



HiSeasNet

INTERNET FOR OCEANOGRAPHIC SHIPS AT SEA

## Current Status

Steve Foley  
Jonathan Berger  
SIO

# HiSeasNet Services

- ◆ Installation & Commissioning
- ◆ On-going Maintenance
- ◆ Satellite Bandwidth (32/96 C, 64/64 Ku)
- ◆ Hub Station connection to Internet
  - ◆ Direct routing through to Home Institution
  - ◆ Voice over IP through to Home Institution
  - ◆ Email
  - ◆ Web Browsing
  - ◆ Video Teleconferencing

# Special Services

- ◆ Recent video feed on R/V Thompson
  - ◆ Real time video from Jason
  - ◆ Juan de Fuca ridge
  - ◆ Ku-band 20 Mbit connection for 1 month
  - ◆ Expensive
  - ◆ Required RF gear change before and after cruise

# HiSeasNet Hub

San Diego  
Supercomputer  
Center



# HiSeasNet "Fleet"



Atlantis



Endeavor



Kilo Moana



Knorr



Marcus G. Langseth



Melville



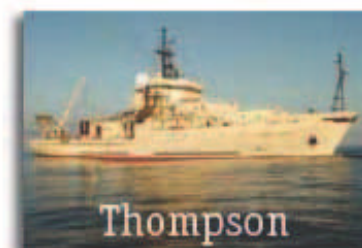
New Horizon



Revelle

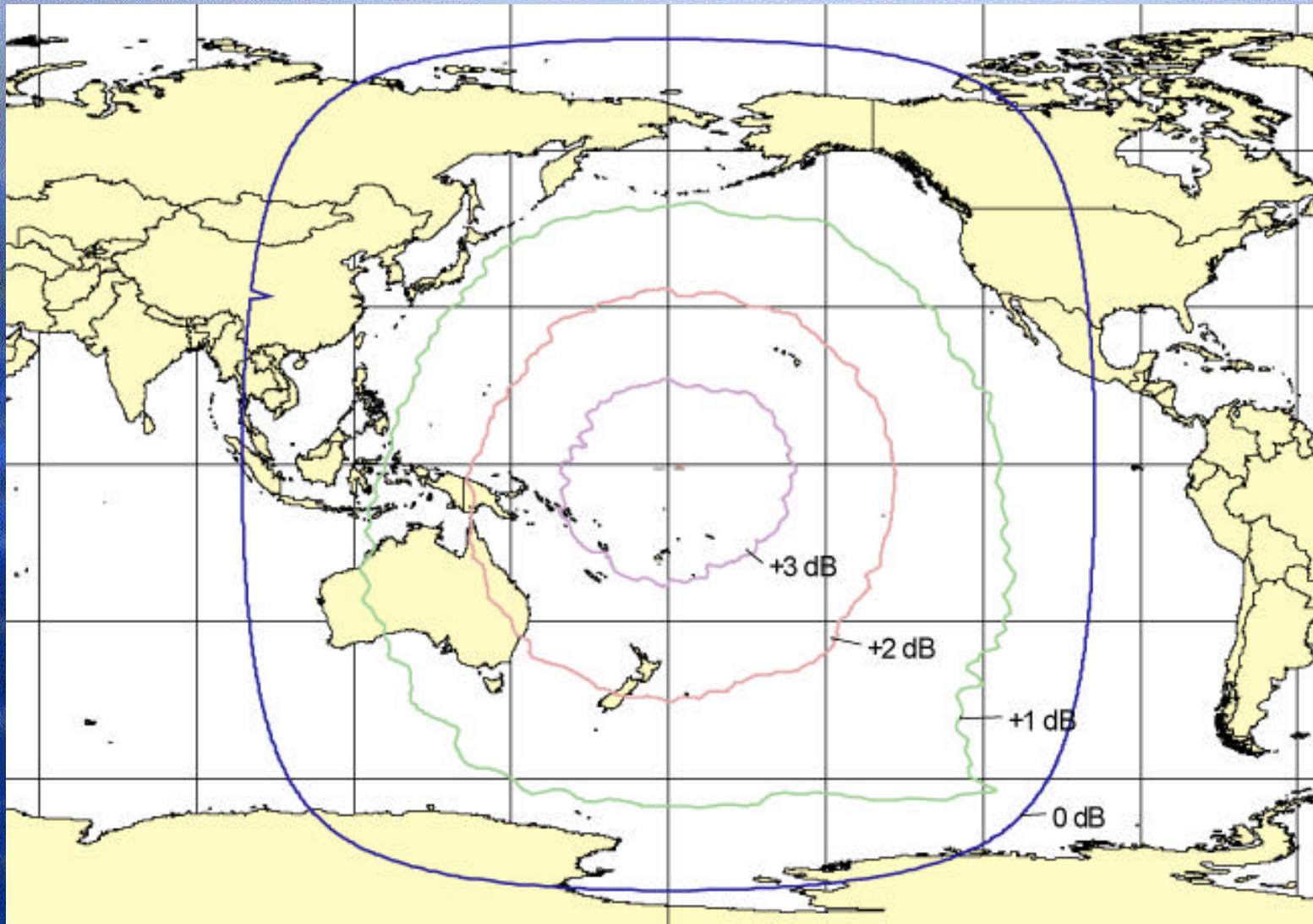


Seward Johnson

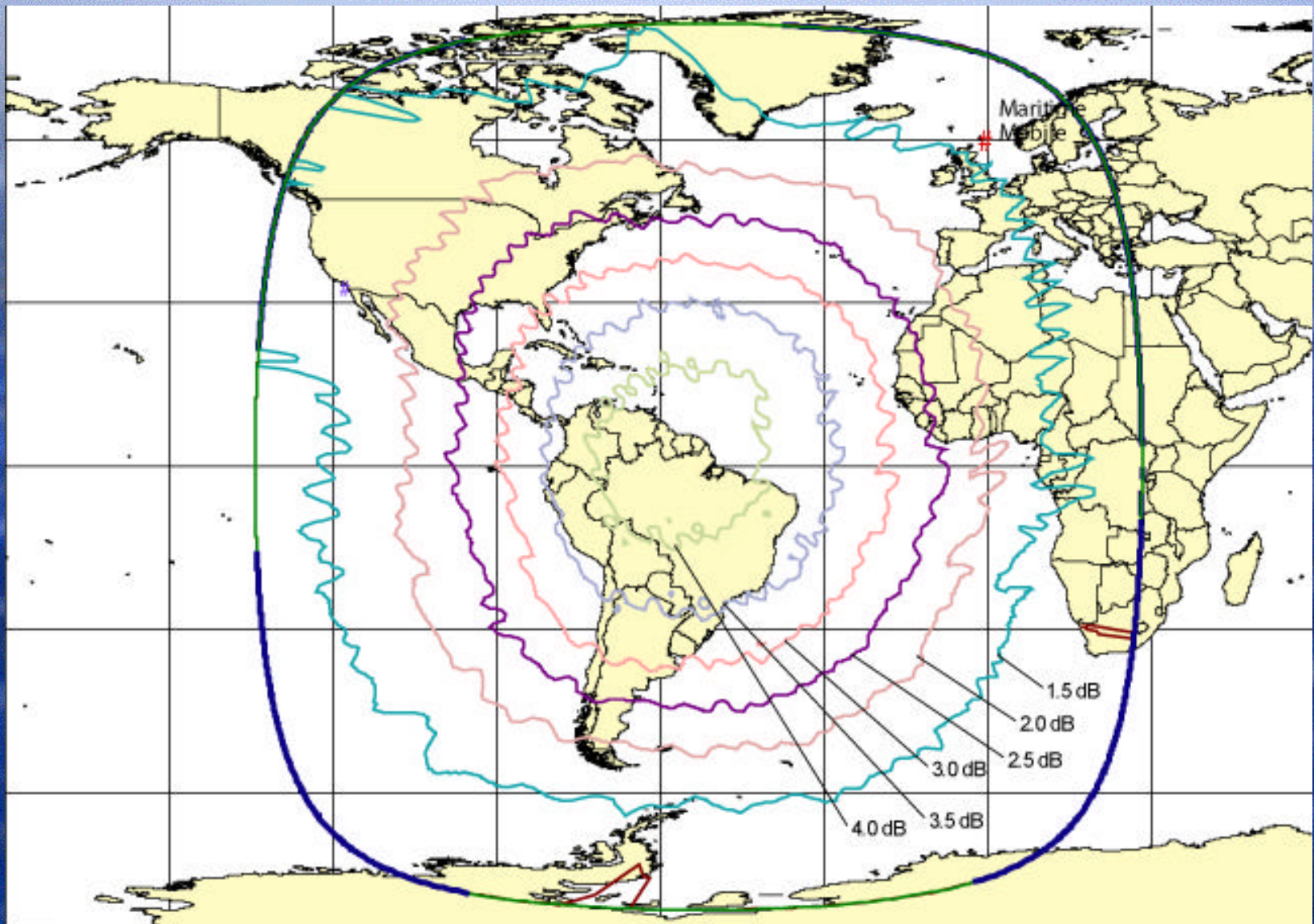


Thompson

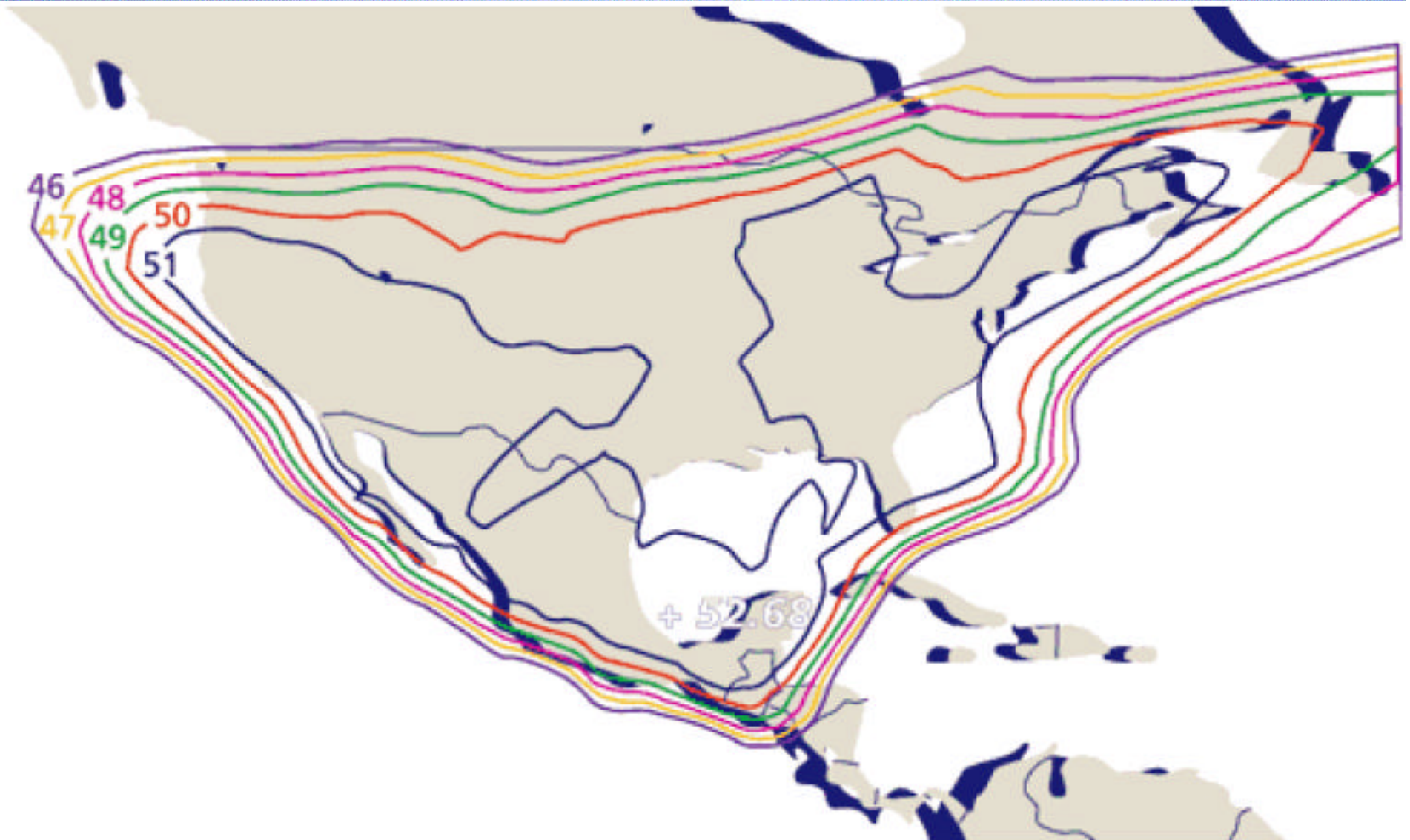
# Pacific Coverage



# Atlantic/Eastern Pacific



# Current KU-Band Coverage





Example  
Alternate  
Ku-band  
Coverage



# Current Bandwidth Use

- ◆ POR hub-to-station (160 kbps, 5 ships):
  - ◆ <http://mercali.ucsd.edu/nagios/opencgi-bin/apan.cgi?host=roadnet-2611&service=HSN-Octets-Out>
- ◆ AOR hub-to-station (128 kbps, 2 ships):
  - ◆ <http://mercali.ucsd.edu/nagios/opencgi-bin/apan.cgi?host=roadnet-2611&service=AOR-Octets-Out>
- ◆ Ku-Band hub-to-station (128 kbps, 1.5 ships):
  - ◆ <http://mercali.ucsd.edu/nagios/opencgi-bin/apan.cgi?host=earthstation-2821&service=SatMex5-Octets-Out>
- ◆ <http://www.hiseasnet.net/traffic-reports.html>

