U.S. Chamber of Commerce Space Transportation Association

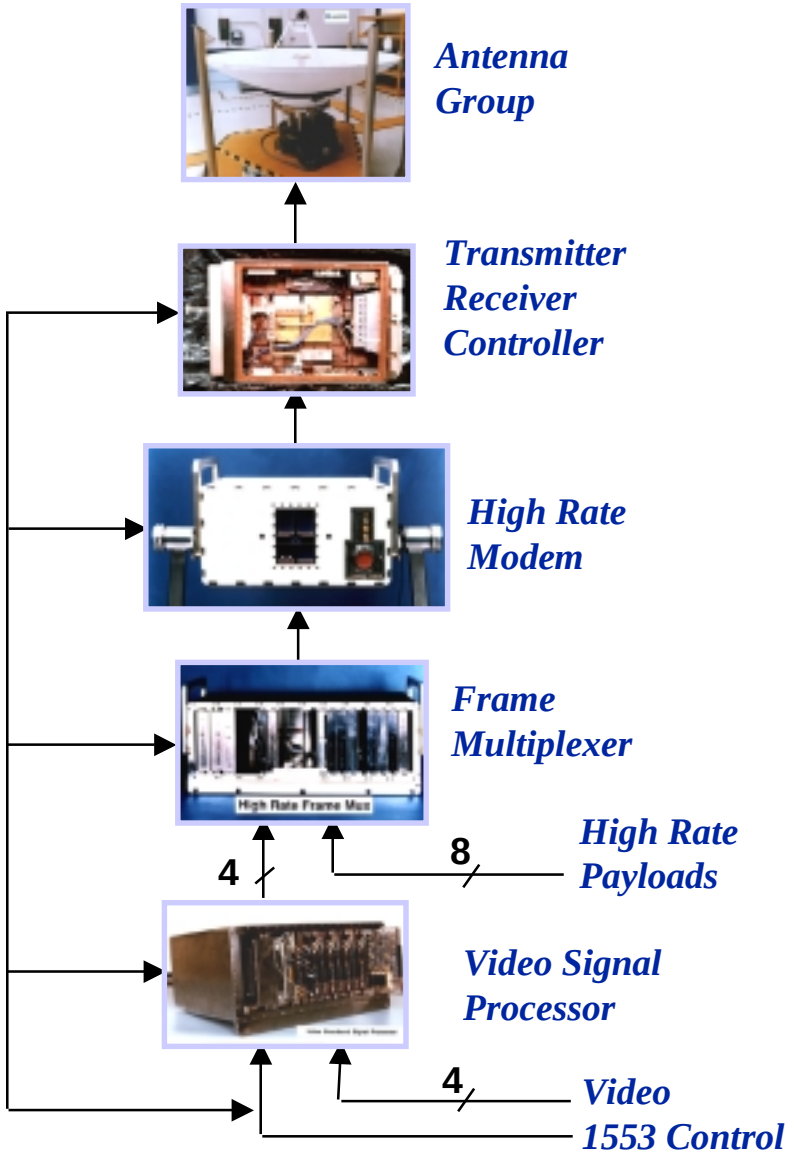
November 7, 2001 Workshop

"Market Opportunities in Space: The Near-Term Roadmap"

