Solar Minimum ALE NVIS Project

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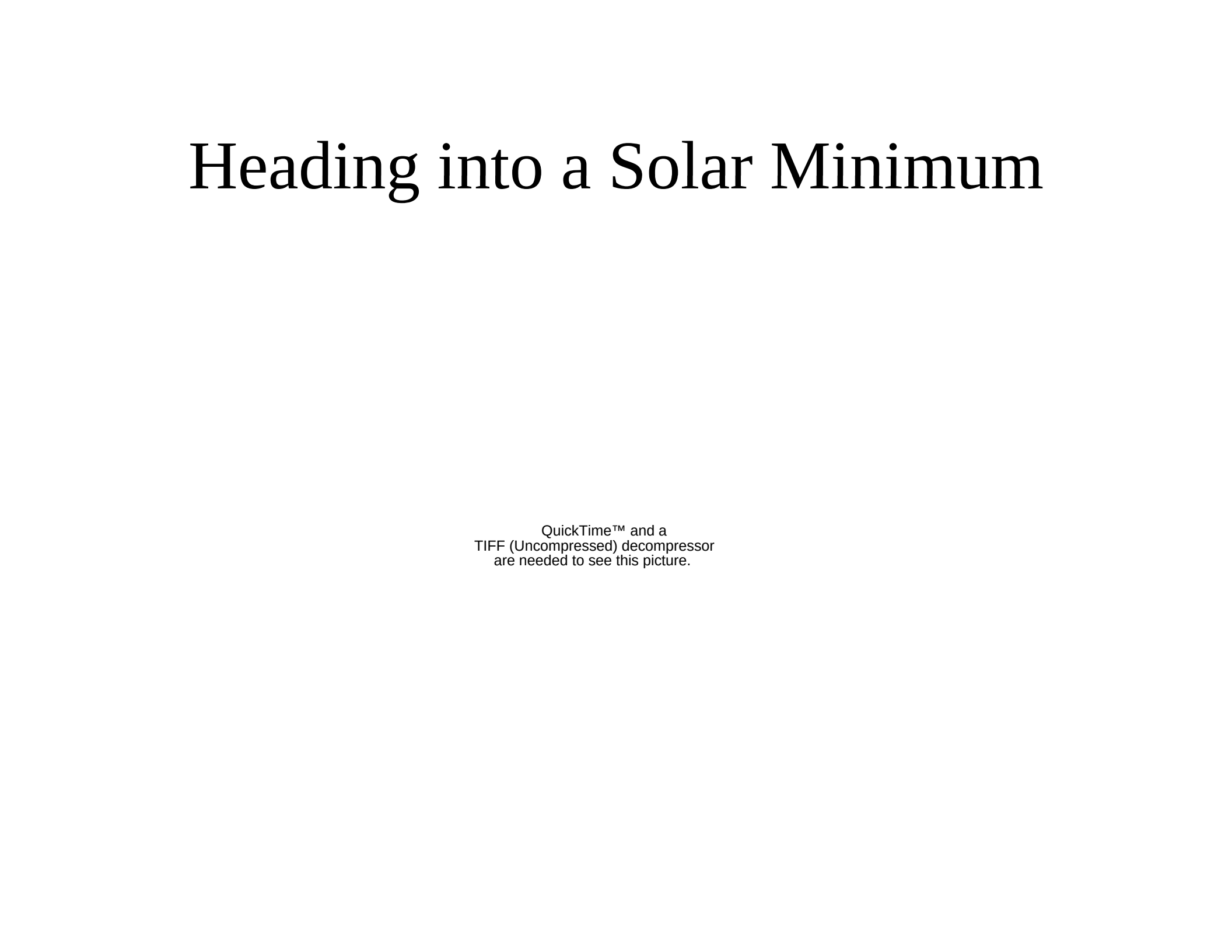
QuickTime™ and a
QuickDraw decompressor
are needed to see this picture.

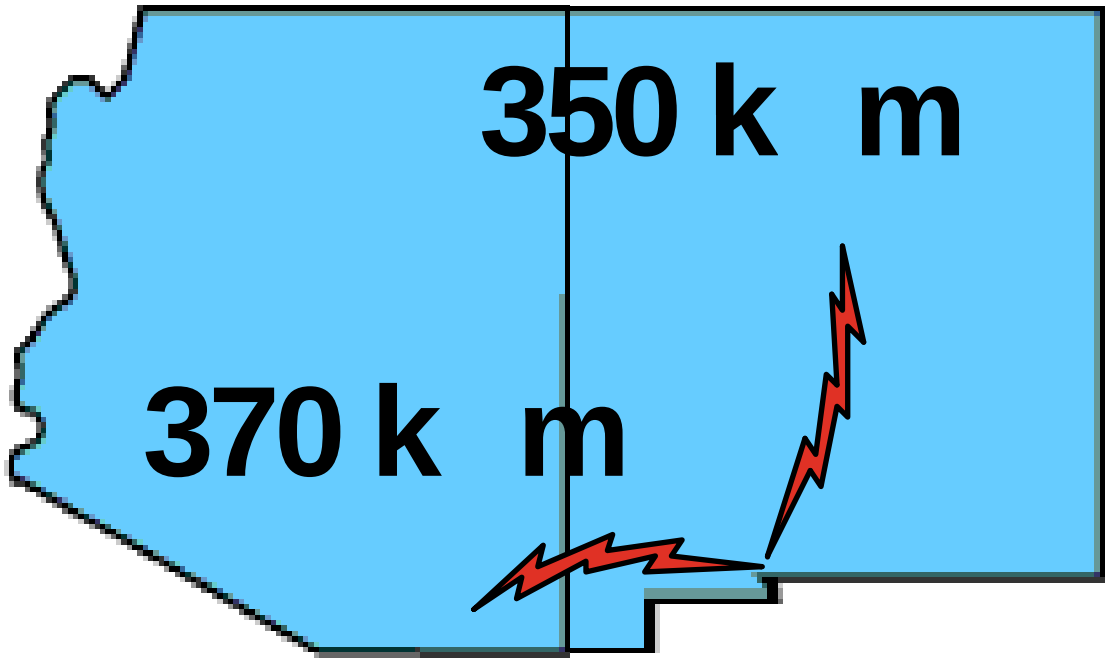
Heading into a Solar Minimum



Purpose of Study

- Will ionization at solar minimum support NVIS operation at temperate latitudes?
- What frequency bands will be required? (Impact of ITU Action Item 1.13)
- Will ALE be effective?

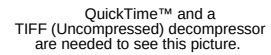
NVIS Paths



Equipment

- ALE radios at NMSU, JITC, Albuquerque
- 100 W nominal (about 50 W into antenna)
- Broadband horizontal dipole antennas (flat and inverted V)
  - Switched to RLP at NMSU starting Aug ‘06

Obligatory Antenna Picture



Antenna Products LPH-1A on freestanding tower behind Physical Science Laboratory, NMSU

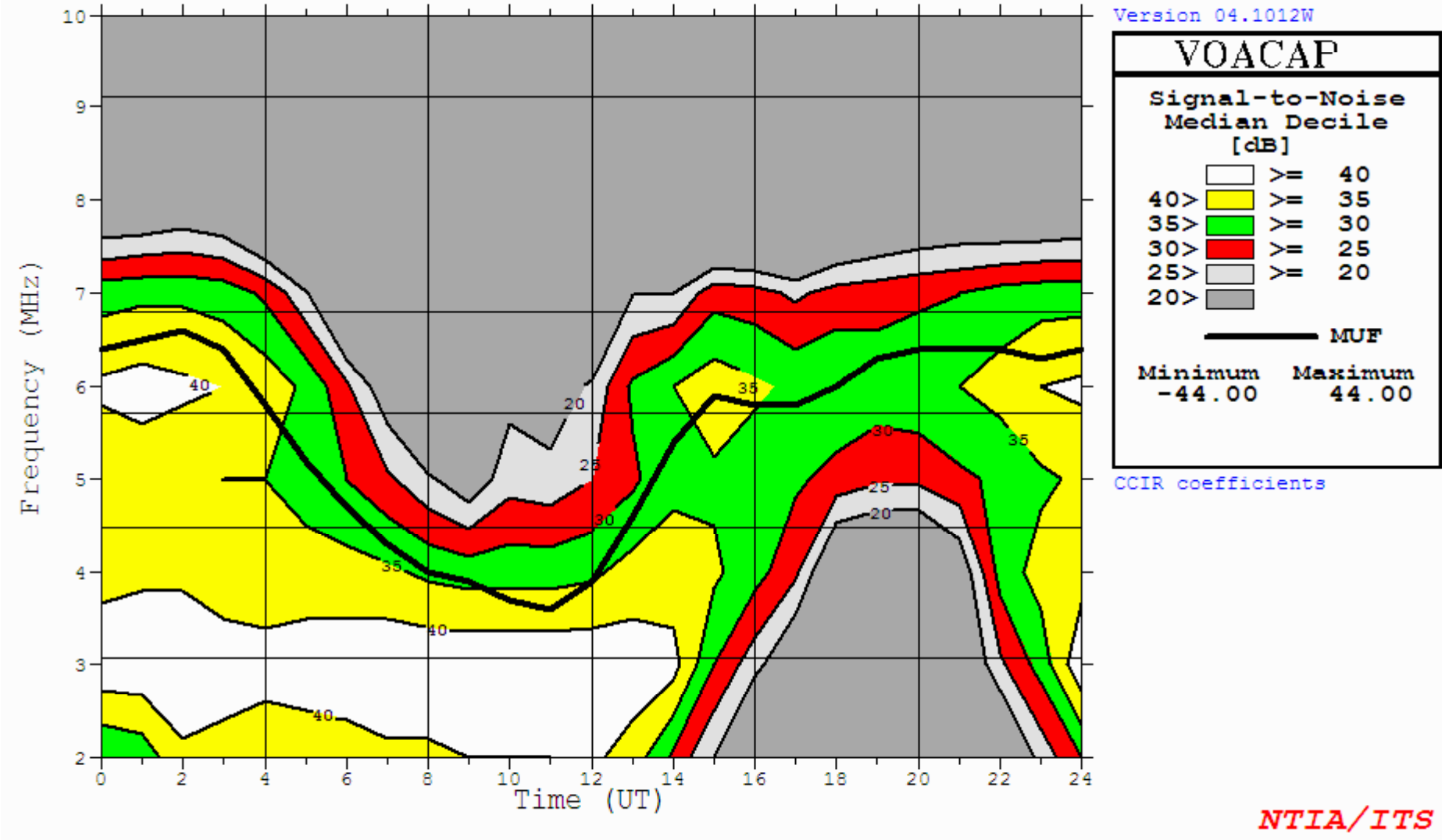
Measurement Approach

- Sounding on 5 Frequencies (DRJ at NMSU)
  - 3.1, 4.5, 5.7, 6.8, and 9.1 MHz
- SNR recorded by receiving ALE radio (JITC)
- Monthly averages of measurements compared to VOACAP predictions