# Equipment Downtime

<b>Date</b>	<b>Location</b>	<b>Problem</b>	<b>Downtime</b>
2/2002	Revelle	Bad rotary joint on install	0 ship days
3/2002	Revelle	Router failure	~0 ship days
4/2002	Revelle	Antenna PCU failure (had spare)	0 ship days
11/11/2003	Melville	Bad PCU at install	0 ship days
4/27/2004	Revelle	Failed LNA	20 ship days
12/1/2004	Revelle	Converter failure in port	0 ship days
2/2/2005	Earth Station	Circuit breaker tripped	1 ship day
3/17/2005	Earth Station	Converter problem?	1 ship day
4/1/2005	Atlantis	Broken antenna sprocket	1 ship day
4/11/2005	Melville	Failed power amp	~30 ship days
5/20/2005	Earth Station	Blown fuse	
7/10/2005	Knorr	Broken antenna drive belt	2 ship days?
7/24/2005	Earth station	Failed power amp	12.5 ship days
7/31/2005	Earth station	Failed power amp	3.5 ship days
8/11/2005	Earth station	Noisy link to the internet	15 ship days
9/12/2005	Earth station	Ku-band converter intermittent	0 ship days
9/5/05	Thompson Video gear	Ku-band power amp failure	1 ship day
10/1/05	Earth Station	Blown fuse	1 ship day?
11/8/05	Thompson	Pedestal structure failure	??

# Failures and Spares

- ◆ Most failures are user or ship related
  - ◆ Power outage, antenna repoints, gyro failure, unfamiliarity with gear, etc.
  - ◆ Solution: Learn to work with gear and ship quirks
- ◆ Antenna pointing failures occur, but usually are not catastrophic
  - ◆ Solution: Work with SeaTel and learn to work with gear/ship quirks
- ◆ When equipment dies, it is usually RF gear, despite it being the "most reliable in the business"
  - ◆ Solution: Spare LNAs, depot converter and power amp spares in SD

# Funding

- ◆ Equipment

- ◆ State of California, ONR, NSF, and matching funds from:

- ◆ Scripps Institution of Oceanography
    - ◆ University of Hawaii
    - ◆ Woods Hole Oceanographic Institution
    - ◆ University of Rhode Island
    - ◆ Lamont-Doherty Earth Observatory

- ◆ Recurring Costs

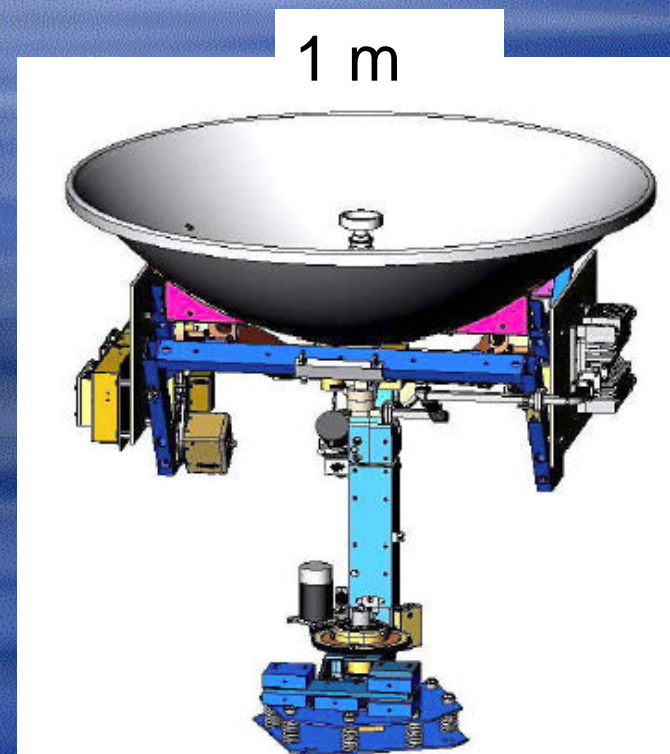
- ◆ NSF through Ships' Tech Services

# 2006 HiSeasNet Recurring Costs

- ◆ Satellite Leases - \$280K
- ◆ Operations & Maintenance - \$180K
  - ◆ 2 trips to each ship per year
  - ◆ Hub maintenance
  - ◆ Management
- ◆ Spares - \$50K
- ◆ Ships Tech Services Day Rates
  - ◆ C-band - \$250
  - ◆ KU-band - \$150

