



HF On-The-Air Test and Analysis Capability at Rockwell Collins

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Rockwell Collins, Inc.
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Topics

- The Case for OTA
- HF Stations at RCI
- Propagation Modeling
- Performance Evaluation

The Case for OTA Testing

- Tests under “Real World” HF Propagation Conditions
- Engineering & Research
- ALE Testing
- Modem Waveform Performance
- Customer “Live” Demonstrations
- HF System Installations Operational Check

Rockwell Collins HF Stations

- Rockwell Collins Government Systems
 - Oxford Junction, IA (brand new “Comm Central”)
 - Cedar Rapids, IA (COTHEN System Integration Lab)
 - Kirvin, TX (mothballed remote site)
- Rockwell Collins Avionics
 - Melbourne, Florida
- Rockwell Collins France
 - Blagnac, France (near Toulouse)
 - CREIL, France (near Paris)



Rockwell Collins HF Station Locations

Rockwell Collins

HF Licenses & Frequencies

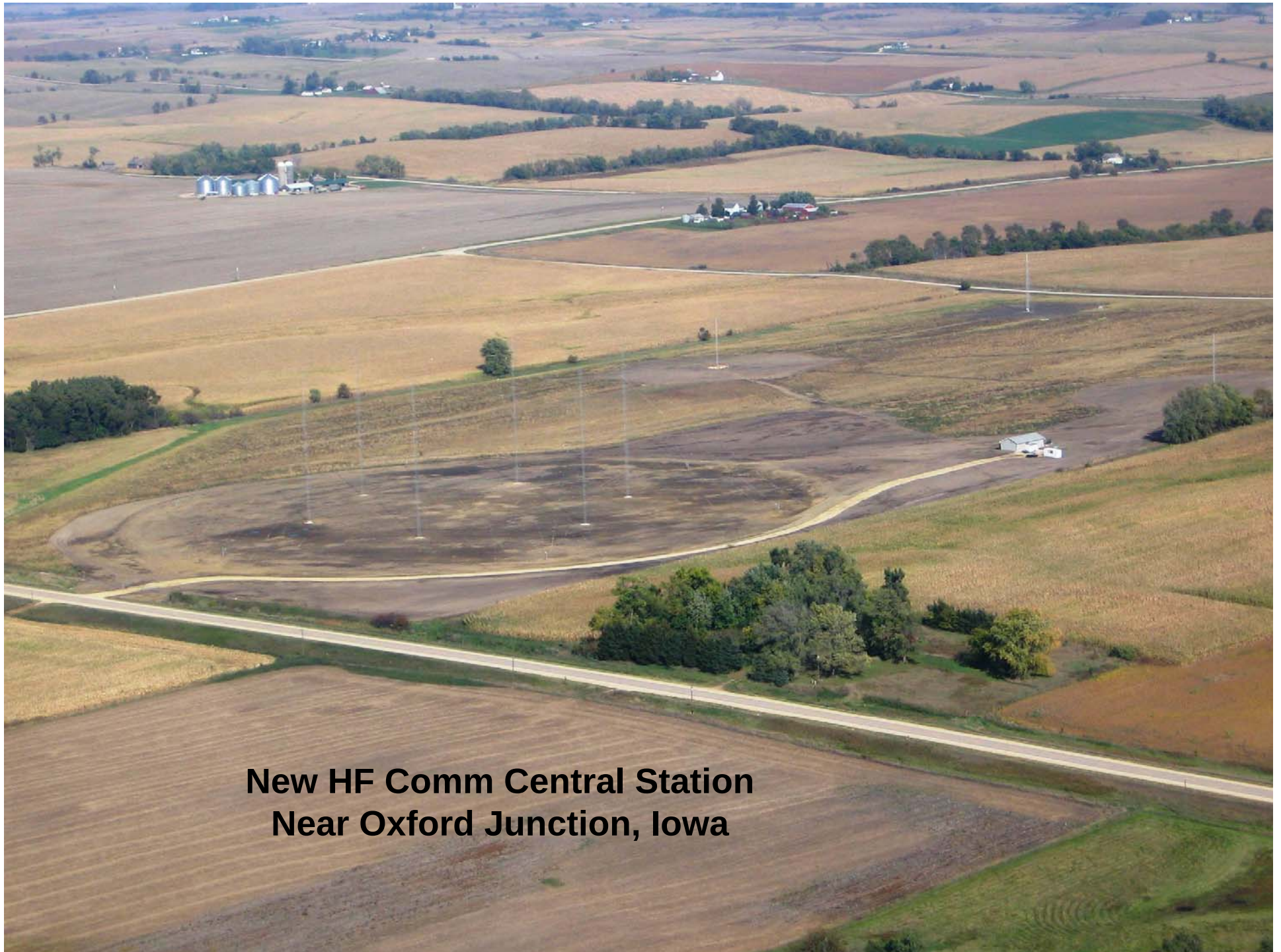
- US Nationwide Experimental Licensees
 - KM2XLB – 16 Frequencies
- Cedar Rapids Area Experimental Licenses
 - KB2XAX – 46 Frequencies; 2.4 – 29.7 MHz
 - KA2XAH – 24 Frequencies
 - KA2XDI – 28 Frequencies (Mobiles)
 - KC2XKG – 19 Frequencies
- Kirvin, Texas Area Experimental Licenses
 - KA2XXA – 19 Frequencies
 - KK2XHQ – 35 Frequencies
 - KK2XHR – 35 Frequencies (Mobiles)
 - KM2XMN – 16 Frequencies