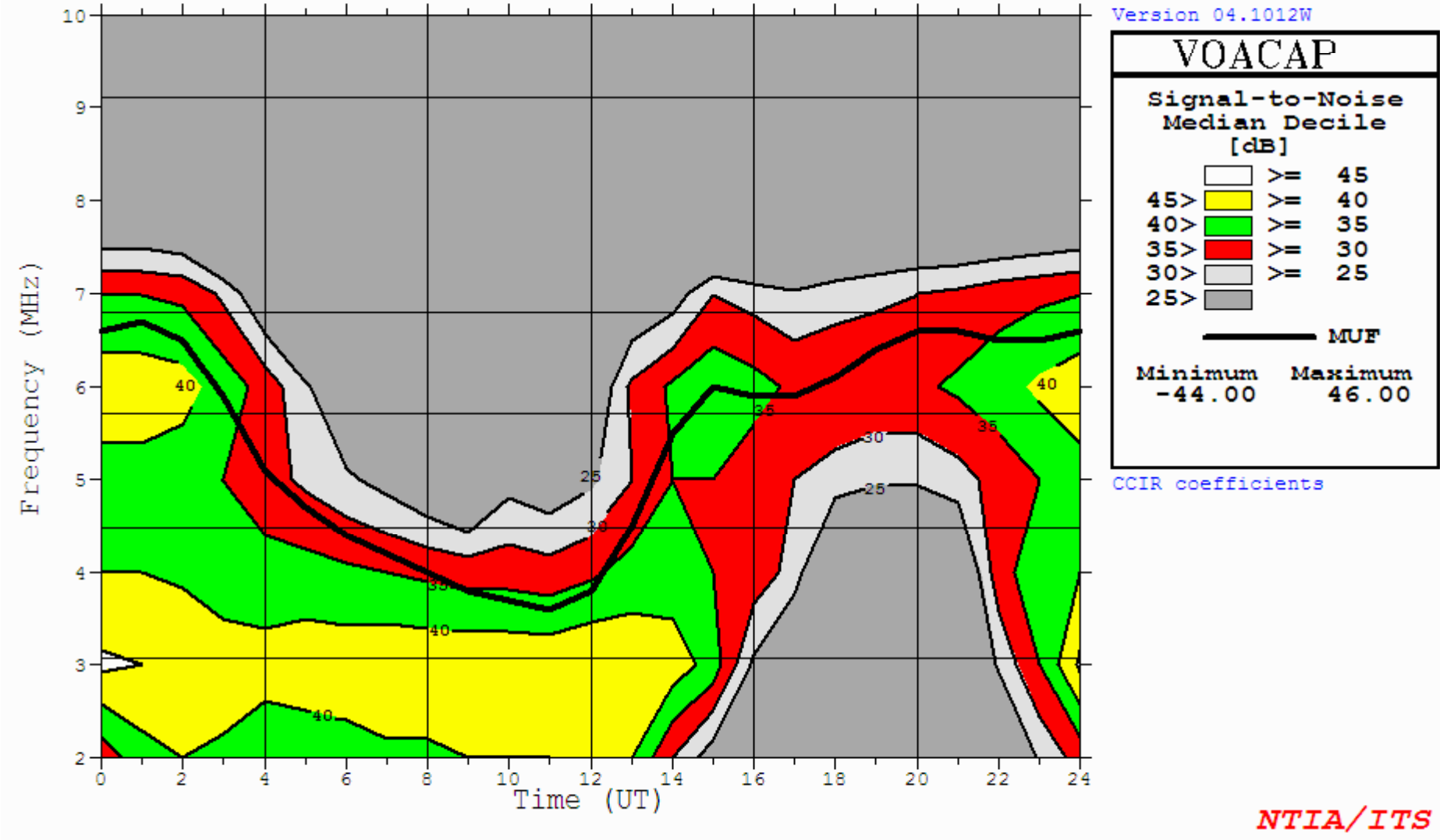
VOACAP Predictions

NOTE: Antenna models not fully calibrated for antennas in use

July 2006: VOACAP

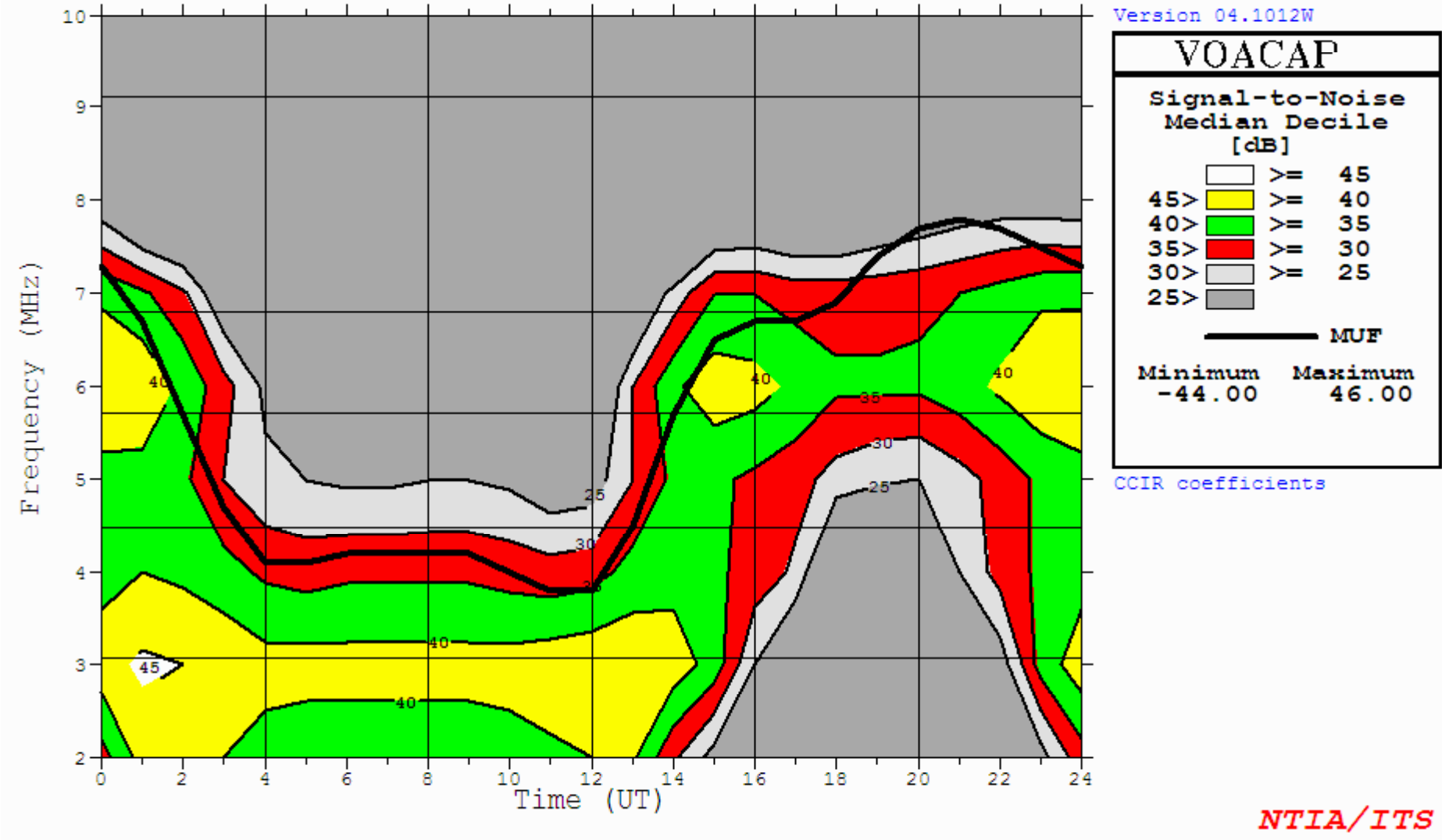


