



78 GHz DXing in the Desert Southwest

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78 GHz DXing in the Desert Southwest

- ▣ Motivation for Arizona 78 GHz Effort
- ▣ 78 GHz Propagation
- ▣ Setting up a High Performance Station
- ▣ Analysis of Possible Paths
- ▣ Weather Forecasts & Choice of Dates
- ▣ Operating Results
- ▣ Further Work to be Done

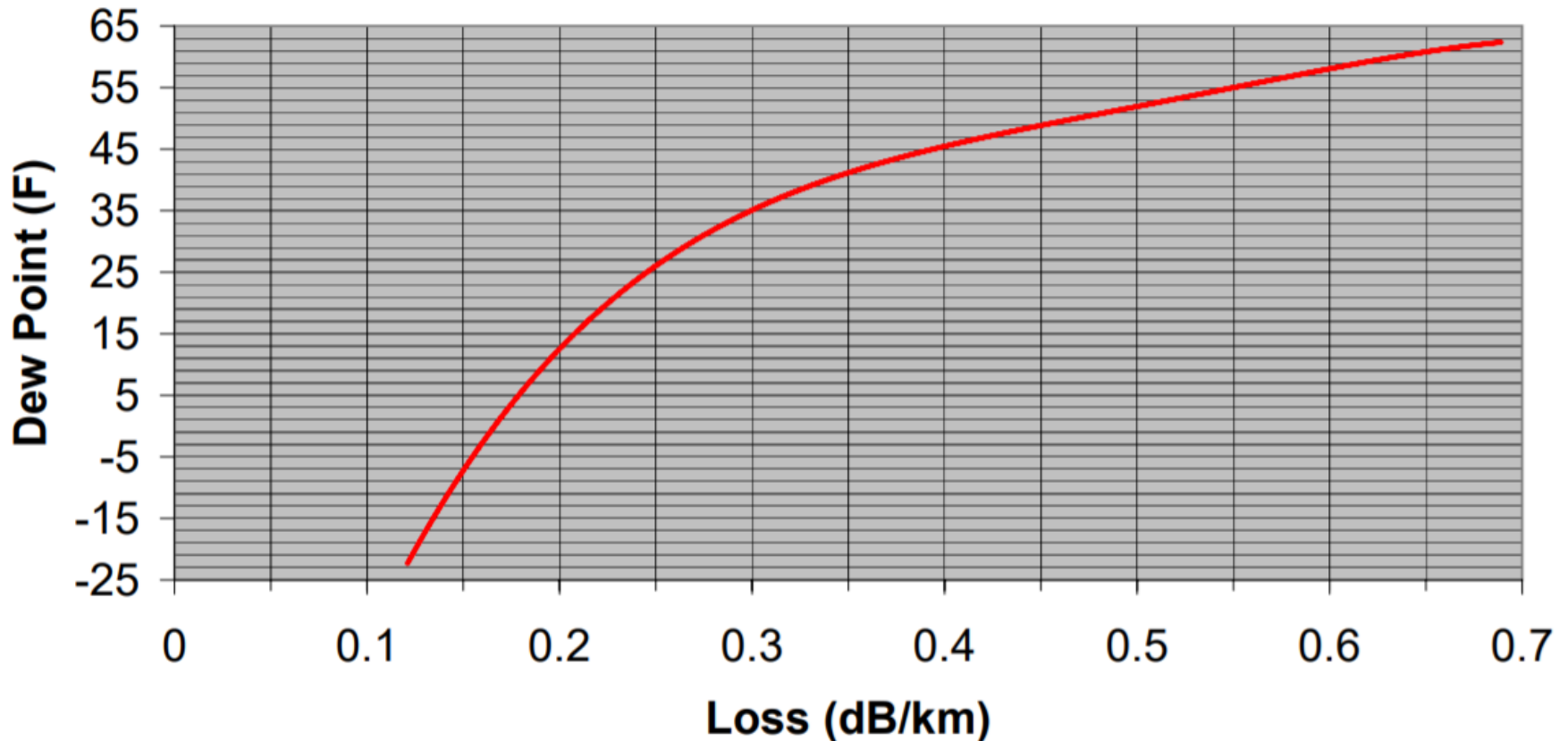
Motivation for AZ 78 GHz Effort

- New High Performance Radio Hardware Available Now
- More Capability to Explore Difficult Paths
- More Stations Becoming Active
- Able to be Active in Colder Months
- Mountainous Terrain with Dry Air
- Disappointment with Lake Superior

