

GOTAhams WG6OTA Amateur Radio Club

GOTAhams Monthly Membership Meeting

Wednesday January 11th

Presentation of Cross Band Repeat

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Cross Band Repeat: The Definition

Crossband Repeating is a process where a Ham transmits one signal on one band (typically UHF), and it is received by another radio with a better antenna/power installation, and re-transmitted (typically on VHF) to another radio system, or a repeater.

Wisconsin Valley Radio Association W9SM / W9NA

- Cross Band Repeat (Portable Remote Base):
 - Repeating signal from one band to another band
 - Cross Band (VHF-UHF or UHF-VHF)
- Signal can be repeated in analog, digital, or both
 - Signal can be cross band repeated in analog only or digital only
 - Signal can be cross band repeated from analog to digital
 - Signal can be cross band repeated from digital to analog
 - Expect a delay when using digital

- Is a Cross Band Repeater the same as a regular repeater like AE6TV?
 - By the simple definition as defined by Part 97.3(a)(37): A repeater is an amateur station which simultaneously retransmits the transmission of another station on a different channel or channels”
 - AE6TV and other regular repeaters retransmit with an offset of 0.6 MHz on VHF or 5.0 MHz on UHF, cross band repeaters retransmit on a completely separate band
 - Regular repeaters are built to withstand constant traffic without interruption at full power, full duplex radios (the ability to send and receive simultaneously) with the ability to cross band repeat are only built for limited traffic and not at full power. Full power is only reserved for a transmission not a simultaneous transmit / receive function. Duty cycle of most cross band repeat radios is reduced especially at high power levels. Since it is possible to prevent others from keying up on the frequency being utilized, operation at low power is strongly recommended to avoid damage to the radio.



