The GRB Simulator: Description of GOES Rebroadcast (GRB) Data Streams for Testing User Terminals

AMS 2014

Authors: Kevin Gibbons[1], E. C. Czopkiewicz[2], C. Miller[1], B. A. Brown-Bergtold[1], B. J. Haman[1], and G. Dittberner[3]

[1]Harris Corporation, Melbourne, FL; [2]Harris Information Technology Services, Omaha, NE;
[3]Harris Corporation, Greenbelt, MD

- GOES-R Rebroadcast (GRB) Simulators enable users to test high-resolution GOES-R weather data broadcasts
- Weather organizations and manufacturers can test receivers in advance to ensure smooth transition from current GOES satellites to GOES-R
- Five GRB simulators were delivered on time in May, 2013 and have already been used to test antenna systems
- Specifications and GRB Simulator information is available from the GRB Simulator Industry Day held this year
- Built-in capability allows users to create test pattern images from graphics files (.png, .jpg)

Receiving GOES-R Data
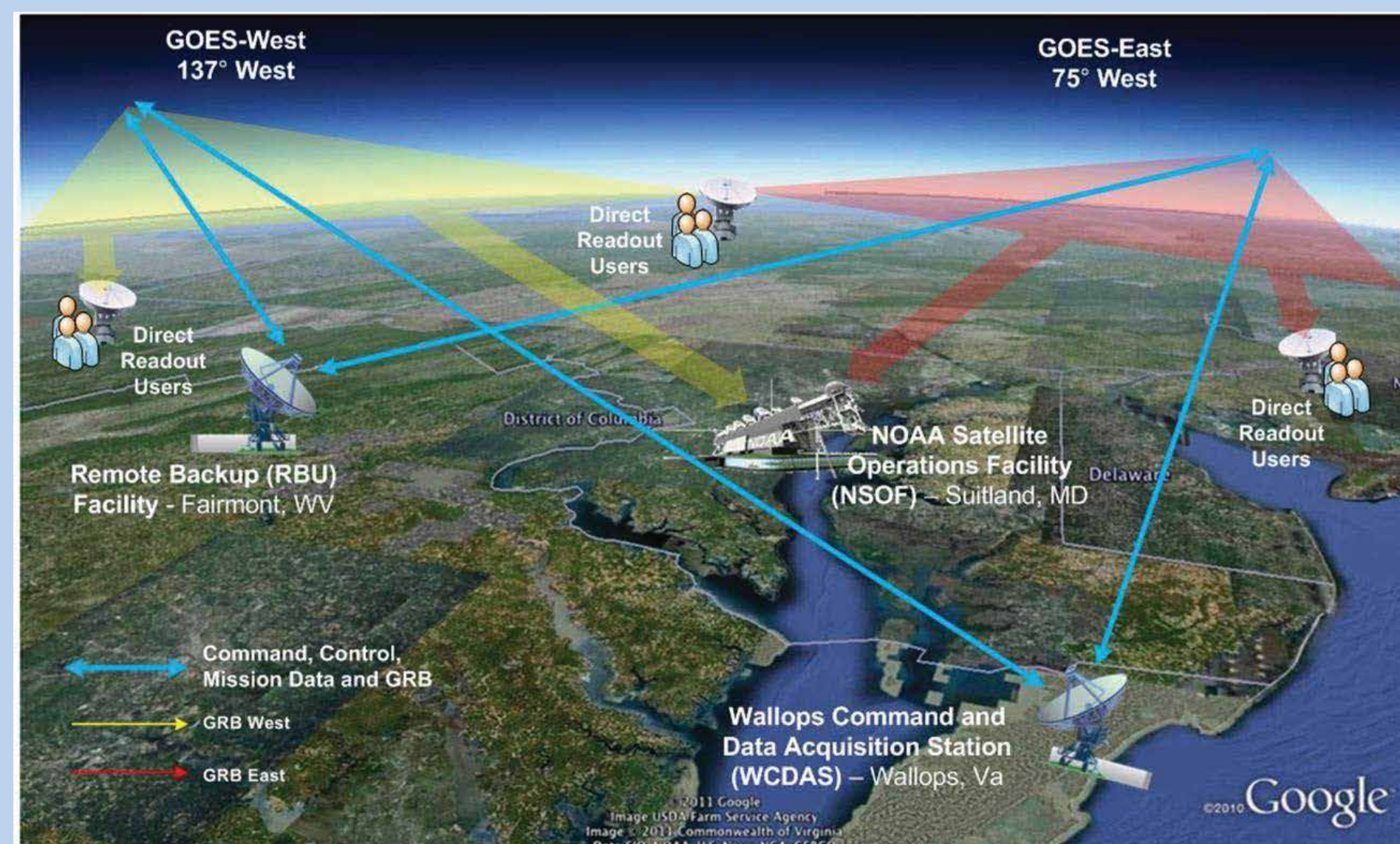
Raw satellite data from all 6 instruments are downlinked from the GOES-R satellite to the Wallops Command and Data Acquisition Station (WCDAS) at Wallops Island, VA and the Remote Backup (RBU) Facility at Fairmont, W.VA.
Upon algorithm processing of the raw satellite data at WCDAS and RBU, the L1b and GLM L2 data output are stored in the Comprehensive Large Array-Data Stewardship System (CLASS) and uplinked back to the GOES-R satellite via the PDA interface.

