Having Fun With VHF

Bob Witte

KØNR

Speaking Today

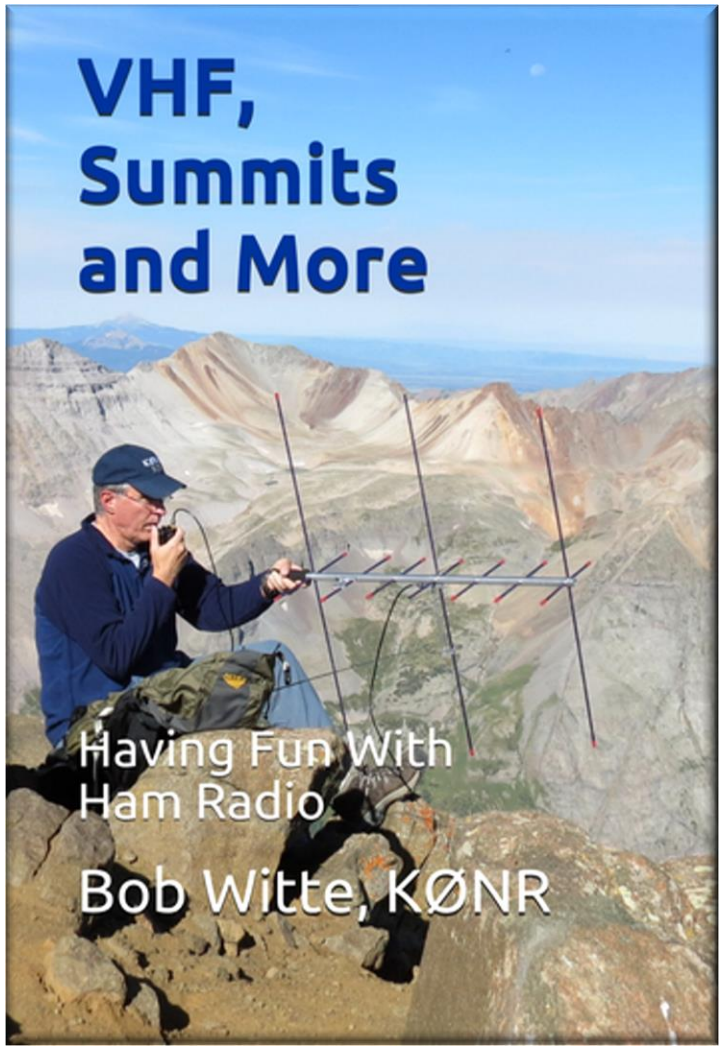
Bob Witte KØNR
Monument, CO USA DM79
bob@k0nr.com www.k0nr.com

I was first licensed in 1977 after taking a ham radio license class at Purdue University

My technical background is Electrical Engineering and I have worked for decades in the electronic test and measurement industry.

Ham radio interest: the confluence of VHF ham radio, mountains and exploring.

And I like to write stuff.



Let’s Talk About…

VHF Basics

VHF Contests

Summits On the Air

What is VHF (and UHF)?

Range	Frequency	Amateur Allocation (band: frequency)
High Frequency (HF)	3 to 30 MHz	80 m through 10 m
Very High Frequency (VHF)	30 to 300 MHz	6 m: 50 to 54 MHz 2 m: 144 to 148 MHz 1.25 m: 222 to 225 MHz
Ultra High Frequency (UHF)	300 to 3000 MHz	70 cm: 420 MHz to 450 MHz 33 cm: 902 to 928 MHz 23 cm: 1240 to 1300 MHz 13 cm: 2300 to 2450 MHz

Ham Shack In Your Hand

- HT: Handheld Transceiver
- Affordable and compact transceiver with antenna, battery
- Typically covers 2 meters and 70 centimeters
- Low power (~5 watts)
- The three best ways to improve your HT:

  Antenna, antenna, antenna

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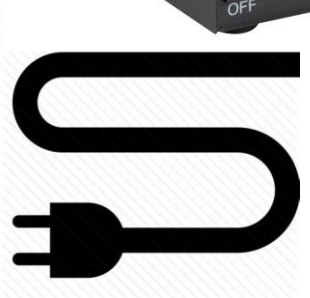
Basic VHF Station

Vertical Antenna

FM Mobile Transceiver

DC Power Supply



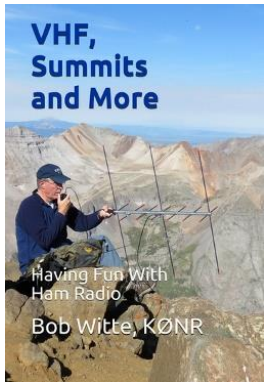
DC cable

Coaxial cable

4. Getting Started on 2m SSB

In the past decade, a new breed of amateur radio transceiver has hit the marketplace — radios that cover from HF through VHF/UHF frequencies. These radios include the ICOM IC-7100, the Yaesu FT-857 and the Yaesu FT-991A. This is not an exhaustive list since there are new radios being introduced every year with additional capability. These radios include "all-mode capability" which means that they can operate FM (Frequency Modulation), CW (Continuous Wave) and SSB (Single Sideband) on the VHF bands. Clearly, FM is the most commonly used mode on VHF and UHF but having SSB opens up a whole new range of operating fun.