Anytone 578



Yaesu FTM-400 xdr



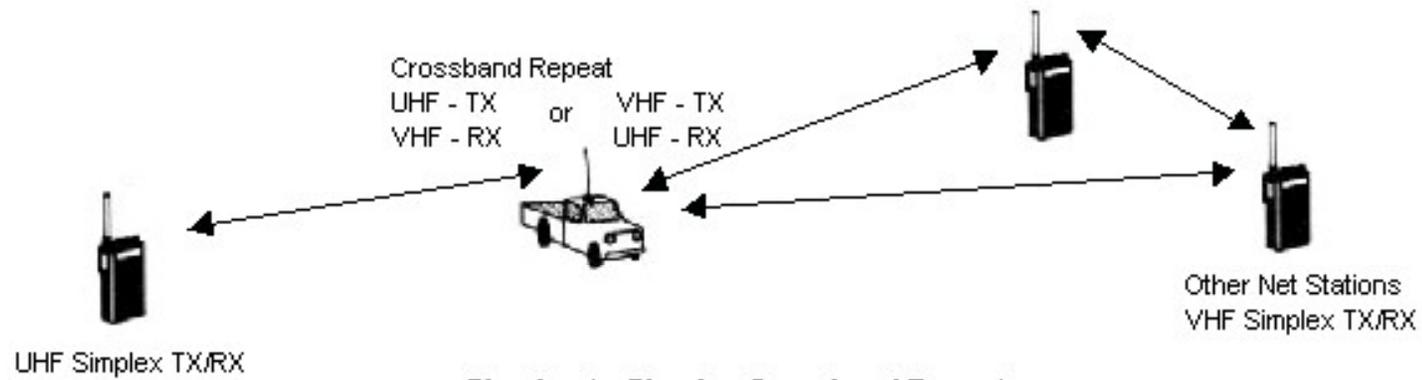
TYT TH-9800



KENWOOD TM-V71A



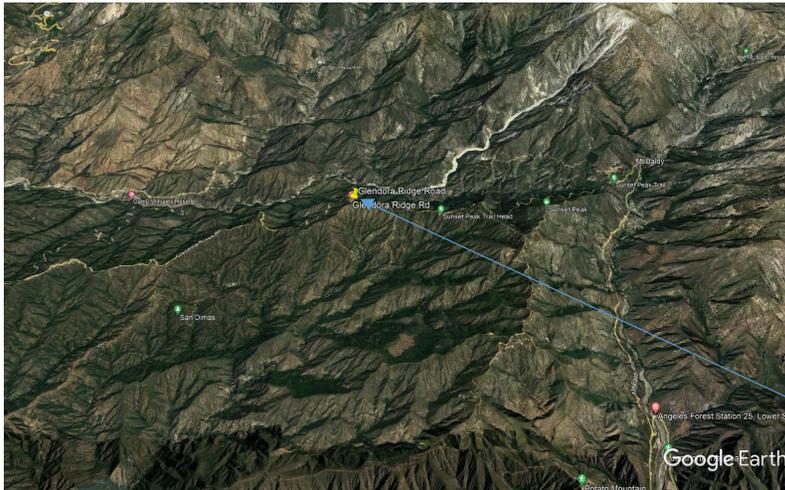
ICOM 2730A



Simplex-to-Simplex Crossband Repeat

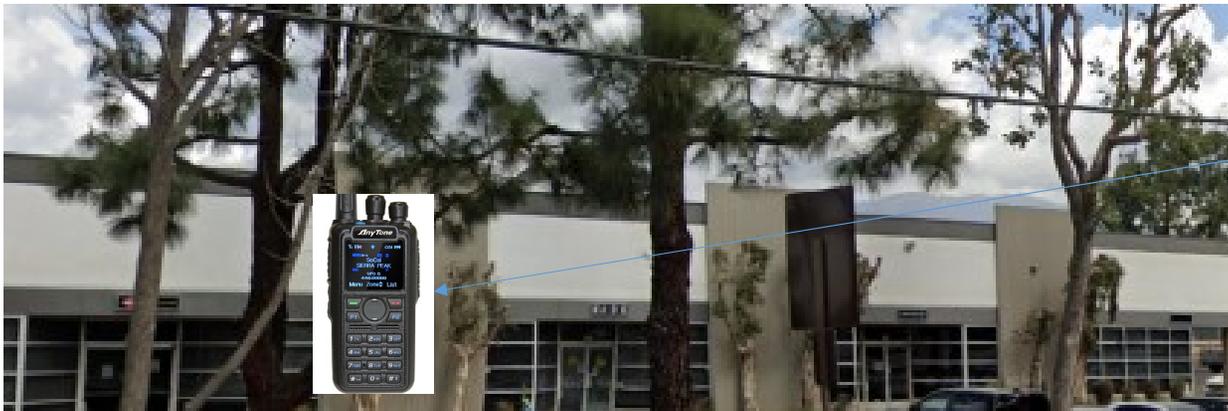
- During the “Great Shake Out” I utilized cross band repeat in order to participate in the simplex net organized by the GOTAhams. Because my office building is surrounded by metal insulation, I would not have had an opportunity to participate in the net without walking away from my daily job, which was not an option. I connected my HT, through a UHF simplex frequency, to the simplex frequency utilized by the GOTAhams for the purpose of the net. I was able to transmit/receive from my office to my vehicle outside my office, and have that signal re-transmitted to VHF frequency utilized for the net. The following page illustrates this procedure.