Panel 3: "Bringing Out the Stars: Advertising/Sponsorship/Media

L-3 Communication Systems-East
Camden, NJ

Current ISS Ku-Band Space to Ground Subsystem



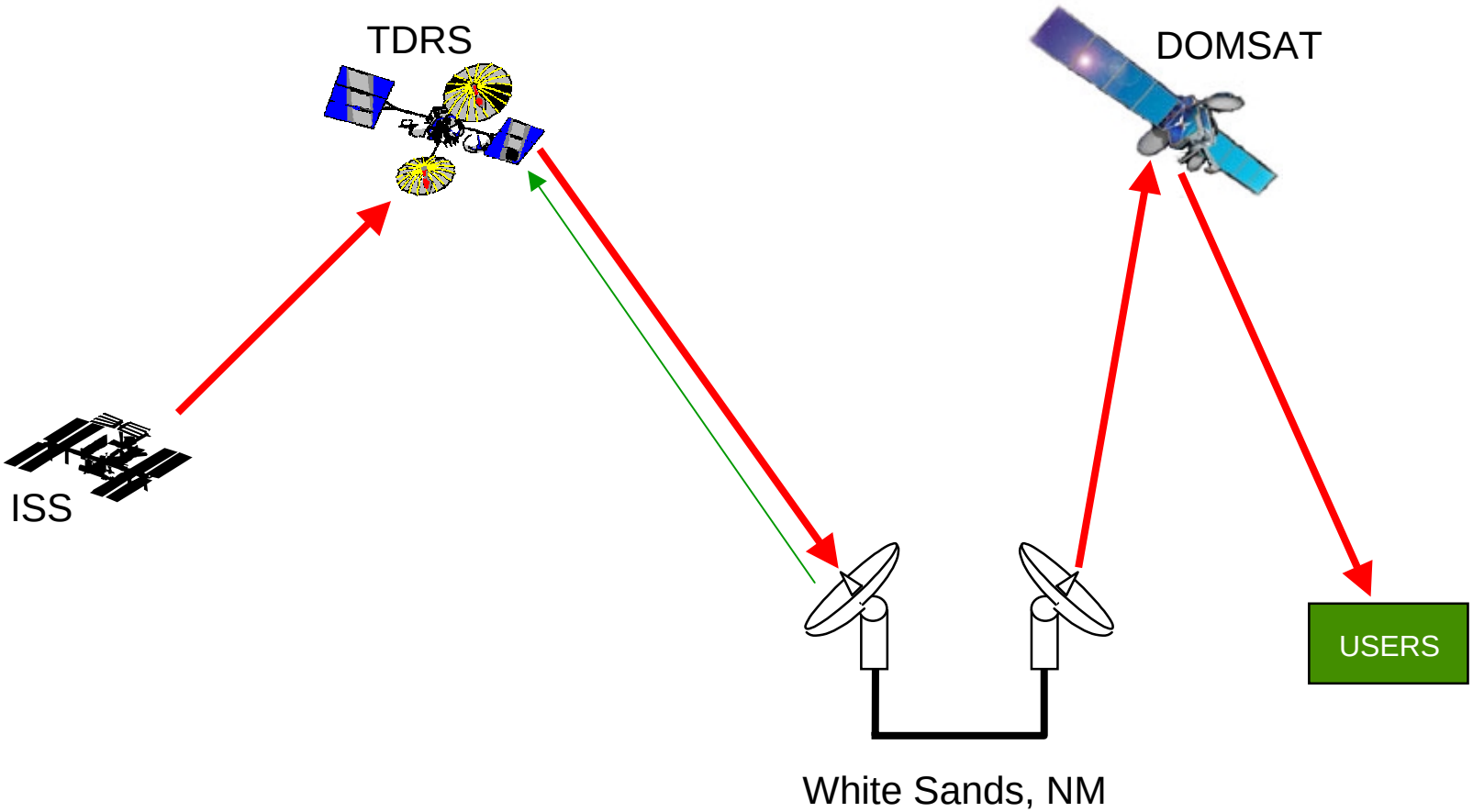
Key Function

Provides Video and Experimental Data Communications Transmission from the Space Station to Ground

Key Parameters

- 50 Mbps BPSK Downlink
- Bit Error Rate 10^{-8}
- Reed-Solomon Error Coding
- Cassegrain Tracking Antenna
- 20 Watt Solid State Amplifier
- Statistical Multiplexer
  - 8 100 M Bit Payload Inputs
  - 4 Digitized Video Inputs
- Multi-Rate Video
  - Full Frame to Freeze Frame
  - 6 or 8 bit quantization

Current ISS Ku-Band System Diagram



Limitations of the Ku-Band System

Zone of Exclusion

TDRS not in view 24x7

Masking

Space Station obstructs view

For safety reasons transmission is commanded-off when certain modules are in the field of view

Other Limitations

No Ku-Band Ground to ISS

Current ISS system limited to 50 Mbps in real time

Commercial Users Likely Want: 2-Way 24x7 Comm Link, and High Bandwidth (150 Mbps)

“Quick Fixes” With Current System

Add A Forward Link (Ground To ISS)

Transmitter already has a forward link I/F

Upgrade High Rate Modem to add a demodulator (25 Mbps)

Increase Return Link Bandwidth

Transmitter has the bandwidth (demonstrated 112 Mbps)

High Rate Modem tested to 150 Mbps

Frame Mux tested to 150 Mbps

White Sands Ground Station can receive 300 Mbps in real time, (but currently only has capacity to pass 50 Mbps off-site)

Is This Good Enough for Commercial User Needs?

If "Quick Fix" Not Adequate, The New System ….

Must …

Meet Severe Space Environmental Conditions

Survive Shuttle Launch Dynamics Likely To Overstress COTS Hardware

Meet Bandwidth Needs Identified By End Users

But …

New Space Qualified Comm Hardware Could Easily Become A Price Barrier To Early Commercialization

Reality of Space Station Commercialization *(From a Comm System Provider Viewpoint)*

Spacecraft Subsystem Provider's Business Model Typically Is To Be Paid To Build The Hardware For The End User

A 24x7 Comm Link Will Require Significantly More Hardware And Still May Not Resolve the Space Station Obscuration Problem

Major Changes/Enhancements To The NASA Ground Infrastructure Remain

We Have Not Seen End Users With Cash For Both The Comm Link Costs And Experiments, Or Costs To Design, Test, Launch, Install, And Operate The Space Borne Equipment