August 2006: VOACAP

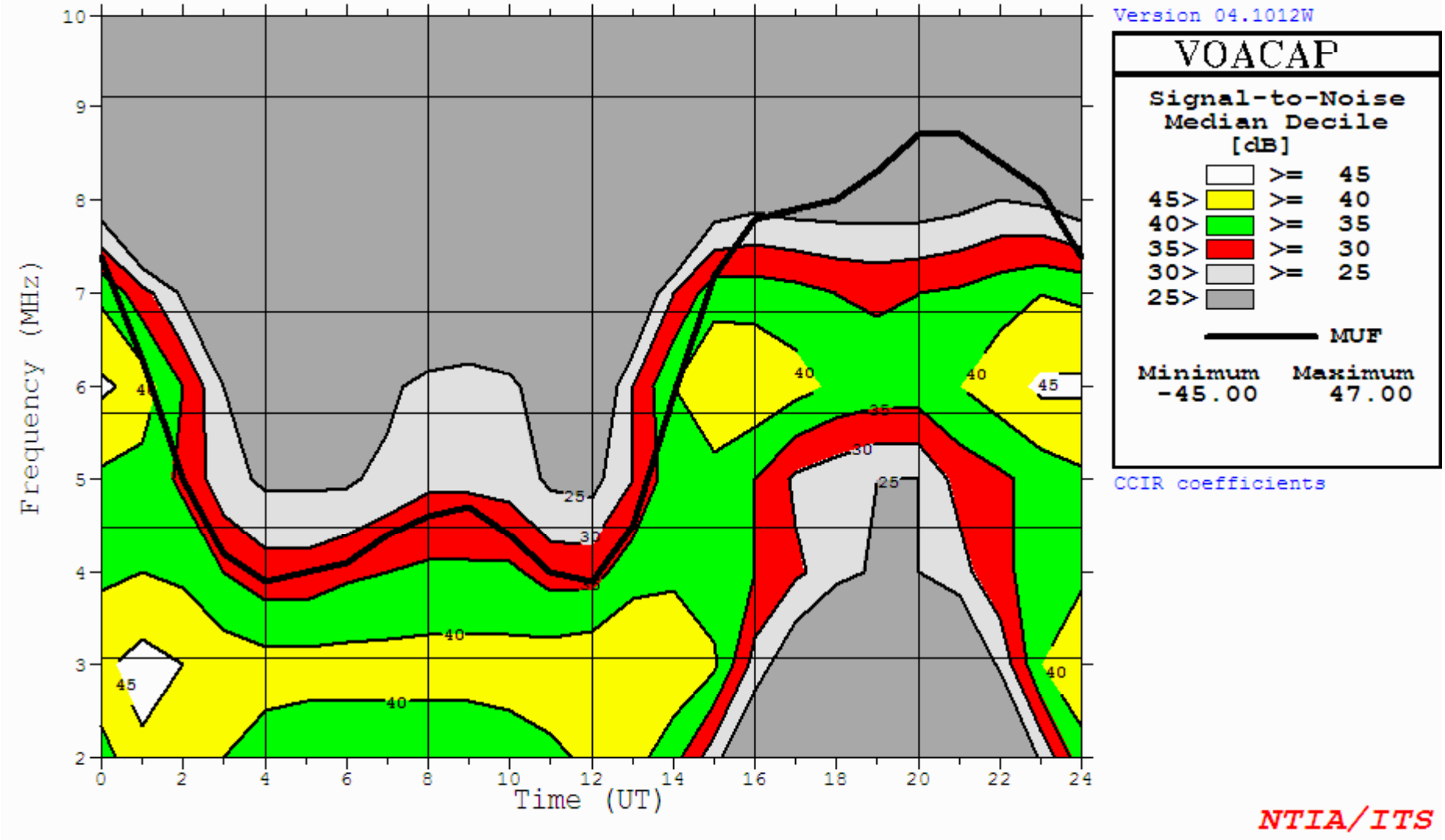


NTIA/ITS

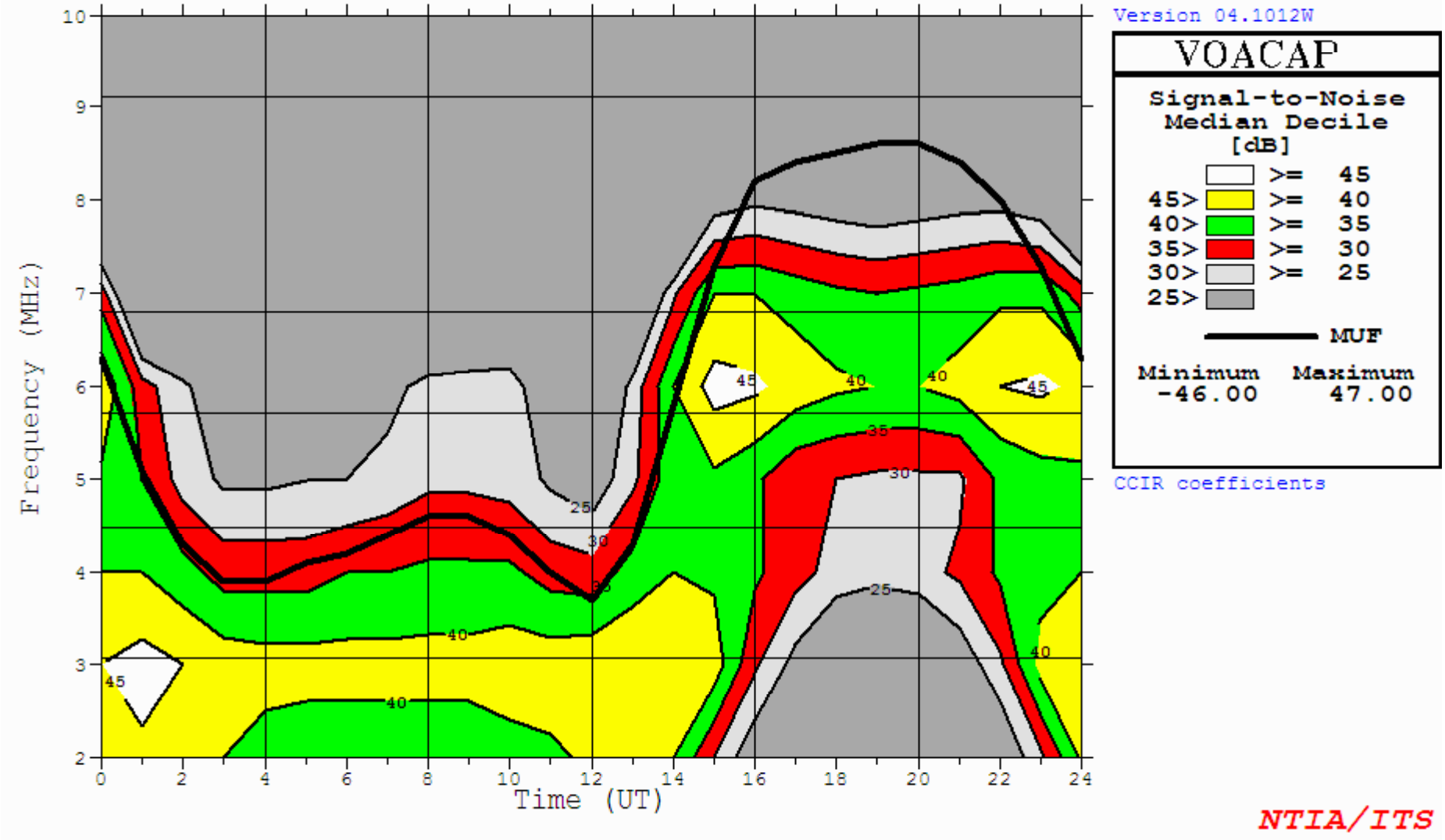
September 2006: VOACAP



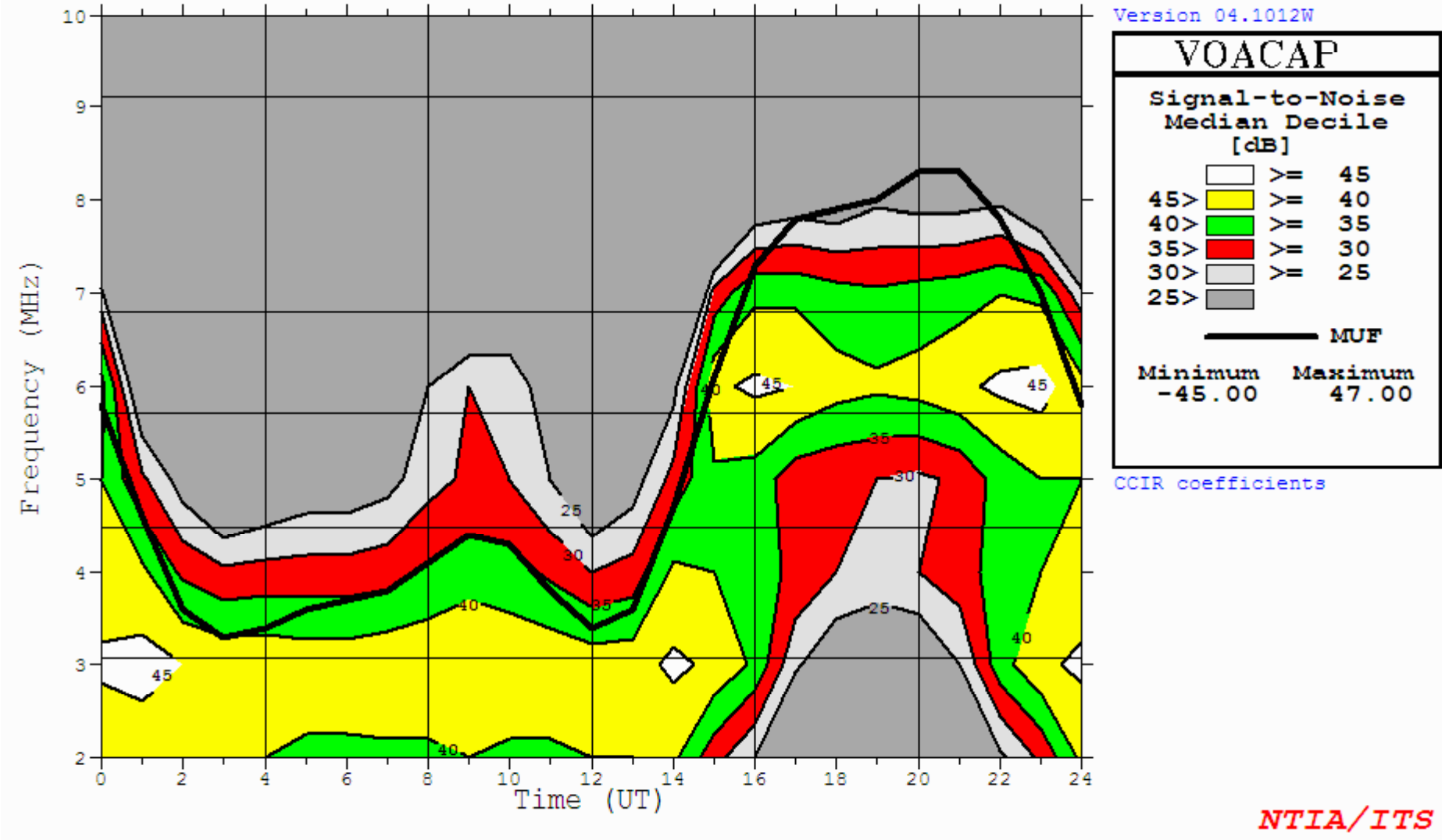
October 2006: VOACAP