Transition Information

	GVAR	GOES-R
Full Disk Image: 30 minutes		Full Disk Image: 5 minutes (Mode 4), 15 minutes (Mode 3)
Other modes: Rapid Scan, Super Rapid Scan		Other modes: 3000 km x 5000 km CONUS: 5 min, (Mode 3), 1000 km x 1000 km Mesoscale: 30 sec
Polarization: Linear		Polarization: Dual circular
Receive Frequency: 1685.7 MHz (L-band)		Receive Frequency: 1690 MHz (L-band)
Packetization: GVAR Blocks		Packetization: CCSDS 133.0-8-1
Data Compression: None		Data Compression: Lossless compression
Data Rate: 2.11 Mbps		Data Rate: ~28.4 Mbps (31 Mbps link rate)
Antenna Coverage: Earth coverage to 5°		Antenna Coverage: Earth coverage to 5°
Data Sources: Imager and Sounder, SXI (MDL Link), SEM & Magnetometer (PCM / Telemetry link)		Data Sources: ABI (16 bands), GLM, SEISS, EXIS, SUVI, MAG
Space Weather: None		Space Weather: ~2 Mbps
Lightning Data: None		Lightning Data: ~0.5 Mbps

Simulating the GRB Signal

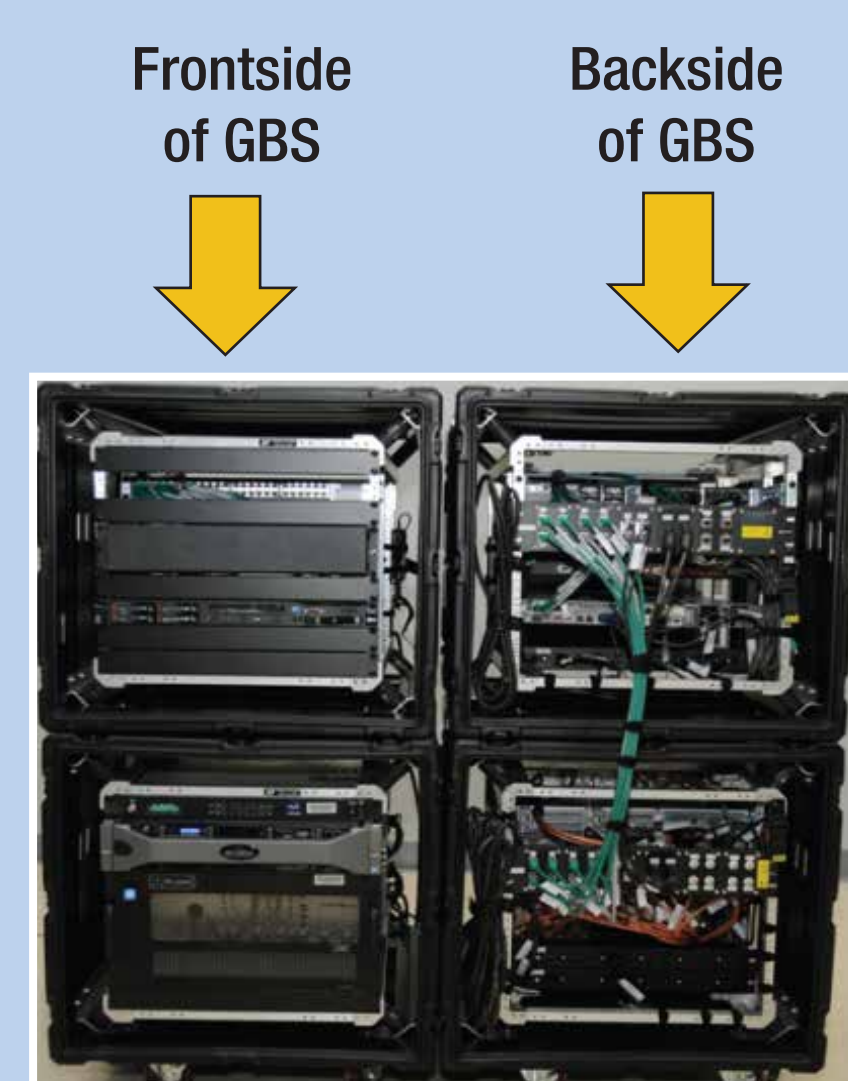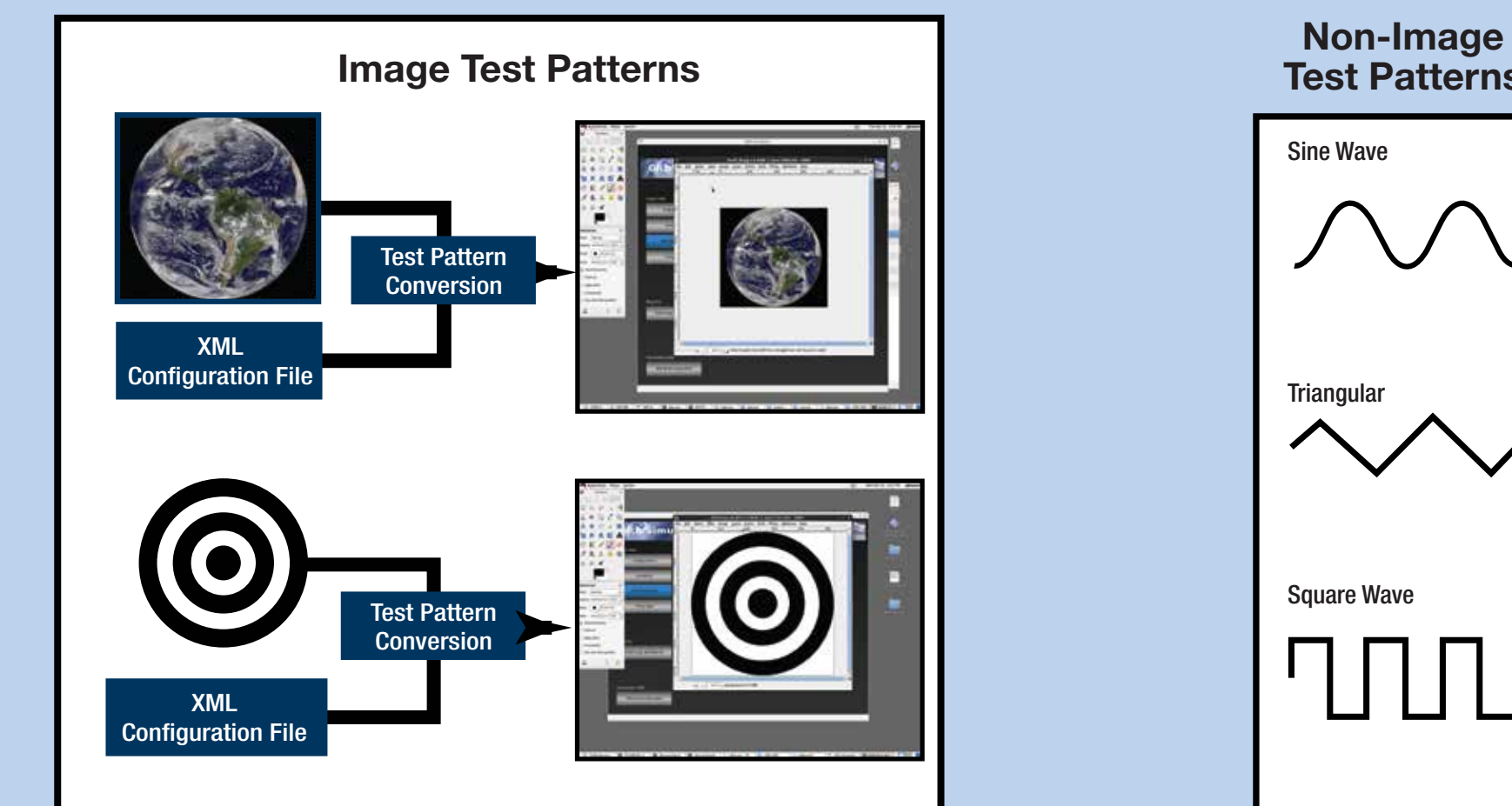GBS = GRB Simulator
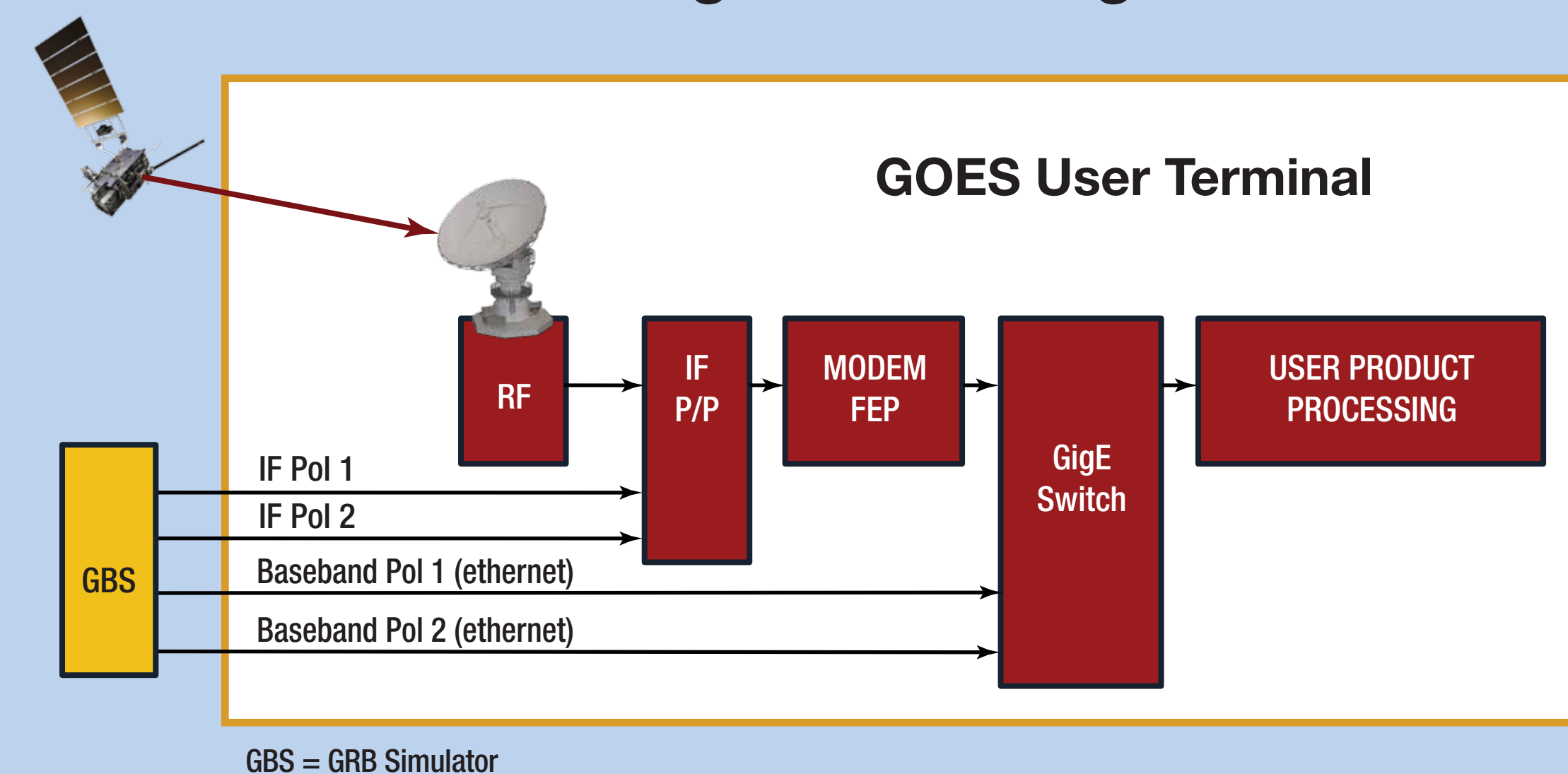
Output of GRB Packets

