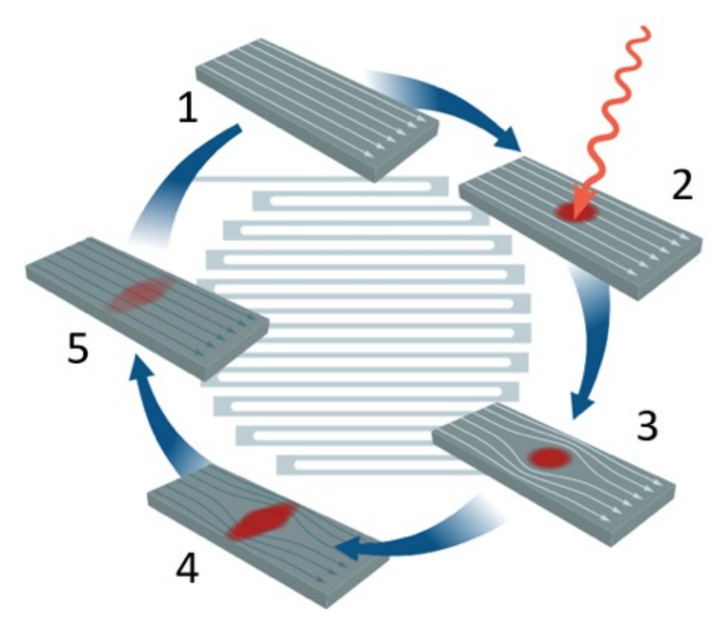
National Aeronautics and Space Administration

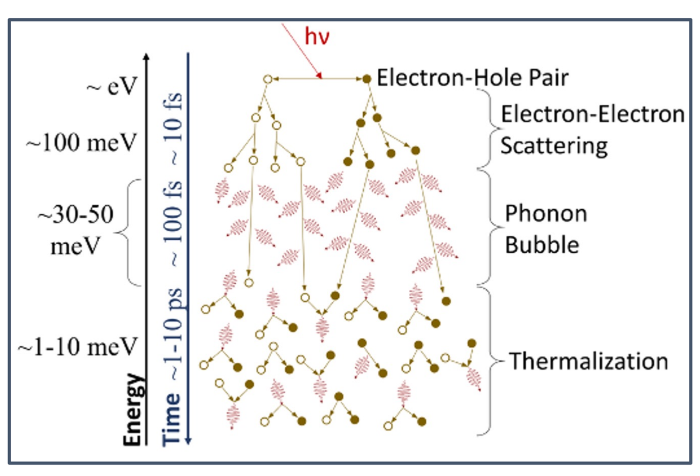
Next-Generation Deep Space Optical Communication Ground Systems

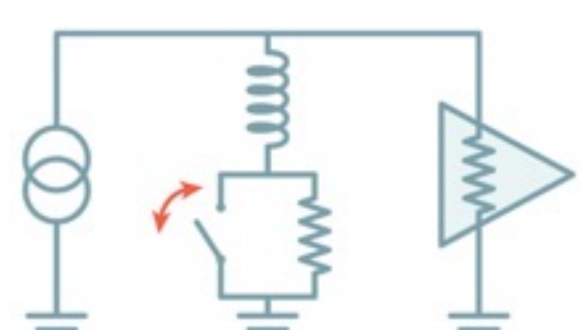
Principal Investigator: Matthew Shaw (389); Co-Investigators: Abhijit Biswas (337), Andrew Beyer (389), Boris Korzh (389), Emma Wollman (389), Jason Allmaras (337), Bruce Bumble (389), Ryan Rogalin (332), Meera Srinivasan (337), Malcolm Wright (337), David Geisler (MIT Lincoln Laboratory)