November 2006: VOACAP

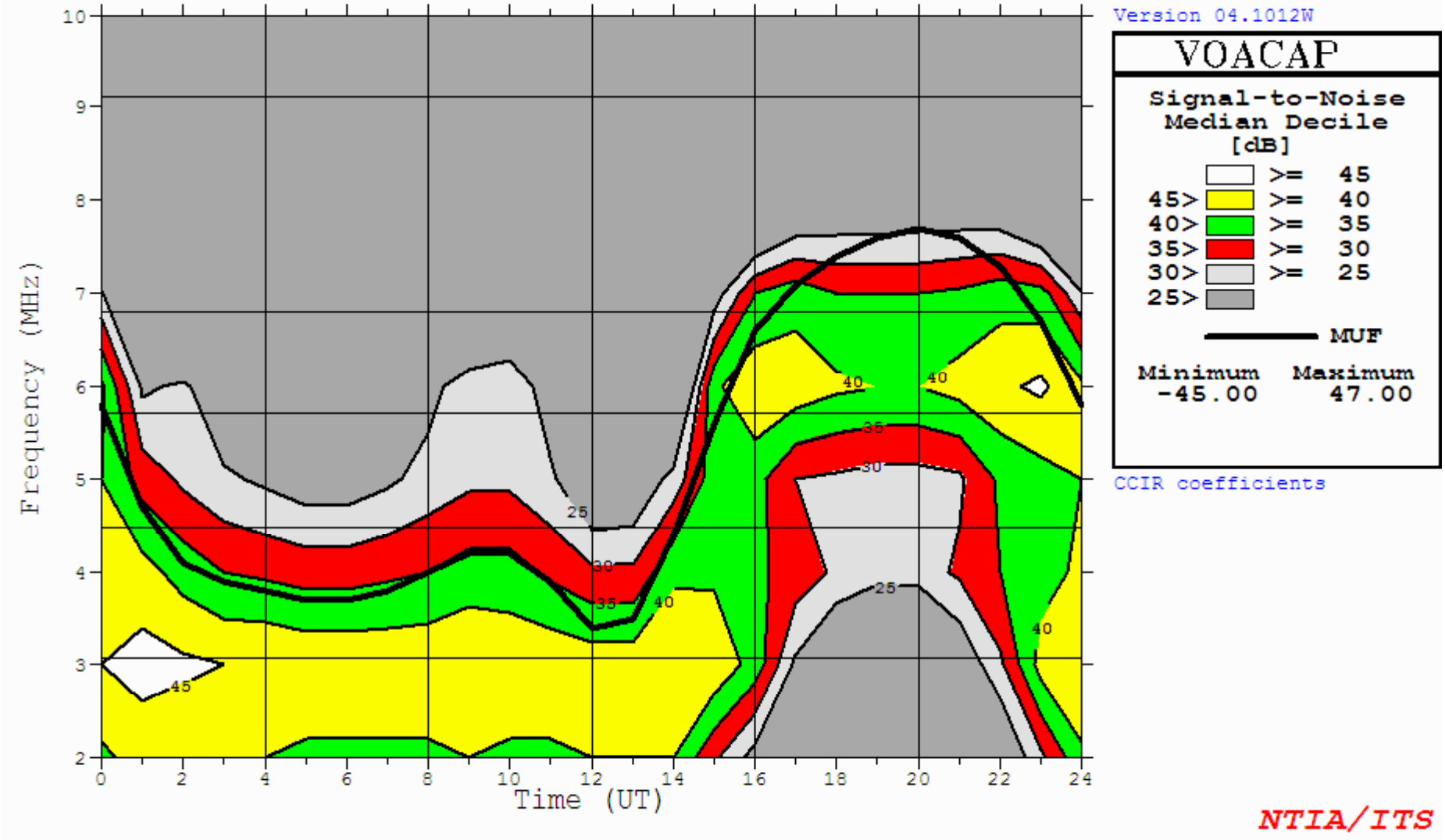


December 2006: VOACAP



NTIA/ITS

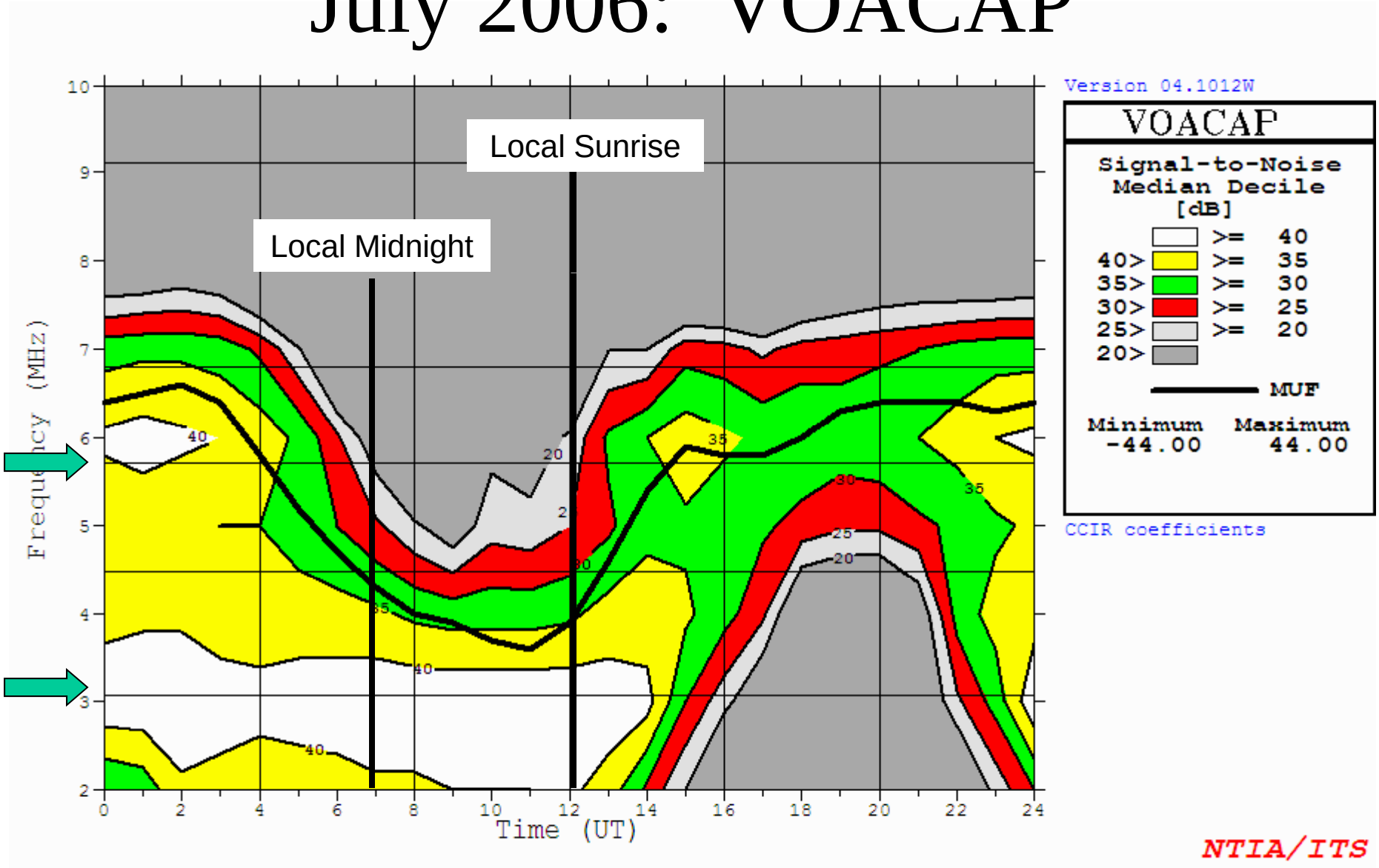
Jan 2007: VOACAP

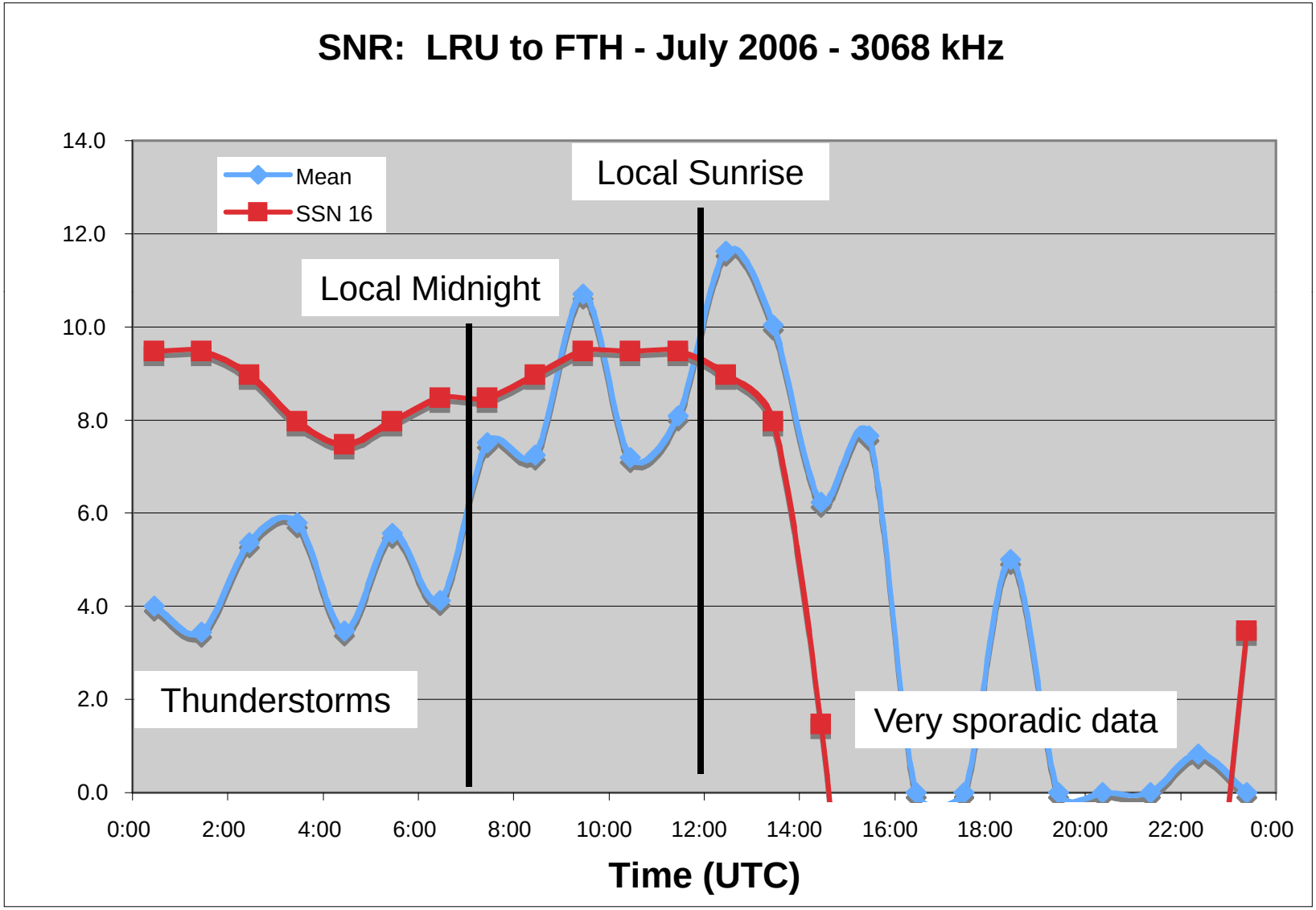