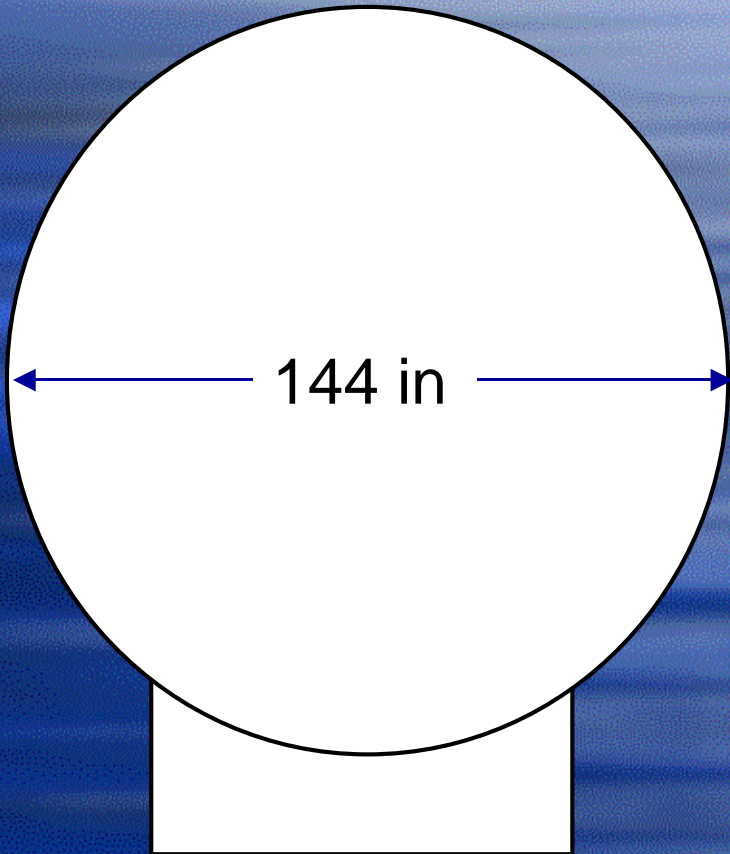


# Next Generation Ku-Band for Small Ships

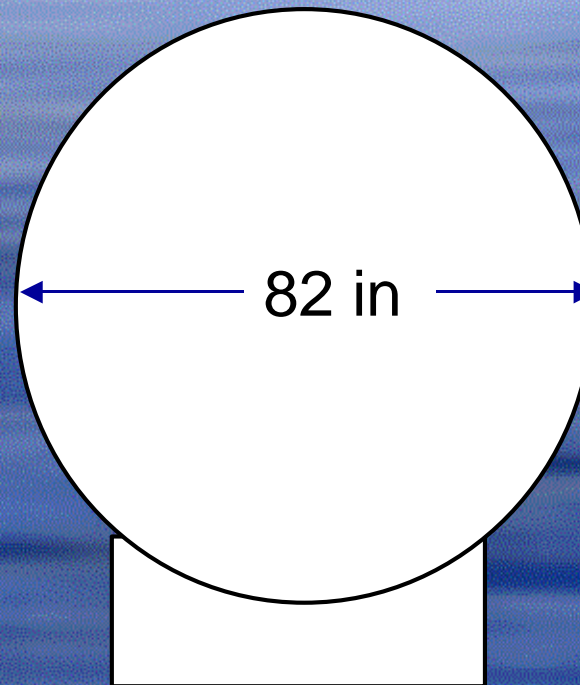


# Radome Sizes

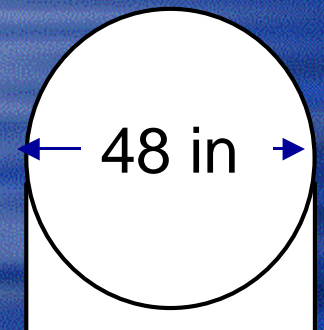
C-Band



KU-Band



NG  
KU-Band

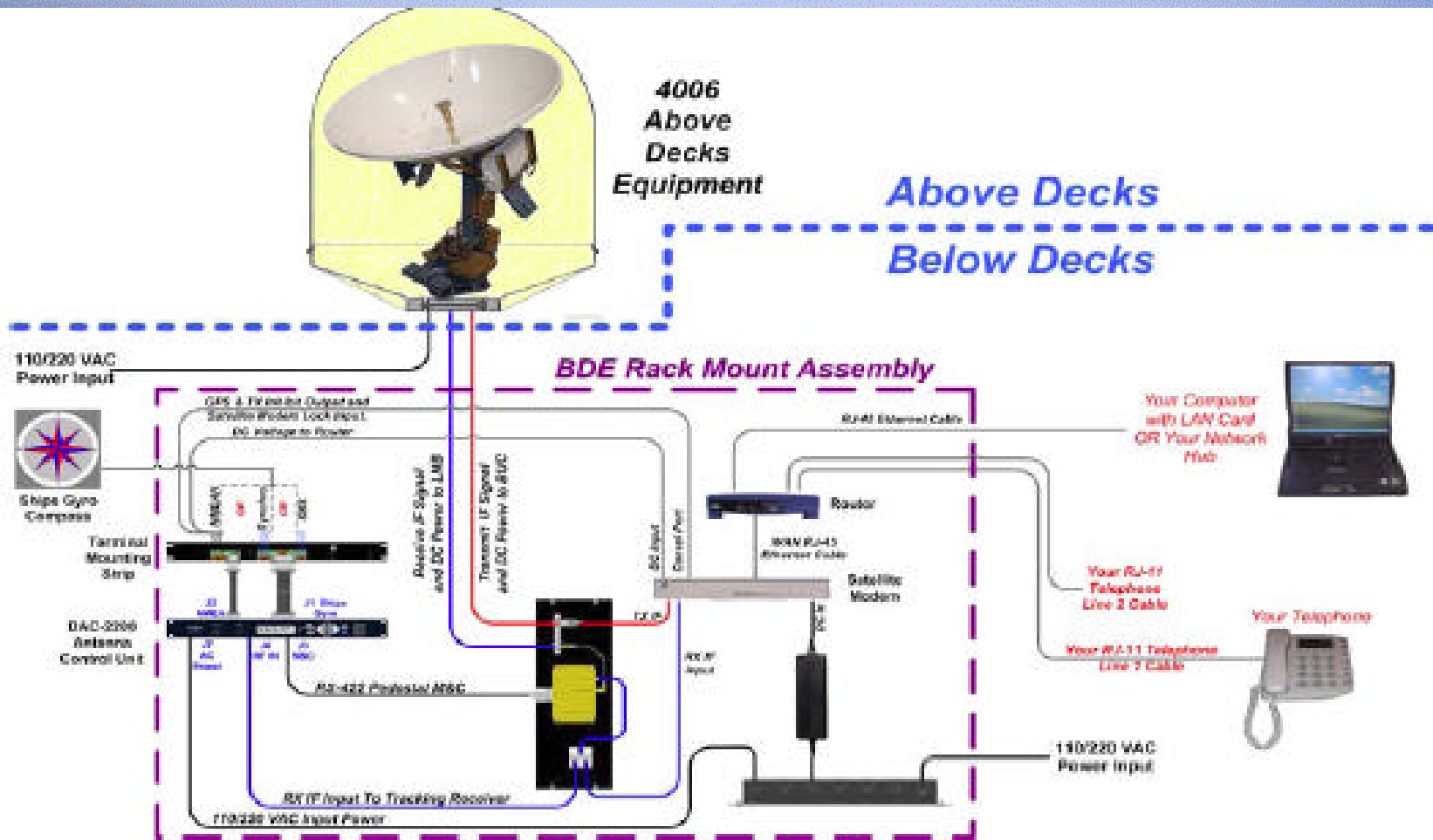




# System Comparisons

	KU-Band	NG KU
Antenna	1.2 m	1.0 m
Radome	82 in	48 in
Weight	800 lb	250 lb
Rx Gain	41.65 dB	40.1 dB
G/T	16.8 dB/K	18.2 dB/K

# Block Diagram



# NG Ku-Band Cost

- ◆ Capital Costs
  - ◆ ~\$80k, installed & commissioned
- ◆ Incremental Recurring Costs
  - ◆ About \$150/day for 64 kbps duplex