78 GHz Propagation

- Heavily Affected by Atmospheric Water Vapor

76GHz Loss vs Dew Point



78 GHz Propagation

- Heavily Affected by Atmospheric Water Vapor
- Radio Technology Historically Poor
 - High Noise Figures from DSB Mixers
 - No Preamps
 - Low Transmit Powers from Multipliers/ Mixers
 - Poor Local Oscillator Stability
- So Paths Limited to Line of Sight on a Dry Day!

High Performance Radio Hardware Available Now

- Kuhne Transverter
- Preamplifiers, Power Amps, WG

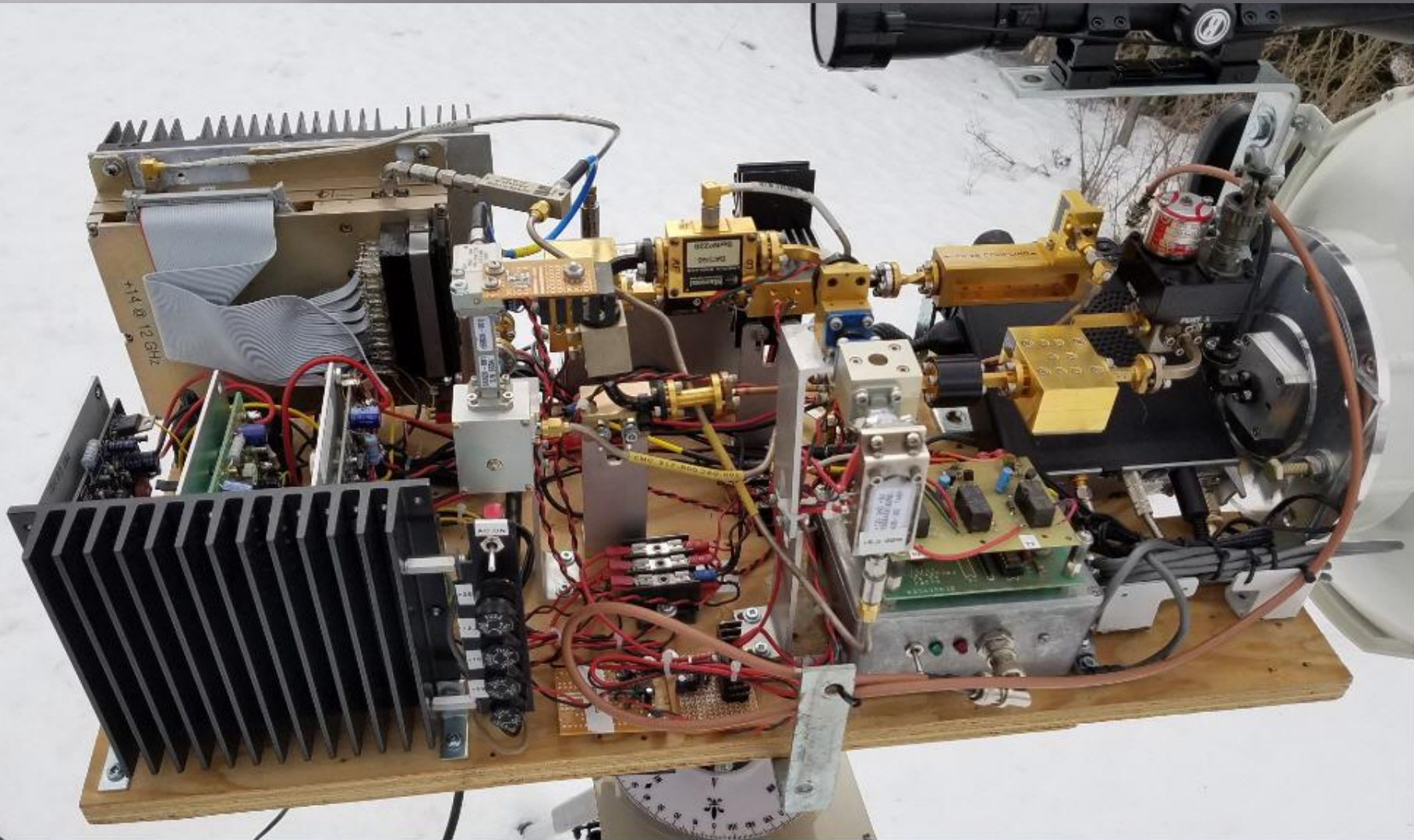


High Performance HDW Available

- Low Phase Noise Local Oscillators
- 10 MHz Reference, Multi-Programability