Oxford Junction, Iowa Station

- New Station Commissioned Sept. 2008
- Located on 80 acres in rural Clinton County
- Ten HF Antennas:
 - Six LPH-0406 Curtains; 30, 90, 150, 210, 270, & 330 degree azimuths; 3.0 – 30 MHz
 - Two Collins 237B-3 RLP; 6.5 – 30 MHz
 - Two CMV-330 Monopoles; 3.0 – 30 MHz
- Eleven HF Radios
 - One 10 kW Transceiver (2.0 – 30 MHz)
 - Ten 1 kW ALE Transceivers (1.6 – 30 MHz)
- 10 X 14 Antenna Switch Matrix
- Emergency Power Generator – 150 kW
- Fiber Optic Telecom Link into Building

Comm Central – Oxford Junction Equipment

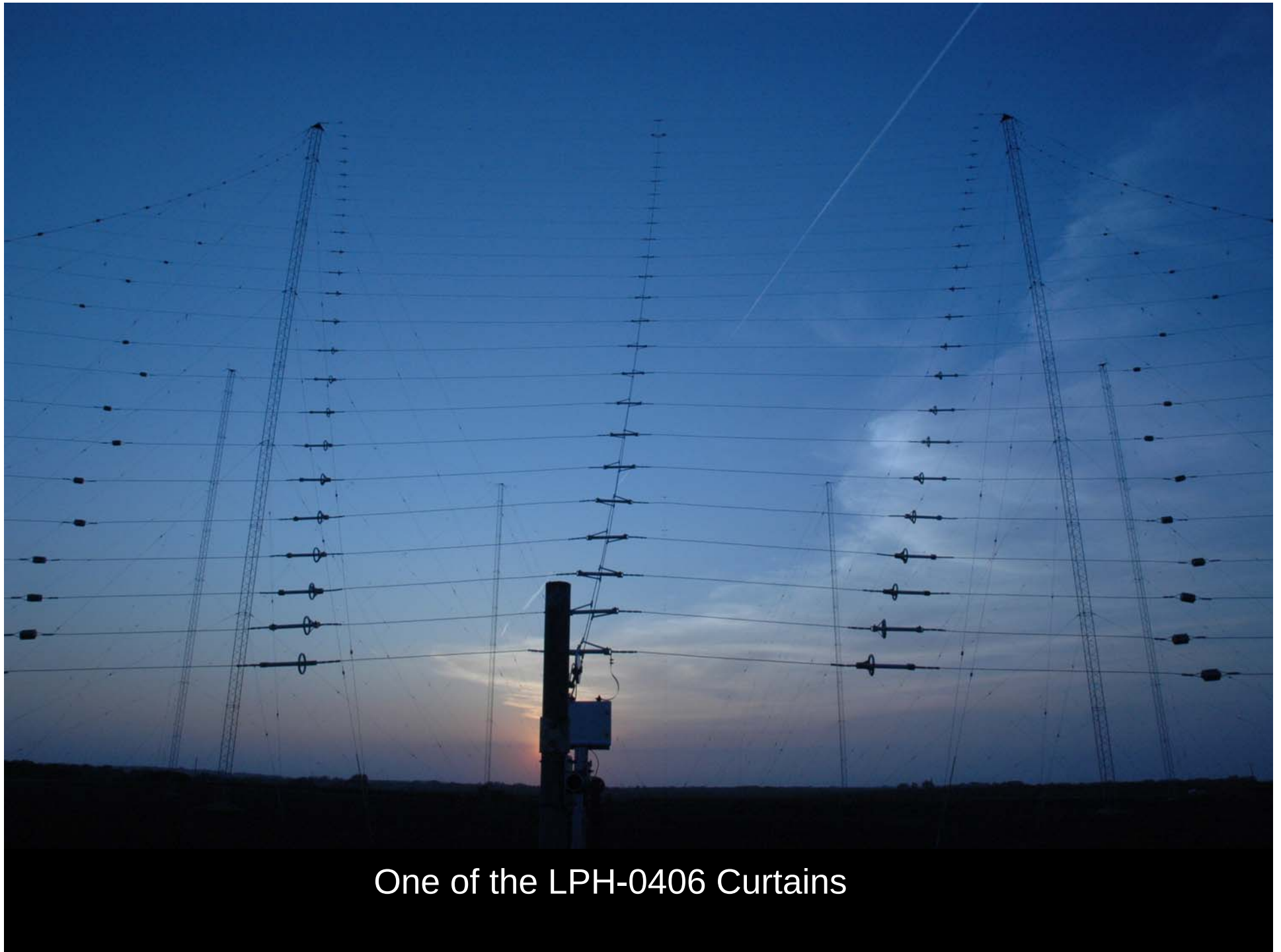
- Normally a “Lights Out” Station
- 4 Operator Consoles (for on-site local use)
- All equipment computer controlled
- On-The-Air Test Capability:
 - HF E-Mail
 - HF ALE
 - HF Modem Waveforms
 - Propagation Data Collection



