HiSeasNet

Any Ocean Any Data Any Time

Systems Architecture and Operation

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RVTEC Update 2017

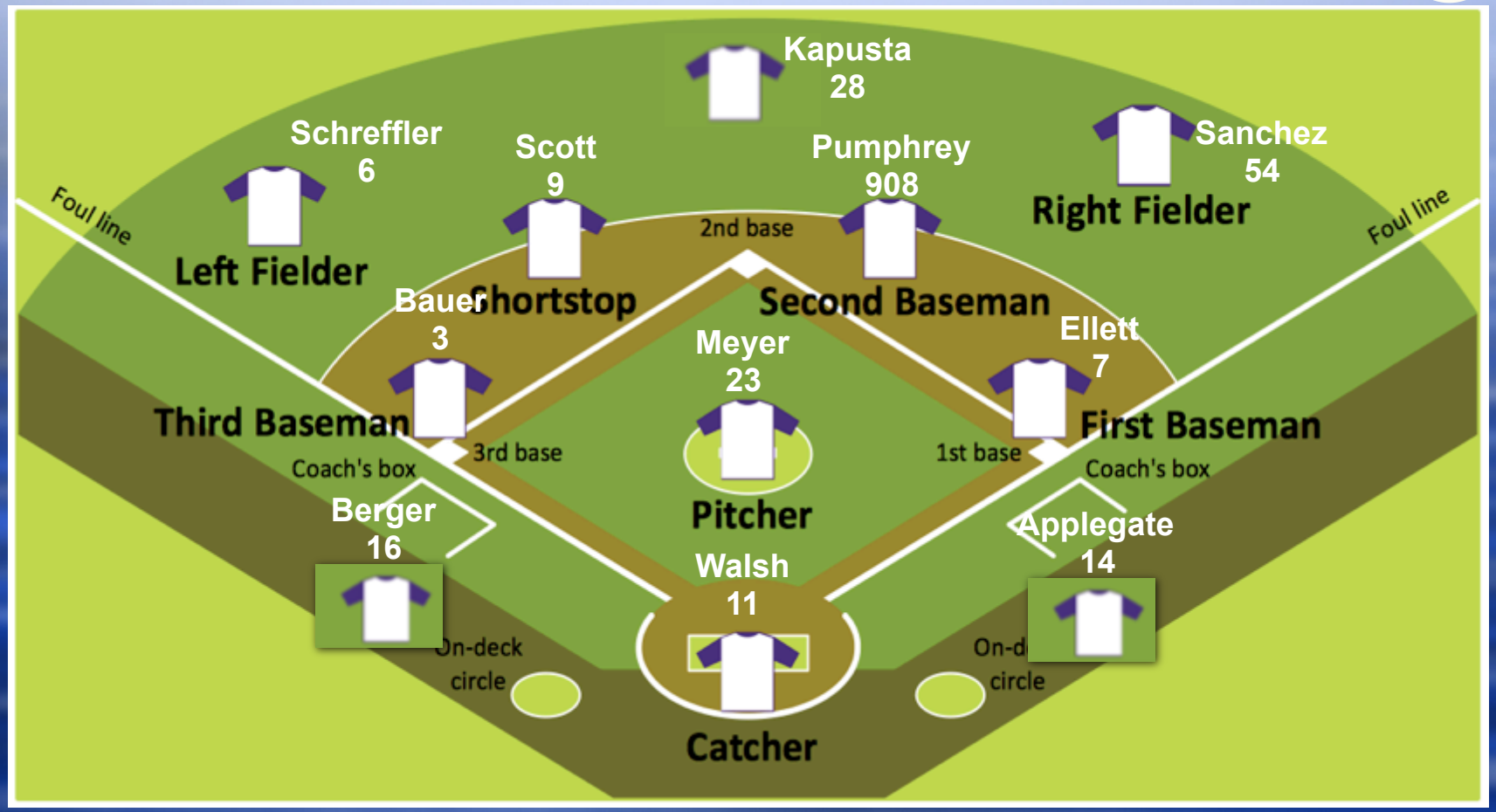
HiSeasNet – 5 earth radii View

- HiSeasNet: Changes during 2017
  - Now a specialized service under Shipboard Technical support
  - Leadership from Ship Operations & Marine Technical Support
- Support Team
- Ships Served
- Ocean Areas of Operations
- Systems of Systems Operation
- Bandwidth Expansions and 18 MHz prototype
- What's next: Life cycle replacements and engineering for uninterrupted Internet access

About HiSeasNet

- UC San Diego - SIO SOMTS based project to bring full-time, scalable bandwidth Internet connections to ships at sea in the University-National Oceanographic Laboratory System (UNOLS) community.
- Currently twelve ships
  - Two with C and Ku systems, Six with C, 3 with Ku only
- Lease dedicated space segment on global C-band, and Ku footprints that cover the majority of the Atlantic, Pacific and Indian Oceans
- Use five satellites: IS-23 (Atlantic), IS-34 (Atlantic), IS-18 (Pacific), Eutelsat 115 (Pacific), IS-903 (Indian) Operate and maintain the earth station on the roof of San Diego Supercomputer Center at UC San Diego
  - Two 7.2 meter dishes for C-band and one 3.8 meter Ku-band
  - Network Access Point for commercial ISPs, CENIC, Pacific Wave, and Internet2