High Performance “the Old Way”



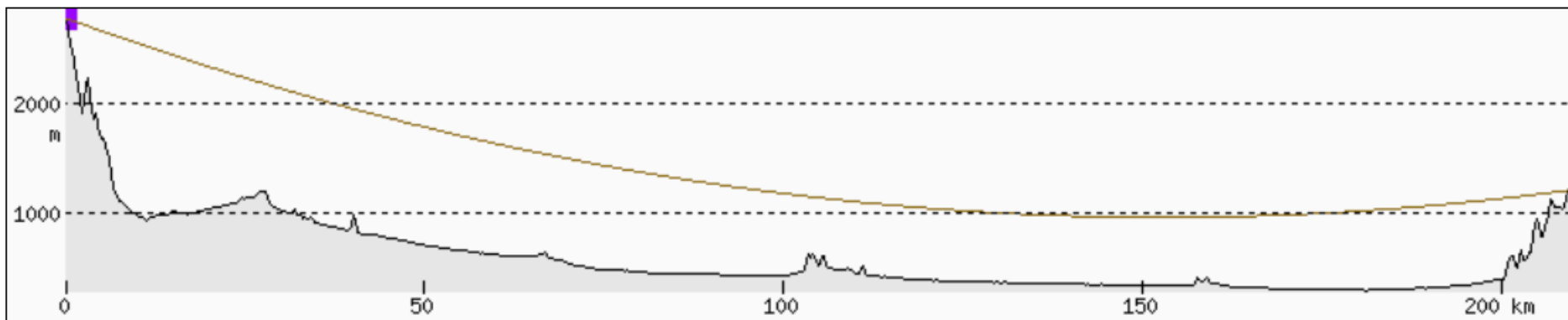
More Stations Becoming Active

- The Availability of the Kuhne Transverter has Resulted in Many New Stations QRV
 - High Sticker Price (~\$2000) but Extraordinary Capability in a Small Package
 - $\sim 1/3 W^*$, Good NF and Image Rejection, Frequency Agile
 - NA Stations with Kuhne 76 include VE2UG, VE4MA, W5LUA, K8ZR, WB8TGY, WW8M
- * FCC Decreed Power Limit is 316W ERP

Analysis of Possible Paths

- “Many” LOS Paths in Phoenix ~60 km
- “Many” LOS Paths in AZ from 200 -270 km
- On a Dry Day Signals Should be Huge!

