NASA community input on gamma-ray astrophysics

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Gamma Ray SIG (GR-SIG)

- Goal is to coordinate community activities and preparations for future gamma-ray missions.
- Activities:
  - Organize sessions at AAS / APS / HEAD / SPIE meetings.
  - Organize monthly webinars to highlight gamma-ray science results and stimulate community discussion.
  - Launch SAGs (Science Analysis Groups) which are time-constrained taskforces with the goal of providing findings that can influence NASA policy.

Chairs: Justin Finke (NRL), Jeremy Perkins (GSFC),
Manel Errando (Washington Univ. St Louis)

Recent GRSIG webinars

- Lessons learned from the Advanced Compton Telescope (Steve Boggs, UCSD)
- Design and implementation of future gamma-ray missions: a co-design approach (Chris Fryer, LANL)
- Science capabilities of future gamma-ray missions (Jeremy Perkins, GSFC)

- Roadmap to Complementarity: Key Investments in the High-Energy Space Infrastructure Environment for 2040 (Tiffany Lewis, GSFC)
- Lessons learned from the 1997 Roadmap for Gamma-ray Astronomy (Peter Michelson, Stanford)

- Searches for indirect dark matter detection in the gamma-ray band (Joshua Foster, MIT)

- Gamma-ray observatories as pulsar timing arrays (Matthew Kerr, NRL)

Slides and recordings are available at https://pcos.gsfc.nasa.gov/sigs/grsig.php

FIG SAG

Future Innovations in Gamma rays Science Analysis Group

Chris Fryer

Michelle Hui

Astrophysical gamma rays span ten orders of magnitude in energy and capture key physics from a broad range of astrophysical phenomena. This task-force will explore gamma-ray science priorities, necessary capabilities, new technologies, and theory/modeling needs drawing on the 2020 Decadal to inspire work toward 2040.

Marcos Santander

Paolo Coppi

Tiffany Lewis

Zorawar Wadiasingh

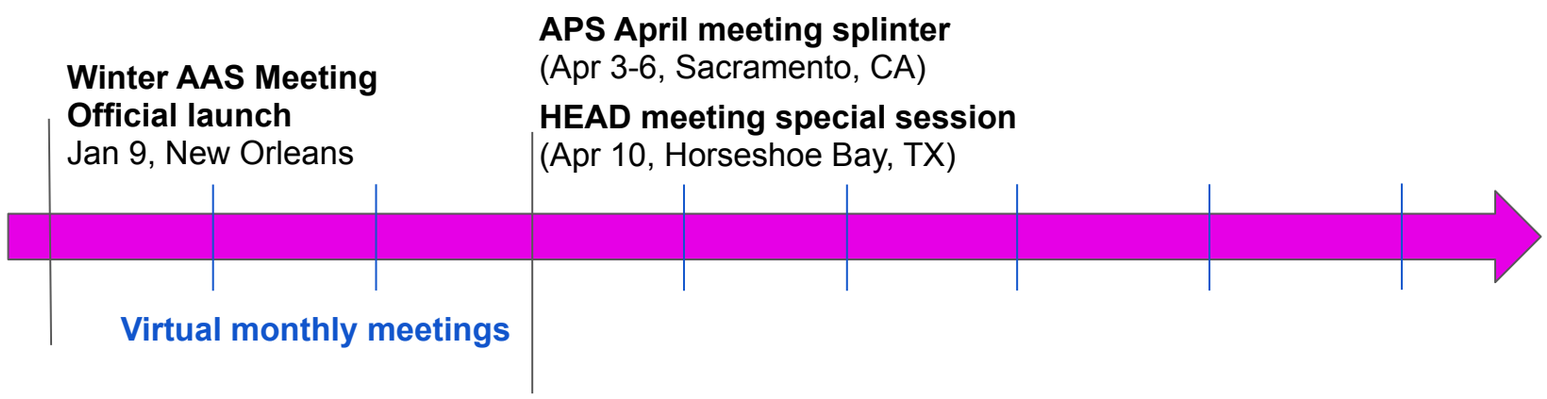
Milena Crnogorčević

FIG SAG Timeline

Future Innovations in Gamma rays

Kickoff session: Tuesday @ 10-11:30AM in Room 219

Manel Errando	Introduction to GRSIG and FIGSAG
Michelle Hui	FIGSAG: overview and goals
Regina Caputo	Previous reports on gamma-ray astronomy
Enrico Bozzo	International context for gamma-ray astronomy
Tiffany Lewis	Recent gamma-ray planning exercises
Chris Fryer	Community discussion and request for inout



Technology gaps

- NASA regularly updates its list of Technology gaps.
- The list informs funding for technology development (SAT, APRA, etc)
- Sollicitation for input is out, due date is June 3rd.