The Yaesu FT-991A is an example of a transceiver that covers HF, VHF and UHF.



- Single Sideband (SSB) is much better than FM for weak signals
- Calling frequency: 144.200 MHz USB
- Horizontal antennas
- Find Activity: Nets and Contests

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All Mode Transceiver – IC-9700

- There is one all-mode VHF/UHF transceiver (from ICOM)
- IC-9700 - Same size as IC-7300.
- 2m, 70cm, 23cm SDR (144 MHz, 432 MHz, 1.2 GHz)
- Color 4.3 inch color TFT touch screen and real-time spectrum display

Price
~$1500

“Do Everything” Transceivers

There are HF through UHF radios that do “all modes” (CW, SSB, FM, AM, digital)

Yaesu FT-991A

HF bands,

6m, 2m, 70cm

All mode

~$1200

Also: ICOM IC-7100, Yaesu FT-857D

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Portable QRP Transceivers

Low power (5 to 10W) portable radios, HF through UHF

Yaesu FT-818

ICOM IC-705

Starting to ship now ?!!?!

Elecraft KX-3 with
2m option

(no 70cm)

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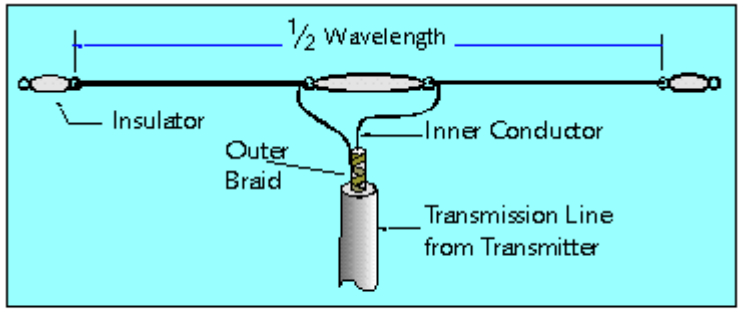
Antennas



dipole antenna

- 6 Meters
  - Wire dipole antenna
  - End-fed halfwave antenna
  - Yagi antenna
- 2 Meters and up
  - Usually going to use a beam antenna
    Typically: Yagi
  - Horizontally polarized for SSB weak signal work

Antennas: Polarization is Important

- Vertical polarization for FM, DMR, D-STAR
  - Naturally omnidirectional
  - Convenient for handheld, mobile and base
- Horizontal polarization for SSB, CW, WSJT (weak signal)
  - Better performance with directional antennas
  - Omnidirectional antennas available, too.
  - Typical installation is a yagi antenna with >8dBd of gain with rotor