**New HF Comm Central Station
Near Oxford Junction, Iowa**



The Array of Six LPH-0406 Log Periodic Curtain Antennas



One of the LPH-0406 Curtains



Side View at the front of an LPH-0406 Curtain



LPH-0406 Curtain Feed Point Configuration



CMV-330 Monopole and a 237B-3 RLP



**The Collins 237B-3
Rotatable Log Periodic Antenna**



Equipment Building with Emergency Generator



Local Operator Positions – Two of Four Available



The Antenna Switch Matrix

RCI COTHEN Lab Station

- Located in Cedar Rapids, Iowa
- HF Capabilities:
 - 1 kW ALE Transceiver
 - TRACS (Tracking Communications System)
 - Voice Privacy (VP-116)
 - Rotatable Log Periodic Antenna
 - Sabre Model 606
 - 100-foot Tower
 - 6.5 – 30 MHz



Saber Model 606 RLP Antenna on Self Supporting 100 Foot Tower

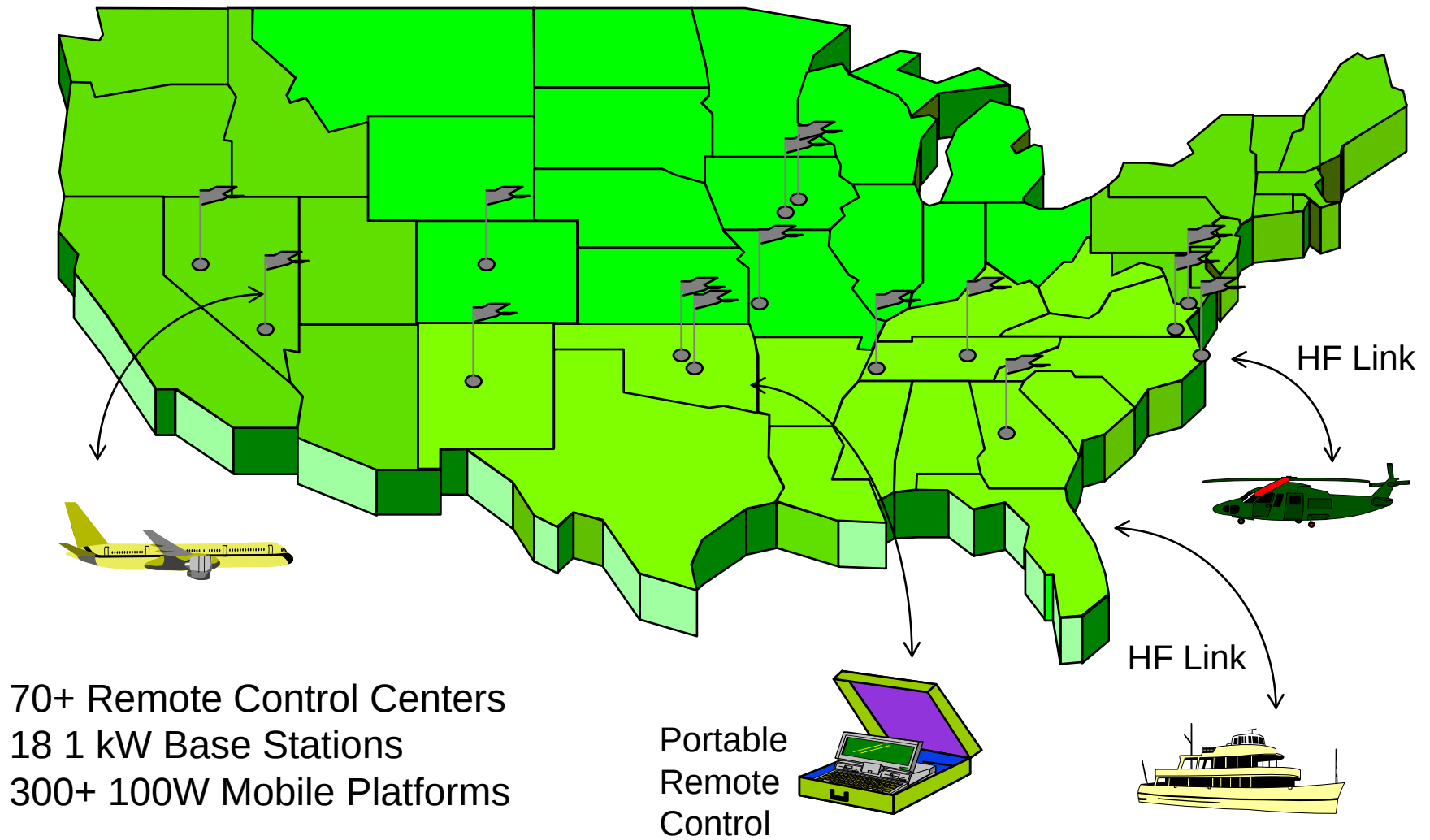


COTHEN System Integration Lab (Cedar Rapids, IA)