The Great ShakeOut 2021 Participation on VHF



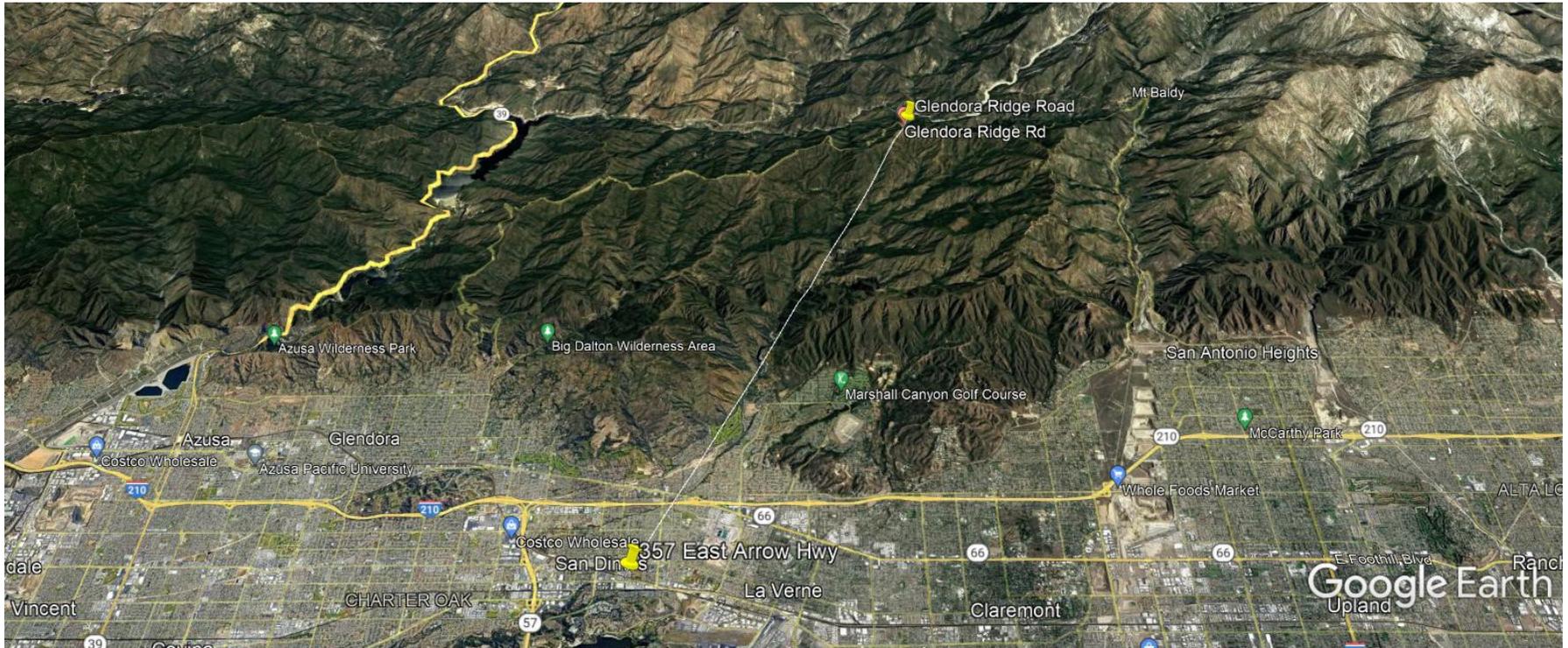
GOTAhams Kathi receiving signal on Glendora Ridge Road

Anyone 578 Mobile receiving the UHF signal, cross-band repeating on 146.580 the Shakeout Simplex net



Anyone 878 HT inside an office, transmitting / receiving on UHF frequency using low power





Graph: Min, Avg, Max Elevation: 970, 1984, 4462 ft
Range Totals: Distance: 9.73 mi Elev Gain/Loss: 4690 ft, -7638 ft Max Slope: 67.7%, -71.2% Avg Slope: 19.8%, -18.7%



Okay, so cross band repeat can be used to get a signal outside of the building in order to increase the distance. But can I REALLY increase my distance?