HiSeasNet Support Team



HiSeasNet Support Line (858)822-3356 hiseasnet@ucsd.edu

Ships Served by HiSeasNet

R/V Atlantis

R/V Neil Armstrong

R/V Marcus G. Langseth

R/V Atlantic Explorer

R/V Roger Revelle

R/V Sikuliaq

R/V Oceanus

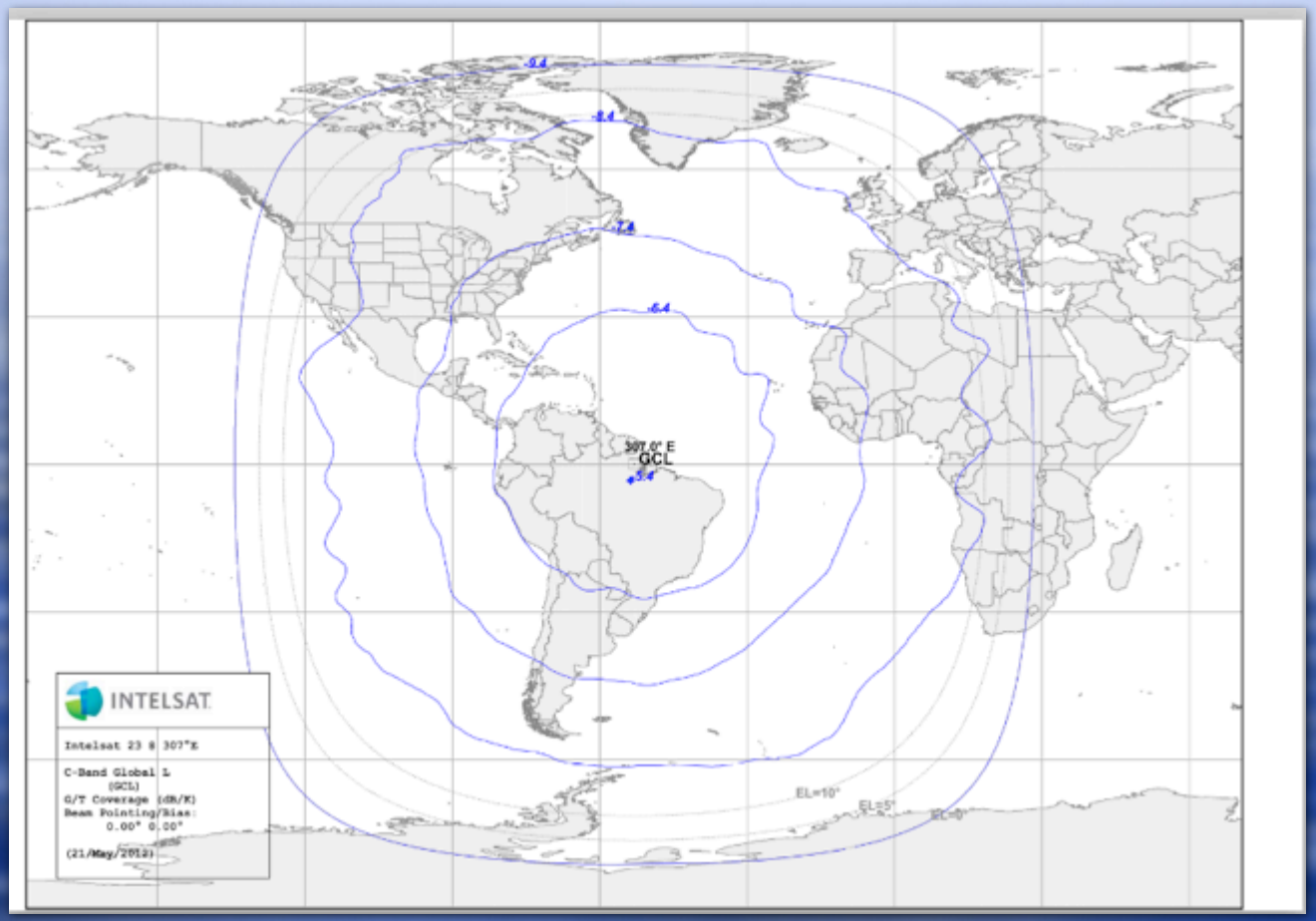
R/V Thomas G. Thompson

R/V Sally Ride

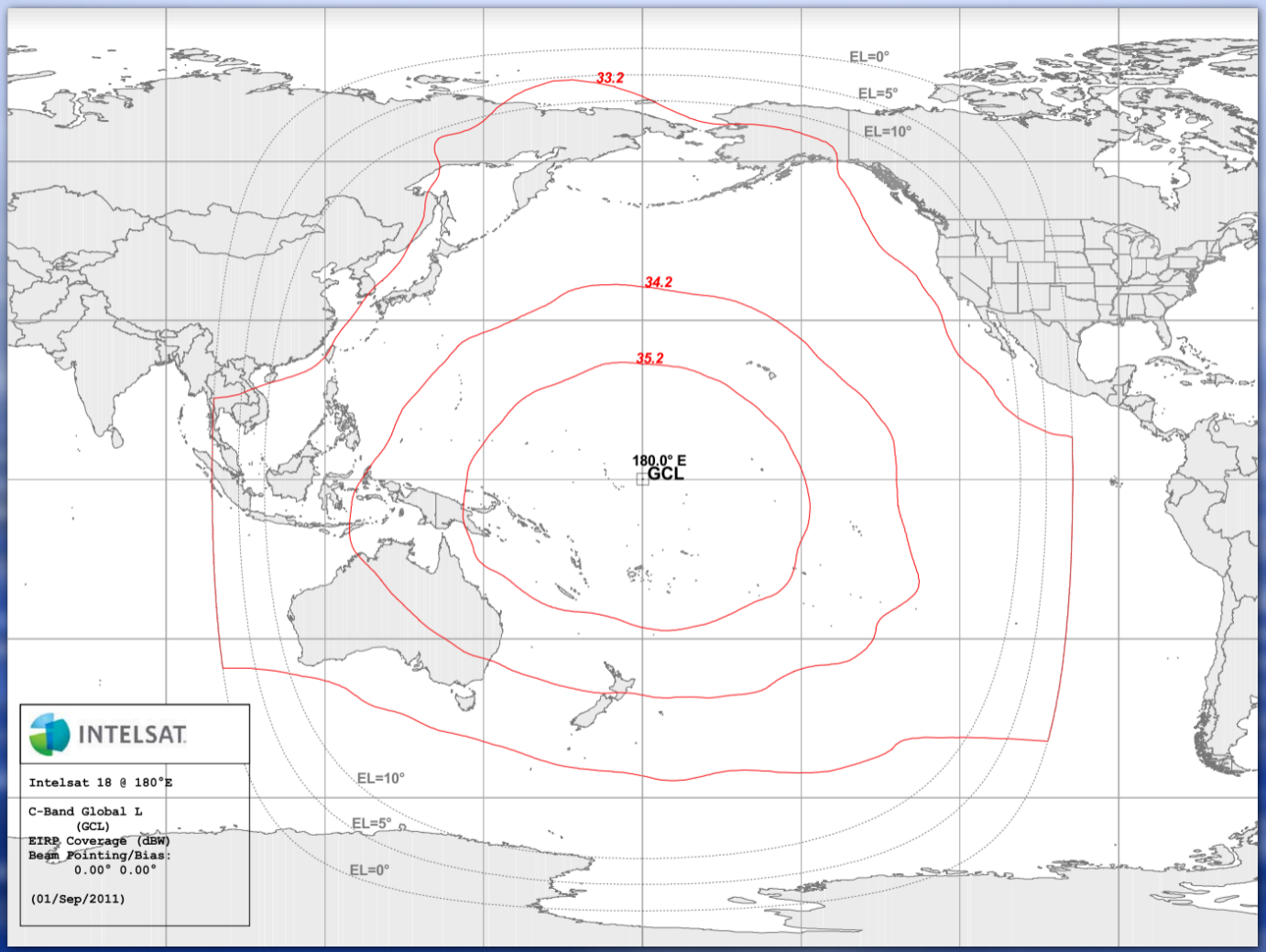
R/V Walton Smith

R/V Kilo Moana

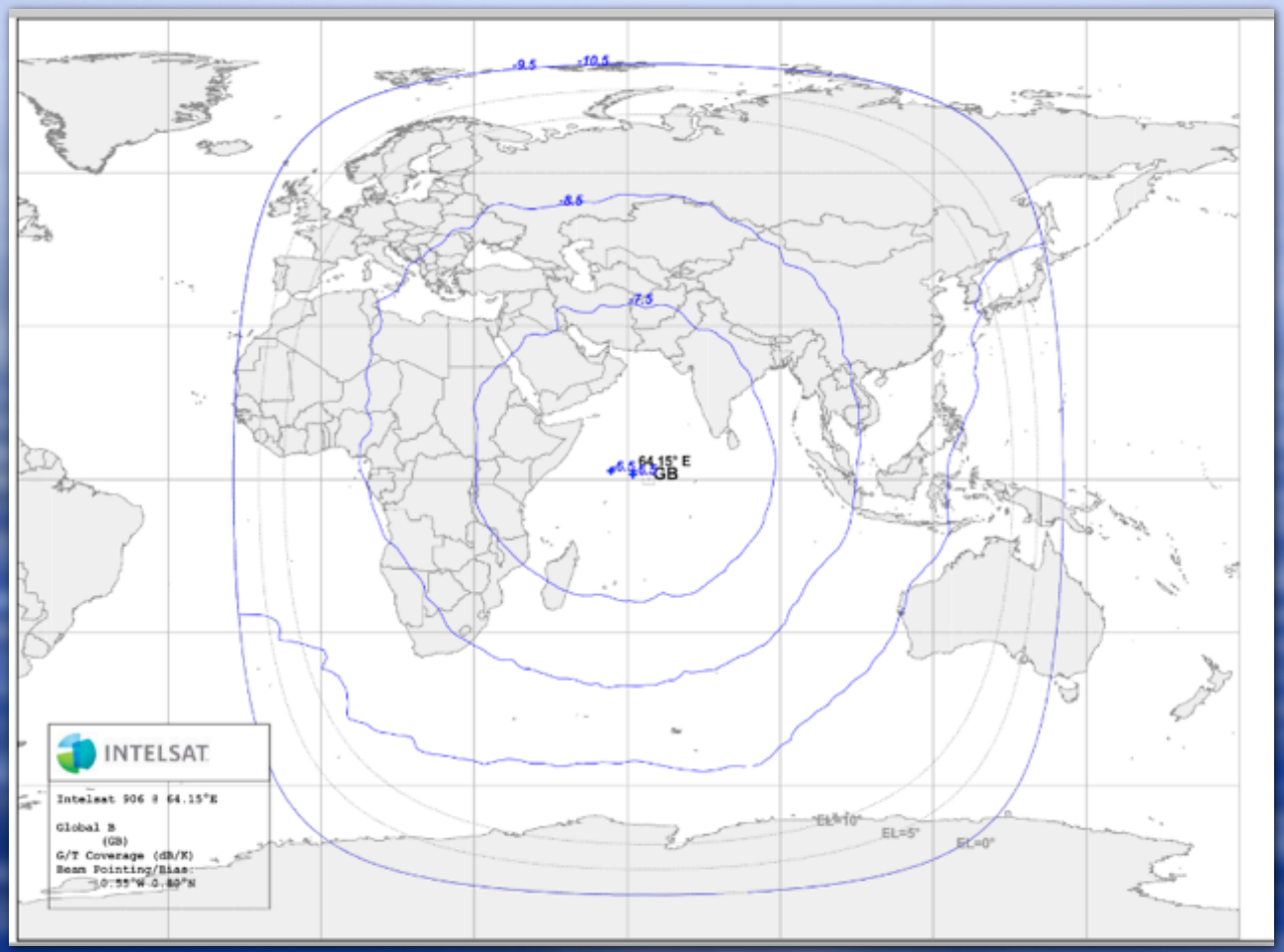
R/V Endeavor



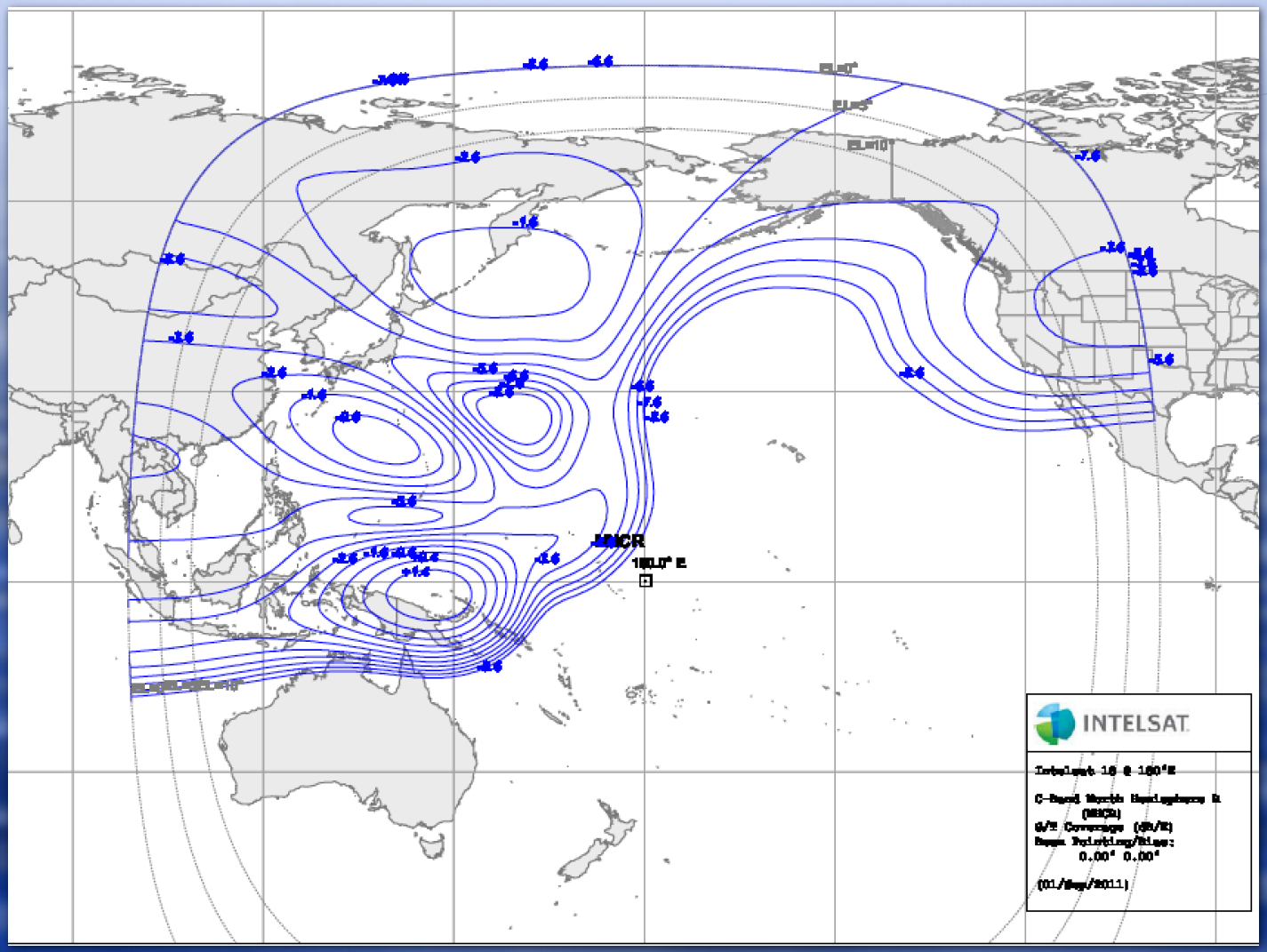
