

# Science at the Horizon

## The Next-Generation EHT

### Meeting Connection Information:

- Please join us on zoom [here](#); if you have registered, you will receive the password before the start of the meeting
- For security purposes, the conference Slack link will be distributed only to registrants; if you wish to listen to the meeting, please register [here](#)
- If at any time you have questions or need assistance, please contact [ngeht-2021-loc@googlegroups.com](mailto:ngeht-2021-loc@googlegroups.com) or ask in the #help channel on Slack
- Slides and Recordings from previous sessions are available to view during the conference, see Slack channel [#general](#) for the link, or email LOC with any questions.
- Spreadsheet [view](#)

### Monday, February 22

15:00 - 15:45 UT (10:00 - 10:45 EST)

*Welcome* (Michael Johnson)  
*Introduction to the ngEHT* (Shep Doeleman)  
Moderator: Avery Broderick  
LOC Support: Britt Jeter, Paul Tiede

15:45 - 16:30 UT (10:45 - 11:30 EST)

*ngEHT Science Introduction*  
Roger Blandford, Stanford University  
Moderator: Avery Broderick, Perimeter Institute for Theoretical Physics  
LOC Support: Britt Jeter, Paul Tiede

16:30 - 16:45 UT (11:30 - 11:45 EST)

Coffee Break  
LOC Support: Britt Jeter, Paul Tiede

16:45 - 17:45 UT (11:45 - 12:45 EST)

*ngEHT Concept Progression and Pathways*

*ngEHT Systems Engineering Overview*  
Garret Fitzpatrick, Smithsonian Astrophysical Observatory

*The ngEHT Reference Design*

Alex Raymond, Smithsonian Astrophysical Observatory

*The ngEHT data landscape*

Lindy Blackburn, Smithsonian Astrophysical Observatory

Moderator: Anton Zensus, MPIfR

LOC Support: Nick Conroy, Daniel Palumbo

17:45 - 18:15 UT (12:45 - 13:15 EST)

Moderated Summary and Discussion

Discussion Leader: Charles Gammie, UIUC

LOC Support: Nick Conroy, Daniel Palumbo

18:15 - 18:30 UT (13:15 - 13:30 EST)

Coffee Break

LOC Support: Nick Conroy, Daniel Palumbo

18:30 - 19:00 UT (13:30 - 14:00 EST)

*M87, Sgr A\*, and micro-arcsecond astrometry...my three (scientific) love affairs*

[\[recording\]](#); [slides](#)

Mark Reid, Center for Astrophysics | Harvard & Smithsonian

Moderator: Geoff Bower, ASIAA

LOC Support: Nick Conroy, Daniel Palumbo

19:00 - 19:15 UT (14:00 - 14:15 EST)

Coffee Break

LOC Support: Britt Jeter, Lindy Blackburn, Nick Conroy

19:15 - 20:15 UT (14:15 - 15:15 EST)

The next decade of black holes: I. Astrophysical Context and Theory

Moderator: Sera Markoff, University of Amsterdam

LOC Support: Britt Jeter, Lindy Blackburn, Nick Conroy

*Probing Accretion Physics and Plasma Physics with the ngEHT*

Eliot Quataert, UC Berkeley/Princeton

*Black Hole Binaries Across Twelve Decades in Frequency*

Alberto Sesana, University of Milano Bicocca

20:15 - 20:30 UT (15:15 - 15:30 EST)

Coffee Break

LOC Support: Britt Jeter, Lindy Blackburn, Nick Conroy

20:30 - 21:00 UT (15:30 - 16:00 EST)

Moderated Summary and Discussion

Discussion Leader: Ramesh Narayan, Center for Astrophysics | Harvard & Smithsonian

LOC Support: Britt Jeter, Lindy Blackburn, Nick Conroy

21:00 - 21:30 UT (16:00 - 16:30 EST)

