BREAD Collaboration Workshop

Report of Contributions

https://harvard-neutrinos.rc.fas.harvard.edu/e/bread-2026

Contribution ID: **1** Type: **not specified**

Welcome and Logistics

Wednesday, 14 January 2026 09:00 (15 minutes)

Presenter: KNIRCK, Stefan (Harvard University)

Session Classification: Welcome and Theory

Contribution ID: **2** Type: **not specified**

A Theory Perspective on Axions

Wednesday, 14 January 2026 09:15 (30 minutes)

Presenter: Prof. REECE, Matt

Session Classification: Welcome and Theory

Contribution ID: **3** Type: **not specified**

GigaBREAD Overview

Wednesday, 14 January 2026 09:45 (20 minutes)

Presenter: BENNING, Maja (TUM / MPP / Harvard)

Session Classification: GigaBREAD and GHz Detection

Contribution ID: **4** Type: **not specified**

Reflector Mechanical Design and Fridge Integration

Wednesday, 14 January 2026 10:05 (25 minutes)

Presenter: BUZZI, Alex (Harvard)

Session Classification: GigaBREAD and GHz Detection

Contribution ID: **5** Type: **not specified**

KI-TWPAs

Wednesday, 14 January 2026 10:50 (25 minutes)

Presenter: Dr SHIU, Corwin

Session Classification: GigaBREAD and GHz Detection

Contribution ID: **6** Type: **not specified**

J-TWPAs

Wednesday, 14 January 2026 11:15 (25 minutes)

Presenter: WANG, Jennifer (MIT)

Session Classification: GigaBREAD and GHz Detection

Contribution ID: **7** Type: **not specified**

Discussion Time

Wednesday, 14 January 2026 11:40 (15 minutes)

Session Classification: GigaBREAD and GHz Detection

Contribution ID: **8** Type: **not specified**

QualityBREAD - Simulations, and W-Band Receiver

Wednesday, 14 January 2026 13:00 (25 minutes)

Presenter: HOSHINO, Gabe (UChicago)

Session Classification: QualityBREAD, SlicedBREAD and mm-wave amplifiers

Contribution ID: **9** Type: **not specified**

SlicedBREAD - Idea and Sensitivity

Wednesday, 14 January 2026 13:25 (20 minutes)

Presenter: JAIDEE, I-see (Harvard)

Session Classification: QualityBREAD, SlicedBREAD and mm-wave amplifiers

Contribution ID: **10** Type: **not specified**

SlicedBREAD - First Measurements

Wednesday, 14 January 2026 13:45 (20 minutes)

Presenter: MCINTYRE, Grant (Harvard)

Session Classification: QualityBREAD, SlicedBREAD and mm-wave amplifiers

Contribution ID: **11** Type: **not specified**

Dielectric Material Characterization with mm-wave Fabry Perot Cavities

Wednesday, 14 January 2026 14:05 (25 minutes)

Presenter: ELWOOD, Brodi (Harvard)

Session Classification: QualityBREAD, SlicedBREAD and mm-wave amplifiers

Contribution ID: **12** Type: **not specified**

Dielectric Stack Diplexers and SIS Detectors

Wednesday, 14 January 2026 14:30 (25 minutes)

Presenters: Dr TONG, Edward (Center for Astrophysics | Harvard & Smithsonian); CARTER, Keara (Center for Astrophysics | Harvard & Smithsonian)

Session Classification: QualityBREAD, SlicedBREAD and mm-wave amplifiers

Contribution ID: **13** Type: **not specified**

Fermilab Axion Cavity Experiment with JPA / transmon qbit

Wednesday, 14 January 2026 15:35 (25 minutes)

Presenter: LYNN, Morgan (UChicago / Harvard)

Session Classification: Other Axion Searches

Contribution ID: **14** Type: **not specified**

MADMAX - Update and Single Photon Detection Plans

Thursday, 15 January 2026 09:00 (25 minutes)

Presenter: MALDONADO, Juan (Max Planck Institute for Physics)

Session Classification: Other Axion Searches

Contribution ID: **15** Type: **not specified**

Requirements for an Ultimate Axion Search w/ BREAD

Wednesday, 14 January 2026 16:00 (20 minutes)

Presenter: KNIRCK, Stefan (Harvard University)

