Development, Testing, and Deployment of Xeos Iridium Communication Systems

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Development Background

- MRI – Development of a Power and Communications System for Remote Autonomous Polar Observations
  - Second year development deployed past season
  - Collaboration between IRIS PASSCAL & UNAVCO
- MRI – Acquisition of Broadband Seismic Stations for Polar Regions
  - Acquisition of 37 cold-hardened stations
  - Currently deployed at AGAP & POLENET
Development Requirements

- Low Power
  - Minimal Power Draw During Standby
- Rugged
  - -55 C Operation
  - Durable Connectors and Enclosure
- Simple Operation
  - LED Status
  - Field Testable
  - Easily Deployed
- Adaptable for Other Systems
  - 2 Way Communication
  - Ethernet Connections
  - Serial Connections
  - Weather Station Compatible
XI-100 PHASE I

- A3LA Iridium Modem
  - Configured for SBD Only
  - ~2 Kb/s Data Rate
- SOH and 10s Data Samples Only
- Command and Control of Connected Devices and Reporting Schedules
- 5 AHR Annual Power Budget for Daily SOH
  - 450 μA Sleep Mode
  - 150 mA During SBD
- Integration of Vaisala Weather Station
- Dimensions
  - 10.75" x 4.25" x 3.5"
XI-100 PHASE II

- SBD & RUDICS (Router-based Unrestricted Digital Internetworking Connectivity Solution)
- -55 deg C to +60 deg C Operational Range
  - Heaters Used to Keep AL3A Within Operational Limits
- 700 mA Current Draw During Transmission with Active Heater
- 350 mA Current Draw During Transmission w/o Heaters
- Data Transmission During Antarctic Summer
- 5 Units Awaiting Testing @ PASSCAL
**XI-101 Development**

- **XI-101**
  - Similar to XI-100
  - 9601 Iridium Modem
    - SBD only
    - ~2 Kb/s Data Rate
    - Lower Operation Cost
    - Lower Initial Cost
  - SOH and 10s Data Samples Only
    - Command and Control of Connected Devices and Reporting Schedules
    - 5 AHr Annual Power Budget for Daily SOH
    - Integration of Vaisala Weather Station
XI-100 Testing

- Environmental Testing
  - Hard Frozen to -60°C
  - Operated @ -50°C
  - Cycled -50 to 20°C
- Power Requirement Testing
- Data Transmission Testing
22 XI-100 (Phase I) Modules Deployed
  14 for POLENET
    Currently Operating @ -23 C
  8 for AGAP
    Currently Operating @-49 C
5 XI-100 Phase II Delivered to PASSCAL
  Awaiting Validation Test Results

5 XI-101 Delivered to PASSCAL
  1 Awaiting Deployment Near Yakutat, Alaska
  2 Awaiting Deployment on Yahtse Glacier
Deployment

- Sat Test
- Das Test
- Antenna
  - SAF5350-C
  - Coax Cable
    - LMR 400
Interface and Control

- **Web Console Developed by IRIS PASSCAL**
  - [www.xeos.passcal.nmt.edu](http://www.xeos.passcal.nmt.edu)
- **SOH Display**
  - Iridium Message Statistics and Time Series Data
  - Weather Data from Vaisala Met Station
  - 10 Second Data Snippets
  - Q330 SOH Statistics and Time Series Data
- **Command and Control**
  - Device Configurations and Programming
  - Reporting Intervals
  - Sensor Control (i.e. Centering and Locking)
- **Phase II Control**
  - Switching between SBD & RUDICS
  - Request Download of Specific Data Sets
Interface and Control

Screen Shot From Iridium Console Device Summary
Interface and Control

Data Snippet Sample from AGAP Station N140
More Information & Design Docs

http://www.passcal.nmt.edu/Polar
http://www.xeos.passcal.nmt.edu
http://www.xeostech.com