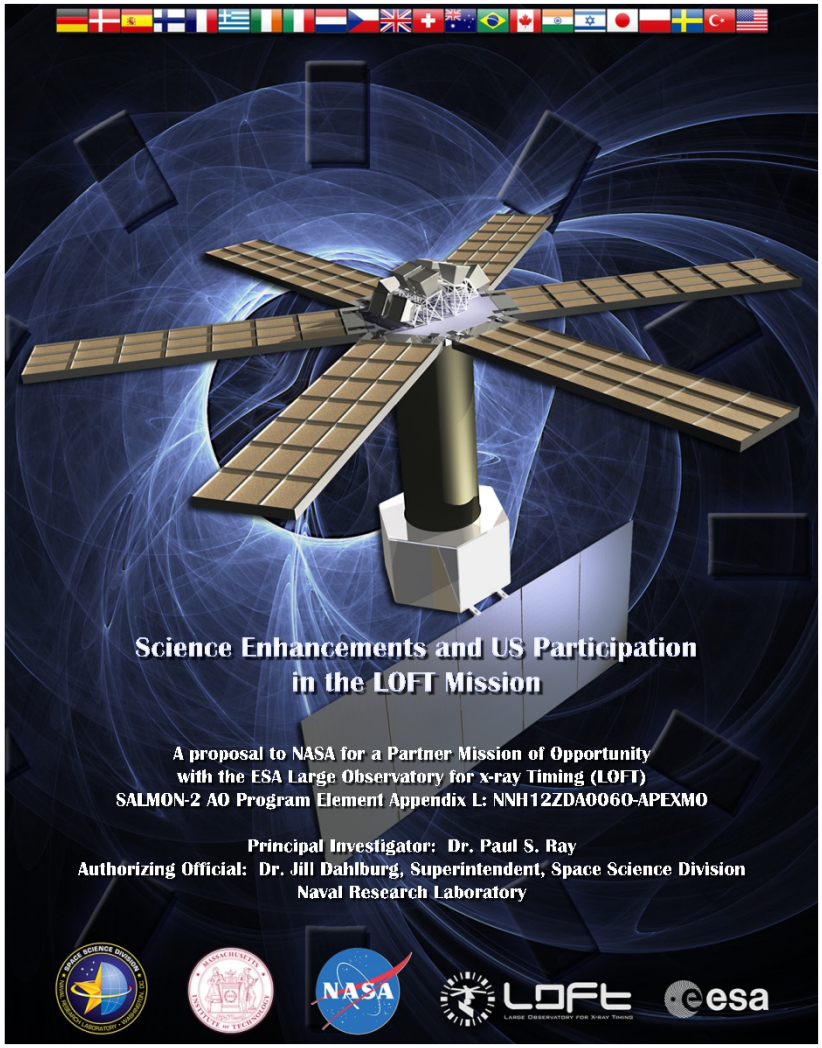
Proposed US Contributions to LOFT

Colleen Wilson-Hodge (NASA/MSFC)
for the US-LOFT team

US-LOFT proposal

- NASA Mission of Opportunity Proposal
- Submitted 14 Dec 2012
- PI: P. Ray (NRL)
- Major contributions from MIT, NASA/MSFC, JPL, and NASA/GSFC
- Large US Science working group
- $40M for US participation if LOFT is selected by ESA.
- Selection activities on hold due to FY14 NASA budget



