

Trends in Experimental Communications Technology Satellites

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Topics

- Trends
- New Developments
- Configurability & the Advanced Communications Technology Satellite
- Multi-Tech Scaleable Experiments for X-CTSats
- New Wideband Users
- X-CTSat Inevitables
- Contacts
- ACTS Transmitter Scaling Data Base

Trends

- Trend-1. Geometric growth in the time between Com Technology X-CTSats
- Trend-2. Geometric growth of the cost of Com Technology X-CTSats
- Trend-3. Multi-Technology X-CTSats
- Trend-4. Virtual Terrestrial Networks for X-CTSats

New Developments

- Government Doctrines to use Commercial Communications Satellites
- NASA's IOA...Space Operations on the Internet
- Transforming Information into Energy – broadband mobility leads to other new markets
- Great Challenges of the HPCC program
- Drift Orbit Operations for the Advanced Communications Technology Satellite (ACTS)
- Disaster Management & Hybrid Networks
- International Orbital Debris Policies

Configurability & the Advanced Communications Technology Satellite

- 5/31 Modes used during 5 years of operations
- Reconfiguration conducted routinely
- Baseband Processor (BBP) mode
- Microwave Switch Matrix (MSM) mode
- Mixed Modes

Multi-Tech Scaleable Experiments for X-CTSats

- **Transmitter Scaling Equations**
- **$DR = C * P * R^2 * E * W * B / Mg$**
 - HDRT scaling equation
 - $DRH = 8.3034E-06 * P * R^2 * E * W * B / Mg$
 - V-SAT scaling equation
 - $DRV-Sat = 1.33E-03 * P * R^2 * E * W * B / Mg$
 - USAT scaling equation
 - $DRU-Sat = 2.38E-02 * P * R^2 * E * W * B / Mg$
- P=Power~watts, R=Antenna Radius~meters, E=Encoding Gain~4for qpsk...2 for bpsk etc, W=Frequency~GHz, B=Modem Bandwidth~MHz, Mg=Margin~2 for 6db...etc.

New Wideband Users

- ARIES
- Telemedicine
- Distance Education
- Innovative Military Applications
 - Fixed Satellite Services
 - Mobile Satellite Services
- Integrated Operations Architecture
 - NASA's Consolidated Space Operations Contract (CSOC)

X-CTSats Inevitables

- **Continued Propagation Research from ground-based test sites**
- **Research investigating higher frequencies (W-Band, V-Band, Optical)**
- **Communications Research on the Space Station**
- **Piggyback Research Payloads on Commercial Satellites**
- **Scaleable Experiments Research**

X-CTSat Inevitables (cont.)

- **Reconfiguration Research**
- **Protocol, Standardization, and Coding Research**
- **Integrated Network Research**
- **Integrated Com-Cam-Comp Technology Research**
- **Orbital Debris Management**
- **Increased NASA / Industry Collaboration**

Contacts

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ACTS Transmitter Scaling Data Base

Data Rate	Margin	Margin	Power	A-Radius	ModSch	Freq	Modem	C
Megabits/Sec	Integer	db	Watts	Meters	Integer	Ghtz	MHz	Number
622.00	2	6.02	120	3.4	4	30	900	8.30E-06
27.50	2	6.02	12	1.2	2	30	40	1.33E-03
1.54	2	6.02	2	0.6	2	30	3	2.38E-02