Session Classification: Towards a Large-Scale BREAD program

Contribution ID: **16** Type: **not specified**

Magnet & Facility Options

Wednesday, 14 January 2026 16:20 (20 minutes)

Presenter: Dr SONNENSCHEIN, Andrew (Fermilab)

Session Classification: Towards a Large-Scale BREAD program

Contribution ID: **17** Type: **not specified**

Other Physics Targets for BREAD (Broadband, Timing, Directionality)

Thursday, 15 January 2026 09:25 (20 minutes)

Presenter: HOSHINO, Gabe (UChicago)

Session Classification: Other Physics Targets for BREAD

Contribution ID: **18** Type: **not specified**

Polarized Dark Photon Analysis of GigaBREAD Data

Friday, 16 January 2026 09:00 (20 minutes)

Presenter: YU, Jialin

Session Classification: Other Physics Targets for BREAD

Contribution ID: **20** Type: **not specified**

Transition Edge Sensors

Thursday, 15 January 2026 09:55 (25 minutes)

Presenter: Dr SONKA, Rita (NASA Goddard (Karwan's group))

Session Classification: TeraBREAD and THz Sensing

Contribution ID: **21** Type: **not specified**

Dark Photon Search with KIDs

Thursday, 15 January 2026 10:40 (25 minutes)

Presenter: Dr BASU THAKUR, Ritoban (JPL)

Session Classification: TeraBREAD and THz Sensing

Contribution ID: **22** Type: **not specified**

Cold-Electron Bolometers for broadband sub-cm wave single photon counting (~60GHz)

Thursday, 15 January 2026 11:05 (25 minutes)

Presenter: Prof. RAMANATHAN, Karthik (Washington University in St. Louis)

Session Classification: TeraBREAD and THz Sensing

Contribution ID: **23** Type: **not specified**

Josephson Photonics Devices for BREAD

Thursday, 15 January 2026 11:30 (25 minutes)

Josephson photonics refers to the physics of Josephson junctions biased at a DC voltage V below the superconducting gap, interacting with electromagnetic radiation. In this regime, Cooper pairs tunnel inelastically through the junction, exchanging their potential energy 2eV with the electromagnetic environment in the form of photons. Because the junction has no inductance in this voltage state, Josephson photonics devices are not limited by the plasma frequency that constrains most Josephson junction technologies to about 30 GHz. This opens the door to much higher operational frequencies.

We are developing two Josephson photonics devices that could be useful for BREAD:

1. Inelastic Cooper Pair Tunneling Amplifier (ICTA), a linear, quantum-limited amplifier [1]. I will present our latest progress in extending ICTA bandwidth to an octave [2] and discuss our roadmap toward ICTAs operating in the W-band (75 to 110 GHz).
2. Photon-Number Amplifier, a device multipling the photon number in an incoming mode into n photons in an outgoing mode [3]. Ideally, this process adds no photon noise, enabling detection far below the standard quantum limit. I will share recent experimental results and describe two readout strategies: time-resolved photon counting [4] and spectral resolution.

[1] Near-quantum-limited amplification from inelastic Cooper-pair tunnelling, S. Jebari, F. Blanchet, A. Grimm, D. Hazra, R. Albert, P. Joyez, D. Vion, D. Estève, F. Portier, M. Hofheinz, Nat Electron 1, 223-227.

[2] DC-powered broadband quantum-limited microwave amplifier, N. Nehra, N. Bourlet, A. H. Esmaeili, B. Monge, F. Cyrenne-Bergeron, A. Paquette, M. Arabmohammadi, A. Rogalle, Y. Lapointe, and M. Hofheinz, to appear on arXiv.

[3] Microwave Photon-Number Amplification, R. Albert, J. Griesmar, F. Blanchet, U. Martel, N. Bourlet, M. Hofheinz, Phys. Rev. X 14, 011011 .

[4] Amplification and Detection of Single Itinerant Microwave Photons, L. Danner, M. Hofheinz, N. Bourlet, C. Padurariu, J. Ankerhold, B. Kubala, arXiv:2510.08030v1.