Vertical Antennas

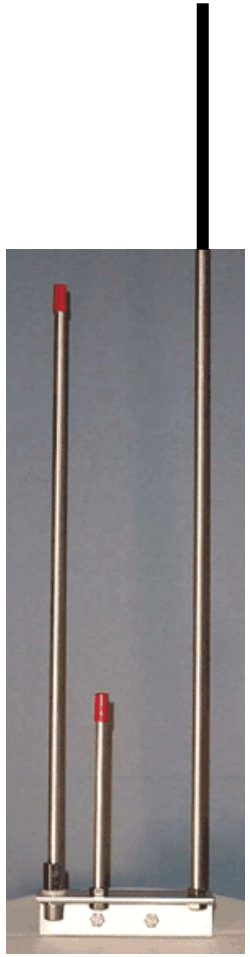
Diamond X-50A

2m & 70cm
5.6 feet tall
~ $90

Arrow GP146/440 Ground Plane

2m & 70cm

~ $50

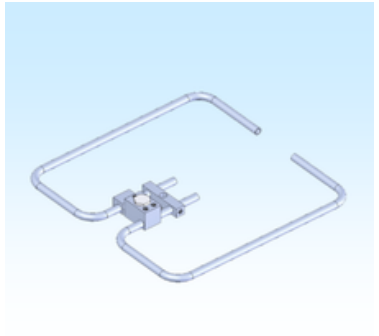


2m & 70cm
58 inches tall
~ $50

Arrow J-Pole OSJ-146/440

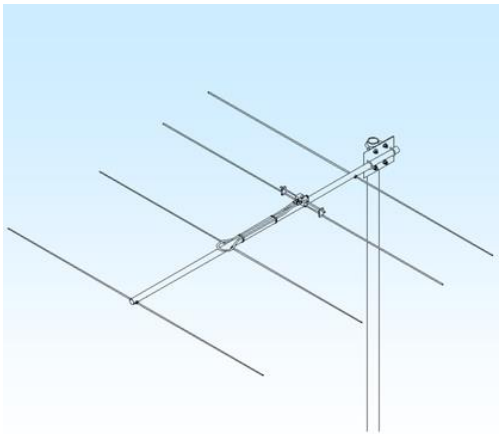
Horizontal Antennas

M^2 2m HO Loop



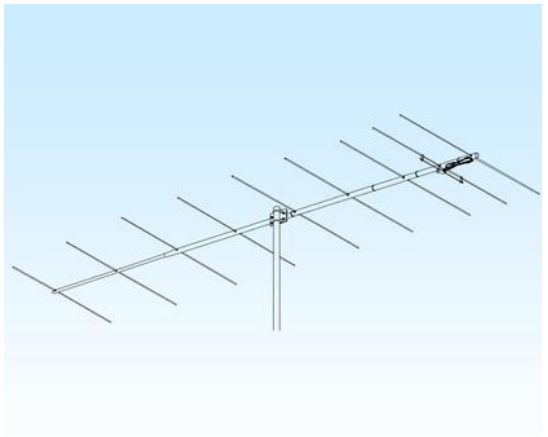
2m loop
Omnidirectional

M^2 2m 4-element Yagi



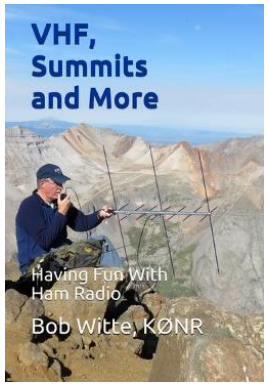
9.6 dBi gain
~$160

M^2 2m 9-element Yagi

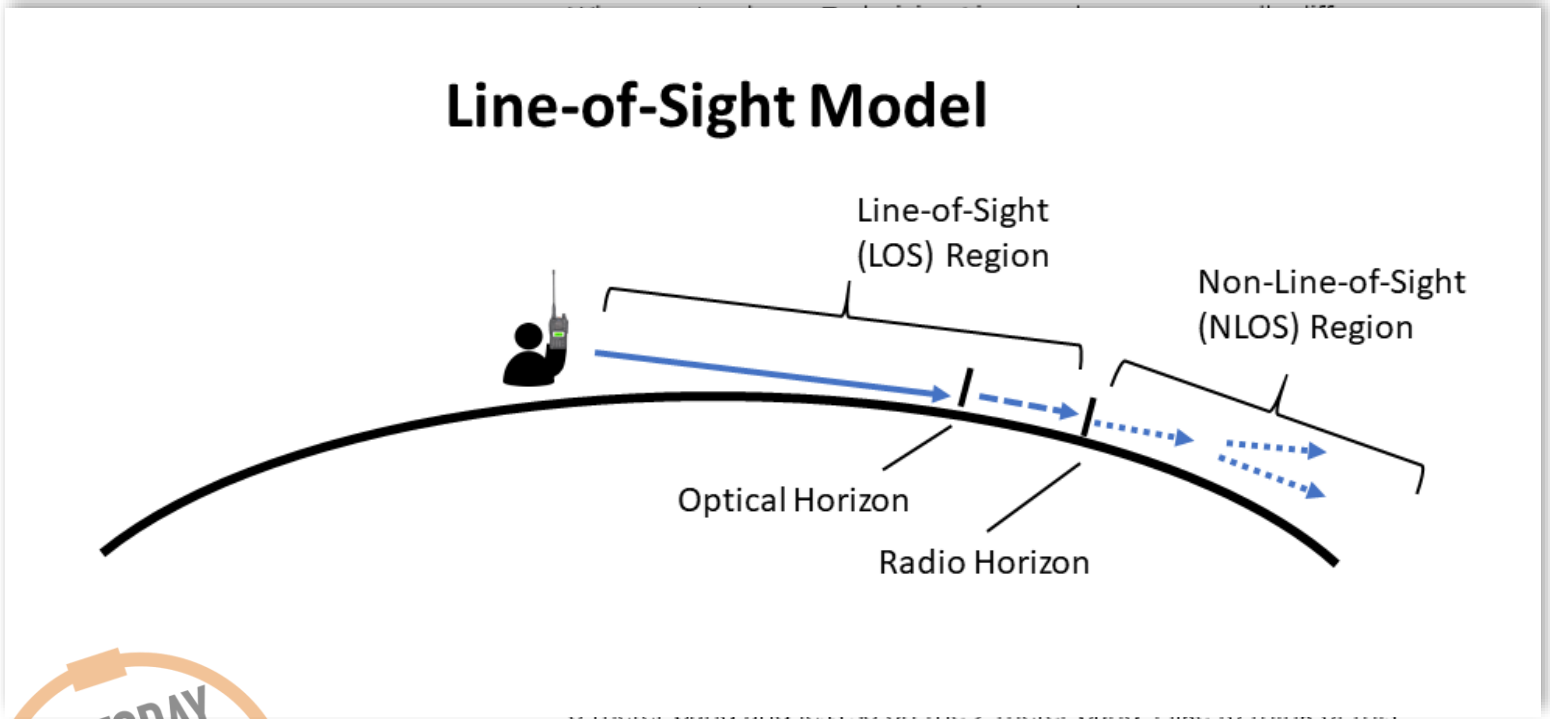


14.1 dBi gain
~$285

Requires rotor for changing direction

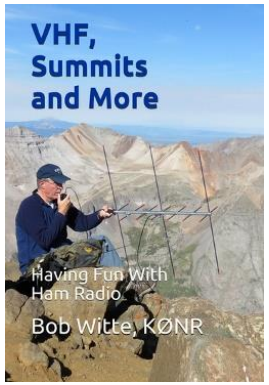


6. The Myth of VHF Line of Sight



as the VHF bands trying to imitate HF. **Tropospheric ducting** sup-
ports long-distance VHF communication when ducts form between