OH YEAH

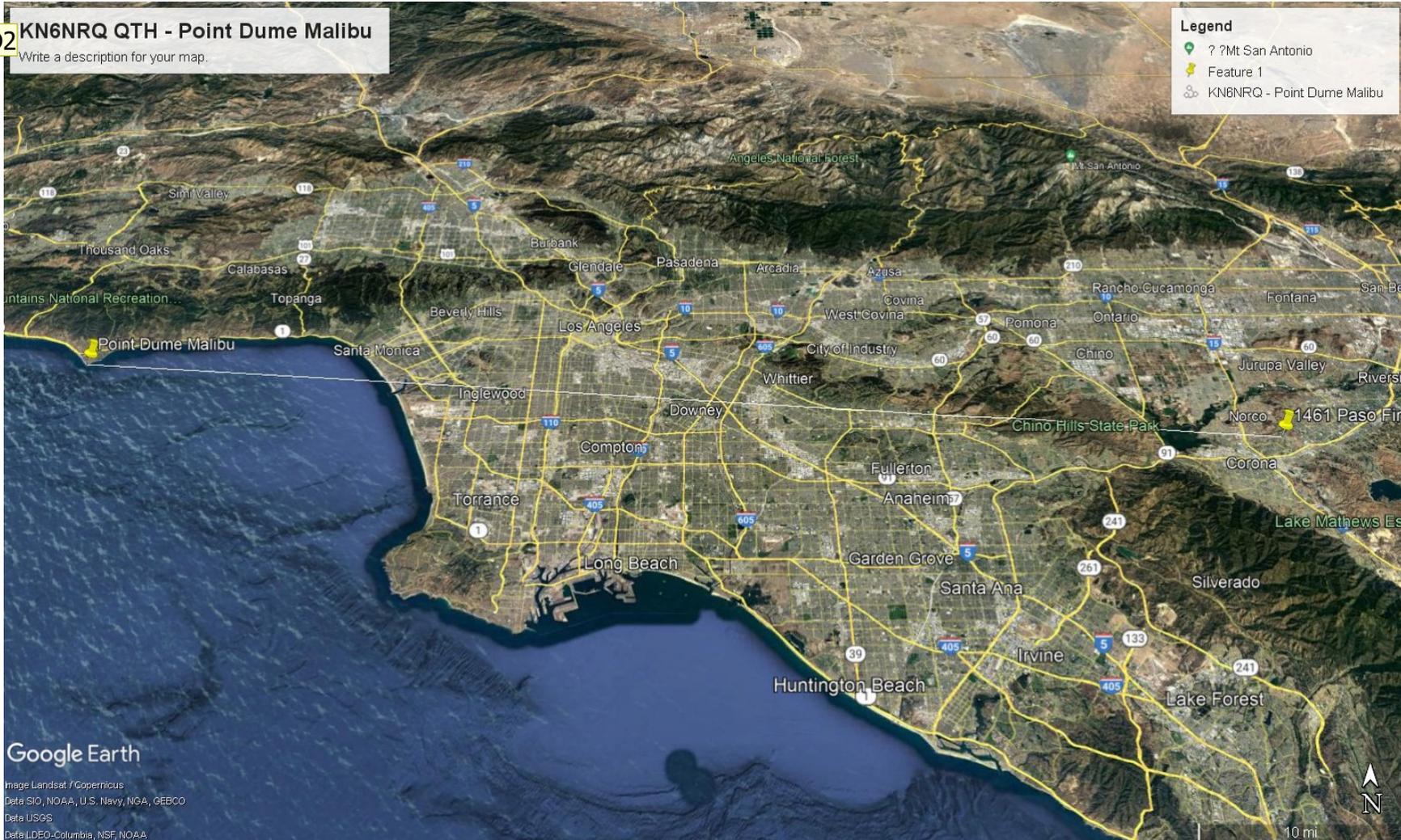
ED1
ED2

KN6NRQ QTH - Point Dume Malibu

Write a description for your map.

Legend

- 📍 ? Mt San Antonio
- 📍 Feature 1
- 📍 KN6NRQ - Point Dume Malibu



Google Earth

Image Landsat / Copernicus
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Data USGS
Data LDEO-Columbia, NSF, NOAA