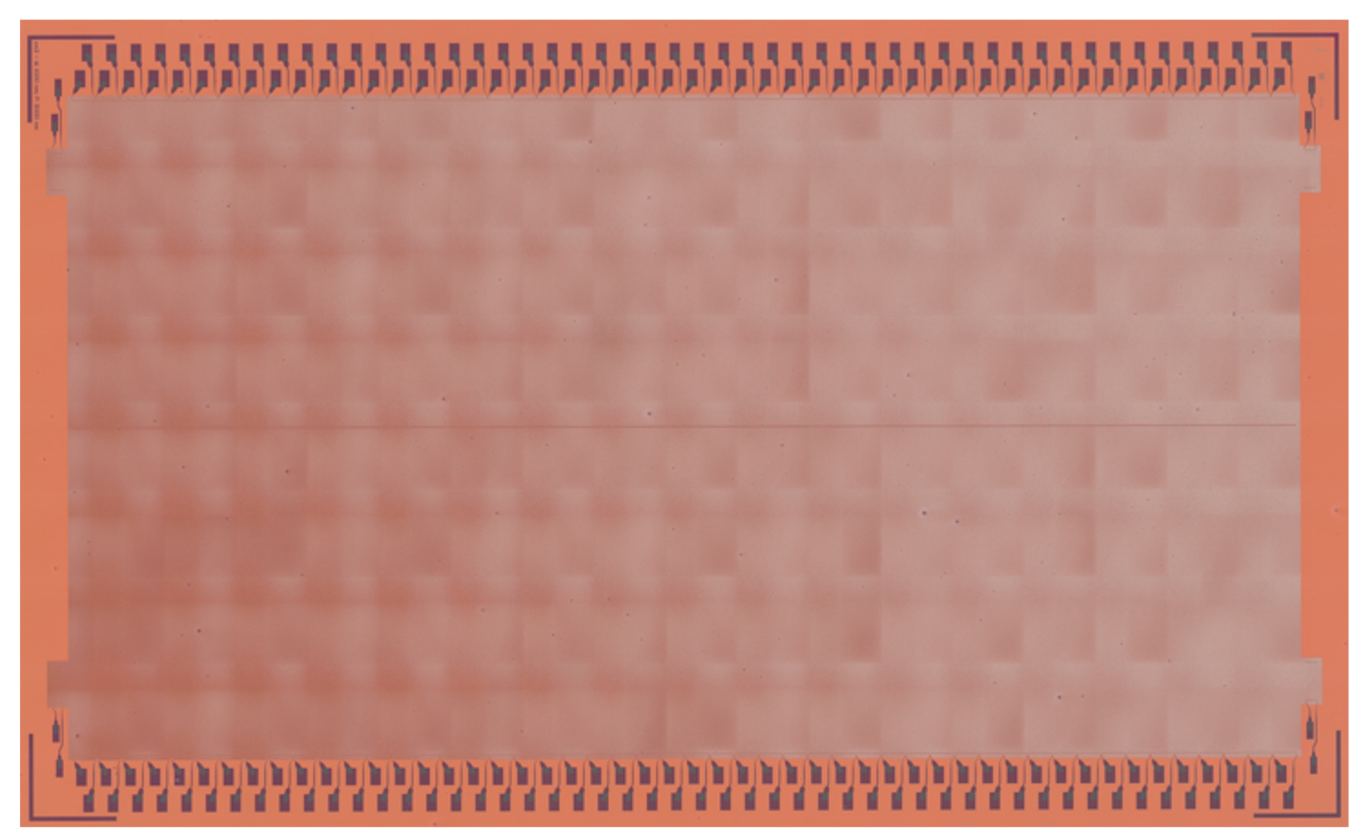
Program: FY22 R&TD Strategic Initiative
Strategic Focus Area: Optimizing Deep Space Optical Communication Ground Systems - Strategic Initiative Leader: Dimitrios Antsos