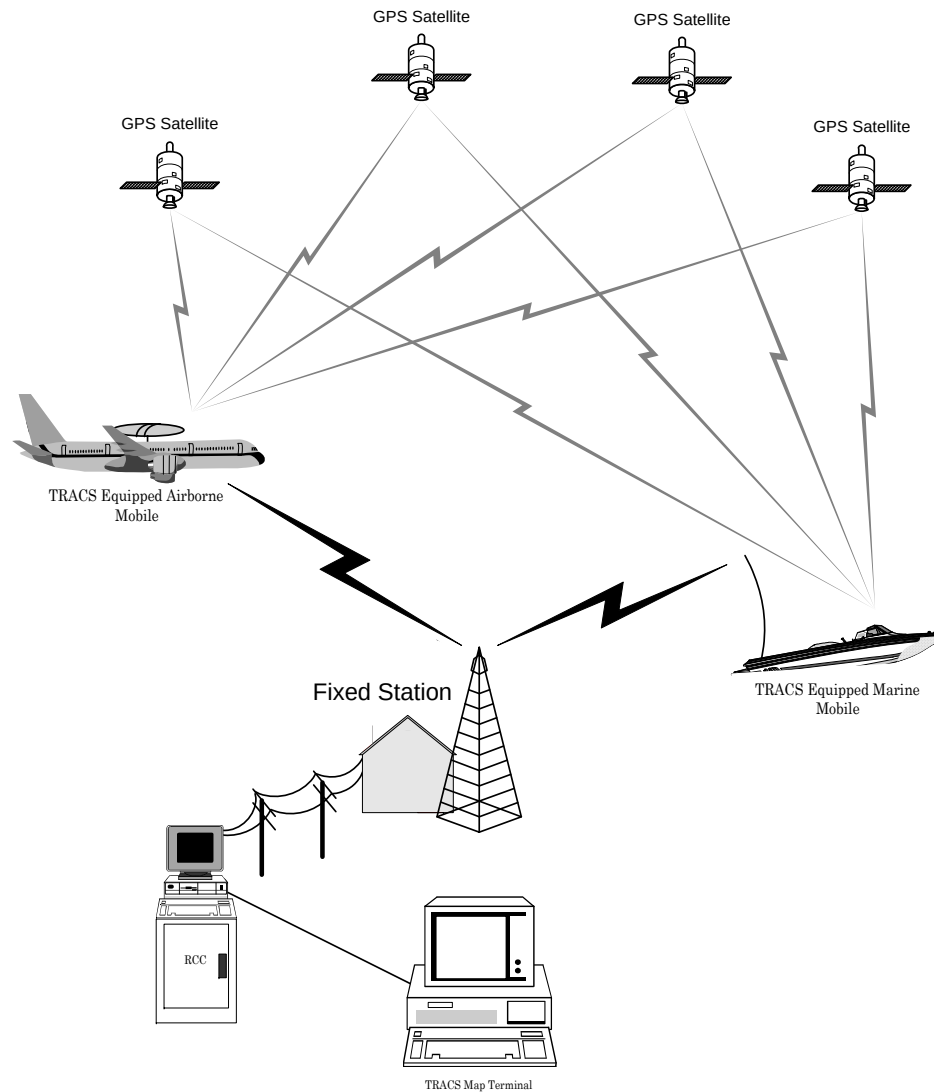
US Customs Service COTHEN

- 18 Fixed Sites in US, Puerto Rico, and Bahamas
 - 1 kW Transceivers; Log Periodic Antennas
 - 70+ Control Centers Networked to Ground Stations
- 300+ Mobile Systems
 - 100 W Mobile Systems
 - On a Variety of Platform Types
- All have ALE, Simplified Control, and Voice Privacy
- Initially Fielded in 1985

