Photonic Transceivers for Spacecraft Data Links up to 5 Gbps
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Outline

- **Problem:**
  - Reducing mass of 1-10 Gbps+ aerospace interconnects

- **Solution:**
  - Fiber optic interconnects

- **Approach:**
  - Rugged photonic transceivers

- **Results:**
  - Performance and environmental test

- **Summary and Conclusions**
Rugged Photonic TX and RX Contacts

- Hermetic GaAs laser and photodiode
- SiGe driver and limiting amps
- No microprocessor or memory
PCB-Mounted Photonic Transceivers

- Uses same circuitry as photonic contacts
- High-speed electrical PCB-mount connector with screw attachment
- Glenair GC or ARINC801 removable optical connector

Fiber Optic connectors support high vibration & shock applications
Easy installation or replacement

High Speed electrical PCB connector
Easy installation or replacement
No soldering required

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Environmental Test Results

- **Accel. Aging:** +85C, 2000 hours
- **Radiation:** 250 Krad Gamma, $2.5 \times 10^{12}$ Neutrons/cm$^2$
- **Temp. Cycling:** 1000 cycles, -55C to +125C
- **Vibration:** 54 Grms, 2 hours per axis
- **Shock:** 650 G, 0.9 ms, 10 shocks/axis
- **Humidity:** MIL-STD 883, temp cycling, 10 days
- **Altitude:** 70,000 feet
- **Explosive Decompression**
- **Passed all above tests**
Summary and Conclusions

- Developed rugged photonic transceivers for aerospace applications
  - Hermetic GaAs lasers and photodiodes
  - SiGe electronics
  - No microprocessors or EEPROMs
  - Widely deployed in mil/commercial aero applications
- Test results to date are promising for space
  - High shock, vibration, thermal extremes
  - 250 Krad Gamma and 2.5x10^12/cm^2 neutrons
- Future Plans
  - Protons, Heavy Ions, 10 Gbps parallel optics
- Collaborations are desired

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