- Line-of-Sight is a simple model
- VHF signals go beyond the radio horizon

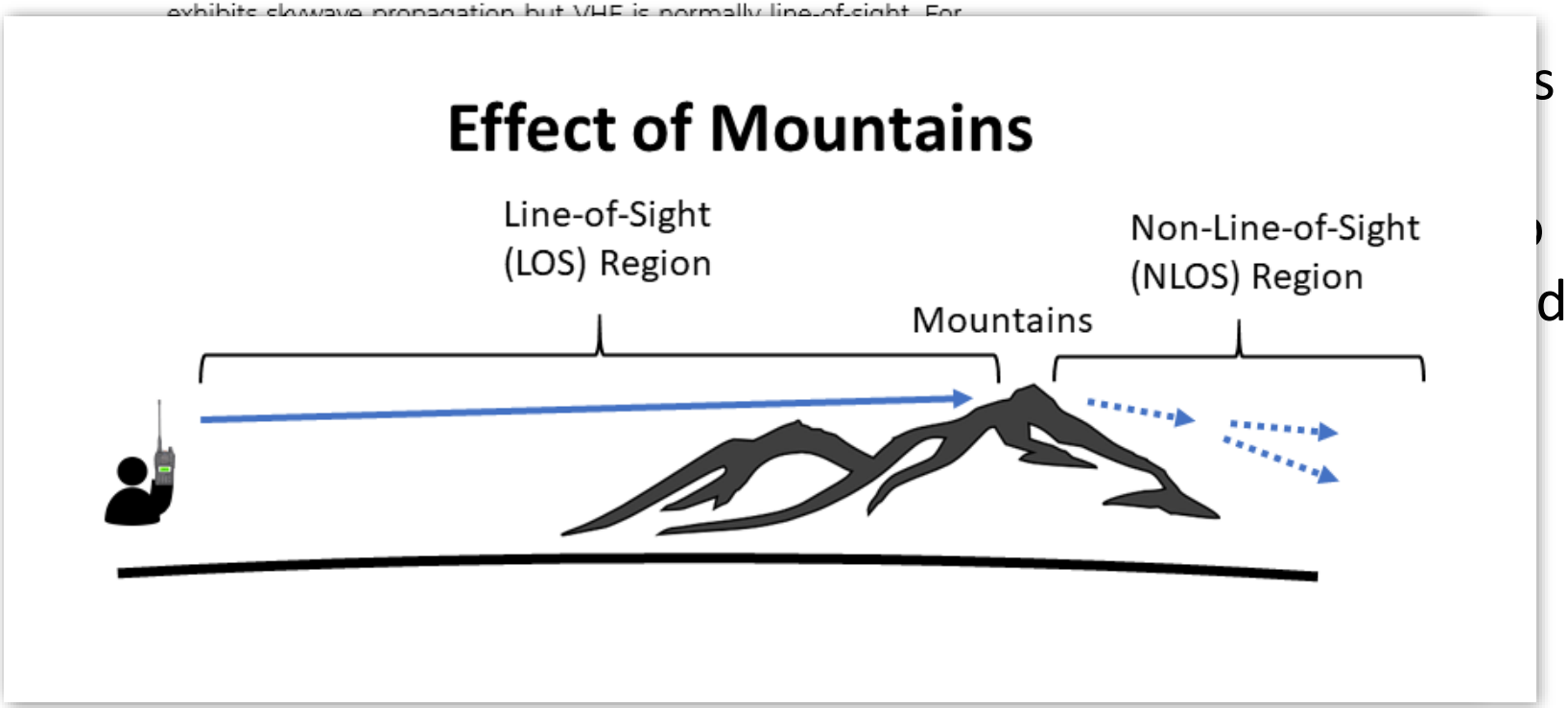


6. The Myth of VHF Line of Sight

When we teach our Technician License class, we normally differentiate between HF and VHF propagation by saying that HF often exhibits skywave propagation but VHF is normally line-of-sight. For

s a

dio



How Far Will My Signal Go on VHF?

- Optical horizon from Pikes Peak: 120 miles, plus 15% for radio horizon = 138 miles
- Mt Sunflower (highest spot in Kansas) is easily worked on 2m FM from Pikes Peak (160 miles)
- Best 2m FM DX during Colorado 14er Event: Phil NØKE on Mt Bross to Larry NØLL near Smith Center, KS (375 miles)