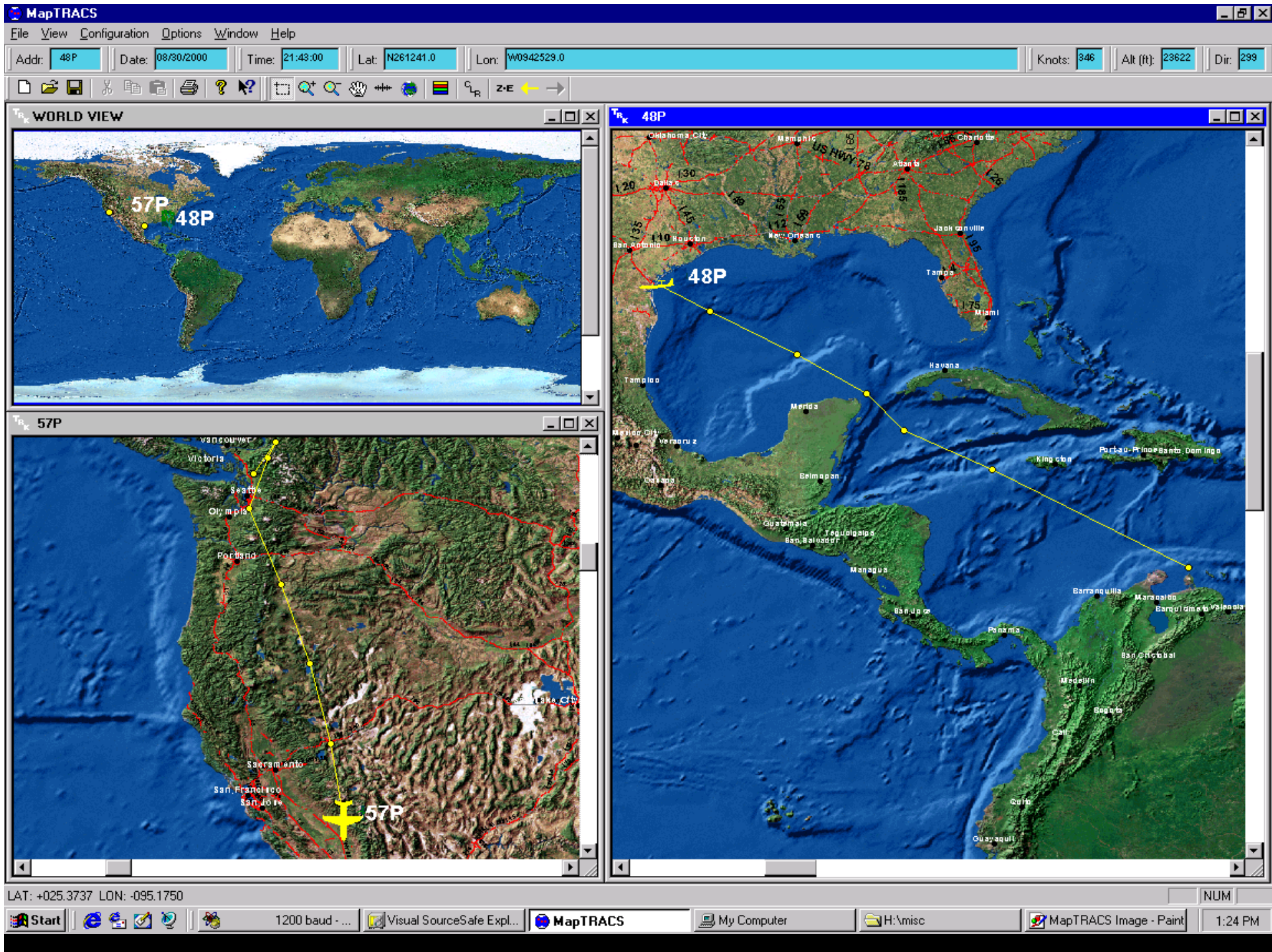
COTHEN



TRACS



- Provides Asset Tracking of Mobile Platforms Using ALE
- Error-Free Position Location Transmission Over HF
- Little to No Operator Assistance
- Accuracy Within 100 Meters



RCI Melbourne, FL Stations

- Building 307 Capabilities:
 - 1 kW HF-80 Transceiver
 - Rotatable Log Periodic Antenna (6.2 – 30 MHz)
 - Antenna Products Model LP-1017CA RLP
 - 80-foot Tower
 - T2FD Antenna; B&W BWD-90 (6 – 30 MHz)
 - Long Wire Antenna with tuner
- Building 312 Capabilities:
 - 400 W HFS-900 Transceiver
 - Aeronautical Voice/Data
 - T2FD Antenna; B&W BWD-90 (6 – 30 MHz)



**Rockwell Collins
Avionics Div
Melbourne, Florida**

**Antenna Products Model
1017CA RLP Antenna on
80 foot Tower**

RC France Stations

- Blagnac Station Capabilities:
 - 1 kW URG-III Transceiver, Q9600 Modem, & HF Messenger
 - Rotatable Log Periodic Antenna (6.2 – 30 MHz)
 - Antenna Products Model LP-1017CA RLP
 - 80-foot Tower
- CREIL Station Capabilities:
 - 400 W URG-III Transceiver, Q9600 Modem, & HF Messenger
 - T2FD Antenna; Telex 1910AA (6 – 30 MHz)
 - Local Control or Remote Control from Blagnac



**Rockwell Collins France
Blagnac, France**

**Rotatable Log Periodic
Antenna (6.5 – 30 MHz)**

HF Propagation Prediction Software

- PropMan 2000 TM
 - Windows GUI with Ioncap Engine
 - Point-to-Point Ionospheric HF Propagation Predictions
 - Determine Optimum ALE Channel Frequencies
- GRWAVE
 - HF Surface Wave Propagation Model
- PropCov Program
 - VOACAP Engine
 - Coverage Area from Single Transmitter
- FreqPlan Program
 - Customized PropMan for Moving Platforms such as Aircraft

PropMan 2000 - [S._CHINA SEA_to_KUALA_LUMPUR]