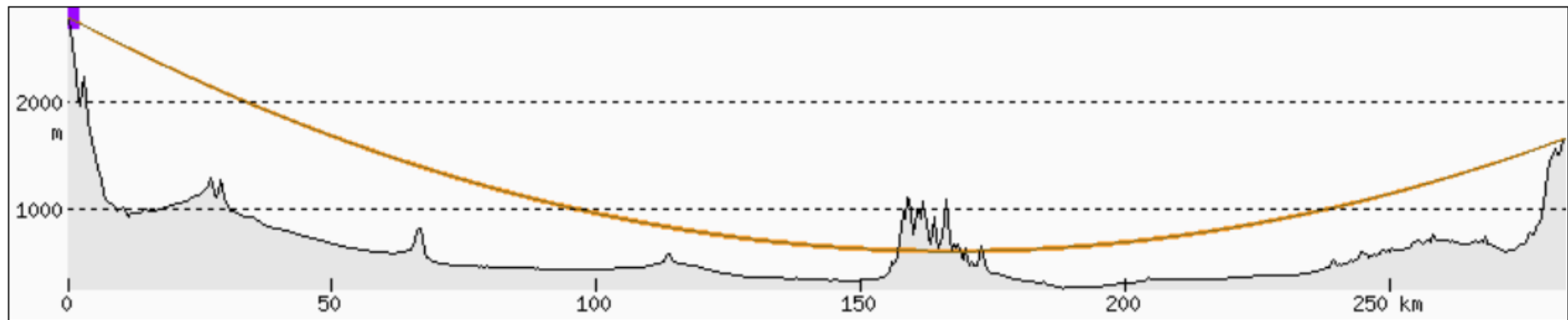
Mt Lemmon to White Tanks 207 km



Analysis of Possible Paths

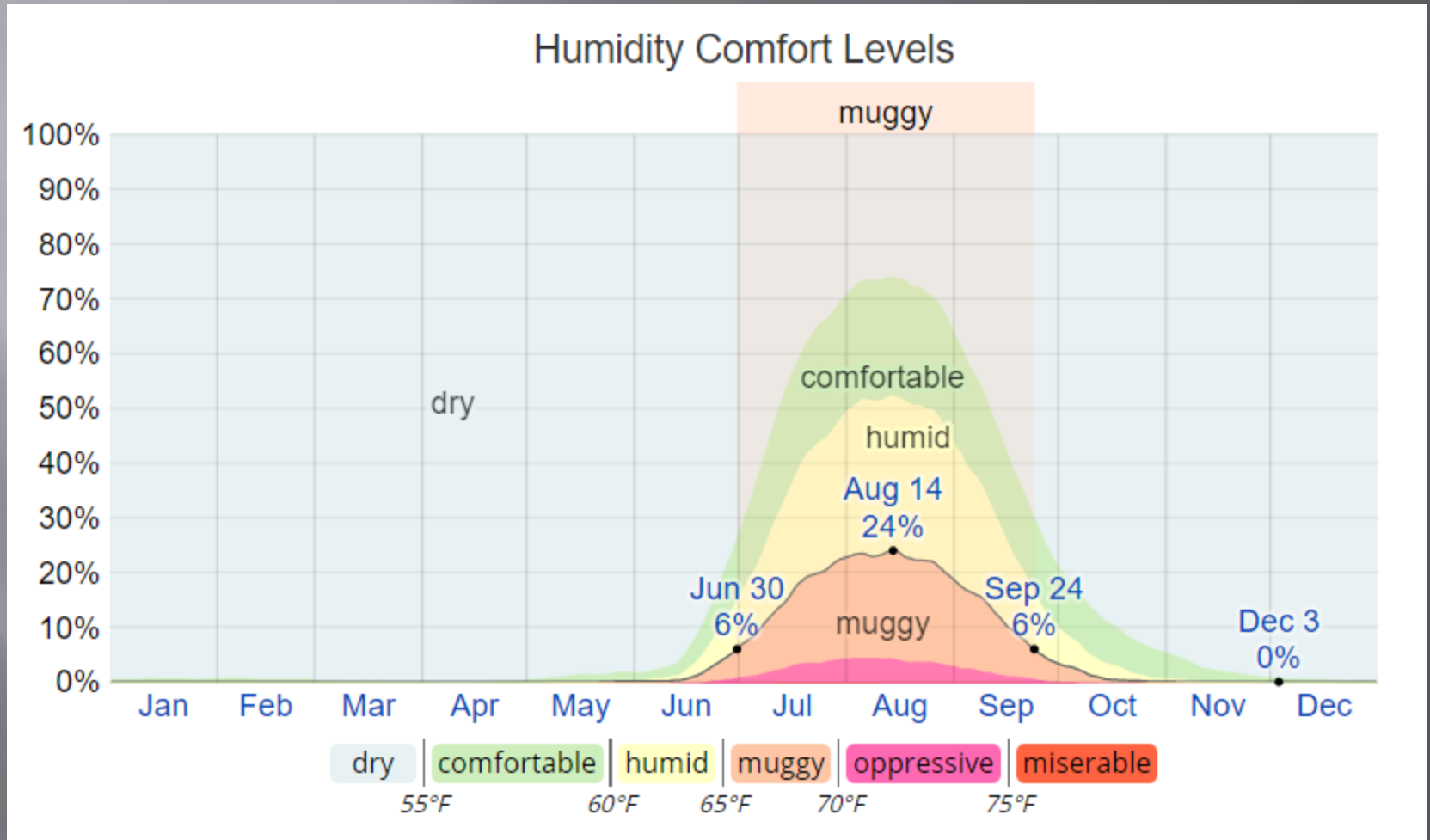
- World Record is 289 km (AZ-CA)
 - Hard to find LOS over 270 km...NON LOS?
 - Path Programs Do Not Agree on Extent of Obstruction