Skywave Propagation

Sporadic-e Propagation

Seasonal: most common during the summer months

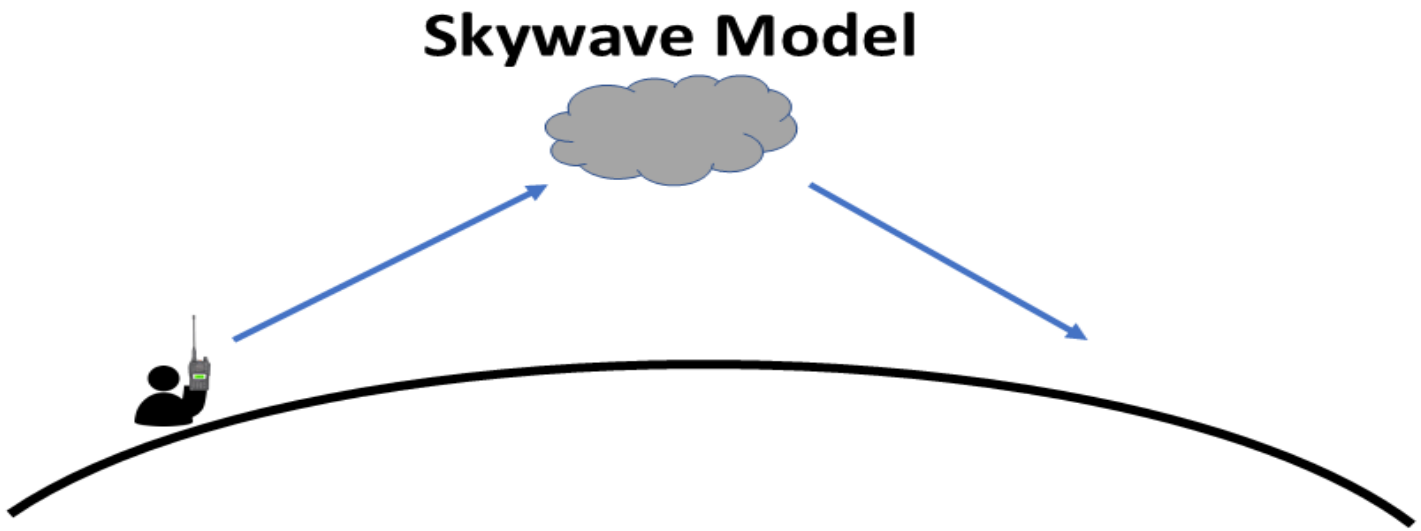
Occurs frequently on 6 meters

Occurs less frequently on 2 meters

F-Layer Propagation

Common propagation mode for HF bands

Occurs on 6 meters with intense sunspot activity



6 Meters – The Magic Band

- Propagation is normally similar to 2 meters
- When sporadic-e (“e skip”) occurs, the band comes alive
  - Sporadic-e openings allow contacts across North America (and more)
  - Sporadic-e is very common in June and July
  - Calling frequency: 50.125 MHz USB
  - Move up in frequency as the band gets busy
  - 50.110 to 50.125 MHz is the DX Window, use it only for contacts to other countries
- FT8 Digital Mode is very popular on 6 meters

  Works very well with weak signals and can compensate for poor propagation

Let's Talk About…

VHF Basics

VHF Contests

Summits On the Air

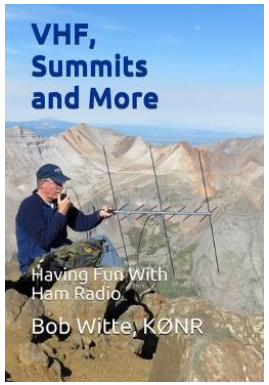
7. How to Work A VHF Contest

This is a brief introduction into how to operate during a VHF contest. The main contests, roughly in order of popularity, are the ARRL June VHF Contest, the ARRL January VHF Contest, the ARRL September VHF Contest and the CQ Worldwide VHF Contest in July.

The ICOM IC-9700 transceiver covers the 2m, 70cm and 23cm bands.

I prefer to think of these "contests" as "activity weekends" because the word "contest" often makes people think of the fast-paced, chaotic, band-crushing experience of HF contests. VHF contests usually have a much different feel. The problem with the VHF bands is that they are often underutilized. You put out a call on simplex and nobody is there. Dead silence. But on VHF contest weekend, you are sure someone is going to be on the air, so the event tends to increase the activity, bringing people out of the woodwork. A VHF contest is more like a friendly reunion of local VHF enthusiasts.

(Sometimes a VHF contest can get pretty intense, especially if there is a significant band opening on 6 meters. Then things start to sound like the HF bands with signals coming in from across the country.)



- VHF/UHF bands above 50 MHz
- Scoring is based on Maidenhead Grid
- Most contest activity is on SSB, also CW, FM, FT8
- FT8 (and FT4) are now popular, especially on 6 meters

Contest Format

- Use all amateur bands above 50 MHz
- 50 MHz, 144 MHz and 432 MHz are most popular
- Work everyone you can on every band
- Score = QSO points x Total Grids Worked

50 MHz (6 meters)	1296 MHz (23 cm)
144 MHz (2 meters)	2304 MHz (13 cm)
222 MHz (1¼ meters)	3456 MHz (9 cm)
432 MHz (70 cm)	5760 MHz (5 cm)
903 MHz (33 cm)	10 GHz (3 cm)

