Dheeraj R. Pasham

Einstein Fellow · MIT Kavli Institute

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Research Interests

Time domain Astronomy: Identification and multiwavelength (Optical, UV, X-ray and radio) studies of transients including tidal disruption of stars by black holes in external galaxies, fast-evolving, luminous blue transients, fast radio bursts, GRBs and electromagnetic counterparts of Gravitational wave events.

High-energy astrophysics: Reverberation mapping of Ultraluminous X-ray sources (ULXs), black hole binaries, and AGN. Search for heavy stellar-mass black holes, intermediate-mass black holes, and hyper-accreting neutron stars.

Refereed Publications

First authored: 12 (10 ApJ, 1 Nature, 1 Science (under review)). **Co-authored:** 7

Education

University of Maryland College Park — *USA*

PhD in Astronomy (Advisor: Tod E. Strohmayer & Coleman Miller) — *Aug. 2010 - Aug. 2014*

- X-ray Time and Spectral Variability as Probes of Ultraluminous X-ray Sources

University of Maryland College Park — *USA*

M.S. in Astronomy — *Aug. 2008 - Aug. 2010*

Indian Institute of Technology Bombay — *India*

Bachelor of Technology in Aerospace Engineering — *Aug. 2004 - May. 2008*

Employment

Einstein Fellow, MIT Kavli Institute — *Cambridge, MA, USA*

Faculty Contact: Prof. Deepto Chakrabarty — *Aug. 2016 - Present*

- Multi-wavelength studies of optical transients including Tidal Disruption Flares, fast-evolving blue transients and quest for intermediate-mass black holes

Postdoctoral Associate, NASA Goddard Space Flight Center — *Greenbelt, MD, USA*

Adviser: Dr. S. Bradley Cenko — *Sept. 2014 - July 2016*

- Multi-wavelength studies of Relativistic Tidal Disruption Flares
- Search for Intermediate-mass black holes using X-ray, optical and UV photometric Reverberation Mapping and time variability

Graduate Research Assistant, University of Maryland College Park — *College Park, MD, USA*

Advisers: Dr. Tod E. Strohmayer, Prof. Richard Mushotzky, Prof. Coleman Miller — *Aug. 2010 - Aug. 2014*

- Time series analysis of accreting compact objects

Graduate Research Assistant, University of Maryland College Park — *College Park, MD, USA*

Advisers: Prof. Massimo Ricotti and Dr. Edward Shaya — *May 2009 - May 2010*

- Near-field cosmological N-body simulations

Research Assistant, École polytechnique fédérale de Lausanne — *Lausanne, Switzerland*

Advisers: Dr. Frederic Courbin and Dr. George Meylan — *May 2008 - July 2008*

- Search for quasar lenses in the SDSS sky survey

Undergraduate research assistant, University of Swinburne *Melbourne, Australia*
Adviser: Dr. Sarah Madison *May 2007 - July 2007*
- Chemical modeling of proto-planetary disks

Awards and Prizes

Einstein fellowship *Spring 2016*
Stanford KIPAC Fellowship (declined) *Spring 2015*
Ann G. Wyile dissertation fellowship *Spring 2014*
Merit-based fellowships awarded by the University of Maryland to Ph.D. candidates; Stipend of $10,000 plus expenses
Won 1 st prize of $500 *April 2012*
Best oral presentation at Graduate Research Interaction Day (University of Maryland)
Won best poster award of $50 at CRESST retreat (twice) *October 2011 and 2012*
Dean's award of $1000 *2008*
Graduate school support at the University of Maryland

Awarded Grants and Proposals

Swift Cycle 14 **$38,900**
XRT and UVOT Monitoring of the tidal disruption flare ASASSN-14li to detect the newly formed accretion disk **50 ks**
Dheeraj R. Pasham (PI), *Ron Remillard*

NICER Collaboration **200 ks**
Search for intermediate-mass black holes with NICER
Dheeraj R. Pasham (PI) *+ NICER observatory working group*

NICER Collaboration **300+ ks**
NICER observations of ultraluminous X-ray sources: Search for intermediate-mass black holes
NICER Observatory working group, **Dheeraj R. Pasham (co-I)**