Poster session social

LOC Support: Britt Jeter, Lindy Blackburn, Nick Conroy

## Tuesday, February 23

15:00 - 16:30 UT (10:00 - 11:30 EST)

The next decade of black holes: II. Observations

Moderator: Paul Ho, ASIAA

LOC Support: Tiffany Nichols, Lindy Blackburn

*The next decade of Galactic Center Black Hole observations with infrared interferometry and 30-40m telescopes*

Frank Eisenhauer, MPE

*Dynamical Studies of Supermassive Black Holes in Nearby Galaxies*

Jonelle Walsh, Texas A&M

*Using radio waves to find supermassive black hole binaries: a multi-messenger approach*

Sarah Burke-Spolaor, West Virginia University

16:30 - 16:45 UT (11:30 - 11:45 EST)

Coffee Break

LOC Support: Tiffany Nichols, Lindy Blackburn

16:45 - 17:45 UT (11:45 - 12:45 EST)

Moderator: David Hughes, INAOE

LOC Support: Lindy Blackburn, Mina Himwich

*ETHER: creating a comprehensive sample of black holes for the (ng-)EHT*

Neil Nagar, Universidad de Concepcion

*Probing AGN physics with high energy neutrinos and the ngEHT*

Silke Britzen, Max-Planck-Institut für Radioastronomie

*Shedding new light on accretion and jets in X-ray binaries with ngEHT*

Alex Tetarenko, East Asian Observatory

17:45 - 18:15 UT (12:45 - 13:15 EST)

Moderated Summary and Discussion

Discussion Leader: Jose Gomez, Instituto de Astrofísica de Andalucía - CSIC

LOC Support: Lindy Blackburn, Mina Himwich

18:15 - 18:30 UT (13:15 - 13:30 EST)

Coffee Break

LOC Support: Lindy Blackburn, Mina Himwich

18:30 - 19:00 UT (13:30 - 14:00 EST)

*Jets from stellar-mass black holes: from launch to termination*

Rob Fender, University of Oxford

Moderator: Sera Markoff, University of Amsterdam

LOC Support: Lindy Blackburn, Mina Himwich

19:00 - 19:15 UT (14:00 - 14:15 EST)

Coffee Break

19:15 - 20:15 UT (14:15 - 15:15 EST)

Parallel Session I: ngEHT Architecture and Design

Moderator: Jonathan Weintraub, CfA

LOC Support: Lindy Blackburn, Nick Conroy

1. *A 230/345 GHz Dual Frequency ngEHT Receiver Prototype for the LMT*  
Gopal Narayanan, UMass Amherst
2. *On the inevitability of a spaceborne extension of EHT*  
Leonid Gurvits, Joint Institute for VLBI ERIC and Delft University of Technology
3. *Considerations for an Extension of the EHT into Space*  
Vincent L. Fish, MIT Haystack
4. *Status of ASIAA 345 GHz receiver for VLBI*  
Ted Huang, Academia Sinica Institute of Astronomy and Astrophysics (ASIAA)
5. *Operational software development*  
Ilse van Bemmel, Joint Institute for VLBI ERIC
6. *The Mexican participation in the ngEHT*  
Laurent Loinard, Universidad Nacional Autónoma de México

Parallel Session II: Astrophysical Studies with the ngEHT

Moderator: Sara Issaoun, Radboud University

LOC Support: Tiffany Nichols, Britt Jeter

1. *Observational Prospects of Nearby AGNs - A Multiwavelength Perspective*  
Venkatesh Ramakrishnan, Universidad de Concepcion
2. *Testing jet formation models with the ngEHT*  
José L. Gómez, Instituto de Astrofísica de Andalucía - CSIC
3. *An Upper Limit on the Spin of SgrA\* Based on Stellar Orbits in Its Vicinity*  
Giacomo Fragione, Northwestern University