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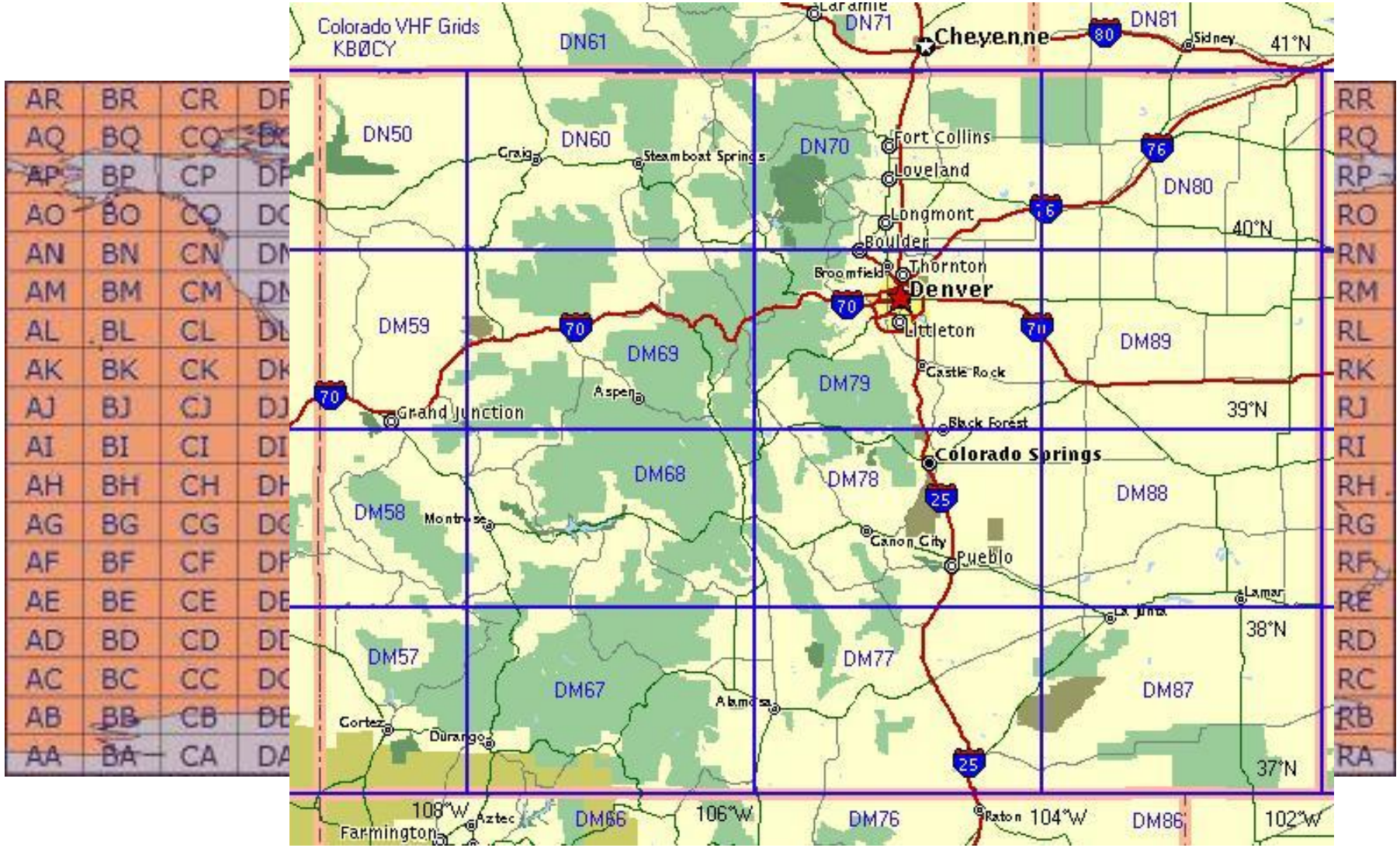
To make a contact, you need to exchange call sign and grid locator with the other station



Contest Calendar

- ARRL January VHF Contest
  Third or fourth weekend in January
- ARRL June VHF Contest
  Second full weekend in June
- CQ Worldwide VHF Contest
  Third full weekend in July
  6 Meters and 2 Meters only
- ARRL September VHF Contest
  Second full weekend in September

June is the big VHF contest: warm weather and sporadic-e


Stu WØSTU
Mt Herman
January VHF 2011


KØNR
CQ WW VHF 2006
Mount Evans

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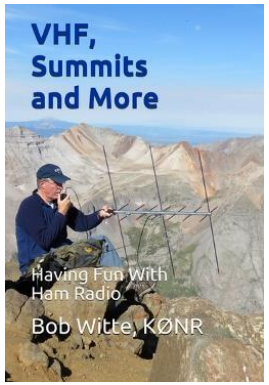
8. So You Want To Be a Rover

This article is about getting started as a rover in VHF contests, with emphasis on operating in or around Colorado. Maybe you've thought about trying some rover operating but weren't sure how to get started, so this article may help. Rover operation can be as simple or sophisticated as you'd like it to be but it is always a lot of fun. Operating rover is often just a good excuse to load up the radio gear and head out on a ham radio road trip.

Step one in understanding rover operation is to read the contest rules carefully to understand the rules specific to rovers. The most popular VHF contests are listed in the Reference section. I won't cover the rules here except to say that the basic concept is that rovers accumulate points by moving from grid to grid, making contacts with stations multiple times. For example, you might operate from 4 to 6 different grids, working many of the same stations from each grid. This type of operation is extremely valuable here in Colorado since many of the Colorado (and Nebraska, Kansas) grids are not occupied by fixed VHF stations.



- Rover stations move from grid to grid, making multiple contacts with the same stations.