NICER Collaboration **40 ks**
To estimate spins of black holes in future tidal disruption flares with NICER
Dheeraj R. Pasham (PI) *+ NICER observatory working group*

NICER Collaboration **150 ks**
X-ray monitoring of tidal disruption flares with NICER
NICER Observatory working group, **Dheeraj R. Pasham (co-I)**

VLA Semester 17A and 18A **21 hrs**
Jet-disk coupling in tidal disruption events
Sjoert van Velzen, **Dheeraj R. Pasham (co-I)**, *James Miller, Peter Jonker, Rob Fender*

NICER Collaboration **50 ks**
Can the claimed 30 $M_\odot$ black hole in IC X-1 simply be a pulsar?
Dheeraj R. Pasham (PI) *+ NICER search working group*

Swift Cycle 12 **$34,700**
High-cadence XRT monitoring of ultraluminous X-ray source to search for orbital periods **100 ks**
Dheeraj R. Pasham (PI), *S. Bradley Cenko*

Chandra cycle 18 (Joint Chandra and Swift) **$35,000**
Chandra and Swift ToO Observations to Constrain the Spins of Supermassive Black Holes in Tidal Disruption Flares **25 ks + 105 ks**
Dheeraj R. Pasham (PI) *S. Bradley Cenko, Suvi Gezari*

XMM-Newton cycle 12 (Joint XMM and VLT) **$65,700**
A search for X-ray reverberation in the ultraluminous X-ray source NGC 5408 X-1 **33 ksx 2**
Tod E. Strohmayer, **Dheeraj R. Pasham (co-I)**, *Margaret L. Trippe, Poshak Gandhi, Richard F. Mushotzky*

Chandra cycle 15 **$35,000**
Confronting IC 10 X-1: Does the most massive stellar black hole also have the most extreme spin? **150 ks**
James Steiner et al., **Dheeraj R. Pasham (co-I)**

XMM-Newton cycle 11 **$65,734**
X-ray timing and eclipse mapping of the massive black hole binary IC 10 X-1 **127 ks**
Tod E. Strohmayer, **Dheeraj R. Pasham (co-I)**, *Richard F. Mushotzky*

Swift ToO (Target of Opportunity)
Confirming the 625 day X-ray period in ULX Holmberg IX X-1 **30 ks**
Dheeraj R. Pasham (PI)

Goodman SOAR spectrograph, NOAO 2013A cycle **1 Night**
Optical spectroscopy of a mysterious periodic X-ray source
Margaret L. Trippe, **Dheeraj R. Pasham (co-I)**

Swift ToO (Target of Opportunity) **30 ks**
Search for X-ray dips in the ULX NGC 5408 X-1
Dheeraj R. Pasham (PI)

Swift ToO (Target of Opportunity) **12 ks**
Search for X-ray, Optical and UV variability in AGN RMID-272
Dheeraj R. Pasham (PI)

Swift ToO (Target of Opportunity) **18 ks**
Conforming the 1.2 d period in NGC 55 ULX
Dheeraj R. Pasham (PI)

Swift ToO (Target of Opportunity)
Confirming the 12.1 hr X-ray period in ULX Holmberg IX X-1 **32 ks**
Dheeraj R. Pasham (PI)

Invited Talks

Using tidal disruption flares to study super-massive black holes — *ISSI, Bern, Switzerland, October 2018*

Invited seminar at University of Milano — *Milan, Italy, October 2018*

Time domain Astrophysics with Swift III — *Clemson University, SC, October 2018*

The radio and X-ray connection in accreting objects — *Monopoli, Italy, May 2018*

Broad band X-ray timing and spectroscopy in AstroSat era	*TIFR, Mumbai* *January 2018*
AstroSat View of AGN Central Engines	*IUCAA, Pune* *December 2017*
Wide Band Spectral and Timing Studies of Cosmic X-ray Sources	*TIFR, India* *January 2017*
Black Hole Initiative Talk	*Harvard University, MA* *November 2016*
High-Energy Talk	*Max Planck Institute for Physics* *October 2016*
Space Science Lab Colloquium	*Stanford University, CA* *August 2014*
Joint Space Institute Symposium	*University of Maryland, MD* *October 2014*
Invited Seminar	*University of Michigan* *September 2013*