Global Atlantic C-band Beam



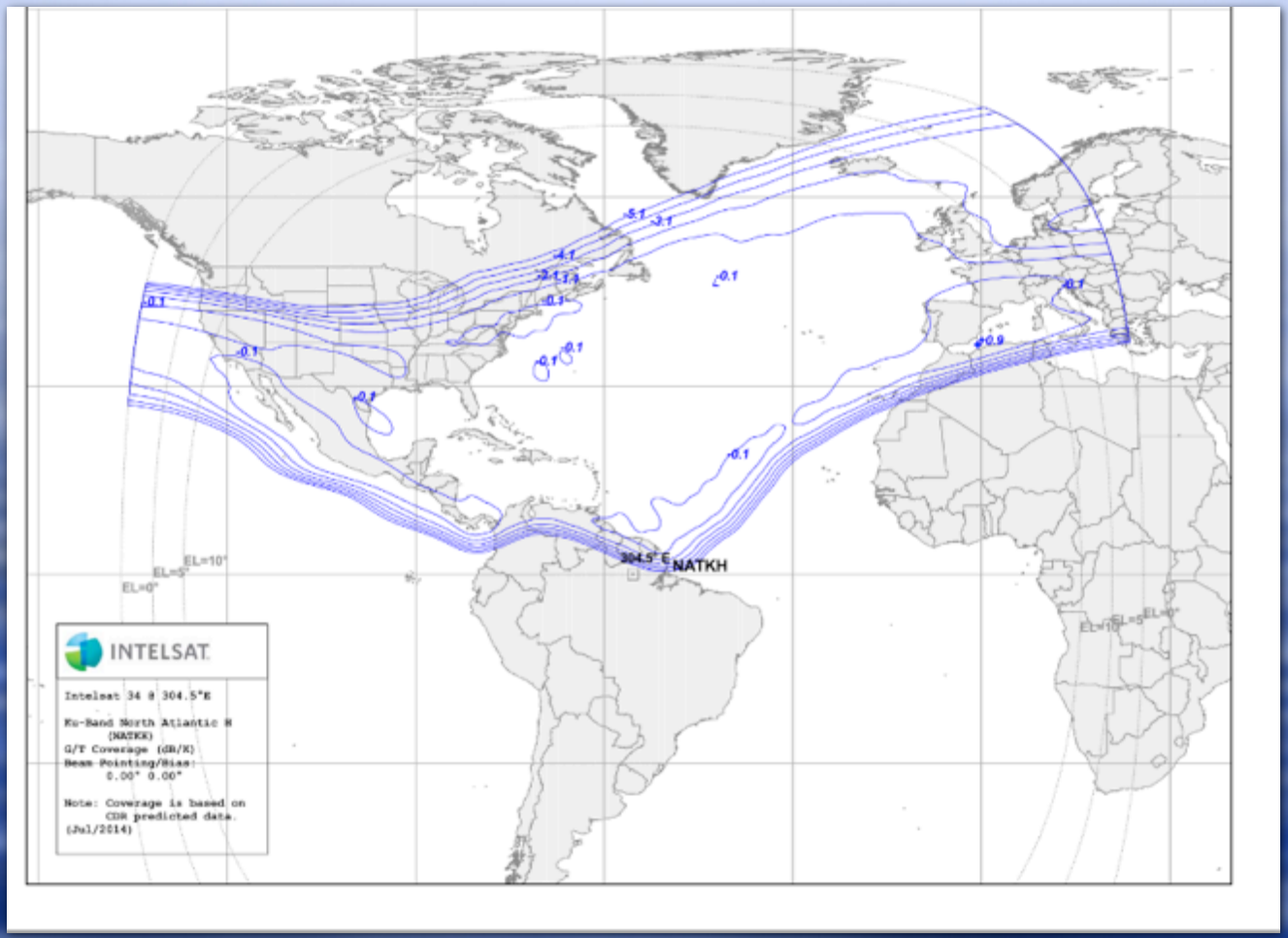
Global Pacific C-band Beam



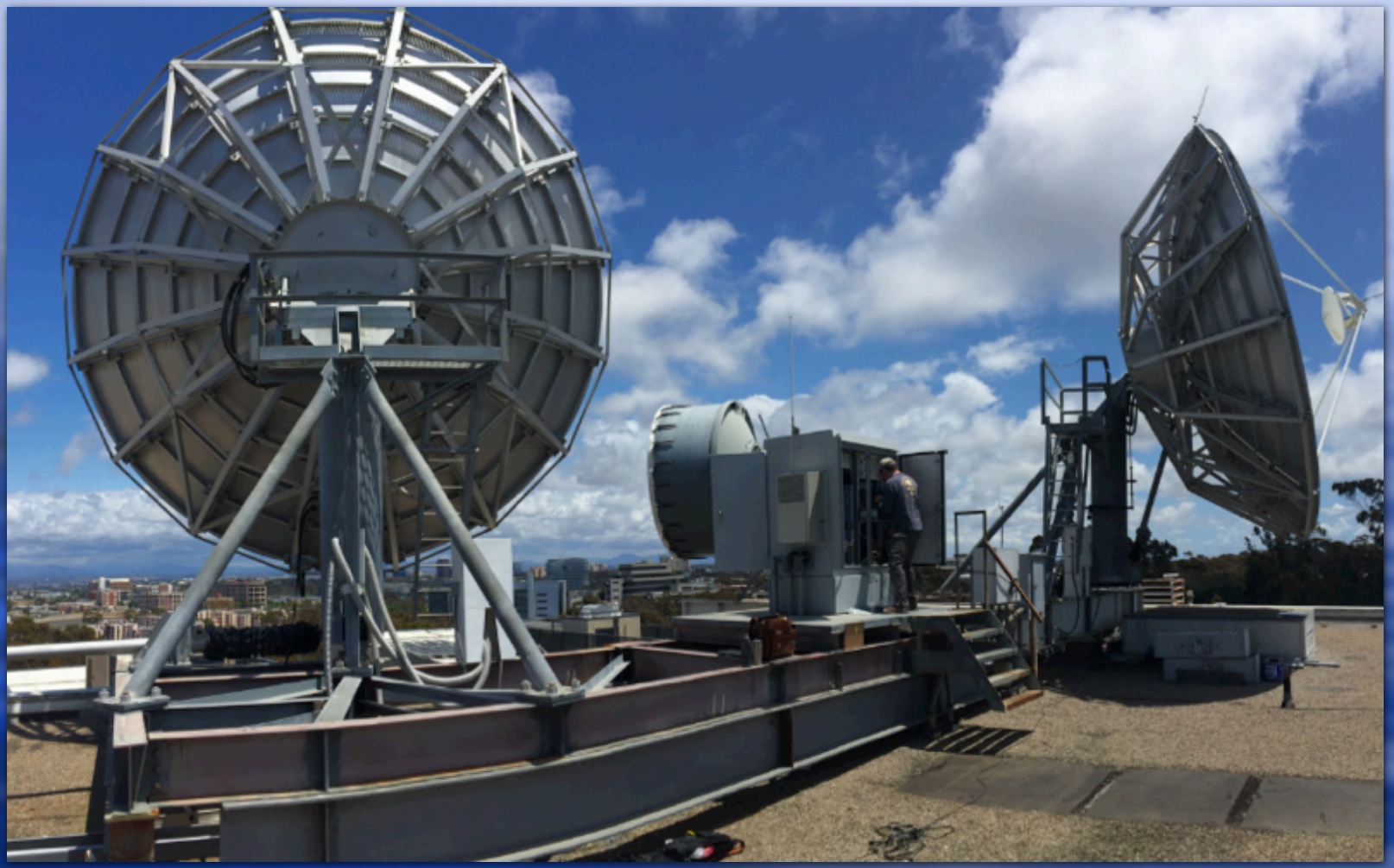
Global Indian Ocean C-band Beam



IS-18 North Hemi C-Band

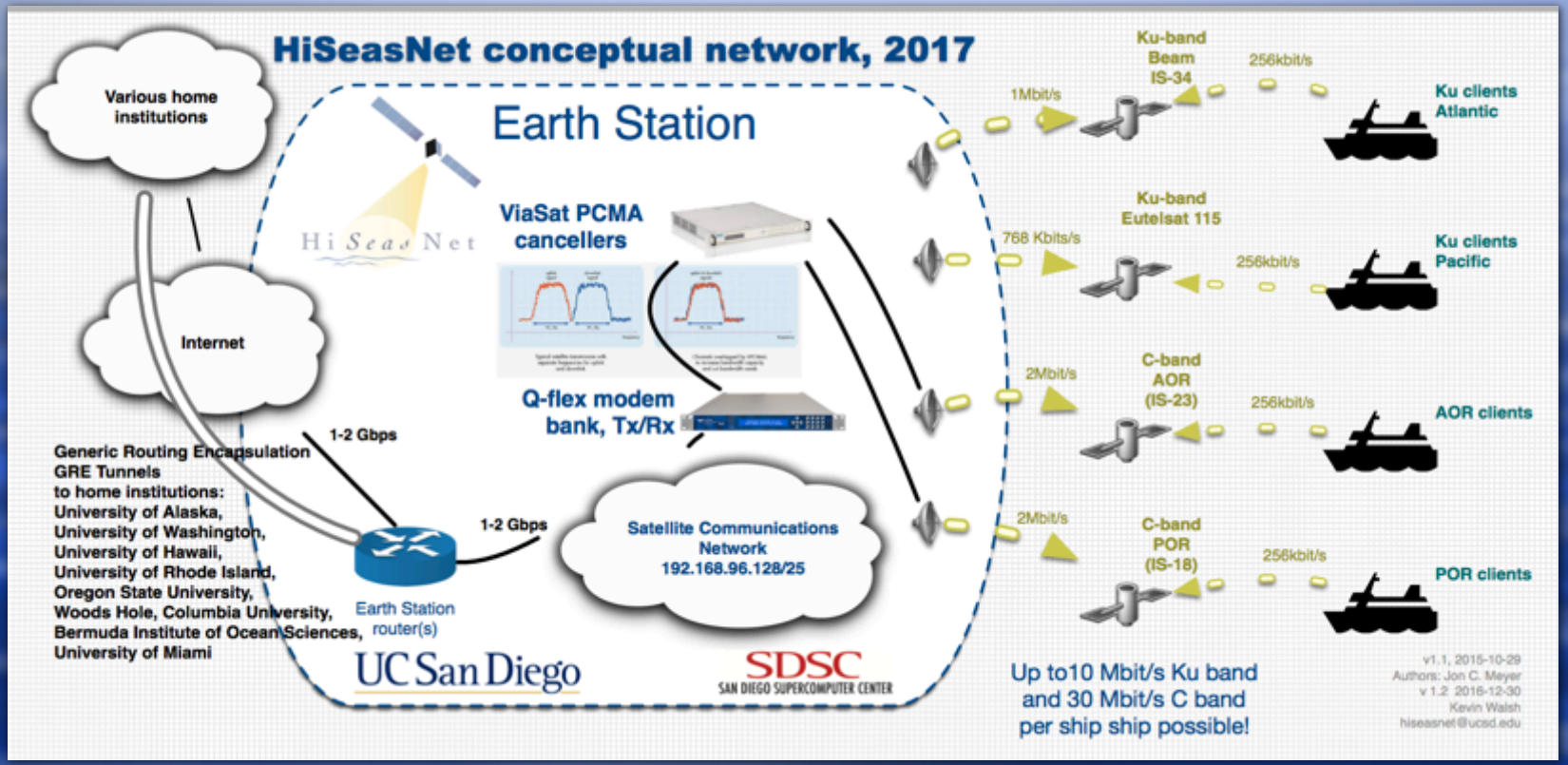


Northern Trans -Atlantic Ocean
Ku-band Beam



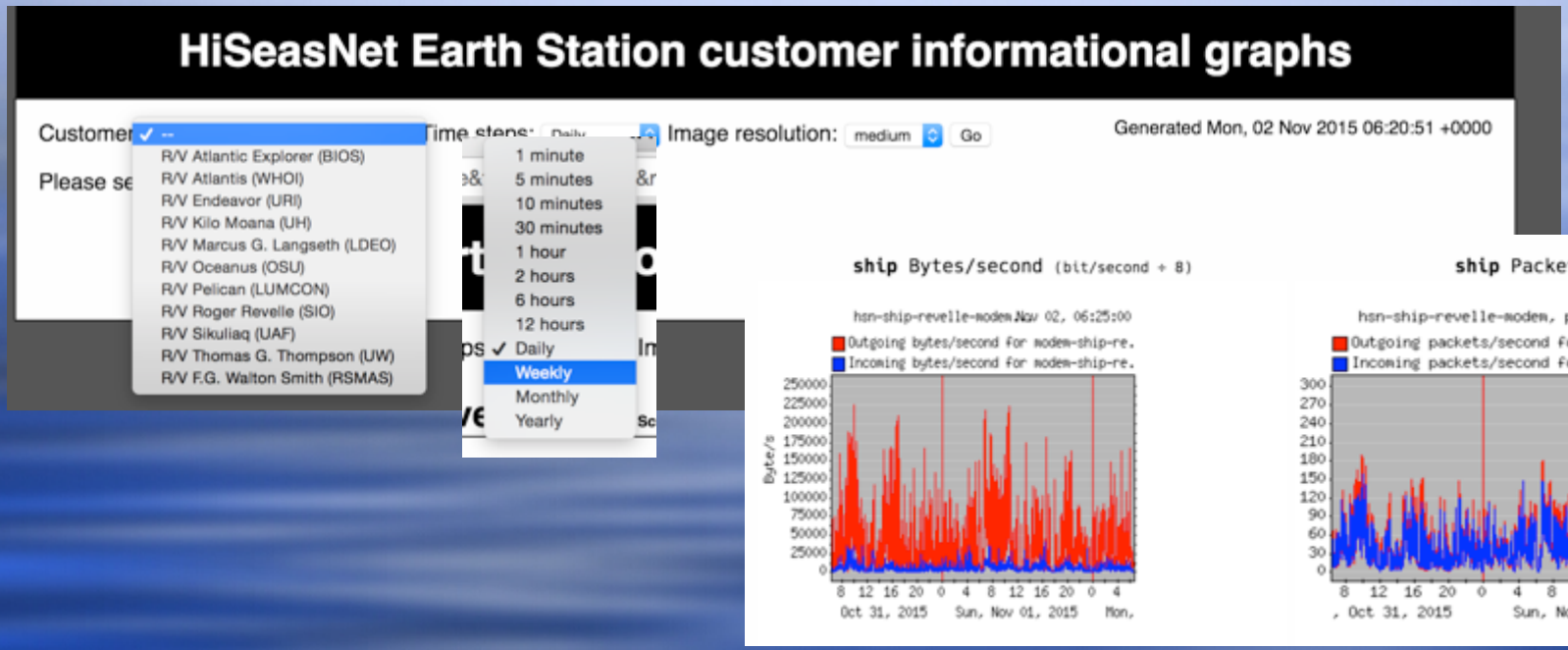
Nice day at the Earth Station

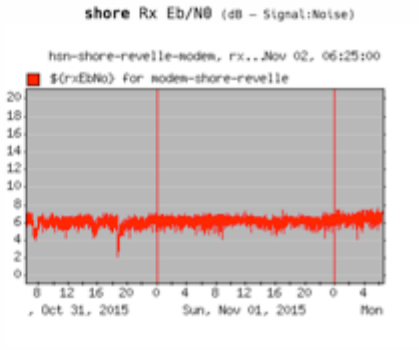
HiSeasNet Conceptual Architecture

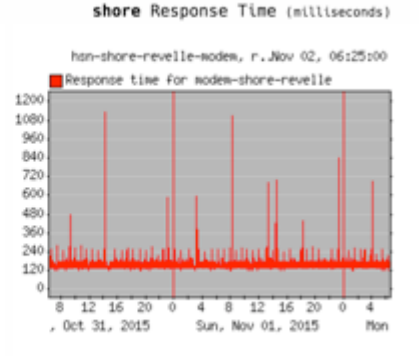


