National Aeronautics and
Space Administration

Space Technology Mission Directorate
Game Changing Development Program

Deep Space Optical Communications (DSOC)

Core Team Architecture Input

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AVAILABLE STANDARDS

- DSOC falls under high photon efficiency communications
- Consultative Committee for Space Data Systems (CCSDS) standards are in formulation
  - HIGH PHOTON EFFICIENCY OPTICAL COMMUNICATIONS PHYSICAL LAYER, Proposed Draft Recommended Standard, White Book, XXX.0-B-0.2, Nov. 2015
  - HIGH PHOTON EFFICIENCY OPTICAL COMMUNICATIONS CODING AND MODULATION, Proposed Draft Recommended Standard, White Book, XXX.0-B-0.4, Nov. 2015

ICD's

- DSOC interface information presented at the Discovery Technology Day, April 9, 2014
  - http://discovery.larc.nasa.gov/discovery/PDF_FILES/03-DSOC-ABiswas-2.pdf

- Detailed ICD's are work in progress
  - Flight-Ground ICD's for DSOC have been drafted and are under internal review
  - DSOC terminal-to-spacecraft ICD discussions have started with initial versions for Discovery Mission studies to be drafted by spring of 2016

DSOC System Specifications

Flight Laser Transmitter

- Laser
  - 4 W average Power
  - Wavelength 1.55 microns
- Telescope
  - 22 cm aperture
  - Capable of operating within 3 degrees of sun
  - FOV = 1mrad
  - Pointing accuracy sub-microradian
  - Max data rate 267 Mb/s
- Mass
  - < 38 kg
- Power
  - < 100 W

Ground Systems

- Uplink
  - OCTL Telescope (1 meter)
  - 5 KW average power
  - Wavelength 1.064 microns
  - Operates day and night
  - 40 microradian beam divergence (nominal)
  - Multi-beam beacon
- Downlink
  - Palomar 5 meter telescope
  - Operates day and night
  - Can point within 12 degrees of sun
  - JPL developed superconducting nanowire photon counting detector > 50% detection efficiency
  - Max FOV 50 μrad with 320 micron diameter detector array