- Two 15.5 Mbps output streams, one for each of the two polarizations:
  - Right-Hand Circular Polarization (RHCP) and Left-Hand Circular Polarization (LHCP).
- Direct bit (Baseband) streams:
  - Available as two ethernet connections.
- Intermediate Frequency (IF) streams:
  - Available as two ~70 MHz IF data streams.

Scale & Size

Frontside of GBS   Backside of GBS

Capabilities

Image Test Patterns

Non-Image Test Patterns
Sine Wave
Triangular
Square Wave

Test Patterns

- Simulates GRB data streams for the four non-imaging instruments (GLM, SEISS, EXIS, MAG) using scenario scripts.
- Non-Imaging Instrument data stream provided as wave patterns (Sine, Triangular, or Square wave).
- Simulates GRB data streams for the two imaging instruments (ABI and SUVI).
- Built-in capability allows operators to create test pattern images from graphics files (.png, .jpg).
- Ingests and converts input imagery up to 22176 by 22176 pixels to output variables of smaller or equal size.
- Ingests channel configuration parameters, netCDF variable attribute information, and global attribute parameters.

Proxy Data

- Capability to generate simulated GRB data from externally provided L1b proxy data (.nc files).
- Image Test Patterns are automatically converted to L1b/GLM L2+ proxy data.

GRB Simulator GUI
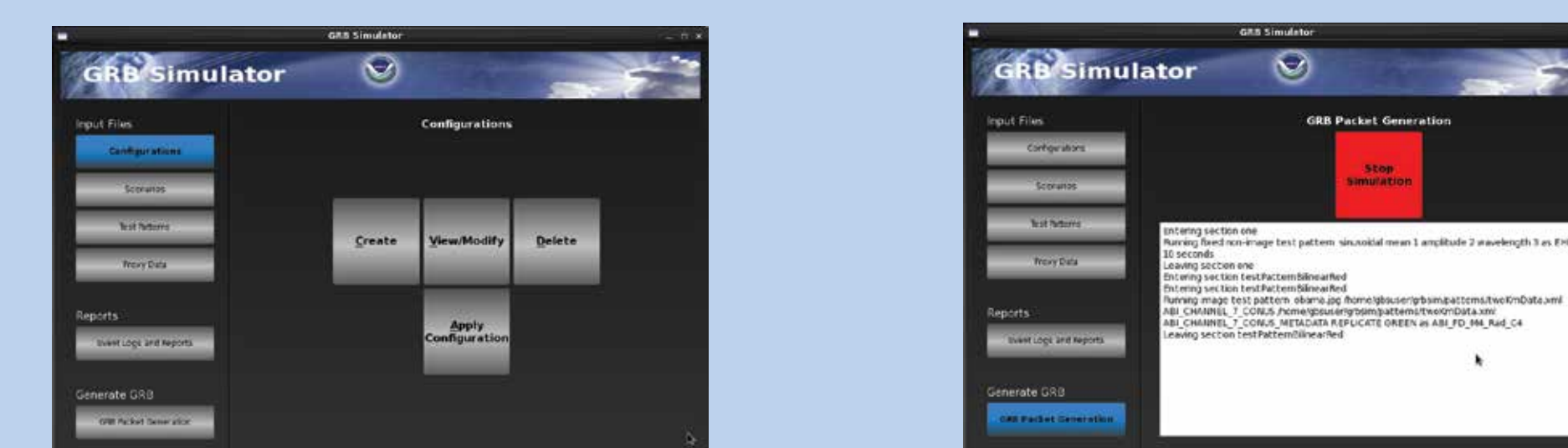
GRB Simulator GUI Features:

- Interface allows users to create, modify, view, and delete configurations, scenarios, test patterns (images), event logs, and reports.
- Manage configuration, scenario, test pattern, and proxy data files.
- The gedit editor is used for text editing of scripts and files.
- Convert PNG or JPEG formatted test pattern imagery file into an equivalent Level 1b Network Common Data Form (NetCDF-4 format).
- GIMP graphics editor provided for image test patterns.