Tier 1 Technology Gaps

- Advanced Cryocoolers
- Coronagraph Contrast and Efficiency
- Coronagraph Stability
- Cryogenic Readouts for Large-Format Far-IR Detectors
- Heterodyne Far-IR Detector Systems
- High-Performance, Sub-Kelvin Coolers
- High-Reflectivity Broadband Far-UV-to-Near-IR Mirror Coatings
- High-Resolution, Large-Area, Lightweight X-ray Optics
- High-Throughput Bandpass Selection for UV/VIS
- High-Throughput, Large-Format Object Selection Technologies for Multi-Object and Integral Field Spectroscopy
- Large Cryogenic Optics for the Mid IR to Far IR
- Large-Format, High-Resolution Focal Plane Arrays
- Large-Format, Low-Darkrate, High-Efficiency, Photon-Counting, Solar-blind, Far- and Near-UV Detectors
- Large-Format, Low-Noise and Ultralow-Noise Far-IR Direct Detectors
- Long-Wavelength-Blocking Filters for X-ray Micro-Calorimeters
- Low-Stress, High-Stability, X-ray Reflective Coatings
- Mirror Technologies for High Angular Resolution (UV/Vis/Near IR)
- Stellar Reflex Motion Sensitivity – Astrometry
- Stellar Reflex Motion Sensitivity – Extreme Precision Radial Velocity
- Vis/Near-IR Detection Sensitivity

Tier 2 Technology Gaps

- Broadband X-ray Detectors
- Compact, Integrated Spectrometers for 100 to 1000 μm
- Far-IR Imaging Interferometer for High-Resolution Spectroscopy
- Far-IR Spatio-Spectral Interferometry
- Fast, Low-Noise, Megapixel X-ray Imaging Arrays with Moderate Spectral Resolution
- High-Efficiency X-ray Grating Arrays for High-Resolution Spectroscopy
- High-Resolution, Direct-Detection Spectrometers for Far-IR Wavelengths
- Improving the Calibration of Far-IR Heterodyne Measurements
- Large-Aperture Deployable Antennas for Far-IR/THz/sub-mm Astronomy for Frequencies over 100 GHz
- Large-Format, High-Spectral-Resolution, Small-Pixel X-ray Focal-Plane Arrays
- Polarization-Preserving Millimeter-Wave Optical Elements
- Precision Timing for Space-Based Astrophysics
- Rapid Readout Electronics for X-ray Detectors
- Starshade Deployment and Shape Stability
- Starshade Starlight Suppression and Model Validation
- UV Detection Sensitivity

Tier 3 Technology Gaps

- Advancement of X-ray Polarimeter Sensitivity
- Detection Stability in Mid-IR
- Far-UV Imaging Bandpass Filters
- High-Efficiency Far-UV Mirror
- High-Efficiency, Low-Scatter, High- and Low-Ruling-Density, High- and Low-Blazed-Angle UV Gratings
- High-Quantum-Efficiency, Solar-Blind, Broadband Near-UV Detector
- Photon-Counting, Large-Format UV Detectors
- Short-Wave UV Coatings
- Warm Readout Electronics for Large-Format Far-IR Detectors

Tier 4 Technology Gaps

- Advanced Millimeter-Wave Focal-Plane Arrays for CMB Polarimetry
- Improving the Photometric and Spectro-Photometric Precision of Time-Domain and Time-Series Measurements
- UV/Opt/Near-IR Tunable Narrow-Band Imaging Capability
- Very-Wide-Field Focusing Instrument for Time-Domain X-ray Astronomy

Tier 5 Technology Gaps

- Complex Ultra-Stable Structures for Future Gravitational-Wave Missions
- Disturbance Reduction for Gravitational-Wave Missions
- Gravitational Reference Sensor
- High-Performance Spectral Dispersion Component/Device
- High-Power, High-Stability Laser for Gravitational-Wave Missions
- Laser Phase Measurement Chain for a Decihertz Gravitational-Wave Mission
- Micro-Newton Thrusters for Gravitational Wave-Missions
- Stable Telescopes for Gravitational Wave-Missions

Summary

Your voice is important! Make it count

Join the GRSIG mailing list
Participate in our monthly meetings

Provide input to the FIG SAG to highlight Science / Technology / Theory needs to define future gamma-ray missions