Contributed Talks

Aspen Winter conference	*Aspen, CO* *January 2018*
AAS meeting	*Washington D.C.* *January 2018*
Einstein Symposium	*Cambridge, MA* *October 2017, 2018*
The X-ray Universe 2017	*Rome, Italy* *June 2017*
6^{th} Nepal meeting on black hole accretion and jets	*Kathmandu, Nepal* *October 2016*
Einstein Symposium	*Cambridge, MA* *October 2016*
American Physical Society Meeting	*Baltimore, MD* *April 2015*
Aspen Winter Conference	*Aspen, CO* *January 2015*
MIT Kavli Institute high-energy talk	*Cambridge, MA* *October 2014*
Columbia Thursday seminar	*New York, NY* *October 2014*
Johns Hopkins University	*Center for Astrophysical Sciences seminar* *September 2014*
Stanford University	*Stanford tea talk* *August 2014*
California Institute of Technology	*Pasadena, CA* *August 2014*
223^{rd} AAS Meeting	*Dissertation talk* *January 2014*
DC/MD/VA AstroConf	*College Park, MD* *June 2013*
13^{th} Meeting of the high-energy astrophysics division (HEAD)	*Monterey, CA* *April 2013*
39^{th} COSPAR scientific assembly	*Mysore, India* *July 2012*

Energetic astronomy: Richard Mushotzky at 65 — *Annapolis, MD, June 2012*

The X-ray Universe 2011 — *Berlin, Germany, June 2011*

Students and Teaching

Jitrapon Lertprasertpong (MIT Sophomore) Supervising research project: A systematic search for QPOs in archival data of ULXs *2017 October - Present*

Chanita Tubthong (MIT Sophomore) Supervising research project: Search for stable QPOs in archival X-ray data of tidal disruption flares *2017 December - Present*

Jake Georon (High school student) Supervised research project: Tracking the mHz QPO in the ULX M82 X-1 *2013 June - August*

Graduate teaching assistant: ASTR 300 - Stars and Stellar systems (Fall 2008), ASTR 380 - Life in the Universe (Fall 2009, Spring 2009)

Service

Referee: The Astrophysical Journal (ApJ), Monthly Notices of the Royal Astronomical Society (MNRAS), Astronomy&Astrophysics (A&A)

NICER observatory working group member

Judge: Chambliss Student Poster Judge, 223rd AAS meeting in Washington

Master of ceremonies: University of Maryland observatory

Publicity and Press

Discovery of a Time Lag between the Soft X-Ray and Radio Emission of the Tidal Disruption Flare ASASSN-14li: Evidence for Linear Disk-Jet Coupling

March 2018

Demonstrated that a newly formed jet in a TDF is efficiently regulated by the inner accretion disk

- MIT Press Release
- NYU Press Release
- Space.com
- IFLScience
- NewsWeek
- UPI

TEDx Talk

July 2017

How to find zombie stars a.k.a black holes!

YouTube Link

Optical/UV-to-X-Ray Echoes from the Tidal Disruption Flare (TDF) ASASSN-14li

March 2017

First multi-wavelength (optical/UV and X-ray) photometric reverberation mapping of a tidal disruption flare (TDF) delineating the origin of the optical and UV emission from TDFs

- NASA Press Release
- MIT Press Release
- Scientific American
- Boston Globe
- Inverse
- Daily Mail
- CBS News

A 400-solar-mass black hole in the galaxy M82

August 2014

Compelling evidence for an intermediate-mass black hole based on harmonic 3:2 frequency ratio X-ray periodicities

- NASA Press Release
- University of Maryland Press
- TIME
- Top 10 stories of 2014 by Astronomy magazine
- IFLScience
- Science
- Times of India
- Space.com
- HuffingtonPost

Evidence for High-frequency QPOs with a 3:2 Frequency Ratio from a 5000 Solar Mass Black Hole

September 2015

Second system, after M82 X-1, where I found harmonic 3:2 frequency ratio X-ray periodicities that allowed identification of a compelling intermediate-mass black hole candidate

- NASA Press Release
- University of Maryland Press
- The Daily Mail

Three quasi-stellar objects acting as strong gravitational lenses

March 2012

Discovery of a sample of quasars acting as gravitational lenses

- NASA Press Release