NTIA/ITS

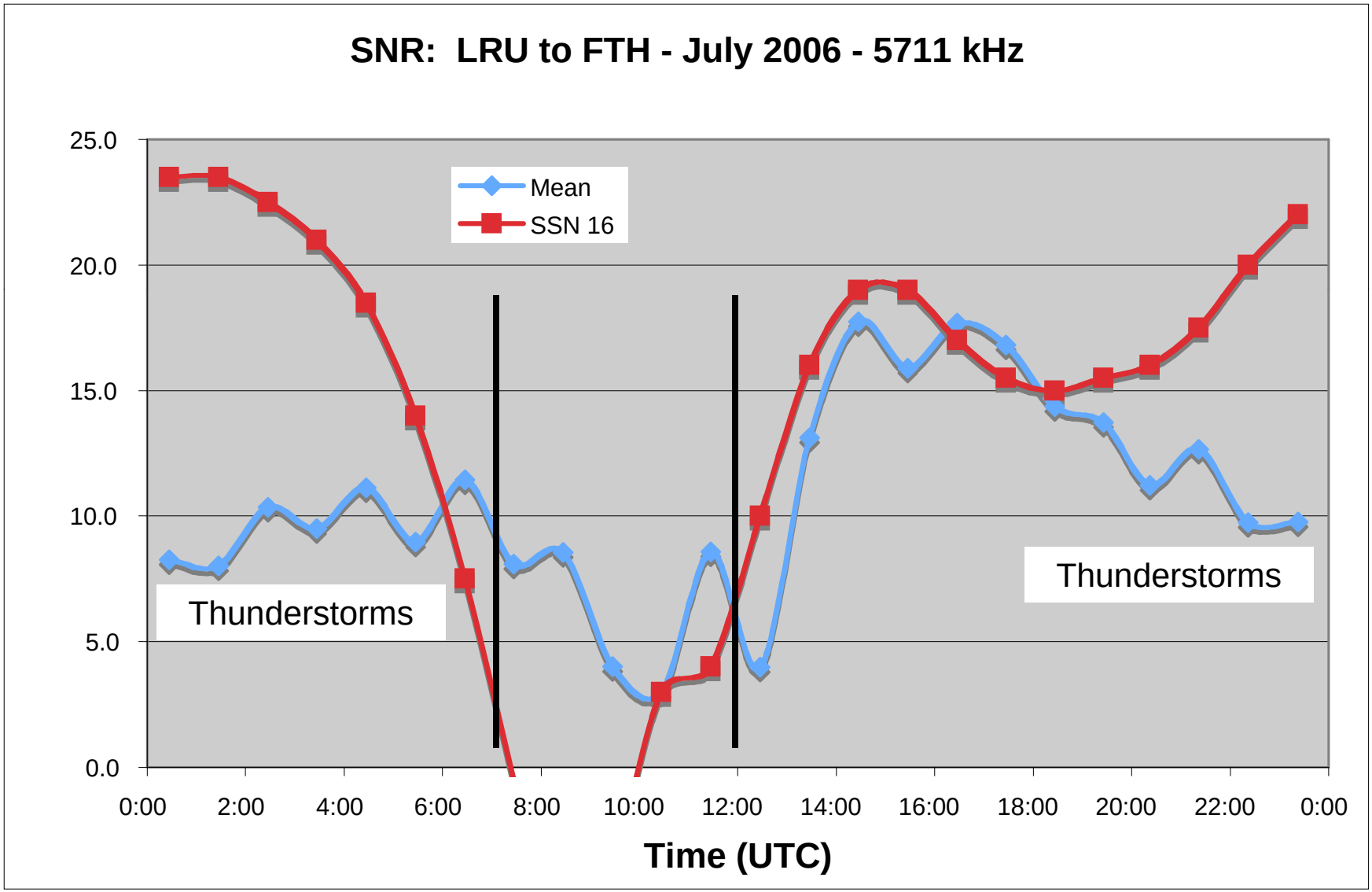
Comparison with Measurements

July 2006: VOACAP



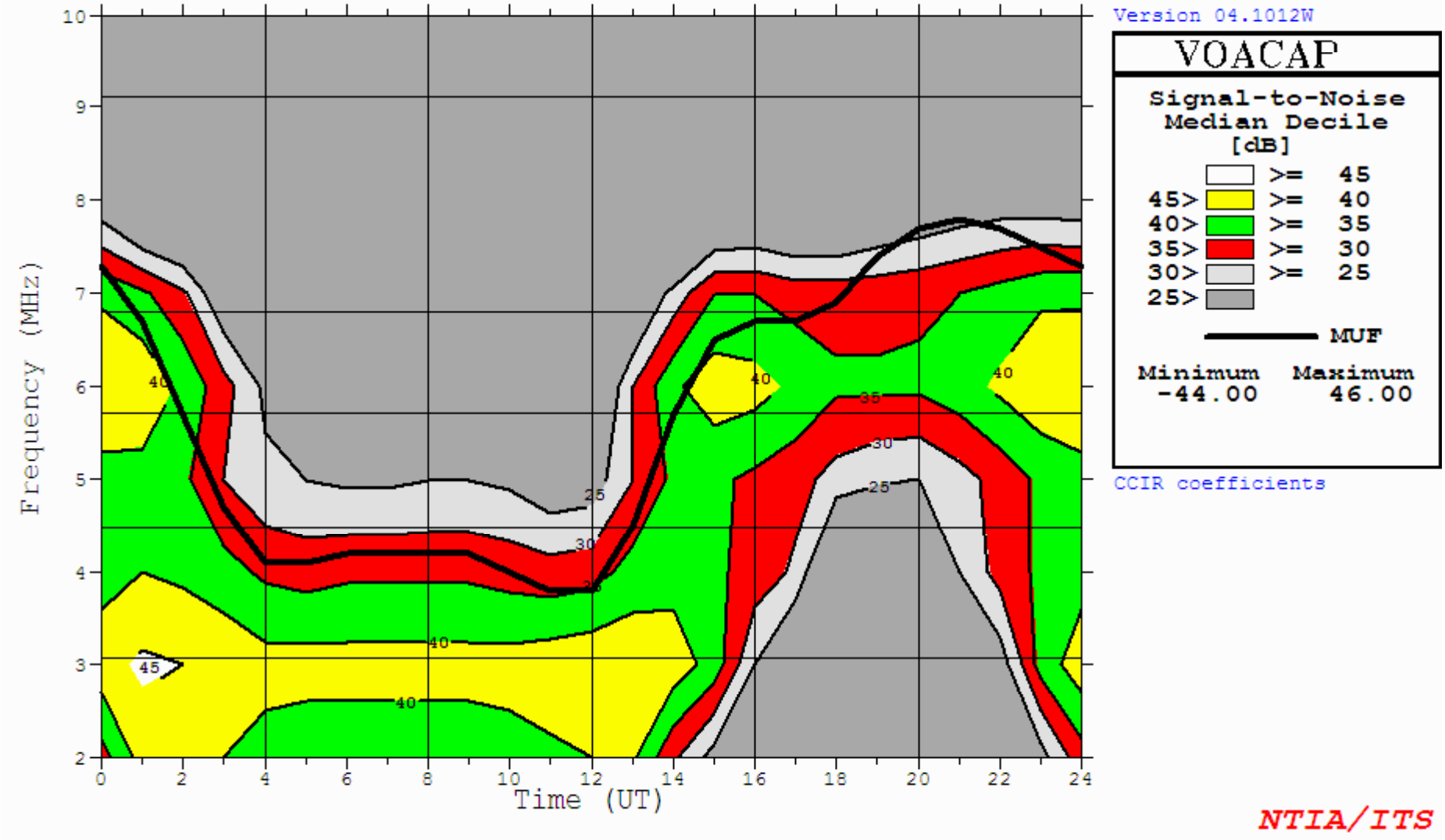


Adjustment: +0.5 dB