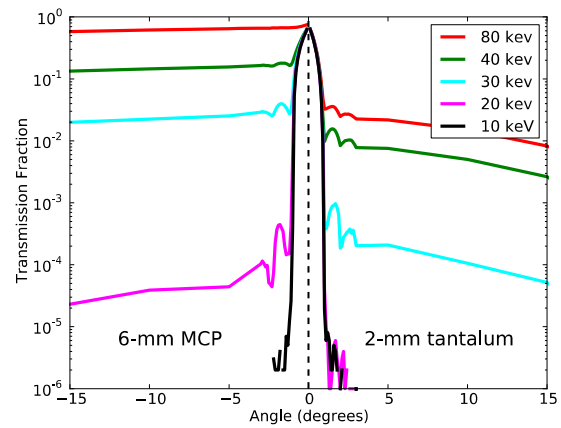
Name	US-LOFT Role	Relevant Experience	Institution
Paul Ray	Principal Investigator	*RXTE*, XNAV, *Fermi*, *AXTAR*	NRL
Deepto Chakrabarty	Project Scientist	*RXTE*, *Chandra*, *AXTAR*, NS Science	MIT
Marc Christophersen	Collimator Scientist	Micromachining	NRL
W. Neil Johnson	Project Manager	*Fermi*, *CGRO*, *ARGOS*	NRL
Michael Kowalski	Contracting Lead	*Fermi*, *STEREO*	NRL
Dennis Lee	System Engineer	SoloHI, *GEMS*	ATK
Walid A. Majid	GS Lead	*XMM-Newton*, *Chandra*, *RXTE*	JPL
Francois Martel	GS Operations	*HETE-2*	Espace
Bernard Phlips	Collimator Lead Engineer	*Fermi*, MISTI	NRL
Ron Remillard	Inst. Team Studies	*RXTE*, BH Science	MIT
Alan Smale	Data Archive	HEASARC, *RXTE*	GSFC
Colleen Wilson-Hodge	Deputy Project Scientist	*Fermi*/GBM, *RXTE*. HEROES, *AXTAR*	MSFC
Michael Wolff	LSSC Scientist	*ARGOS*, *RXTE*, *XMM-Newton*	NRL
Kent Wood	ICD Requirements Tracking	X-ray Timing Astrophysics	NRL
Science Working Group			
Narayana Bhat	GRBs, AGNs	*Fermi*/GBM, Accretion Theory	UAH
Michael Briggs	GRBs	*Fermi*/GBM, Flight Software	UAH
Ed Cackett	Strong Gravity, Reverberation	*Chandra*, *XMM*, *Suzaku*	Wayne State
Valerie Connaughton	GRBs	*Fermi*/GBM, FSSC	UAH
Michael F. Corcoran	HMXB, Multiwavelength	*RXTE*, HEASARC Scientist	USRA/GSFC
Mark Finger	Accreting Pulsars	*RXTE*, BATSE, *Fermi*/GBM	USRA/MSFC
Peter Jenke	Accreting Pulsars, X-ray bursts	*Fermi*/GBM	UAH
Dieter Hartmann	GRBs	*CGRO*, *Fermi*, *XMM-Newton*, *Swift*	ClemsonU
Jeroen Homan	NS/BH Astrophysics	*RXTE*, X-ray Observations	MIT
Laurens Keek	X-ray Burst Theory & Observation	*XMM-Newton*, *Chandra*, *RXTE*	MSU
Dong Lai	BH QPO Theory, NS Astrophysics	Accretion Theory	Cornell
Fred Lamb	NS QPO Theory, NS Astrophysics	*RXTE*, NS and Accretion Theory	Illinois
Joseph Lazio	Time Domain Astronomy	SKA, Radio Wavelength Counterparts	JPL
Tom Maccarone	NS/BH Astrophysics	*RXTE*, *Chandra*	Texas Tech
Simin Mahmoodifar	NS Astrophysics	NS Theory, Nuclear Astrophysics	Maryland
Cole Miller	NS QPO Theory, NS Astrophysics	*RXTE*, Accretion Theory	Maryland
Jon Miller	BH Astrophysics, Strong Gravity	*RXTE*, *Chandra*, *Suzaku*, *NuSTAR*	Michigan
Joseph Neilsen	BH/NS Astrophysics, Line Spectra	*Chandra*, *RXTE*	MIT
Mike Nowak	NS/BH Astrophysics	*Chandra*, *RXTE*, Analysis Software	MIT
Feryal Ozel	NS Mass/Radius, NS Astrophysics	*RXTE*, NS Theory	Arizona
Veronique Pelassa	GRBs	*Fermi*	UAH
Dimitrios Psaltis	Strong Gravity, QPOs	*RXTE*, *AXTAR*, NS/BH Theory	Arizona
Christopher Reynolds	AGN, Strong Gravity,	*ASCA*, *Chandra*, *XMM-Newton*	Maryland
Jeremy D. Schnittman	Strong Gravity, QPO Theory,	*RXTE*, *AXTAR*	GSFC
Nikolai Shaposhnikov	NS and BH Timing	*RXTE*, X-ray Burst Theory	Maryland
David Smith	BH Astrophysics, SFXTs	*RHESSI*, *RXTE*	UCSC
Andrew Steiner	NS EOS, Nuclear Physics	Nuclear Theory	UW
Tod E. Strohmayer	X-ray Timing, X-Ray Bursts	*RXTE* Project Scientist	GSFC
John Tomsick	BH Spectra, Multiwavelength	*RXTE*, *Chandra*, *NuSTAR*	UC Berkeley
Nevin Weinberg	X-ray Burst Theory	*RXTE*, *Chandra*, Theory	MIT
Bing Zhang	GRBs	*Swift*, *Chandra*, *XMM-Newton*	UNLV

