

# DX with a Technician License

by Wayne Estes W9AE

The technician class license gives access to much more than just FM repeaters.

Other modes allow VHF/UHF contacts up to 1000 miles or more.

# Technician Privileges

28-28.5 MHz                      200 Watts

50-54 MHz                        1500 Watts

144-148 MHz                    1500 Watts

222-225 MHz                    1500 Watts

420-450 MHz                    1500 Watts

902-928 MHz                    1500 Watts

1240-1300 MHz                 1500 Watts

# VHF DX Propagation Modes

Tropospheric Scatter

Sporadic E

Aurora

Meteor Scatter

Earth-Moon-Earth

Satellite

# Tropospheric Scatter

Medium distance contacts achieved when moisture refracts (bends) signals through the troposphere.

250 mile contacts are possible 24/7 with high power and high antennas on both ends.

Bands: 50, 144, 432 MHz

Modes: USB, CW, data

# Sporadic E

Long distance contacts achieved by reflecting signals off the E layer of the ionosphere.

400-1500 miles for a single hop.

Rare. Peaks in early summer and winter solstice.

Hard to predict. Not correlated to sunspot cycle.  
Monitor beacons or the 50.125 MHz call channel.

Bands: 28, 50, 144 MHz      Modes: USB, CW, data

# Aurora

Medium distance contacts achieved by reflecting signals off an Aurora Borealis cloud.

500 mile range is typical.

Signals come back very distorted.

All stations point antennas north towards the Aurora.

Rare but predictable: solar A-index of 4 or more.

Bands: 28, 50, 144 MHz

Modes: CW, SSB

# Meteor Scatter

Long distance contacts achieved by reflecting signals off the ionization trail of a burning meteor.

1000+ mile range is possible 24/7, even with no identified meteor shower.

Contacts are made using “fast” data modes that can deal with extremely short bursts of propagation.

Bands: 50, 144, 432 MHz

Modes: JT65, FT8



# Earth-Moon-Earth

Very long distance contacts achieved by reflecting signals off the moon.

Coverage of half the earth at a time.

Every place where the moon is above the horizon.

Possible to make 2m contacts with a single big Yagi.

Extreme antenna gain required unless you use a “slow” data mode for ultra weak signals.