Rover Station
Eric KRØVER

Rove Route – Jun 12-13, 2010

1 – DN71, Panorama Pt., NE

2 – DN70/DN71 Line and DN70 ops to DEN (PM), CO

3 – DN71/DN61 Line, NE

4 – DN61 CR-19 Ops to Denver, NE

4 (again) – DN60/DN61 Line

5 – DN61 More ops to DEN (PM)

6 – Night in Fort Morgan

7 – DN70/DN60 Line

8 – DN61 Microwave Twr. More ops to DEN (AM)

9 – DN70 More ops to DEN (AM)

10 – DM79/DN70 Line

11 – Placeholder to force route onto Rector-Leader Rd.

12 – DM89, Cedar Pt. Ops to Denver

13 – DM88/DM89 Line

14 – DM79/DM89 Line

15 – DM78/DM79 Line

Possible Additions: a) DN60/DM89 & b) DM78/DM88 lines
a – Four mi. round trip down CR-11 south for microwave twr
b - Five mi. round trip down Rt 149 just south of Pt. 14

Pt. 1 to Pt. 14 distance is 238 miles

Let's Talk About…

VHF Basics

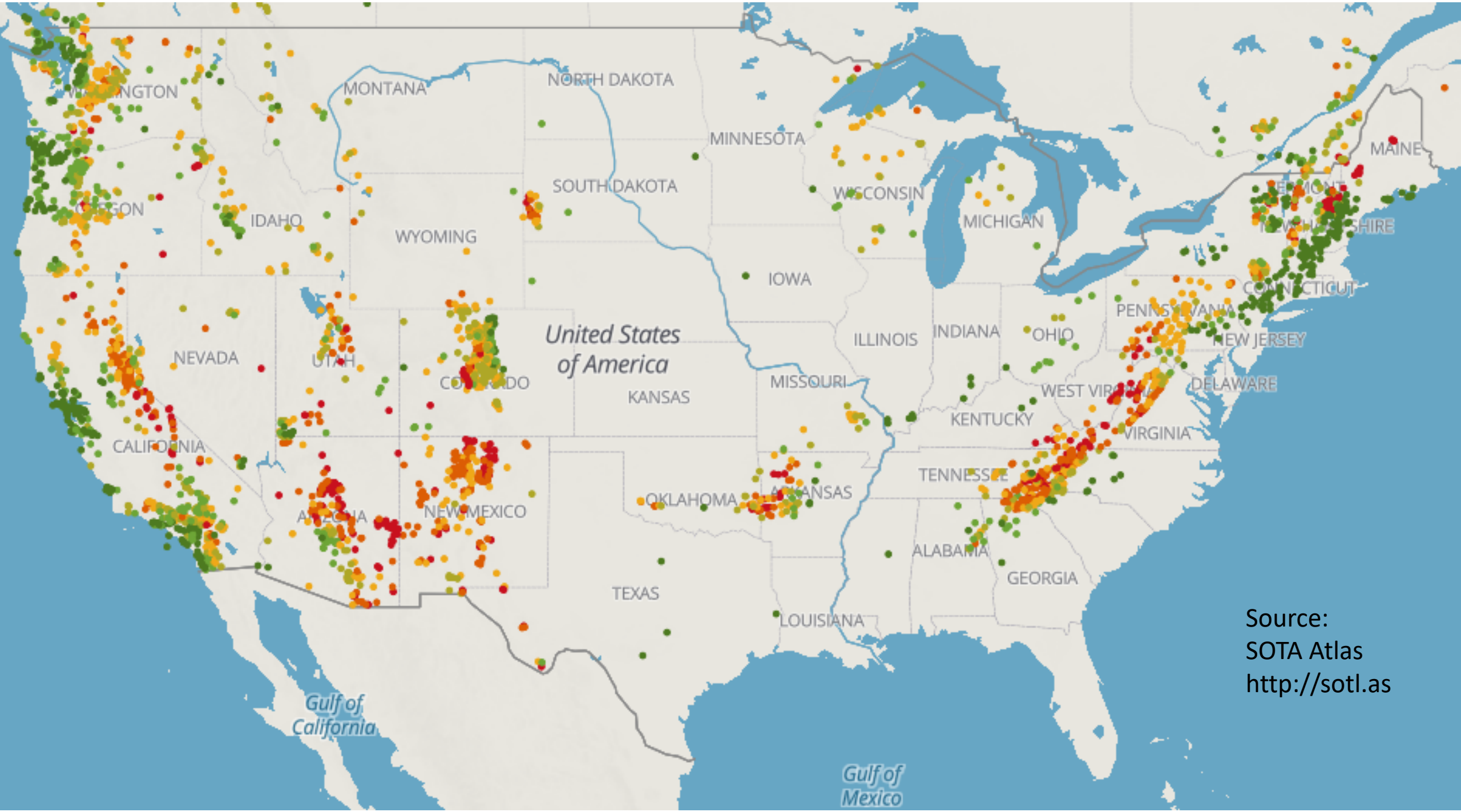
VHF Contests

Summits On the Air

Summits On The Air (SOTA)

- Two ways to participate
  - Activator
  - Chaser
- Worldwide program
- Points and Award System
- Over 1800 SOTA summits in Colorado
- SOTA activation requirements:
  - summit must be on the SOTA list
  - equipment must be carried (no minimum distance, not attached to vehicle)
  - portable power (no fossil fuel generators)

See https://www.sota.org.uk/

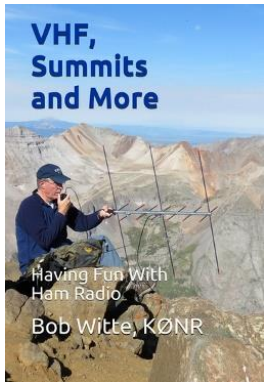


Source:
SOTA Atlas
http://sotl.as

41. How To Do A VHF SOTA Activation

The *Summits On The Air* (SOTA) program has really taken off in North America. SOTA originated in the UK in 2002 and it took a little while for it to make it across the Atlantic to this continent. The basic idea of SOTA is to operate from a designated list of summits or to work other radio operators when they activate the summits. The list of designated summits are assigned scoring points based on elevation and there are scoring systems for both *activators* (radio operators on a summit) and *chasers* (radio operators working someone on a summit).