Proposed US Enhancements

- Tantalum X-ray collimator
- Additional ground station
- LOFT instrument team participation
- US science support center & data archive
- Science enabled by US hardware

Tantalum X-ray Collimator

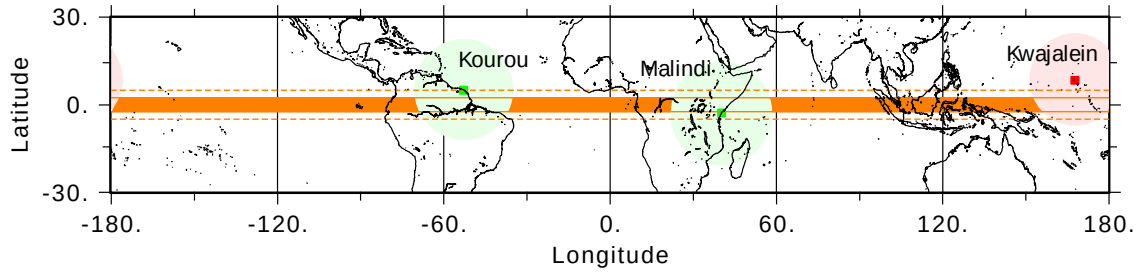
- High-Z material with excellent stopping power
- Fabricated using a combination of laser micro-machining and chemical etching.
- Known technology capable of producing high-aspect ratio holes and large open fractions.
- Reduces LOFT LAD background by a factor of 3
- Details and status in Phlips talk next.



Collimator Specifications

Parameter	Ta Collimator	MCP
Channel Aspect Ratio	60:1	60:1
Thickness	2 mm	6 mm
Open Area Fraction	70%	70%
Pore Size	33 μm	100 μm
Septum Thickness	3.3 μm	20 μm
Outer Dimension	112.5 x 74 mm	
Active Area	108.5 x 70 mm	
Tile Mass	98 g	57 g