Internet 2 US Backbone

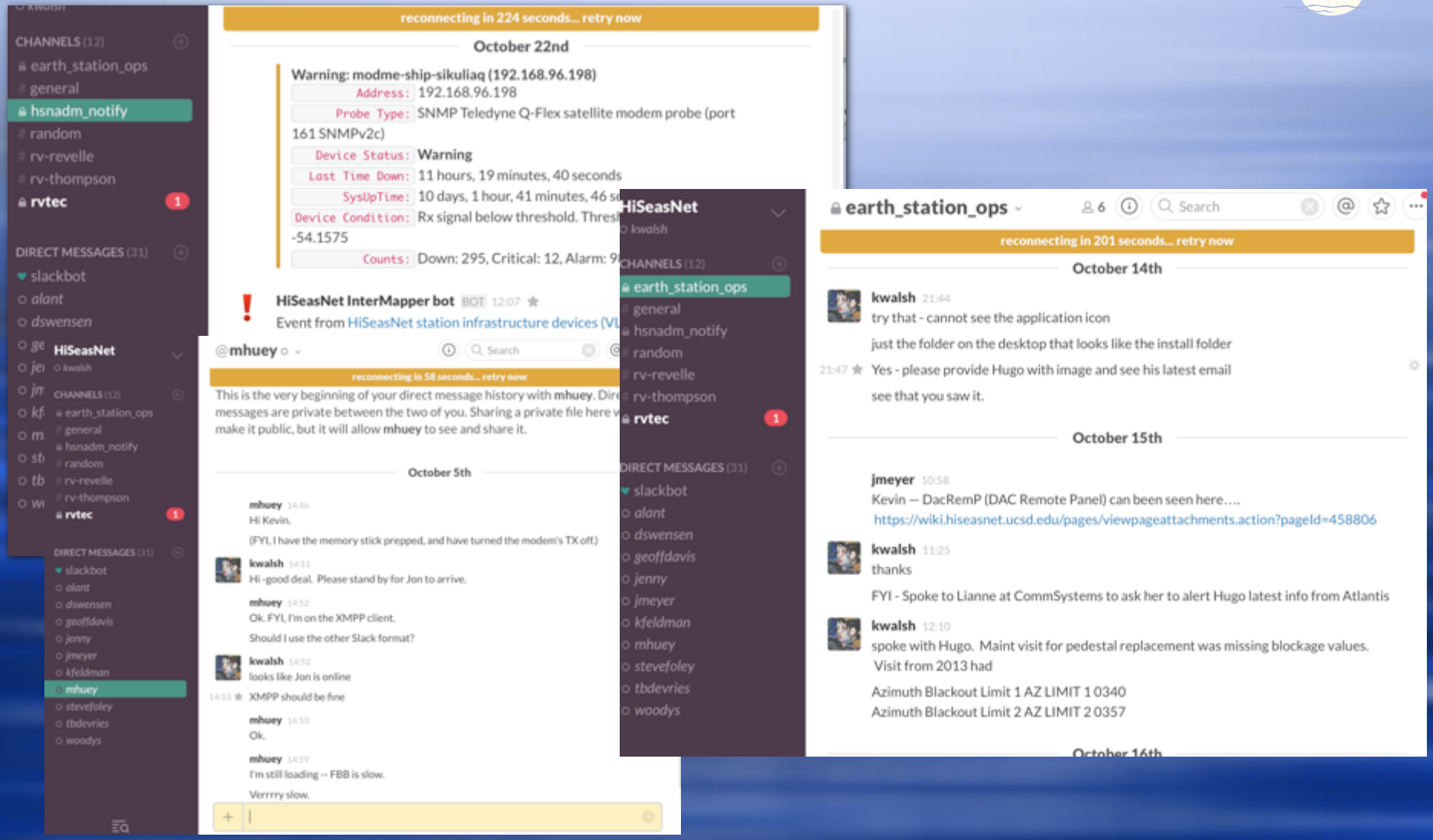
http://hiseasnet.ucsd.edu/customer/







Slack - Collaboration and Situational Awareness



Industry standard workflow processes

Edit | Comment | Assign | More | Start Progress | Close Issue

Details

Type:	Task	Status:	OPEN (View Workflow)
Priority:	Major	Resolution:	Unresolved
Component/s:	R/V Roger Revelle		
Labels:	ebno drops, troubleshooting		
Operational categorization:	Process Request - Audit		

Description