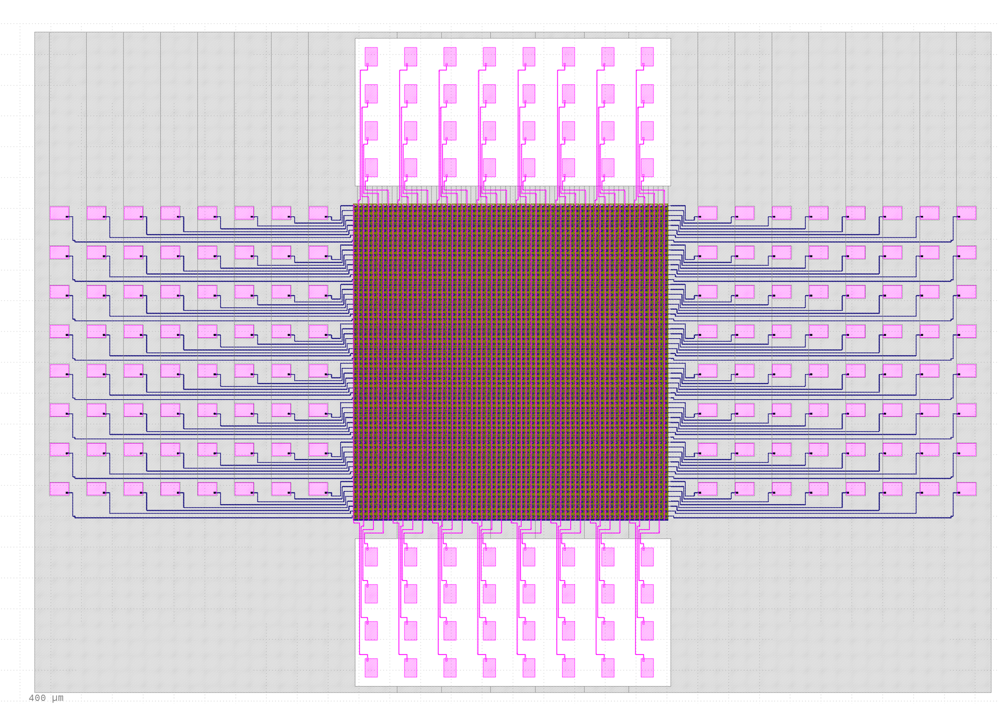
Objectives:
This effort represents the third year of the strategic initiative. The objective was to develop advanced ground technology for future deep-space optical communication systems. The performance of an optical communication system depends in equal measure on flight and ground technology, and present technology demonstration projects such as DSOC and O2O are currently operating with the most advanced technology possible.In year three, we have focused on three key technology areas. Firstly, we have performed significant technology development towards improved superconducting nanowire single photon detectors (SNSPDs) for deep-space optical communication ground terminals. We have been working toward a goal of a 2-mm active area and a 6 Gcps maximum count rate, which will prepare JPL for a high-rate optical Deep Space Network moving forward. Secondly, we have performed a receiver architecture trade study to best understand the regime where time-tagging electronics is superior to a clocked receiver. Finally, we have performed a technology development study toward high-rate, high-power uplink lasers, in collaboration with MIT Lincoln Laboratory. This work is critical to establishing symmetric bidirectional data links for human exploration of deep space, which require 20 Mbps uplinks or higher.