Additional Ground Station

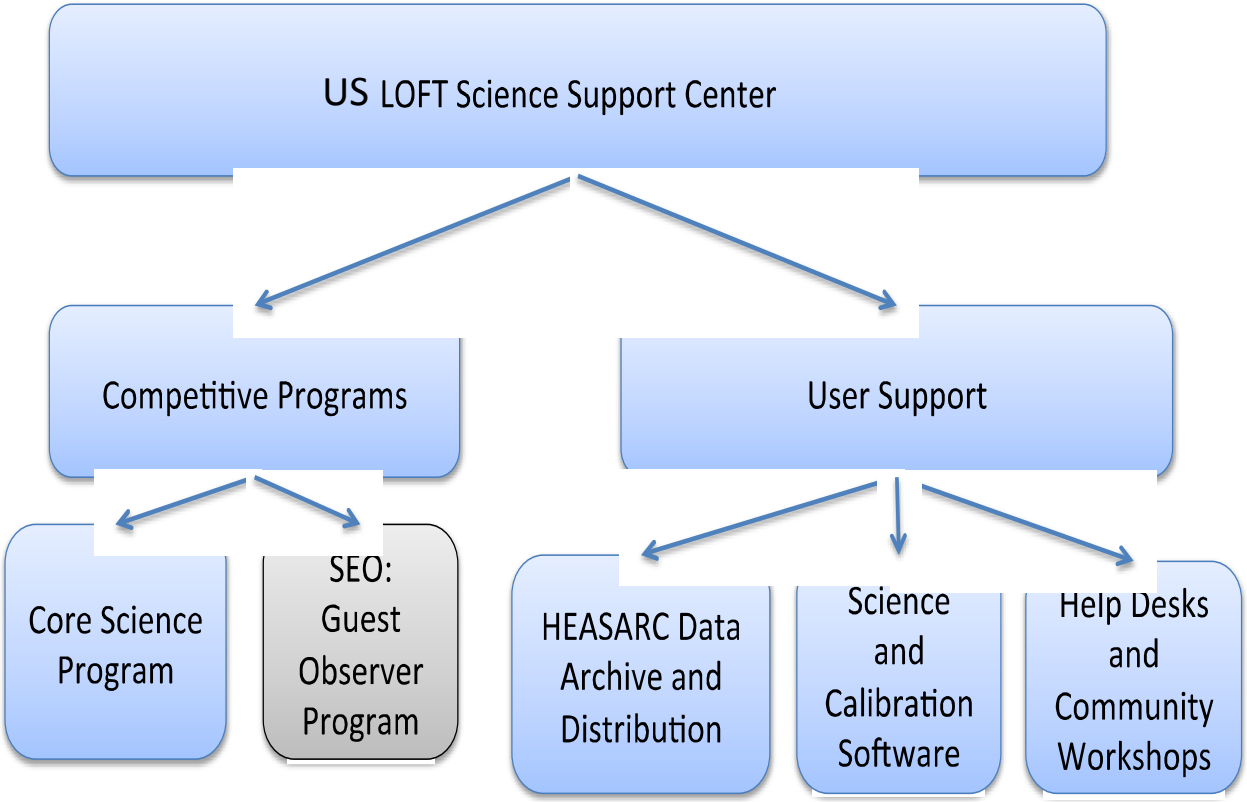


- Baseline plan
  - Move 12-m DSN antenna currently maintained by JPL to Kwajalein
  - Expected contact time of 8.6 min/orbit
  - Additional downlink capability of 5.1Gb/orbit
  - Operated by Espace, Inc.
  - Data transfer to ESA via existing optical fiber from Kwaj to Guam
- Descope option
  - 6-m dish, 6 min contact time, 3.6 Gb/orbit

Instrument team participation: example trade studies

- Telemetry formats for LOFT based upon RXTE/EDS experience
- Ground system software and strategies for WFM based upon RXTE/ASM automated pipeline software
- MSFC engineering trade studies supporting the Ta collimator
- Burst alert triggers based upon Fermi/GBM and HETE-2

US Science Support Center & Archive



Competitive US funding programs

- Core science program
  - Funds ~20 scientists to become members of LOFT science working groups beginning 2-yrs before launch.
  - Supports data analysis, modeling, calibration and multi-wavelength observations
- Guest Observer program
  - Observing proposals selected by LOFT TAC
  - Proposals for analysis of public WFM and LAD data
  - Multi-wavelength observations directly supporting LOFT

Science Enhancements Enabled by US Hardware

- Tantalum collimator
  - Reduces background by factor of 3
  - Improves sensitivity to faint sources such as AGN
  - Eliminates contamination by bright/variable sources outside the LAD field of view.
- US Ground Station
  - Enables continuous telemetry of all events from the WFM.
  - Allows LAD to observe very bright >500 mCrab sources with full event resolution.