4. *Formation Rate of Extreme Mass Ratio Inspirals in Active Galactic Nucleus*  
Zhen Pan, Perimeter Institute
5. *OJ 287: Potential Rosetta stone for the nascent multi-messenger nano-Hz GW astronomy*  
A. Gopakumar, Tata Institute of Fundamental Research

Parallel Session III: Black Hole Shadows I

Moderator: Maciek Wielgus, CfA/BHI

LOC Support: Mina Himwich, Paul Tiede

1. *Shadows and negative precession in non-Kerr spacetime*  
Aadarsh Mehta, P.D.Patel Institute of Applied Sciences
2. *Shadow of a null singularity without photon sphere*  
Joshi Ashok, International Center for Cosmology
3. *Probing strong gravity and fundamental physics via black hole shadows: A theory-agnostic approach*  
Che-Yu Chen, Academia Sinica
4. *Theory independent tests of gravity with black hole shadows*  
Sourabh Nampalliwar, Eberhard Karls University of Tuebingen
5. *Stationary black holes and light rings*  
Pedro V.P. Cunha, University of Aveiro

20:15 - 20:30 UT (15:15 - 15:30 EST)

Coffee Break

LOC Support: Lindy Blackburn, Britt Jeter

20:30 - 21:00 UT (15:30 - 16:00 EST)

Moderated Summary and Discussion

Discussion Leader: Ue-Li Pen, CITA

LOC Support: Lindy Blackburn, Britt Jeter

## Wednesday, February 24

15:00 - 16:30 UT (10:00 - 11:30 EST)

The next decade of black holes: III. Fundamental Physics

Moderator: Mariafelicia De Laurentis

LOC Support: Daniel Palumbo, Mina Himwich

*BHs beyond GR and their observational signatures*

Enrico Barausse, Scuola Internazionale Superiore di Studi Avanzati

*Searching for light bosons with black hole superradiance at the EHT*

Asimina Arvanitaki, Perimeter Institute

*New physics on the horizon? Testing the nature of dark compact objects*  
Paolo Pani, Sapienza University of Rome

16:30 - 16:45 UT (11:30 - 11:45 EST)

Coffee Break

LOC Support: Daniel Palumbo, Mina Himwich

16:45 - 17:45 UT (11:45 - 12:45 EST)

Moderator: Heino Falcke, Radboud University

LOC Support: Nick Conroy, Paul Tiede

*The Black Hole Photon Ring*

Alex Lupsasca, Princeton University

*Relating Black Hole Shadow to Quasinormal Modes for Rotating Black Holes*

Huan Yang, Perimeter Institute and University of Guelph

17:45 - 18:15 UT (12:45 - 13:15 EST)

Moderated Summary and Discussion

Discussion Leader: Vitor Cardoso, CENTRA/Dept. Physics, Instituto Superior Técnico

LOC Support: Nick Conroy, Paul Tiede

18:15 - 18:30 UT (13:15 - 13:30 EST)

Coffee Break

LOC Support: Nick Conroy, Paul Tiede

18:30 - 19:00 UT (13:30 - 14:00 EST)

*Disks, jets, and the ambient medium*

Sasha Tchekhovskoy, Northwestern University

Moderator: Priya Natarajan, Yale University

LOC Support: Nick Conroy, Paul Tiede

19:00 - 19:15 UT (14:00 - 14:15 EST)

Coffee Break

LOC Support: Britt Jeter, Lindy Blackburn

19:15 - 20:15 UT (14:15 - 15:15 EST)