Bands: 50, 144, 432 MHz

Modes: JT65, FT8

# Satellite

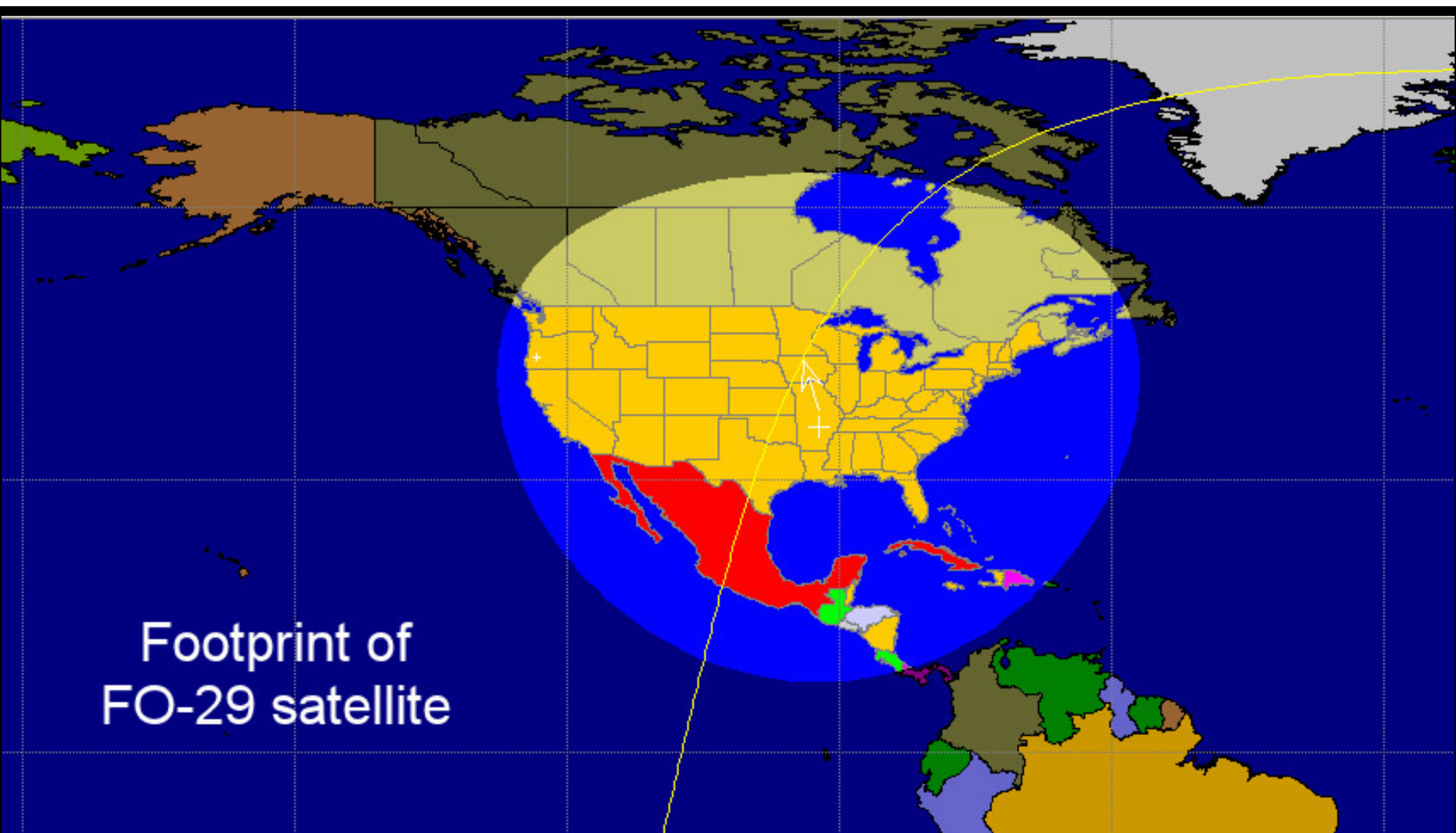
Long distance contacts achieved by relaying signals through a satellite in low earth orbit.

Crossband: 144 and 435 MHz. Full Duplex.

Some satellites are FM single-channel repeater.

Other satellites have a linear passband that supports multiple operators who use CW, SSB, data modes.

Footprint constantly moves. A pass lasts 15 minutes.



Footprint of  
FO-29 satellite

Azimuth	Elevation	MA	Height	Range	L	SSP	B	Orbit	Squint	Aos	Los	MaxE
97.3	3.4	234.1	844	3048	268	36	6138	--		00:10	11	

# WSJT-X Software

Free digital communication software from  
Joe Taylor K1JT, Nobel winning pulsar astronomer.

4 slow modes: JT4, JT9 (slow), JT65, QRA64.  
For extremely weak signals such as Earth-Moon-Earth.  
1 minute TX cycle.

3 fast modes: MSK144, JT9 (fast), ISCAT.  
Short repetitive transmissions for momentary  
propagation paths such as Meteor Scatter.

# WSJT-X Software

New *not-so-slow* weak signal mode: FT8

15 second TX cycle. 12 words per minute.

Rapidly replacing PSK31 on HF bands.

Rapidly replacing JT65 for Sporadic E and EME.

Works with extremely weak signals.

Contacts possible when the band seems dead.

# Radio Required

Multi-Mode Transceiver (CW, SSB, FM, data).

50 MHz and 144 MHz essential.

432 MHz optional, but necessary for satellite.

100 Watts minimum.

Computer and interface for digital modes.

# Antenna Required

You need gain for RX and TX.

Gain antennas are directional, require a rotor.

VHF/UHF antennas are small, can use a TV rotor.

The higher the better!

Horizontal polarization.