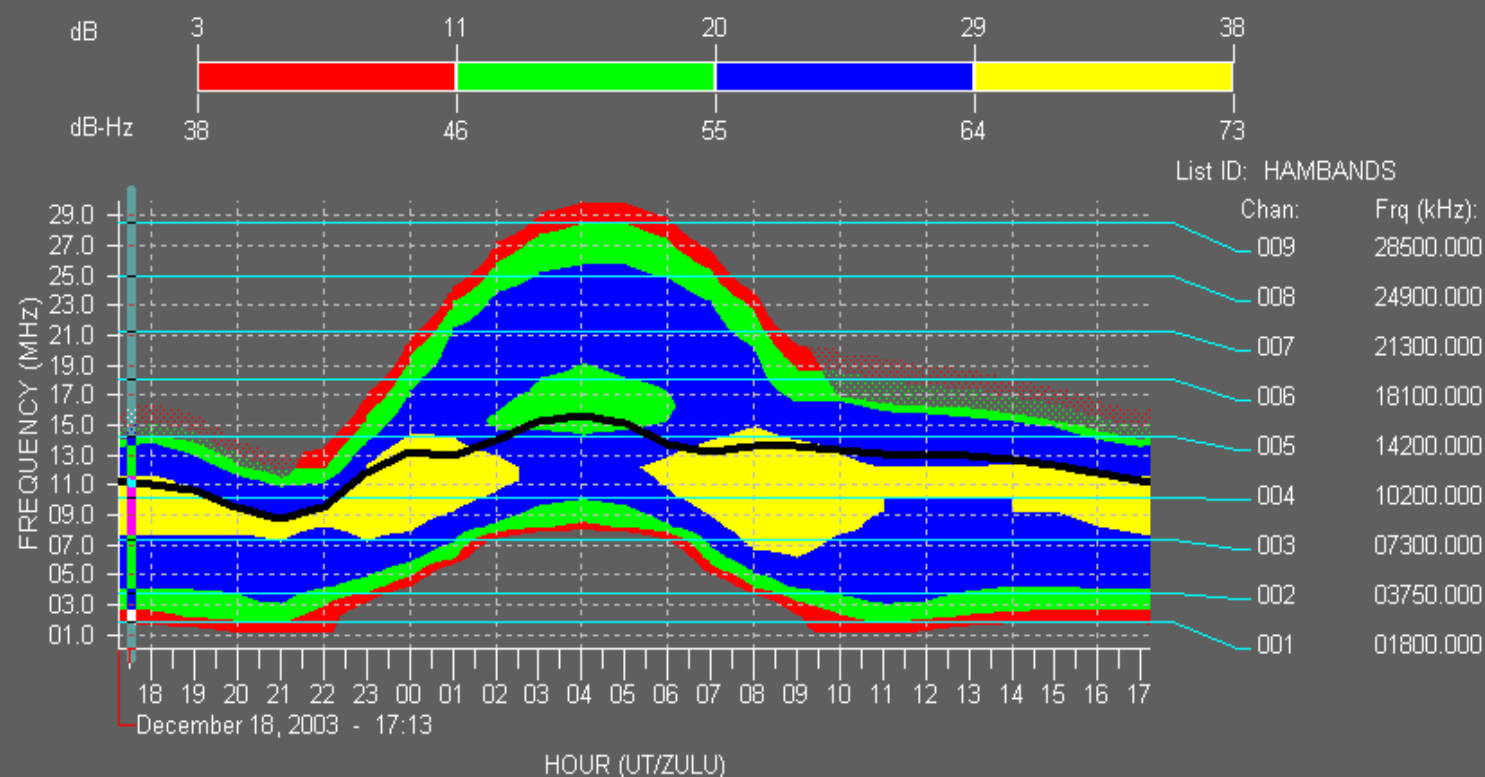
File View Parameters Options SpaceWeather Window Help



Xmt Station: S. CHINA SEA, MALAYSIA 245.44 Deg. Az. 547.4 Naut. Mi. Default All
 Rcv Station: KUALA LUMPUR, MALAYSIA 64.70 MAPM Deg. Use Default
 Xmt Ant. Gain: 0.00 dBi Xmt Pwr: 1.000 kW Rcv Ant. Gain: 3.00 dBi SSN: 97 Apply
 Path: SHORT Path Usage: AMD DATA Noise Type: REMOTE Cancel