Slide 10

ED1 Erik Długajczyk, 11/7/2021

ED2 Erik Długajczyk, 11/7/2021

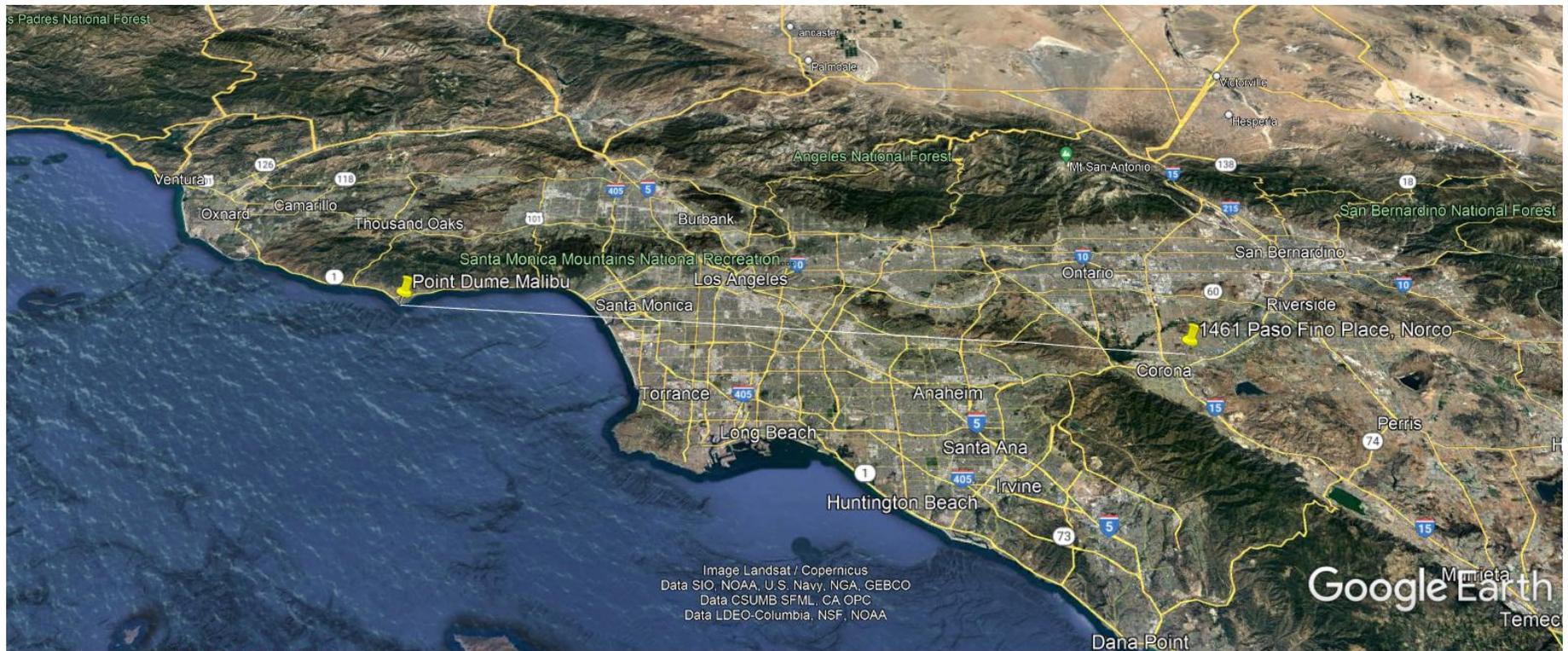
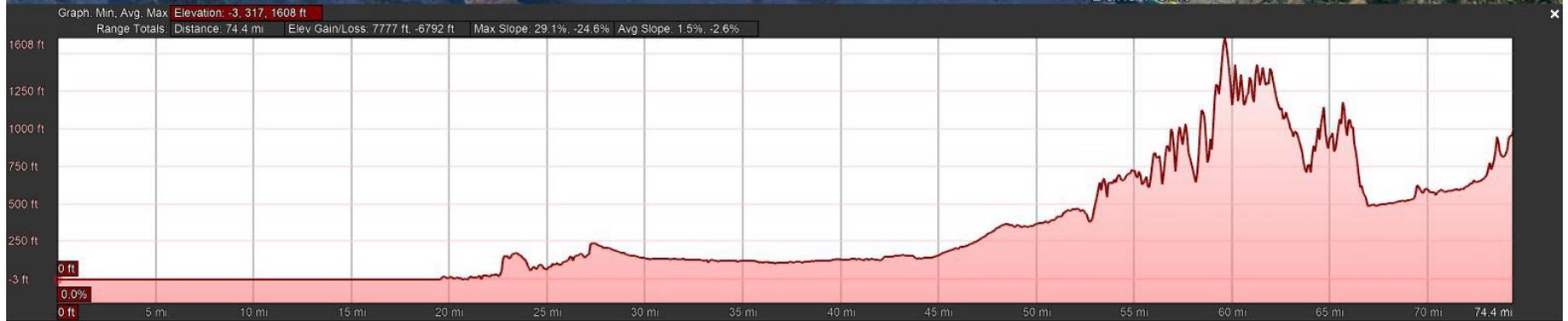