## "Cheap Yagi"

Designed by WA5JVB in 1994

Versions for 144, 222, 432, 902, 1296 MHz

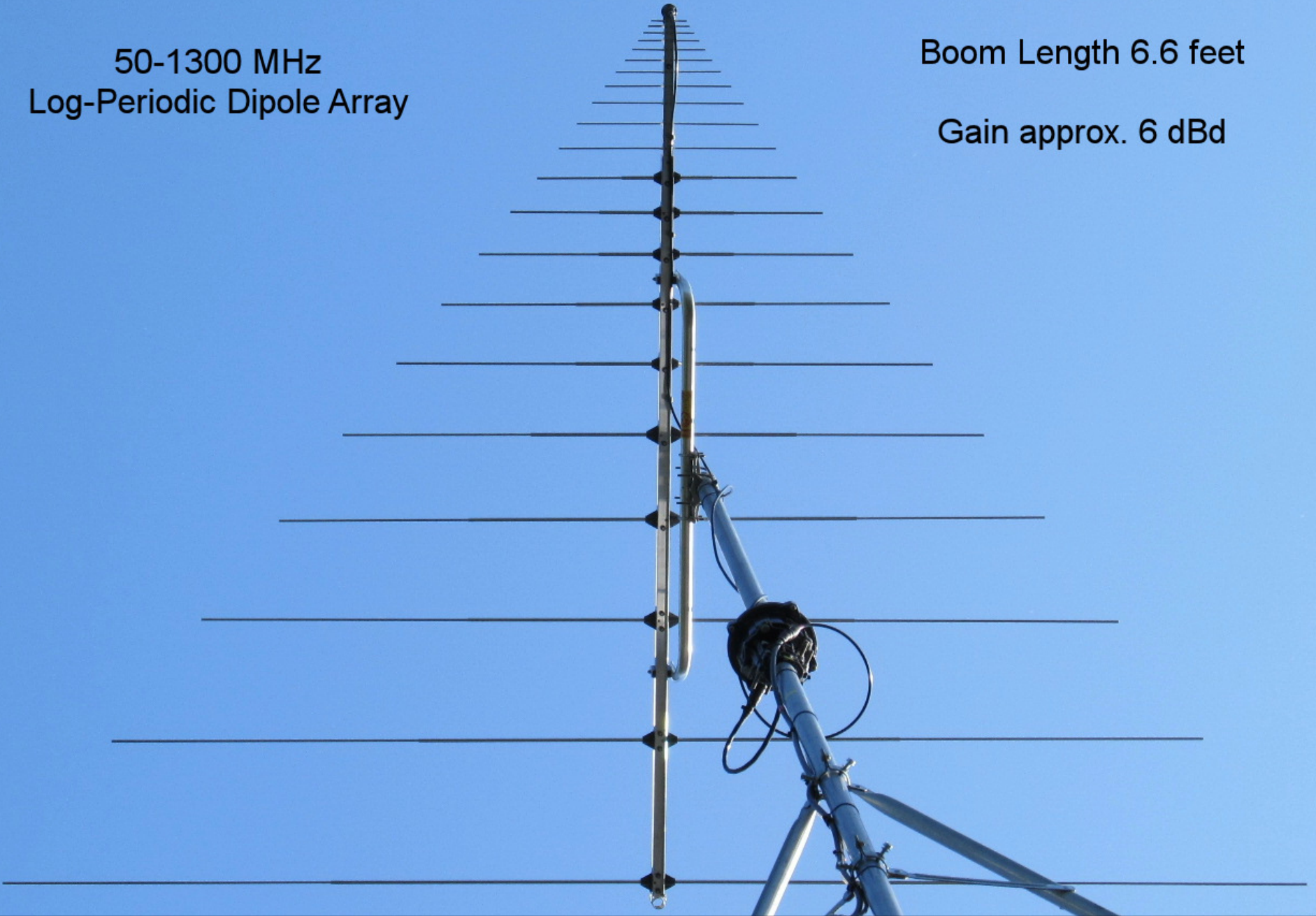




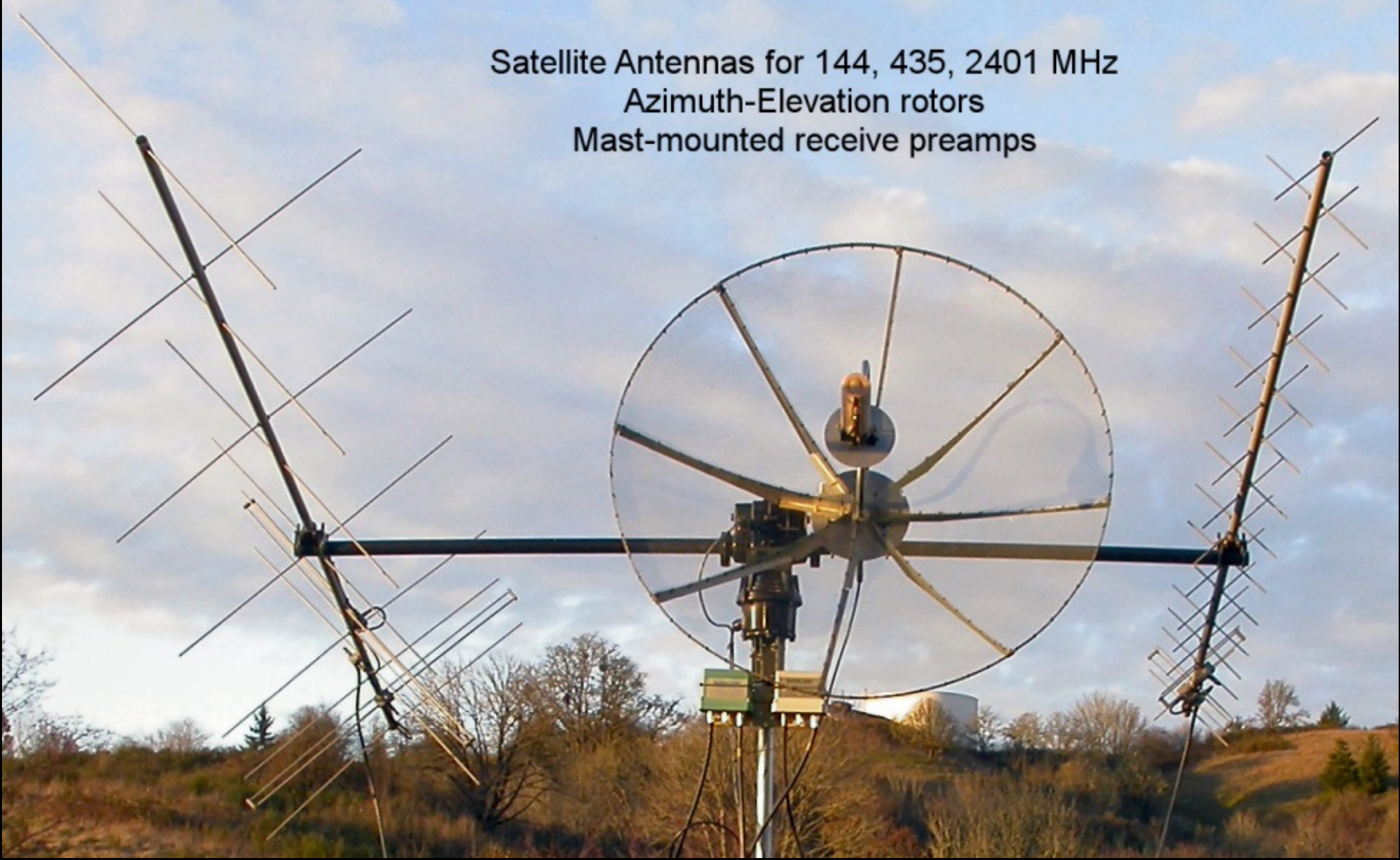
50-1300 MHz  
Log-Periodic Dipole Array

Boom Length 6.6 feet

Gain approx. 6 dBd



Satellite Antennas for 144, 435, 2401 MHz  
Azimuth-Elevation rotors  
Mast-mounted receive preamps



# Weak Signals!

Must use modes that offer good weak signal performance.

Antenna gain matters.

Feedline loss matters.

Receive filtering matters.

Mast-mounted preamps greatly improve RX.

# Hills: Enemy and Friend

Most people live at the bottom of hills. Not good.

Hills block the direct signal but can *reflect* a signal.

A directional antenna allows you to bounce signals off a hill with minimal multi-path distortion.

VHF equipment is portable, can be moved to the top of a hill or even a big mountain.

# Contests

Contests have much more activity than usual.

Good time to operate from a very high location.

Weekend VHF contests in Jan, June, Sept.

Field Day weekend has a lot of VHF activity.