**Aircraft Flying in
South China Sea
(N 7.0 E 110.0)
Transmitting 100-W to
Malaysia Receiver
with 7dBi Antenna**

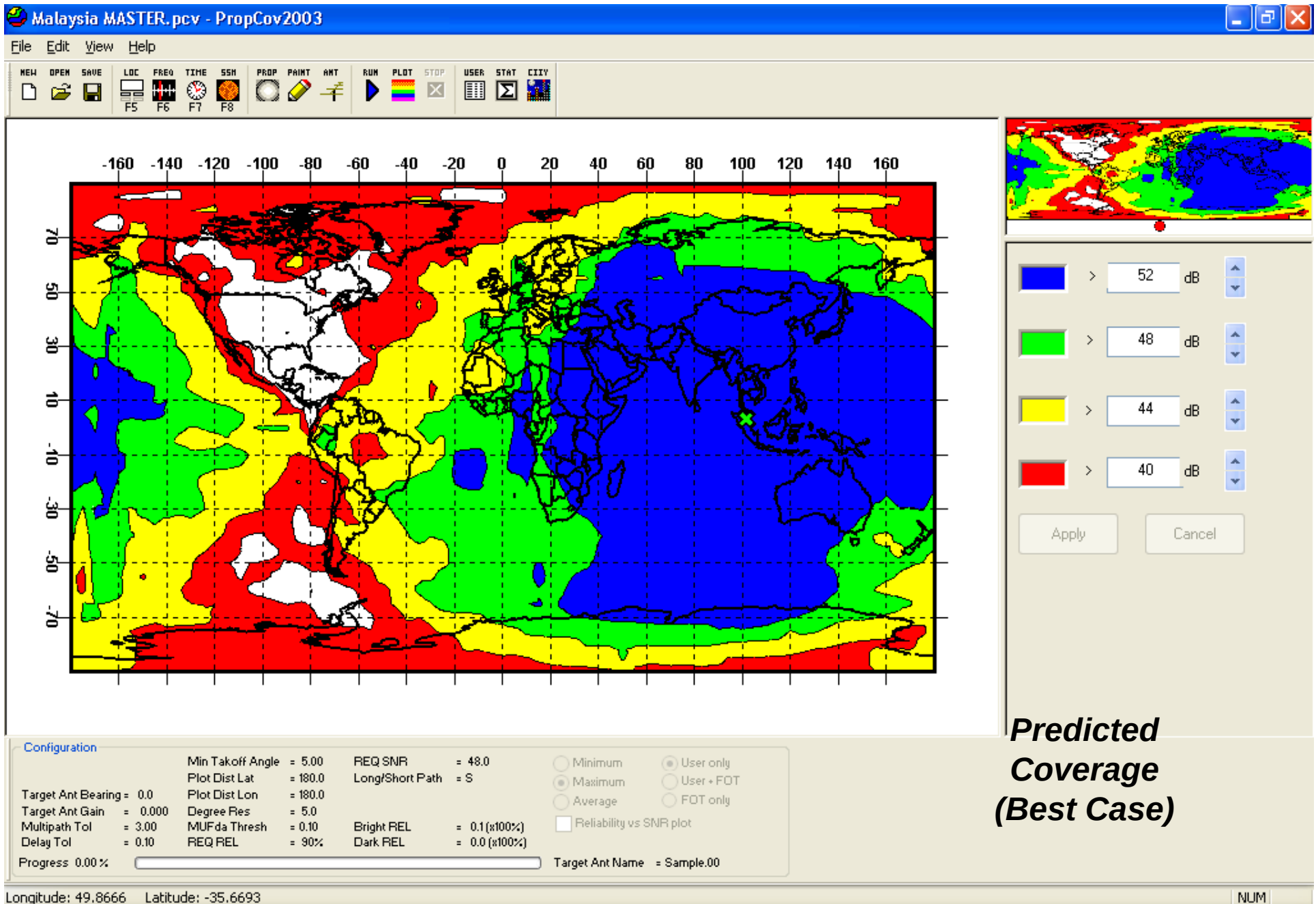
Frequency/SNR Vs Time



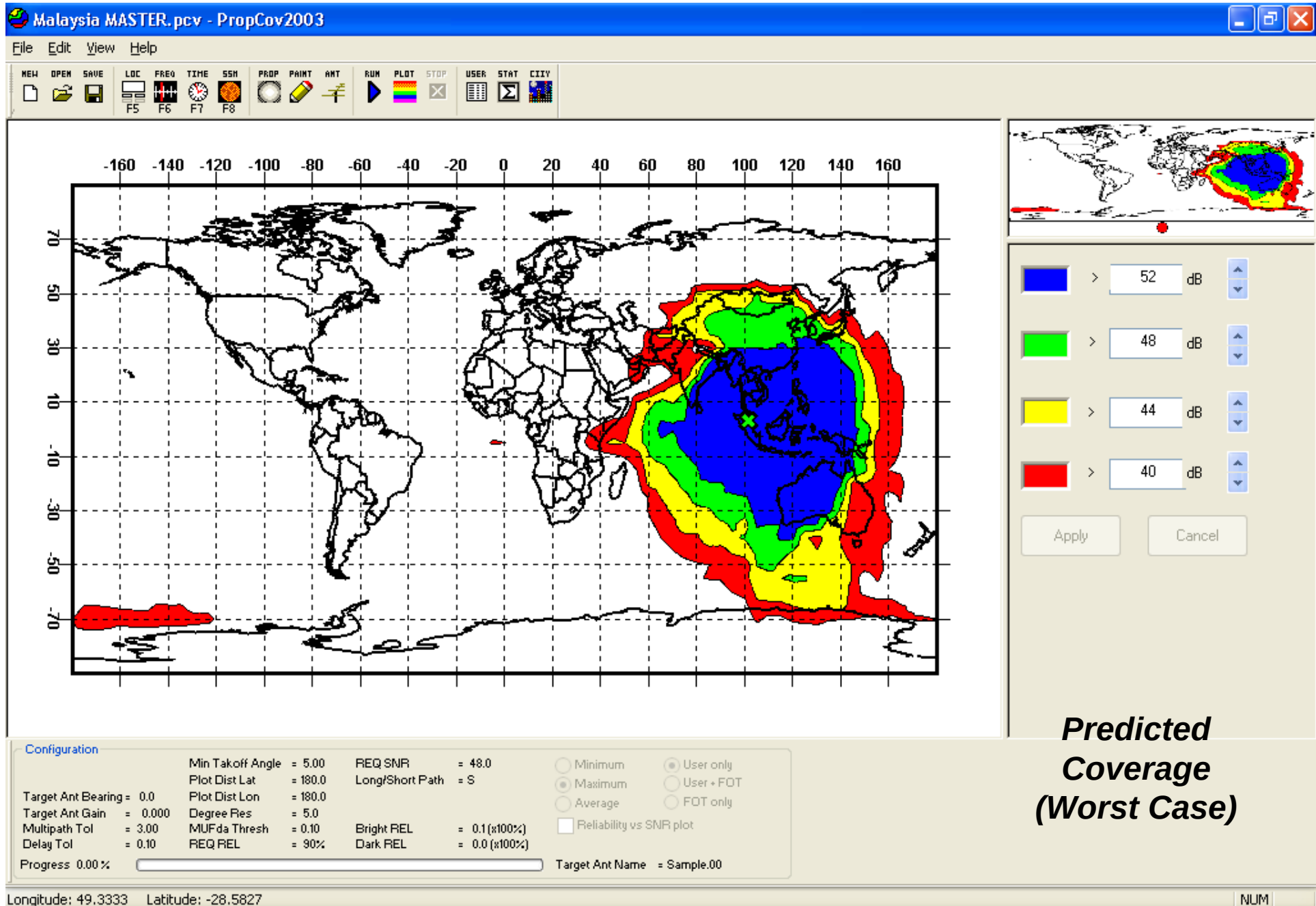
Freq = 21.3 MHz, SNR = -8 dB, 27 dB-Hz, 10:26:38