Image Landsat / Copernicus
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Data CSUMB SFML, CA OPC
Data LDEO-Columbia, NSF, NOAA

Google Earth
Merrieta
Temec





Anytone 578 Mobile receiving the UHF signal, re-transmitting simultaneously to my QTH ham shack

Anytone 878 HT inside my house, transmitting on a simplex UHF frequency, on low power with a rubber ducky



KN6NRQ QTH GP-9 / Anytone 578 receiving UHF signal / cross band repeating on 146.52

146.52 QSO from Norco to Point Dume, Malibu

Ham Shack with a Anytone 578 and a GP-9 receiving / sending signals to/from HT

KN6NRQ QTH GP-9 / Anytone 578 receiving UHF signal / cross band repeating on 146.52



HT at home, using low power transmitting / receiving on UHF station



146.52 QSO from Norco to Point Dume, Malibu

Could I have made this long distance 2M QSO with just my mobile radio and antenna?

MAYBE

Typically with line of sight 2M/70cm simplex line of sight, the antenna makes all the difference, let's compare the 2 antennas involved:



MOBILE

Comet CSB-790A

CSB: Comet Super Beam

2M/440MHz high gain mobile antenna

2M: 7/8 wave 5.1 dBi

440 MHz: Three 5/8 Waves in phase, 7.7 dBi

SWR: 1.5:1 or less

Length: 62"

BASE (QTH)

Comet GP-9

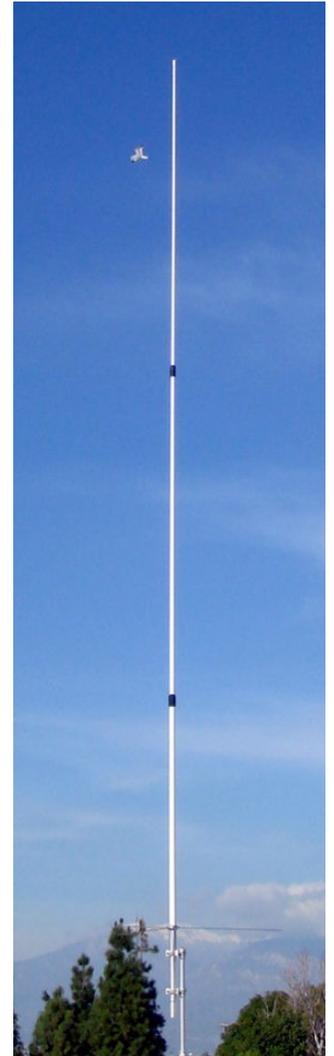
2M/440MHz Base Antenna

2M: 5/8 Wave x3, 8.5 dBi

440MHz: 5/8 Wave x3, 11.9 dBi

SWR: 1.5:1 or less

Length: 16'9"



Can you listen to AE6TV or other repeaters on the HT while using cross band repeat only to transmit?

YES

You can program your radio for the “transmit” frequency of the repeater, which is the offset frequency. That way you’re not hearing the receive frequency of the repeater and it is not being constantly repeated, only when you are transmitting.

Channel Name		AE6TV Trans Only	
Receive Frequency	444.16000	<input type="checkbox"/> PTT Prohibit	<input type="checkbox"/> Talk Around(Simplex) <input type="checkbox"/> Auto Scan
Transmit Frequency	444.16000	<input type="checkbox"/> APRS RX	<input type="checkbox"/> Work Alone <input type="checkbox"/> DataACK Disable
Correct Frequency[Hz]	0	Digital	
Channel Type	A-Analog	Contact	1 MOTO RuKi
Transmit Power	Mid	Radio ID	KNSNRQ
Band Width	25K	Color Code	1
Busy Lock	Off	Slot	Slot A
Scan List	Repeaters	Receive Group List	None
Exclude Channel From Roaming	Off	Digital Encryption	Off
DMR MODE	Repeater	AES Digital Encryption	Off
		TX Interrupt	Off
		Multiple key	Off
		Random key	Off
		SMS Forbid	Off
		<input type="checkbox"/> Call Confirmation	<input type="checkbox"/> Ranging
		<input type="checkbox"/> SMS Confirmation	<input type="checkbox"/> BT Hands Free
Analog		Scrambler Set	Off
CTCSS/DCS Decode	Off	Custom Scrambler	2.8k
CTCSS/DCS Encode	CTCSS	<input type="checkbox"/> Compander	
Squelch Mode	Carrier	<input type="checkbox"/> Reverse	
Optional Signal	Off	2TONE Decode	
DTMF ID		Custom CTCSS	251.1
2Tone ID		R5ToneBot	customize
5Tone ID		R5ToneEst	customize
PTT ID	Off		
	Cancel	Previous	Next