Mt Lemmon to Mt Harquahala 283 km



Weather Forecasts & Choice of Dates

- Historical Phoenix Weather Pattern

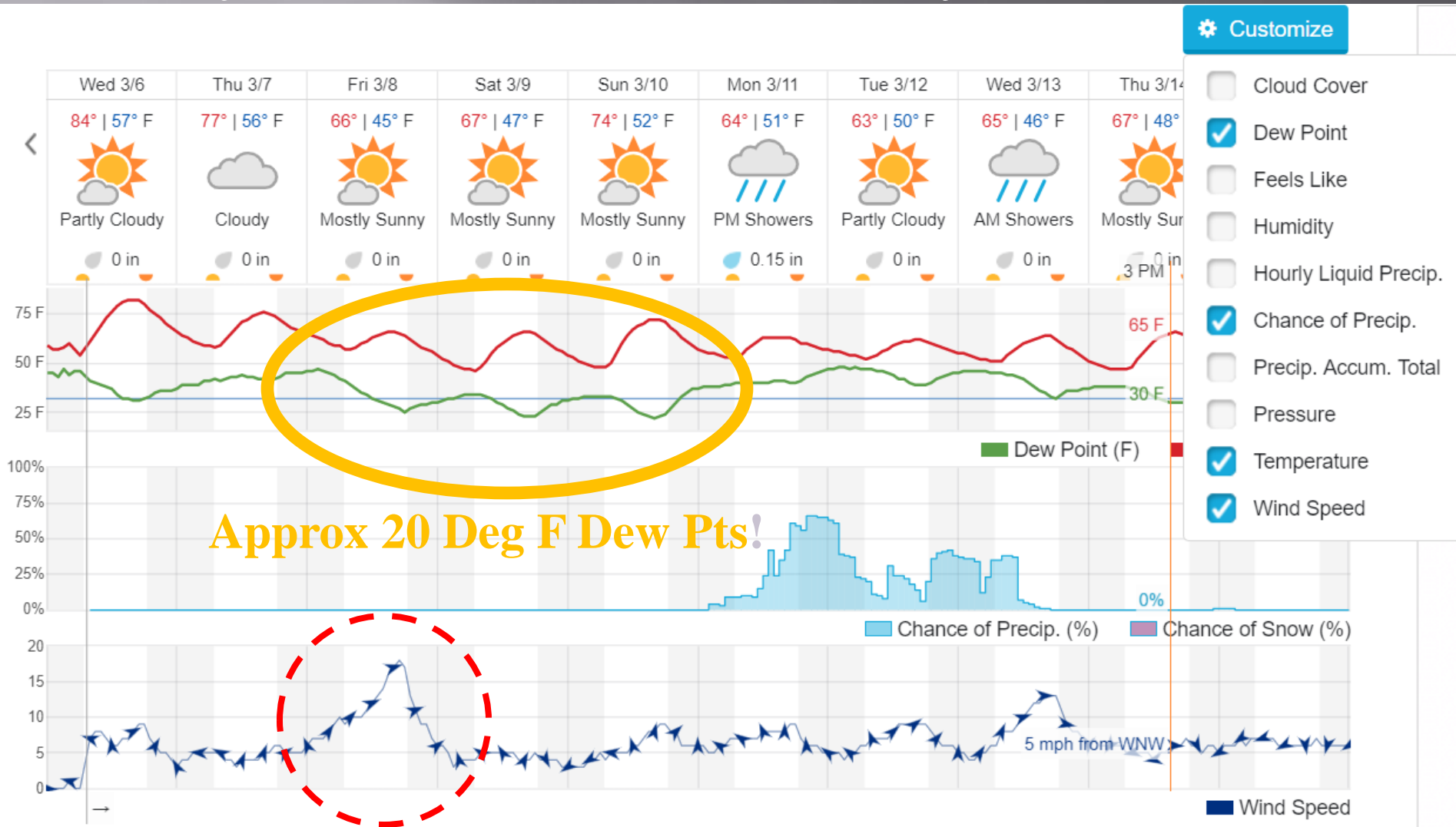


Weather Forecasts & Choice of Dates

- This year WX Was Anything but Normal
- 2x Normal Rainfall, Temps >10 deg F Lower
- Normally the Best Months are November to March...But Mountain Top Access Can be Difficult
- Decided to Try for Early March...then Over 3 ft of Snow in Mountains!

Weather Forecasts & Choice of Dates

9 Day Phoenix Forecast for Early March 2019



Operating Results Day 1

- ▣ VE4MA Joined Al W5LUA, and Tony K8ZR
- ▣ Reprogrammed Tony's LO from 76 to 78 GHz
- ▣ Had "One km" local QSOs with Al & Tony
- ▣ Moved to San Tan Mountain Site for successful 60 km QSOs on 10, 24, 47 & 78 GHz with Group on Shaw Butte (Mark N0IO, Bill W7QQ and supported by Kevin AD7OI and Tammy KI7GVT)
- ▣ K0KFC "10/24 Liason Rig" Tripod Toppled in Wind

Operating Results Day 1



Operating Results Day 1

24/ 47/ 78 GHz on Shaw Butte



Operating Results Day 1

N0IO with 47 & 78 GHz on Shaw Butte



Operating Results Day 1



Edge of San Tan Mountain

Operating Results Day 2

- ▣ VE4MA, Al W5LUA, and Tony K8ZR Travel to 9000 ft Mt Lemmon near Tucson, AZ
- ▣ Supported by Steve KJ7OG and Ron K7RJ
- ▣ Second Group Travels to White Tanks Mtn on West side of Phoenix (207 km hop)
- ▣ Weather on Mt Lemmon, Snow Cover, Cloudy, 29 deg F, Dew Point 0 to -10 Deg F ! (Approx 35 dB of Water Vapor Loss)
- ▣ 78 GHz Signals Weak at White Tanks !?

Operating Results Day 2



White Tanks Mountain

Operating Results Day 2

View From Mt Lemmon



Operating Results Day 2



Operating Results Day 2

- ▣ Signals Much Better at Mt Lemmon!