Parallel Session IV: Simulations I: Plasma Physics

Moderator: Richard Anantua

LOC Support: Britt Jeter, Alex Raymond

1. *Magnetic reconnection in black hole accretion disks*

Bart Ripperda, Flatiron Institute/Princeton University

2. *The plasma physics of horizon-scale images of BHs*

Mohamad Shalaby, Leibniz Institute for Astrophysics Potsdam

3. *Positron Effects on Polarized Images and Spectra from Jet and Accretion Flow Models of M87 and Sgr A\**  
Razieh Emami Meibody, Center for Astrophysics | Harvard & Smithsonian
4. *2D GR PIC simulations of BH magnetosphere*  
Kouichi Hirotani, Academia Sinica Institute of Astronomy and Astrophysics (ASIAA)
5. *Identifying Small-Scale Structure in High Resolution Images of Black Holes*  
Zachary Gelles, Smithsonian Astrophysical Observatory
6. *Faraday Effects in Models of M87\**  
Angelo Ricarte, Center for Astrophysics | Harvard & Smithsonian

Parallel Session V: Time Domain Physics with the ngEHT

Moderator: Alex Tetarenko, East Asian Observatory

LOC Support: Paul Tiede, Nick Conroy

1. *Sgr A\*, M87, and other LLAGN Multi-wavelength Studies*  
Daryl Haggard, McGill University
2. *Supermassive Black Hole Binaries: GRMHD simulations in full GR and simple geometric modeling*  
Roman Gold, University of Southern Denmark
3. *Mapping Spacetime around Sgr A\* using Flares*  
Paul Tiede, University of Waterloo and Perimeter Institute
4. *Probing black-hole spacetime with ngEHT: theory and observations of radiative echoes*  
Kotaro Moriyama, MIT Haystack Observatory
5. *Photon Ring Autocorrelations*  
Shahar Hadar, Harvard University

Parallel Session VI: Black Hole Shadows II

Moderator: Frederic Vincent, Paris Observatory/LESIA

LOC Support: Daniel Palumbo, Lindy Blackburn

1. *Shadow of Naked Singularity*  
Dipanjan Dey, International Center for Cosmology
2. *The light ring and the appearance of matter accreted by black holes*  
Francisco Duque, Instituto Superior Técnico
3. *Testing rotating regular spacetimes with shadow observations*  
Rahul Kumar, Jamia Millia Islamia
4. *Rings Anchored in Shadows: Astrometric Cosmology and Celestial Reference Frames Using Black Hole Event Horizons*  
T. Marshall Eubanks, Space Initiatives Inc.
5. *A possible appearance of M87 jet bases with future EHT observations*  
Tomohisa Kawashima, Institute for Cosmic Ray Research, University of Tokyo

20:15 - 20:30 UT (15:15 - 15:30 EST)

Coffee Break

LOC Support: Britt Jeter, Lindy Blackburn

20:30 - 21:00 UT (15:30 - 16:00 EST)

Moderated Summary and Discussion

Discussion Leader: Chung-Pei Ma, UC Berkeley

LOC Support: Britt Jeter, Lindy Blackburn

21:00 - 21:30 UT (16:00 - 16:30 EST)

Junior Scientist Fireside Chat with Katie Bouman, Avery Broderick, Shep Doeleman, Kari Haworth, and David Hughes

Moderator: Daniel Palumbo, Center for Astrophysics | Harvard & Smithsonian

LOC Support: Britt Jeter, Lindy Blackburn

## Thursday, February 25

15:00 - 16:30 UT (10:00 - 11:30 EST)

The Next Decade of Black Holes: IV. Simulation

Moderator: Monika Moscibrodzka, Radboud University

LOC Support: Paul Tiede, Mina Himwich

*Kinetic plasma physics near the event horizon*

Sasha Phillippov, Flatiron Institute

*ngEHT Insights from Radiative Simulations: Extended Jets and Lensed Horizons*

Andrew Chael, Princeton University

*Mass loading the jet: pairs and entrainment*

George Wong, University of Illinois at Urbana-Champaign

16:30 - 16:45 UT (11:30 - 11:45 EST)

Coffee Break

LOC Support: Paul Tiede, Mina Himwich

16:45 - 17:45 UT (11:45 - 12:45 EST)