Is this stuff really legal?

YES

Let's hear from the authority

The following is copied from ARRL's "Auxiliary Station FAQ":

"A cross-band repeater (or "portable remote base") is okay as long as several conditions are met: 1) The user communicates with his cross-band rig via the UHF side. Since this serves as his control and voice uplink, it is a form of auxiliary operation and must be conducted above 144-MHz. Since the operator is the control operator, that person must actually be able to control the station! That person must be able to turn it off remotely if a problem develops. If the operator can't control it, it's not legal [97.7, 97.201, 97.213]. 2) If the control link fails, the remote station must shut down within three minutes which means a 3-minute timer is required [97.213]. 3) The unattended station must be identified on all frequencies it transmits on. Since this is a form of remote base, the user's ID over the UHF uplink to the dualband radio also serves to ID the VHF output of the mobile rig. In the other direction, however, there is no way for the control operator to ID the UHF downlink from the mobile remote base, so some form of automatic ID must be employed [97.119]."

<http://www.arrl.org/auxiliary-station-faq>

Unfortunately, few manufacturers include the capabilities listed above in their rigs. Hence, to be fully legal, some form of add-on controller may be necessary. Another use for cross-band operation is to link together two existing repeaters on different bands. This is usually done on a temporary basis during an emergency, a drill or a special event. Again, the requirements for proper station identification and control on both sides of the dualband radio's transmissions still apply. If both the VHF and UHF transmitters are not properly identified and controlled, the operation is not legal. In the examples cited above, the control requirement can be satisfied by having a control operator at the station, thus making it a locally controlled station. Although this may not always be convenient, it is a way to satisfy all of the station control required. Additionally, at least one of the radios featured in this presentation (Kenwood TM-V71A) can be set up for automatic station identification in both CW and voice.

In order to maintain control from off site, Wi-Fi smart home devices can be utilized such as the power strip below



My radio does not list Cross Band Repeat in the instruction manual, but through Youtube I realize that it's capable. Why isn't it listed?

Depending on the manufacturer of your radio there are 2 likely reasons:

1. Radio does not deploy some form of automatic ID [97.119].
2. Radio duty cycle is unable to maintain repeater-like performance for extended periods of time and current safety nets only exist within the user, not within the radio.

Suggested Simplex Frequencies

2 Meter Simplex:

Frequency MHz	Comments
144.310-144.375	Un-channelized Simplex, Multiple use. Avoid band
144.405-144.475	Un-channelized Simplex, FM. Avoid band edges.
144.490	Uplink FM to Int'l Space Station. Avoid for other u
145.510	FM Simplex channel
145.525	FM Simplex channel
145.540	FM Simplex channel
145.555	FM Simplex channel
145.570	FM Simplex channel
145.585	FM Simplex channel
145.600	FM Simplex channel
145.615	FM Simplex channel. Some D-Star
145.630	FM Simplex channel
145.645	FM Simplex channel
145.660	FM Simplex channel
146.520	National US FM Calling Frequency. Short QSO.
146.535	FM Simplex channel
146.550	FM Simplex channel

70 Centimeter Band Simplex

Frequency MHz	Comments
441.500	Simplex Digital/packet
441.520	Simplex Digital/packet
446.000	FM Simplex. No Digital. National Calling Frequen
446.500	FM Simplex. No Digital
446.520	FM Simplex. No Digital

QUESTIONS

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