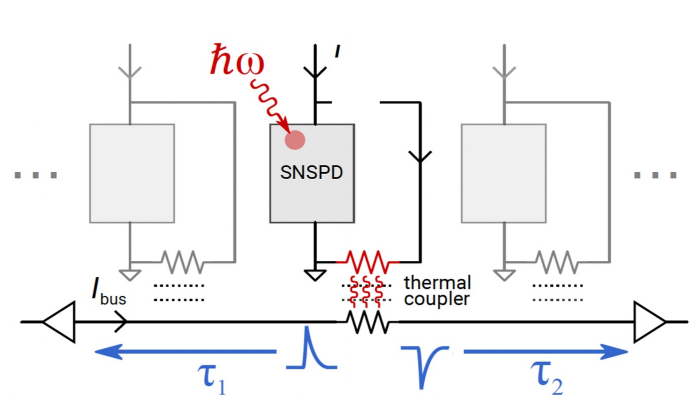


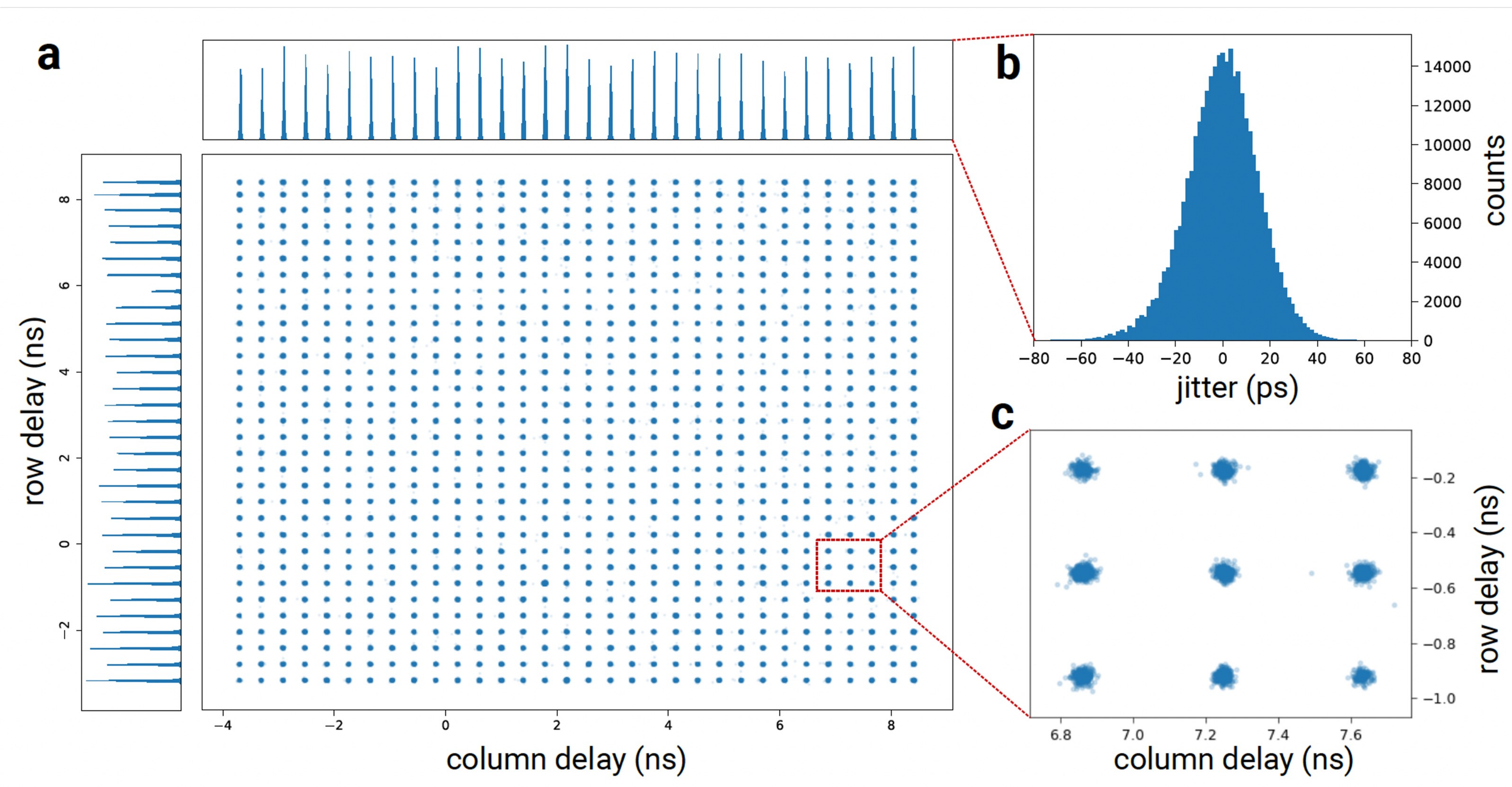


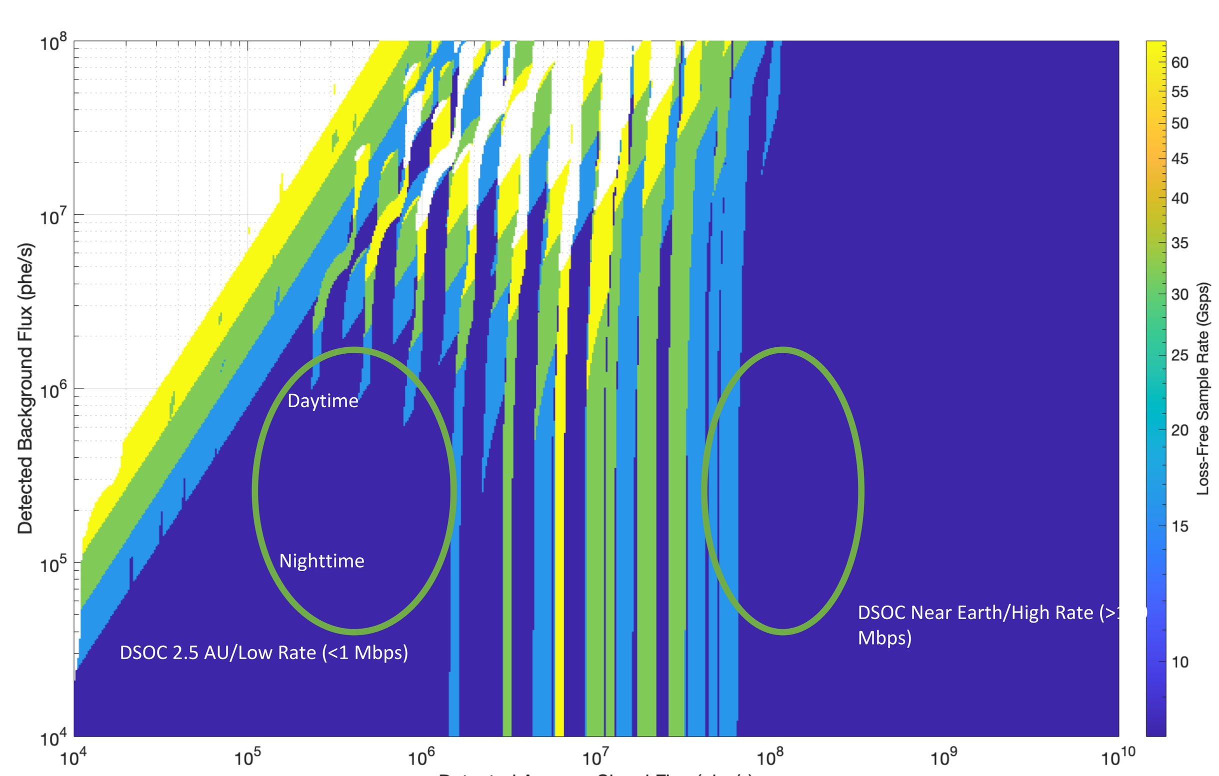


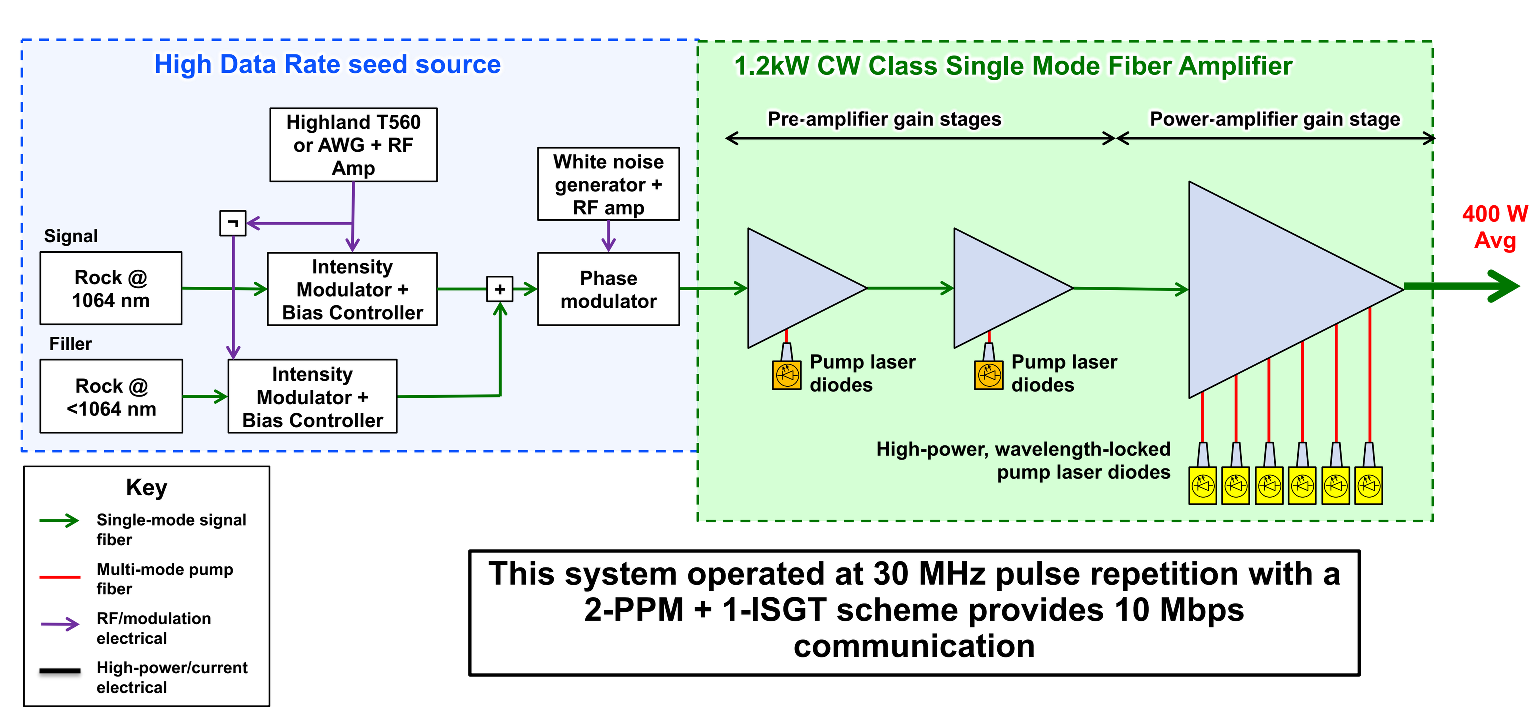












National Aeronautics and Space Administration

Jet Propulsion Laboratory
California Institute of Technology
Pasadena, California

www.nasa.gov

Clearance Number: CL#
Poster Number: RPC#

Publications:

A. N. McCaughan, Y. Zhai, B. Korzh, J. P. Allmaras, B. G. Oripov, M. D. Shaw, and S. W. Nam. The thermally coupled imager: A scalable readout architecture for superconducting nanowire single photon detectors. Appl. Phys. Lett. 121, 102602 (2022); doi: 10.1063/5.0102154

PI/Task Mgr. Contact Information:

Email: Matthew.D.Shaw@jpl.nasa.gov