We have been observing short duration loss of shore EbNo and occasional demod unlock from Revelle. Lasts a matter of seconds. May be a reoccurrence of what we saw back in early July.

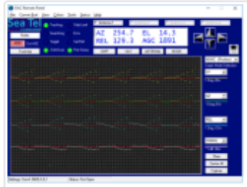
Checked Sally Ride and Sikuliaq on same beam and they are not experiencing the same problem symptoms. So, isolated to the Revelle. See momentary EnNo drop on modem and see carrier level reduced.

Captured on video. See

https://www.dropbox.com/s/3sqq7uc1oxudhnr/Revelle_ShoreModem_SpecAnn_2023_08222017.mov?dl=0

Attachments

Drop files to attach, or browse.



18 MHz Prototype

- RV Sally Ride, RV Sikuliaq, and RV Roger Revelle
- Multiple back-to-back Jason cruises on Revelle
- Several use cases to divide up the 18 MHz:
  - Shared 21.5 Mbit shore to ships with 1 Mbit to 1.5 Mbit ship to shore
  - 11.4 Mbit shore to ships with 10.5 Mbit ship to shore for Revelle and 1 Mbit ship to shore for Sally Ride and Sikuliaq
  - 11.4 Mbit shore to ships with 10.5 Mbit ship to shore for Sally Ride and 1 Mbit ship to shore for Revelle and Sikuliaq

18 MHz Lessons Learned

- Increased bandwidth enhances science mission success
- Improves scientific party and crew morale and welfare
- Reduces burden on shipboard computer resource staff
- Enables shore based management of shipboard networking equipment
- Enables shore based management of shipboard systems
- HSN scalable architecture verified and tailored per use case (JASON on Revelle, CASPER on Sally Ride)