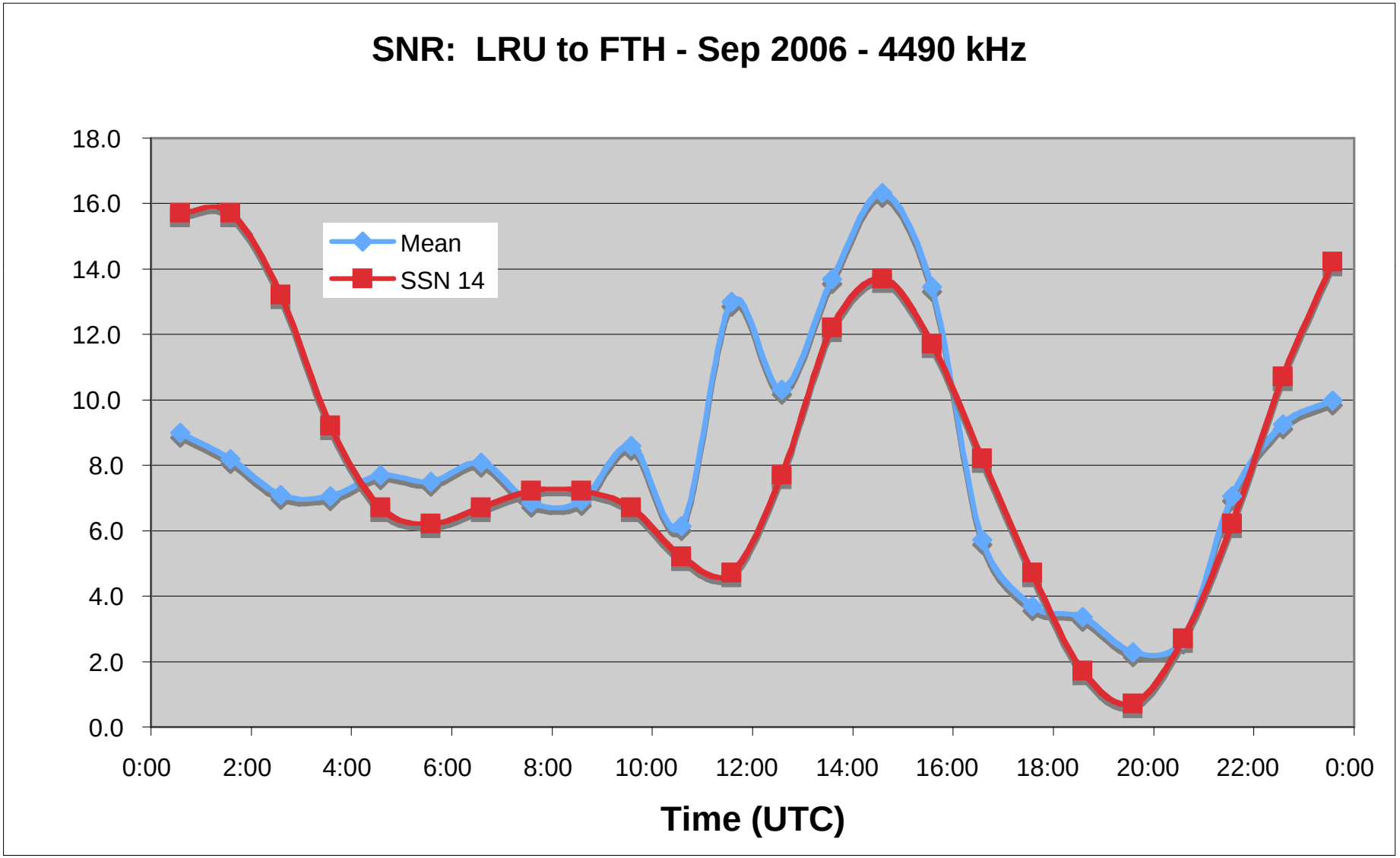


Adjustment: +18 dB

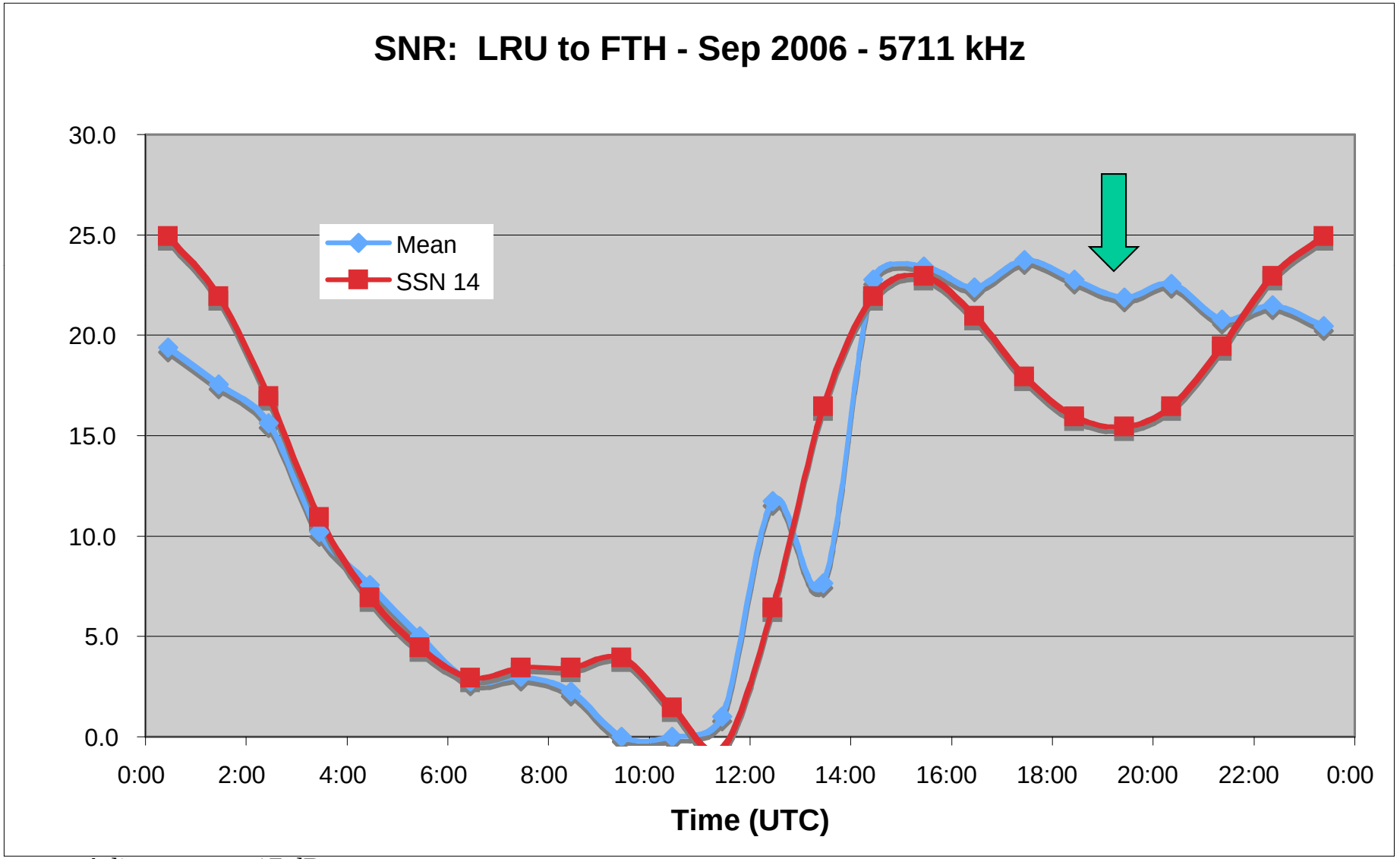
September 2006: VOACAP



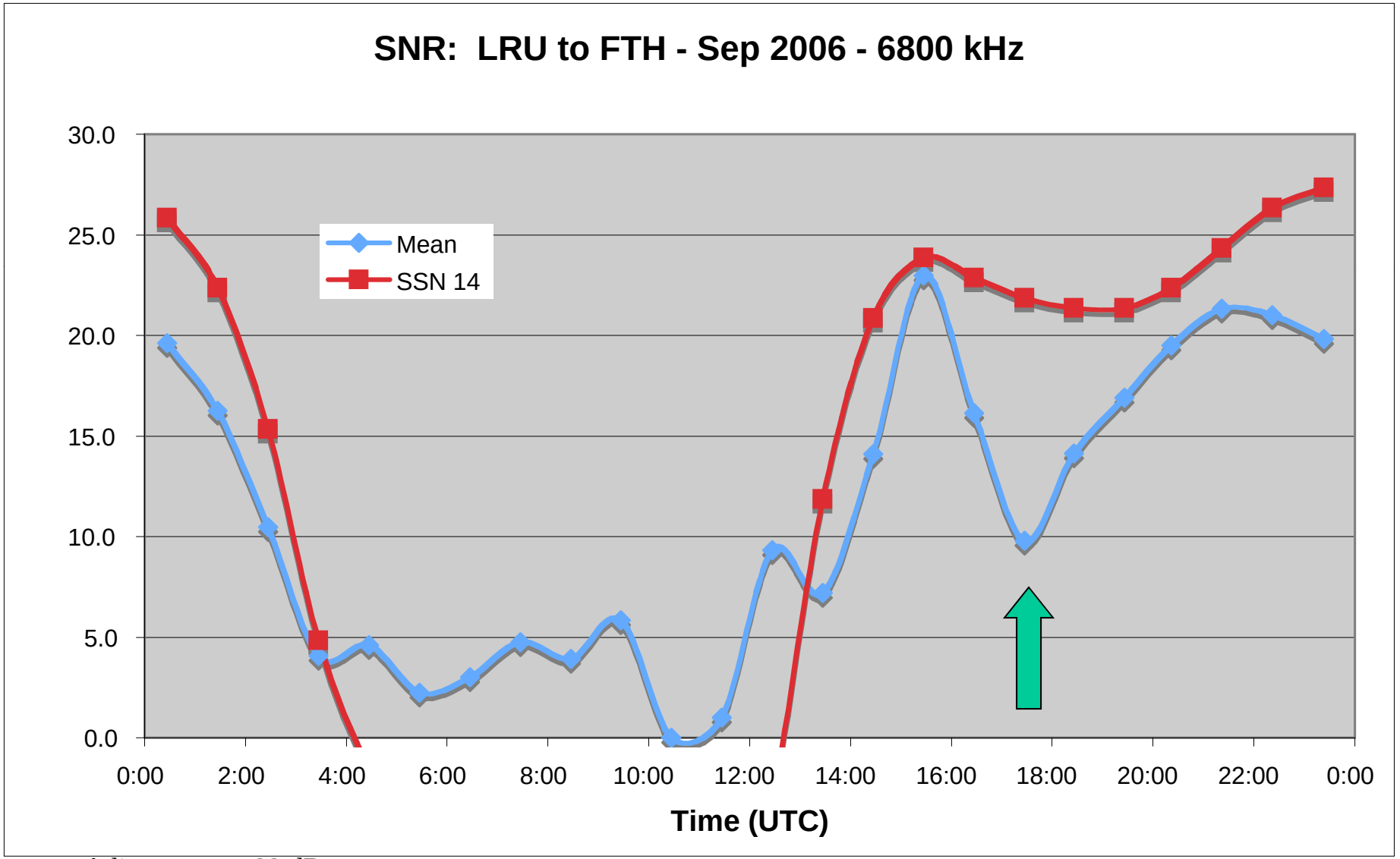
(3068 kHz unreliable)