Operating Results Day 2

VE4MA

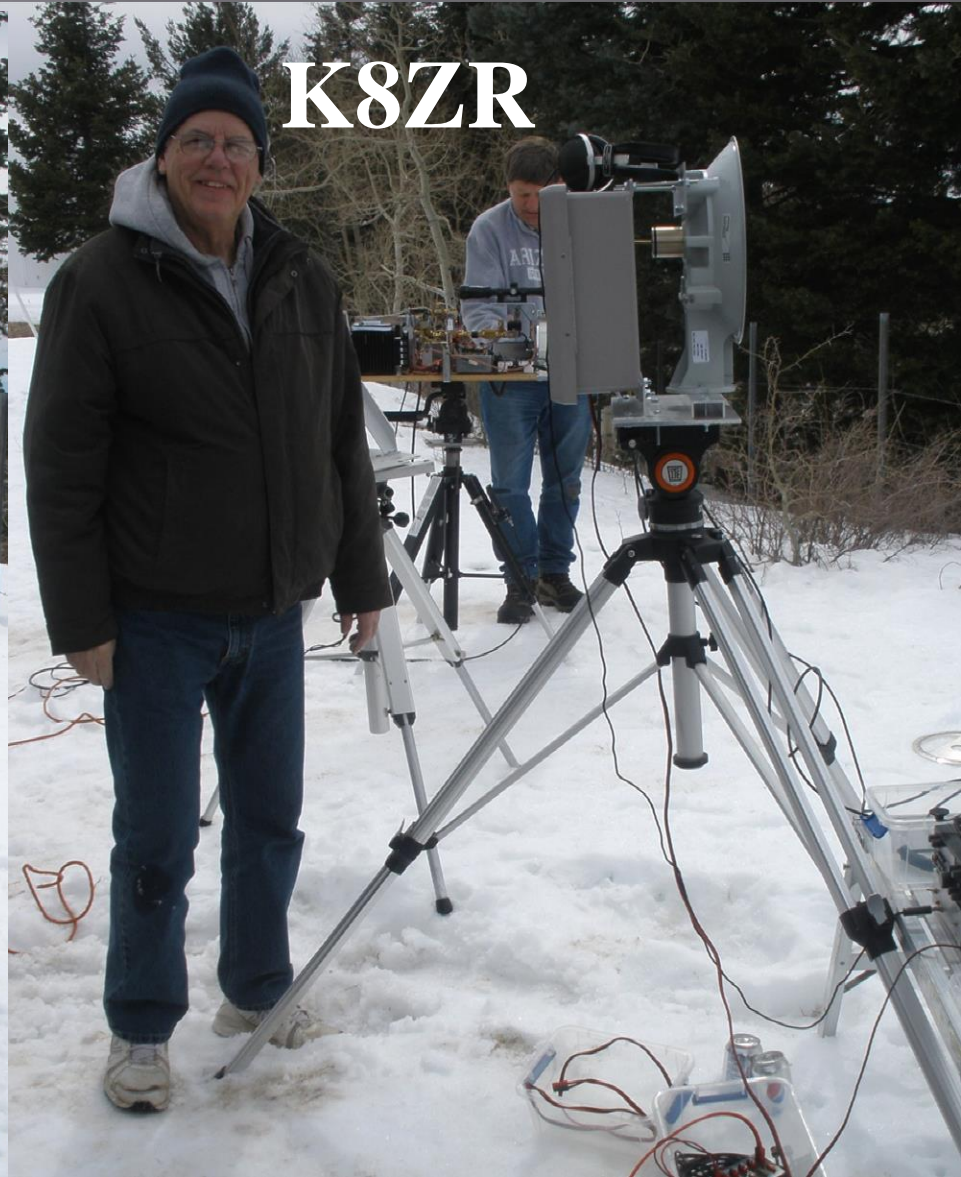
GROUP

K7RJ

KJ7OG

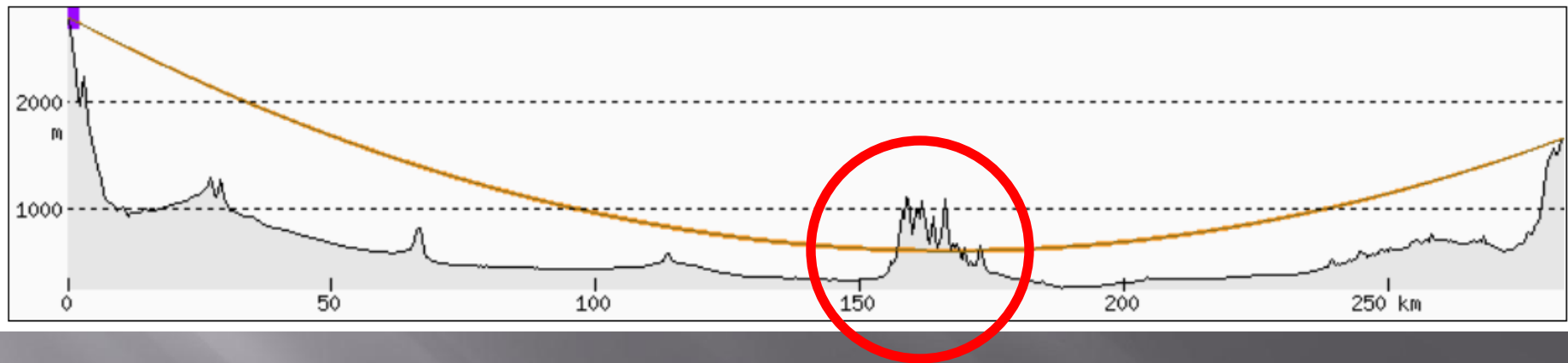


Operating Results Day 2



Operating Results Day3

- ▣ Mt Lemmon to Mt Harquahala 283 km
Obstructed Path



- ▣ Amount of Obstruction Loss?

Operating Results Day3

- ▣ Weather Changed Abruptly on Mt Lemmon
- ▣ 50 MPH Wind Gusting to 64 MPH
- ▣ Dew Point Temperature ~ 25 Deg F

Water Vapor Loss~52 dB....Increase of 17 dB !

- ▣ Extreme Difficulty Setting Up 10 G Liason
- ▣ 10 G Weak and No Signals on 47 or 78 GHz

Operating Results Day3

▣ View from Mt Harquahala