GRB Simulator Uses to Date
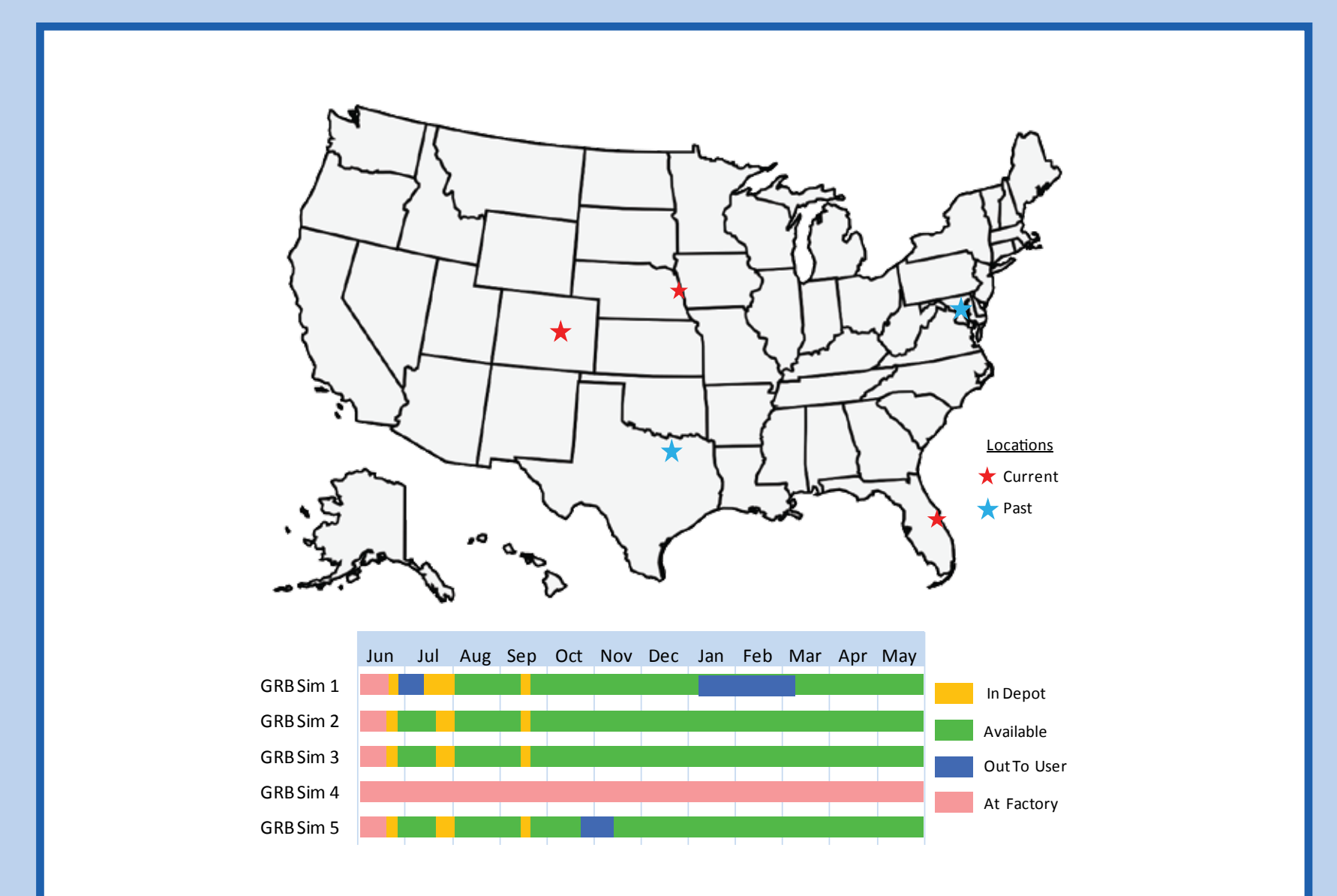
Successfully performed measurements of the overall response of the X-band uplink with inputs from the X-band RF Modulator

- GRB measurements with the GRB Simulator and a Signal Generator as input to the Antenna System (Conducted on June 18-19, 2013):
  - The measurement results confirmed the technical analysis performed by Harris and the GOES-R Ground Segment Project, that the X-band RF uplink are within the GSFPS-3534 & NTIA specifications when using operational GOES-R equipment.
- Successfully demonstrated GRB Simulator at NOAA Industry Day, Oct 25, 2013

Contact Information

Ed Czopkiewicz, ECzopkie@Harris.com
402-293-3402

Jeff Hohenstein, JHohenst@Harris.com
402-293-3234

HARRIS®
assuredcommunications®