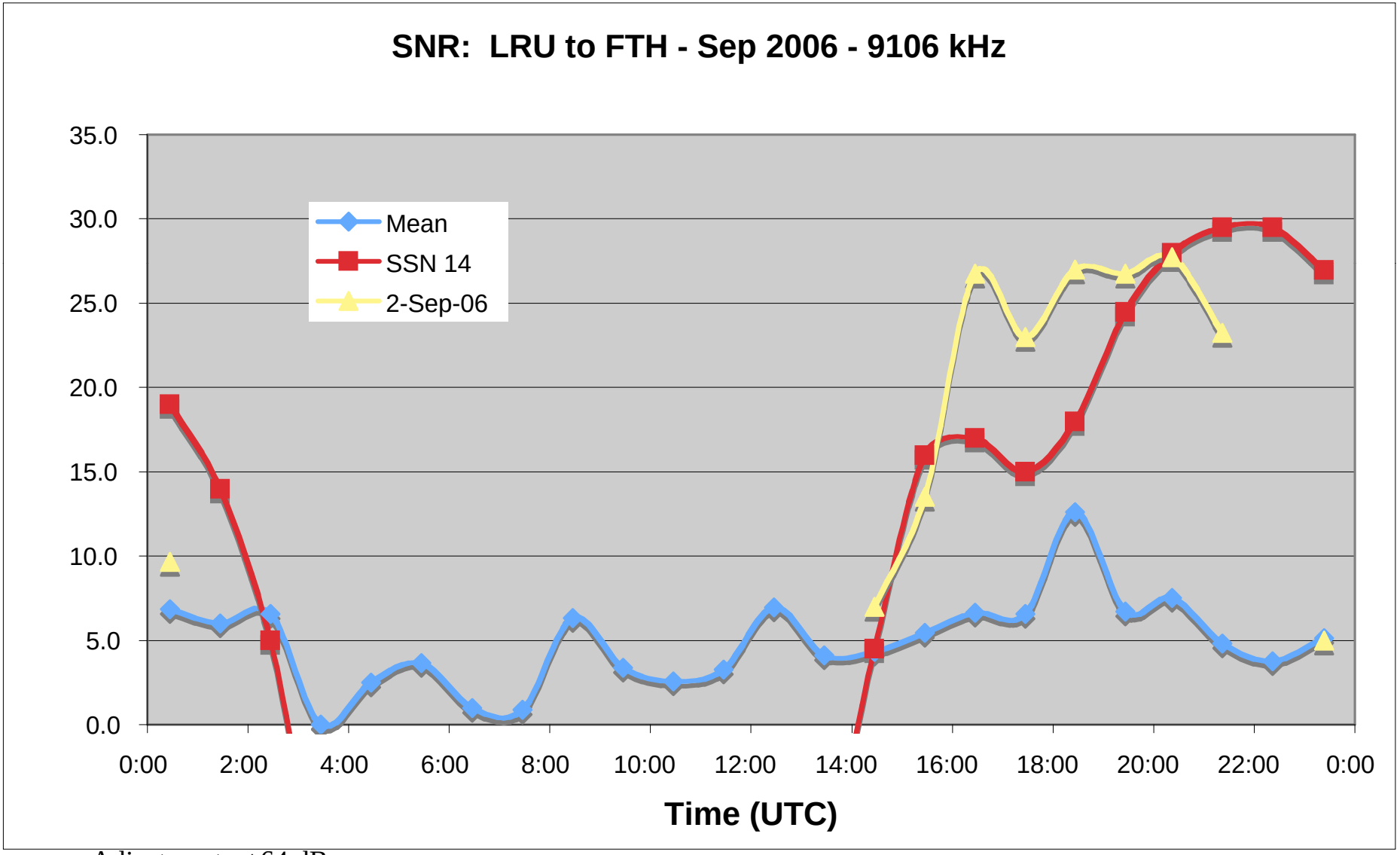
Adjustment: +12 dB



Adjustment: +17 dB

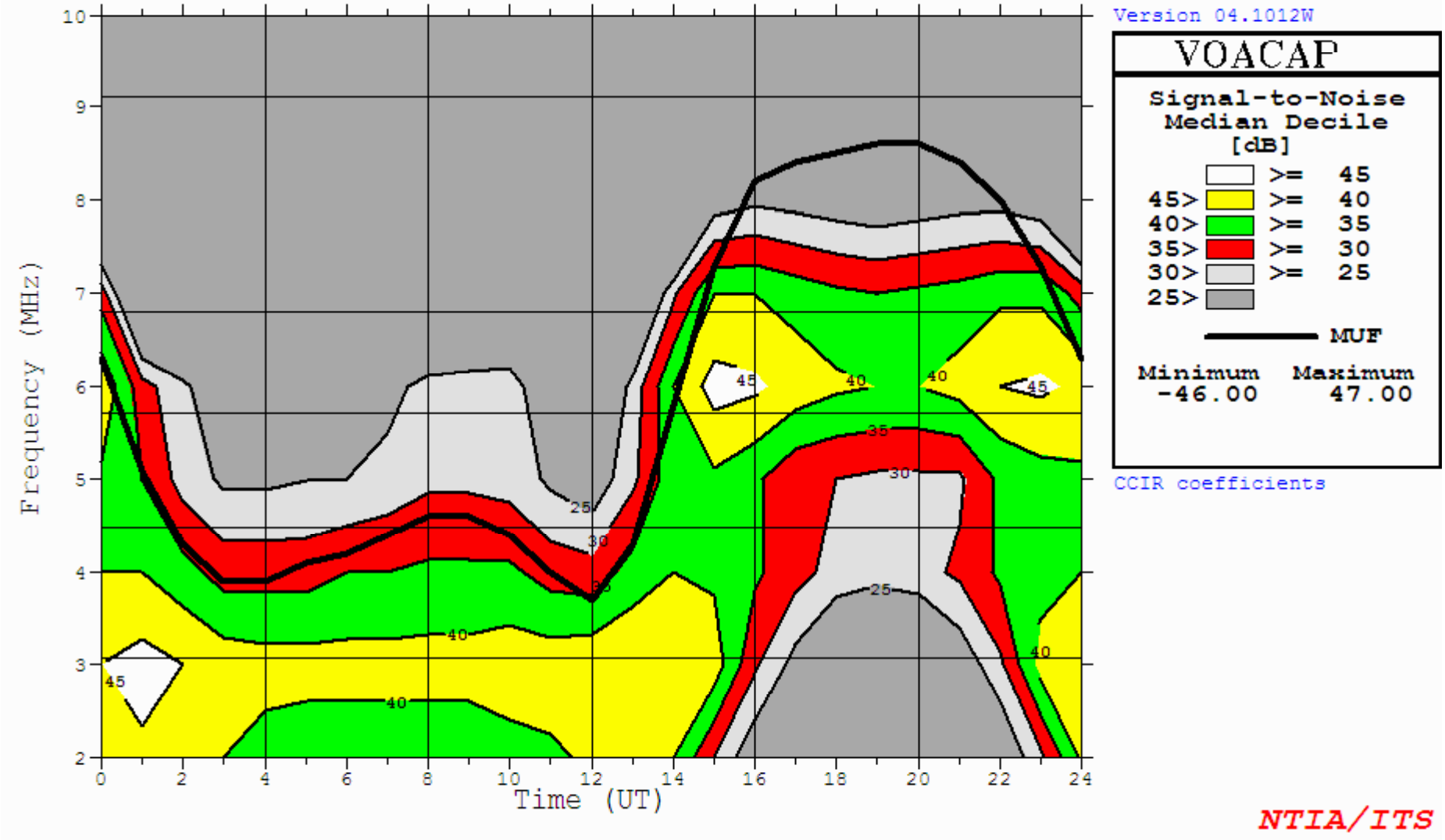


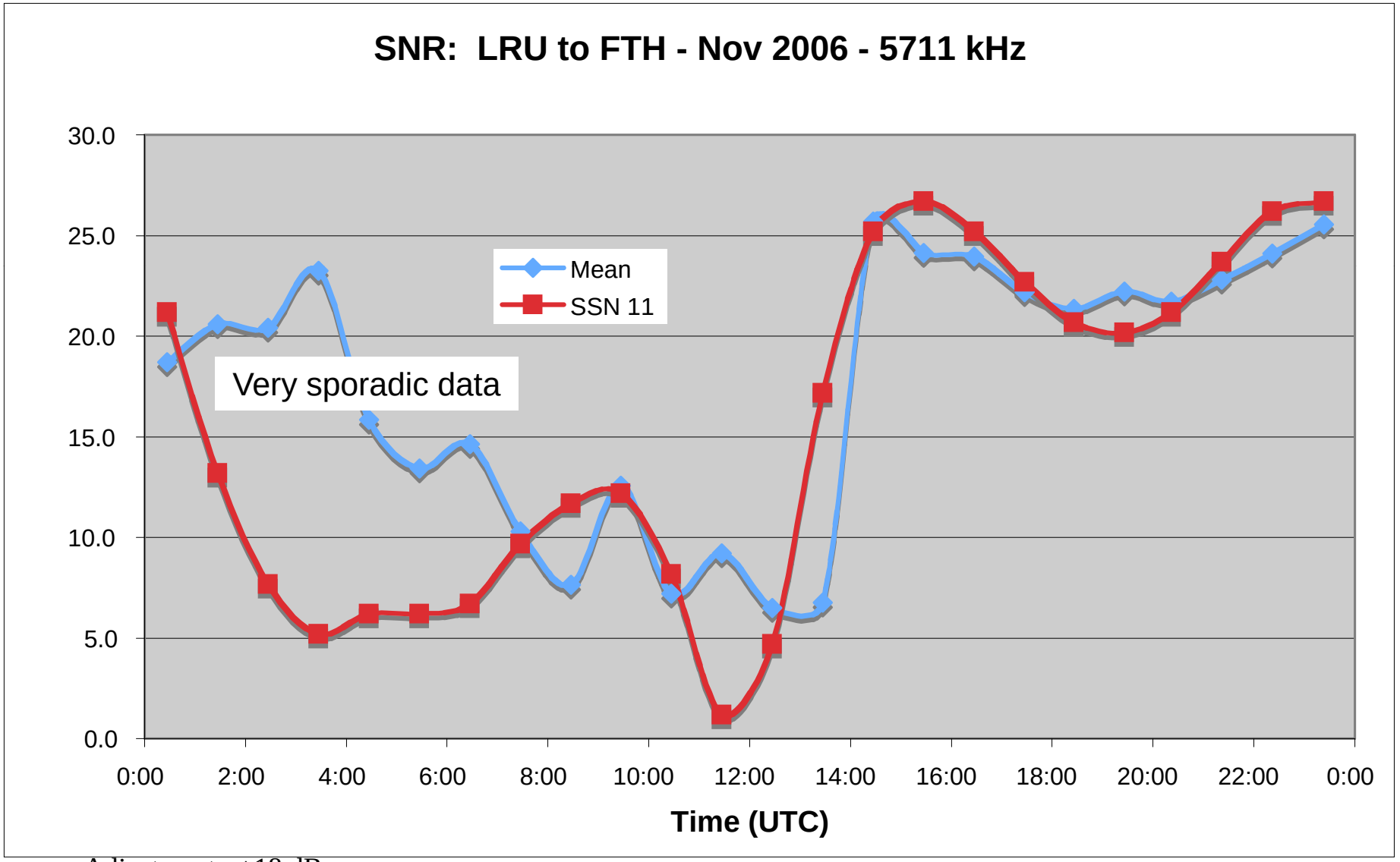
Adjustment: +22 dB



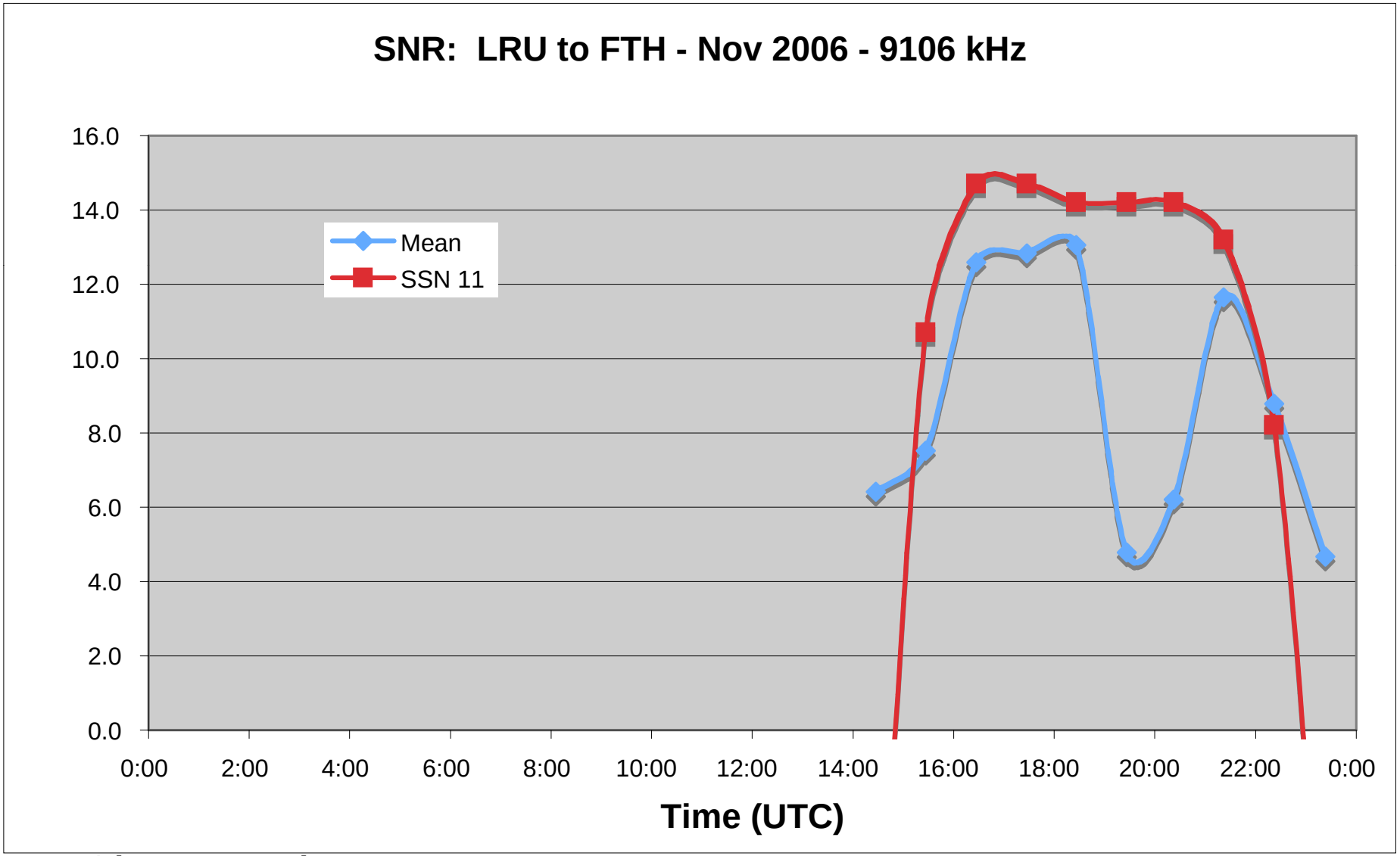
Adjustment: +64 dB

November 2006: VOACAP





Adjustment: +18 dB



Adjustment: +42 dB

Observations So Far

- Low-power NVIS circuit providing daytime comms near solar minimum
  - Nighttime support is sporadic.
- Little margin for thunderstorms (for example)
- VOACAP is generally accurate, but with some notable departures.
  - Also need to improve our antenna models

Planned Revision to Rec 533

- ITS Boulder

Questions?