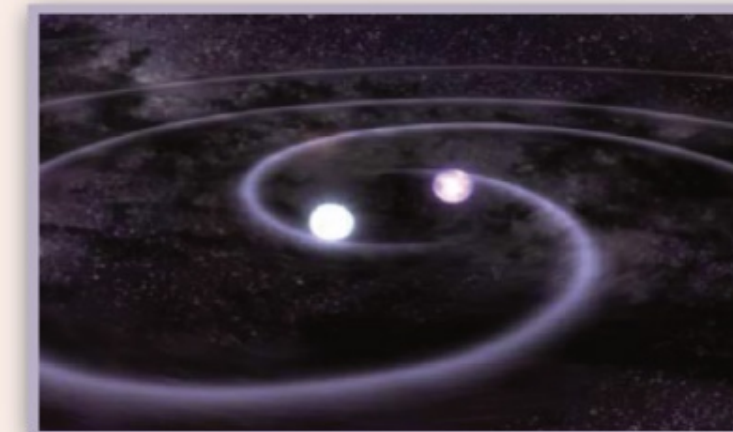
10^4 Galactic Nuclei
 monitored weekly to search efficiently for modulated X-ray flux associated with the circumbinary disk of inspiraling supermassive black hole binaries.



Supernova Shock Breakouts ~20/yr
 Elusive short bright X-ray flashes 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.



Multi-wavelength followup
 of transient facilities

More Information on TAP

- TAP NASA Concept Study Report
 - https://smd-prod.s3.amazonaws.com/science-red/s3fs-public/atoms/files/TAP_Study_Rpt.pdf
- TAP Decadal White Paper
 - https://113qx216in8z1kdeyi404hgf-wpengine.netdna-ssl.com/wp-content/uploads/2019/09/085_camp.pdf
- TAP RFI
 - To be posted soon at <https://asd.gsfc.nasa.gov/tap/documents.html>