11:14:04 Local

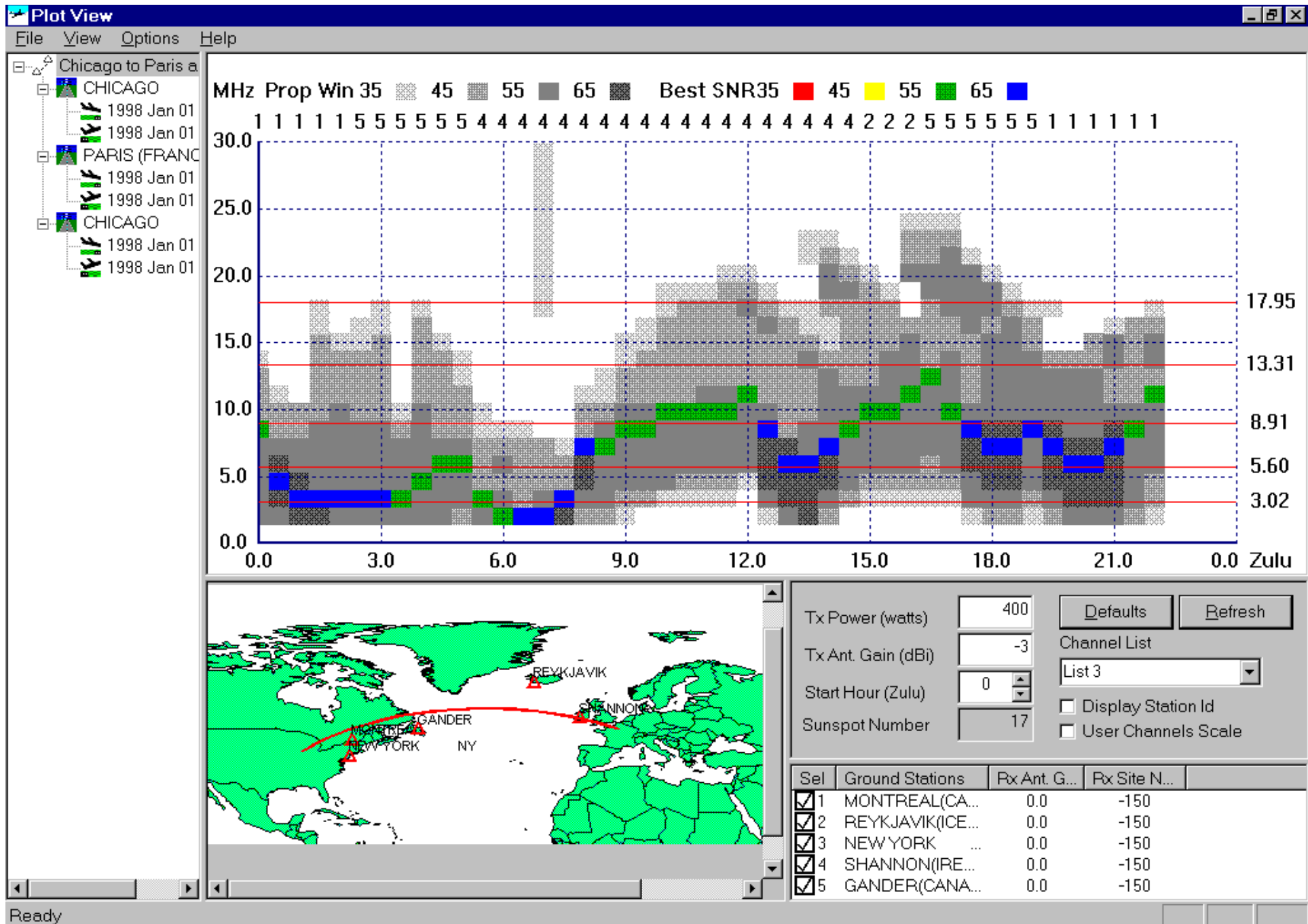
PropMan 2000 HF Propagation Prediction Program



PropCov Area HF Propagation Prediction Program



PropCov Area HF Propagation Prediction Program



FreqPlan HF Propagation Prediction Program

Summary

HF On-The-Air Testing Options

- HF Test Links among Rockwell Collins Stations
- Two way test link between RCI HF Station(s) and customer's HF station
- RCI HF Station(s) combine with other HF stations for HF Network testing

Summary

HF On-The-Air Testing Options

- Real World HF Performance Evaluations
 - ALE Testing
 - Modem Waveform Testing
 - Data Protocols
 - HF Networking Protocols
 - Interoperability on-the-air Testing
- Propagation Prediction, Monitoring, & Analysis
- Technical Support and Analysis Available



The End