Moderator: Alan Marscher, Boston University

LOC Support: Britt Jeter, Tiffany Nichols

*Connecting multi-scale to multi-wavelength/-messenger with the ngEHT*

Sera Markoff, University of Amsterdam

*Multi-frequency AGN Monitoring Programs and the ngEHT*



Matthew Lister, Purdue University

17:45 - 18:15 UT (12:45 - 13:15 EST)

Moderated Summary and Discussion

Discussion Leader: Daryl Haggard, McGill University

LOC Support: Britt Jeter, Tiffany Nichols

18:15 - 18:30 UT (13:15 - 13:30 EST)

Coffee Break

LOC Support: Britt Jeter, Tiffany Nichols

18:30 - 19:00 UT (13:30 - 14:00 EST)

*Tests of General Relativity with (current) Gravitational-Wave Observations*

Moderator: Andy Strominger, Harvard University

Alessandra Buonanno, Max Planck Institute for Gravitational Physics

LOC Support: Britt Jeter, Tiffany Nichols

19:00 - 19:15 UT (14:00 - 14:15 EST)

Coffee Break

LOC Support: Britt Jeter, Tiffany Nichols

19:15 - 20:15 UT (14:15 - 15:15 EST)

Parallel Session VII: Simulations II: Accretion and Outflow

Moderator: Laurent Loinard, IRyA, UNAM

LOC Support: Britt Jeter, Alex Raymond

1. *Choked accretion: from Bondi accretion to bipolar outflows*  
Emilio Tejeda, Instituto de Física y Matemáticas - Universidad Michoacana de San Nicolás de Hidalgo
2. *A self-consistent treatment of warped accretion disks surrounding spinning supermassive black holes*  
Davide Gerosa, University of Birmingham
3. *Predictions for the ng-EHT from ADAF-models*  
Dominik Schleicher, Universidad de Concepcion
4. *Large scale simulations of M87*  
Christian Fromm, Black Hole Initiative at Harvard University
5. *Ray-tracing of GRMHD simulations with strong winds and jets and their implication for the observation with ng-EHT*  
Bidisha Bandyopadhyay, Universidad de Concepcion
6. *Tracking the M87 jet with ngEHT*  
Koushik Chatterjee, Anton Pannekoek Institute for Astronomy

Parallel Session VIII: Science Extraction with the ngEHT

Moderator: Katie Bouman, Caltech

LOC Support: Daniel Palumbo, Lindy Blackburn

1. *SYMBA and applications: synthetic data for next-generation VLBI arrays*  
Freek Roelofs, Radboud University
2. *A D-term Modeling Code (DMC) for simultaneous calibration and full-Stokes imaging of very long baseline interferometric data*  
Dominic Pesce, Center for Astrophysics | Harvard & Smithsonian
3. *Forward Modeling Schwarzschild Black Hole Parameters and Emissivity Distributions*  
Daniel Palumbo, Center for Astrophysics | Harvard & Smithsonian
4. *Feature Extraction on Synthetic Black Hole Images with Neural Networks*  
Joshua Yao-Yu Lin, University of Illinois at Urbana—Champaign
5. *Gallifray: A Geometric Modelling and Parameter Estimation Framework for Black hole images using Bayesian Techniques*  
Saurabh, University of Delhi

Parallel Session IX: Exotic Physics with the ngEHT

Moderator: Mina Himwich, Harvard

LOC Support: Tiffany Nichols, Nick Conroy

1. *Post-Newtonian properties of EMRI with Power Law Potential*  
Chinmay N Gandevikar, Birla Institute of Technology and Science, Pilani - Goa
2. *Probing Axions with Event Horizon Telescope Polarimetric Measurements*  
Yifan Chen, Institute of Theoretical Physics, Chinese Academy of Sciences
3. *Non-horizon science: binary black holes, transients, dark matter*  
Vikram Ravi, California Institute of Technology
4. *Multi-Messenger Science with Black Holes, Exploring Black Hole Populations with the ngEHT*  
Juan Garcia-Bellido, Universidad Autónoma de Madrid
5. *Generating Spacetime Solutions in Modified Gravity Theories For Observational Tests*  
Wei-Hsian Shao, National Taiwan University
6. *Photon ring signature of non-Kerr spacetimes*  
Maciek Wielgus, Black Hole Initiative at Harvard University