Intelsat Updates

Dan Lesmez

Defining High Throughput Satellites

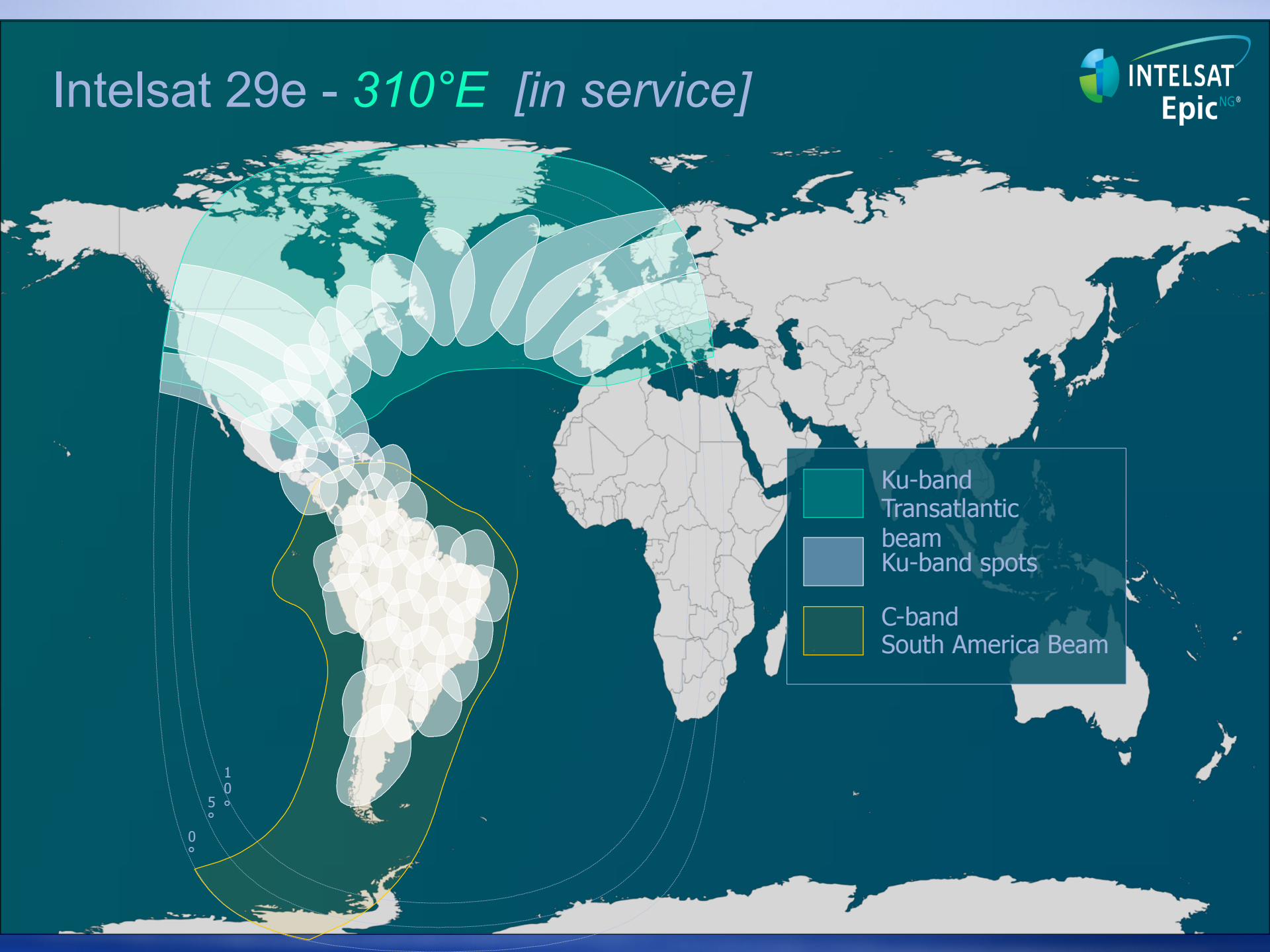
From Wide Beams to Spot Beams

AND

Modern traditional satellite IS-34

High Throughput Satellite IS-29e

Intelsat 29e - *310°E [in service]*



Intelsat IS-29e Epic^{NG} Test Results

Increased link margins, increased spectral efficiency** and/or **higher Mbps throughput

With deployed hardware	With new generation modems
↗ 165%	↗ 330%

COMTECH TELECOMMUNICATIONS CORP.

iDIRECT

Newtec

Intelsat Space Segment Roadmap

LAUNCH & DESIGN PHASE

LEO HTS

- Pole-to-pole coverage
- Small terminals, low latency

More GEO HTS

- Software defined payloads with flexible coverage, power and connectivity

- HTS satellites fully contracted
- OneWeb design and implementation

OneWeb ACCESS FOR EVERYONE

INTELSAT Epic NG

COMPLETED

HTS
High Throughput Satellites (GEO)

- HTS spots positioned in high traffic areas
- Complementing first layer not replacing it
- Provides depth of coverage

- 5 HTS satellites launched

INTELSAT Epic NG

COMPLETED

WIDEBEAM SATELLITES

- Uniform quasi global coverage
- Base layer of the network
- Provides breadth of coverage

- 50+ satellites
- 100% complete

INTELSAT

Up through 2015 → 2016-2017 → 2018 onwards

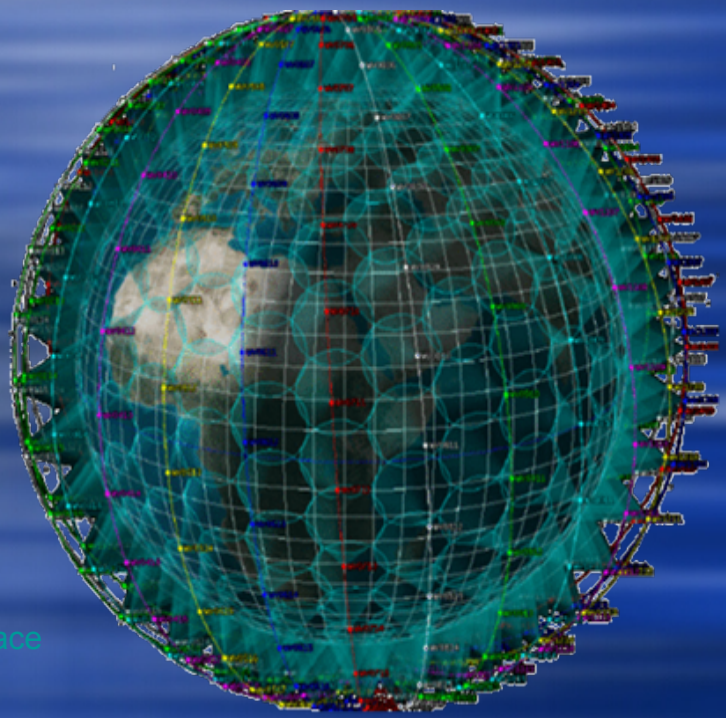
OneWeb

First fully global, pole-to-pole high throughput satellite system

- The OneWeb satellite constellation
- 700 satellites (Constellation – 18 planes of 36 satellites)
- Low latency (<30ms round trip delay)
- Look angles > 57◦

Total Throughput of the system:

5 Terabits per Second



Credit: Airbus Defence and Space

2017 Incremental Progress

- Completed SatMex to IS-34 Ku band transition
- Achieved C-Ku ship parity (2Mbit x 256K)
- Rolled Atlantic Explorer into baseline HSN
- Upgraded Amp/BUC on Kilo Moana
- Upgraded Amp/BUC on Sikuliaq
- Replaced pedestal on Langseth (not trivial)
- Completed engineering for dual C/Ku for Tommy Thompson
- Upshot: Most ocean class ships capable of 25 Mbit bi-directionally

What's Next 3 to 5 Years = Bandwidth + Life cycle replacements

- More bandwidth for C and Ku
- Pacific Ku service for Earth Station
- RF over Fiber to move shore modems to SDSC machine room
- Life cycle replacement for Tommy Thompson – Sea Tel 9711 C and Ku
- Dual radome treatment for Neil Armstrong
- Dual radome treatment for Sikuliaq
- Life cycle C/Ku upgrade for Roger Revelle
- Life cycle C/Ku upgrade for Atlantis with Revelle style radome placement
- Next generation antennas for Ku ships
- Prototype testing of LEO satellites
- Upshot: Increased performance and uninterrupted Internet access for ocean class ships

We are all made of stars.
-Moby

Thank you for your attention.