Operating Results Day3

▣ Group on Mt Harquahala



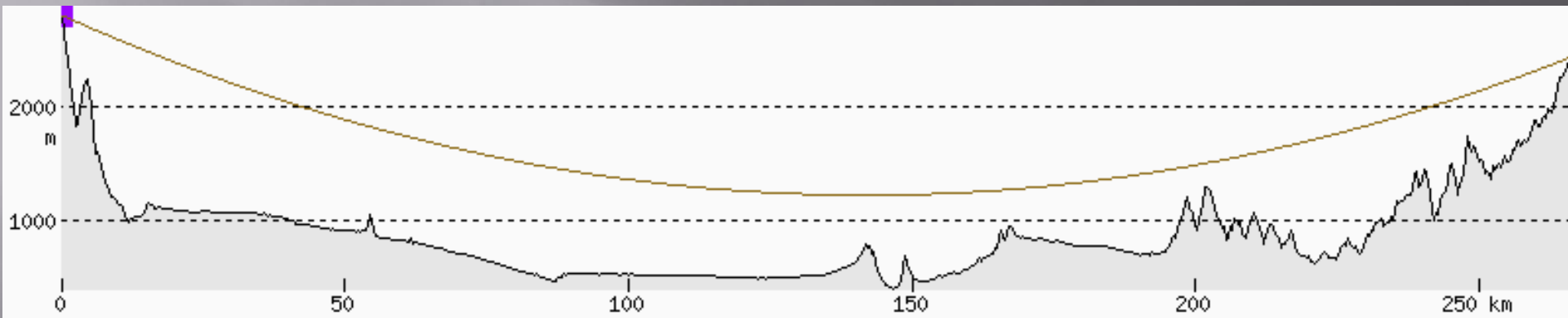
Operating Results Day3

▣ Group on Mt Lemmon



Further Work for Fall 2019

- ▣ Try Mt Lemmon to Mt Union 265 km LOS



- ▣ Try Some LOS & NON LOS Hops >290 km !
- ▣ Play with 122 & 241 GHz on Shorter Hops

A photograph of a desert landscape featuring several tall saguaro cacti in the foreground and middle ground. The background shows a range of mountains under a sky with light, wispy clouds. The overall scene is brightly lit, suggesting a sunny day.

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Questions?