20:15 - 20:30 UT (15:15 - 15:30 EST)

Coffee Break

LOC Support: Britt Jeter, Lindy Blackburn

20:30 - 21:00 UT (15:30 - 16:00 EST)

Moderated Summary and Discussion

Discussion Leader: Sasha Tchekhovskoy, Northwestern University

LOC Support: Britt Jeter, Lindy Blackburn

## Friday, February 26

15:00 - 16:30 UT (10:00 - 11:30 EST)

ngEHT Science Case Development

[Breakout Sessions in Small Groups: [Sign Up Here](#)]

Discussion Leader: Shep Doeleman, CfA

LOC Support: Britt Jeter, Lindy Blackburn

16:30 - 16:45 UT (11:30 - 11:45 EST)

Coffee Break

LOC Support: Britt Jeter, Lindy Blackburn

16:45 - 18:15 UT (11:45 - 13:15 EST)

ngEHT Science Case Development

[Breakout Sessions by Topical Groups]

Moderator: Avery Broderick, Perimeter Institute for Theoretical Physics

[Science Goal Spreadsheet](#)

1. Fundamental Physics

Leads: Alessandra Buonanno & Vitor Cardoso

2. AGN/Galaxies/Cosmology

Leads: Priya Natarajan & Jose Gomez

3. Jet Launching

Leads: Charles Gammie & Sasha Philippov

4. Accretion

Leads: Andrew Chael & Chi-Kwan Chan

5. non-SMBH

Leads: Mark Reid & Daryl Haggard

6. New Horizons

Leads: Andrei Lobanov & Lindy Blackburn

LOC Support: Nick Conroy, Daniel Palumbo

18:15 - 18:30 UT (13:15 - 13:30 EST)

Coffee Break

LOC Support: Nick Conroy, Daniel Palumbo

18:30 - 19:00 UT (13:30 - 14:00 EST)

*Tidal Disruption Events: Prospects for the ngEHT?*

Jean Pierre Luminet, Laboratoire Univers et Théories, Centre de Physique Théorique,

Laboratoire d'Astrophysique de Marseille

LOC Support: Nick Conroy, Daniel Palumbo

19:00 - 19:15 UT (14:00 - 14:00 EST)

Coffee Break

LOC Support: Mina Himwich, Tiffany Nichols, Paul Tiede

19:15 - 20:15 UT (14:15 - 15:15 EST)

Presentations from ngEHT Topical Groups

Moderator: Michael Johnson, CfA

[Science Goal Spreadsheet](#)

[Shared Presentation Slides](#)

1. Fundamental Physics  
Leads: Alessandra Buonanno & Vitor Cardoso
2. AGN/Galaxies/Cosmology  
Leads: Priya Natarajan & Jose Gomez
3. Jet Launching  
Leads: Charles Gammie & Sasha Philippov
4. Accretion  
Leads: Andrew Chael & Chi-Kwan Chan
5. non-SMBH  
Leads: Mark Reid & Daryl Haggard
6. New Horizons  
Leads: Andrei Lobanov & Lindy Blackburn

LOC Support: Mina Himwich, Tiffany Nichols, Paul Tiede

20:15 - 20:30 UT (15:15 - 15:30 EST)

Coffee Break

LOC Support: Mina Himwich, Tiffany Nichols, Paul Tiede

20:30 - 21:00 UT (15:30 - 16:00 EST)

Conference Summary

LOC Support: Mina Himwich, Tiffany Nichols, Paul Tiede