Presenters: Prof. HOFHEINZ, Max (Université de Sherbrooke); Dr BOURLET, Nicolas (Université de Sherbrooke)

Session Classification: TeraBREAD and THz Sensing

Contribution ID: **24** Type: **not specified**

SQuAT (Superconducting Quasiparticle-Amplifying Transmons)

Thursday, 15 January 2026 14:10 (25 minutes)

Presenter: Dr DROSTER, Alexander (Stanford University/SLAC)

Session Classification: TeraBREAD and THz Sensing

Contribution ID: **25** Type: **not specified**

WIXARD (WIdeband graphene-based aXion dARk matter quantum Detector) for BREAD and MADMAX

Thursday, 15 January 2026 14:35 (20 minutes)

Presenter: Prof. FONG, Kin Chung (Northeastern University)

Session Classification: TeraBREAD and THz Sensing

Contribution ID: **26** Type: **not specified**

Designing a Graphene Microwave single photon detector

Thursday, 15 January 2026 14:55 (20 minutes)

Presenter: Prof. ARNAULT, Ethan (Syracuse University)

Session Classification: TeraBREAD and THz Sensing

Contribution ID: **27** Type: **not specified**

Single Electrons in a Penning Trap as a meV Single Photon Counter for BREAD

Thursday, 15 January 2026 15:25 (25 minutes)

Presenter: Prof. FAN, Xing (Harvard)

Session Classification: TeraBREAD and THz Sensing

Contribution ID: **29** Type: **not specified**

Axion Dark Matter Detection with Axion Quasiparticles

Thursday, 15 January 2026 15:50 (25 minutes)

Presenter: Prof. XU, Suyang (Harvard)

Session Classification: TeraBREAD and THz Sensing

Contribution ID: **30** Type: **not specified**

InfraBREAD - Reflector & SNSPD Chcaracterization

Friday, 16 January 2026 09:20 (30 minutes)

Presenter: Dr WANG, Christina (Fermilab)

Session Classification: InfraBREAD and Infrared

Contribution ID: **31** Type: **not specified**

Sub-IR SNSPDs

Friday, 16 January 2026 09:50 (25 minutes)

Presenter: PAUL, Dip Joti (MIT)

Session Classification: InfraBREAD and Infrared

Contribution ID: **32** Type: **not specified**

Powder Haloscope (remote)

Friday, 16 January 2026 10:15 (25 minutes)

Presenter: Prof. BARYAKHTAR, Masha (University of Washington)

Session Classification: InfraBREAD and Infrared

Contribution ID: **33** Type: **not specified**

Photomixer R&D

Friday, 16 January 2026 11:00 (20 minutes)

Presenter: Dr PERRY, Emily (Lawrence Berkeley National Laboratory (LBNL))

Session Classification: TeraBREAD and THz Sensing

Contribution ID: **35** Type: **not specified**

Fourier Transform Spectrometer Options

Friday, 16 January 2026 11:40 (25 minutes)

Presenter: Dr BASU THAKUR, Ritoban (JPL)

Session Classification: TeraBREAD and THz Sensing

Contribution ID: **36** Type: **not specified**

Discussion - Options for Frequency Resolution in BREAD

Friday, 16 January 2026 12:05 (20 minutes)

Session Classification: TeraBREAD and THz Sensing

Contribution ID: **37** Type: **not specified**

Closeout

Friday, 16 January 2026 12:25 (15 minutes)

Presenters: Dr SONNENSCHEIN, Andrew (Fermilab); KNIRCK, Stefan (Harvard University)

Contribution ID: **40** Type: **not specified**

Discussion

Wednesday, 14 January 2026 14:55 (15 minutes)

Session Classification: QualityBREAD, SlicedBREAD and mm-wave amplifiers

Contribution ID: **41** Type: **not specified**

Discussion

Wednesday, 14 January 2026 16:40 (10 minutes)

Session Classification: Towards a Large-Scale BREAD program

Contribution ID: **42** Type: **not specified**

Discussion

Thursday, 15 January 2026 11:55 (10 minutes)

Session Classification: TeraBREAD and THz Sensing

Contribution ID: **43** Type: **not specified**

Discussion

Thursday, 15 January 2026 16:15 (15 minutes)

Session Classification: TeraBREAD and THz Sensing

Contribution ID: **44** Type: **not specified**

Discussion

Thursday, 15 January 2026 09:45 (10 minutes)

Session Classification: Other Physics Targets for BREAD