Handheld transceiver with half-wave antenna for 2 meters.



- Summits On The Air
- HF or VHF (or both)
- 2m FM is the most popular VHF mode

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Easy VHF SOTA Activation

Also known as “take along a 2m handheld on a hike”

Kaufman Ridge HP
(WØ/SP-081)

10,765 feet elevation

The ½-wave Vertical Antenna

MFJ-1714 – SMA or BNC connector

The ½-wave Vertic

Dualband 2m/70cm halfwave antenna
Search Amazon for TWAYRDIO RH770

SMA (male or female)
BNC

$17 delivered

Improved VHF SOTA Activation

Also known as “bring along a small 2-meter Yagi antenna”

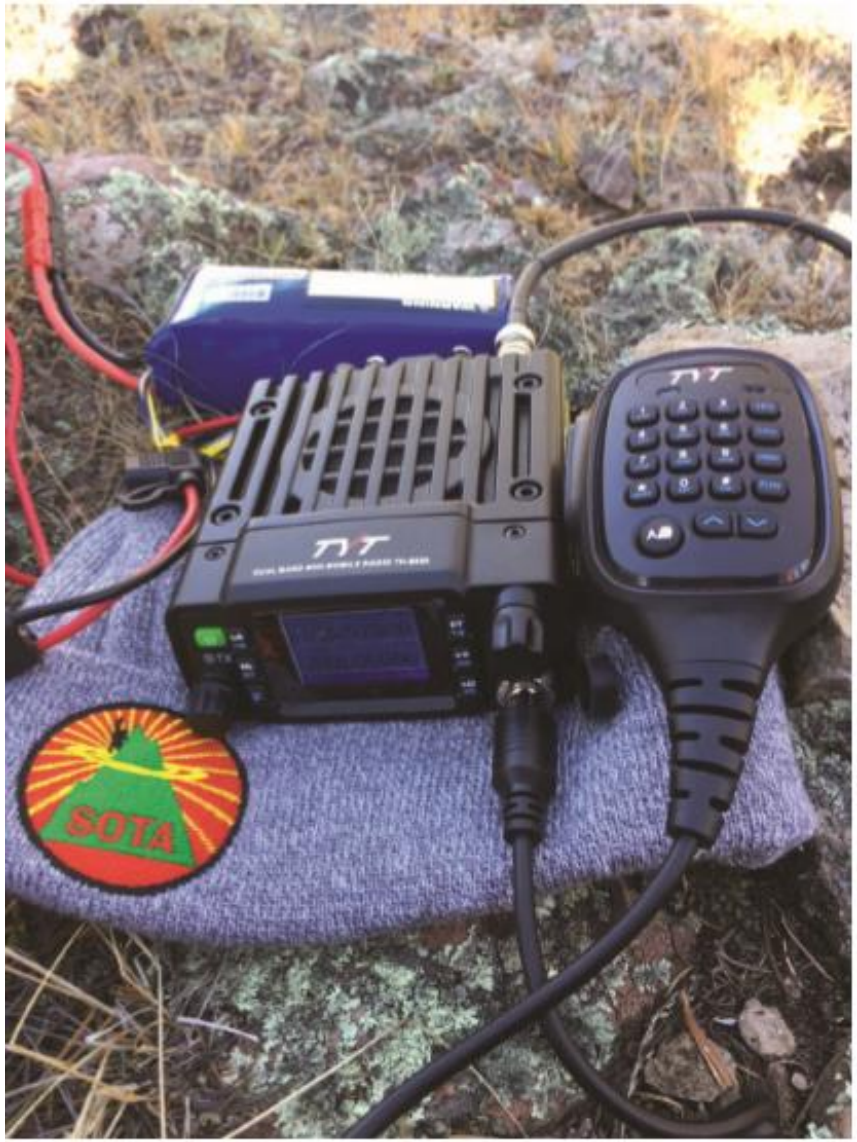
Aspen Ridge (WØC/SP-084)

10,740 feet elevation

Arrow 3-element Yagi for 2m

Bob KØNR on Mt Sneffels (14,150 Feet)

Steve WGØAT at 14,000 Feet



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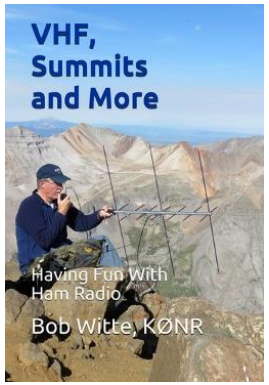

- More punch for the NLOS region
- Improve antenna first
- Increase transmit power

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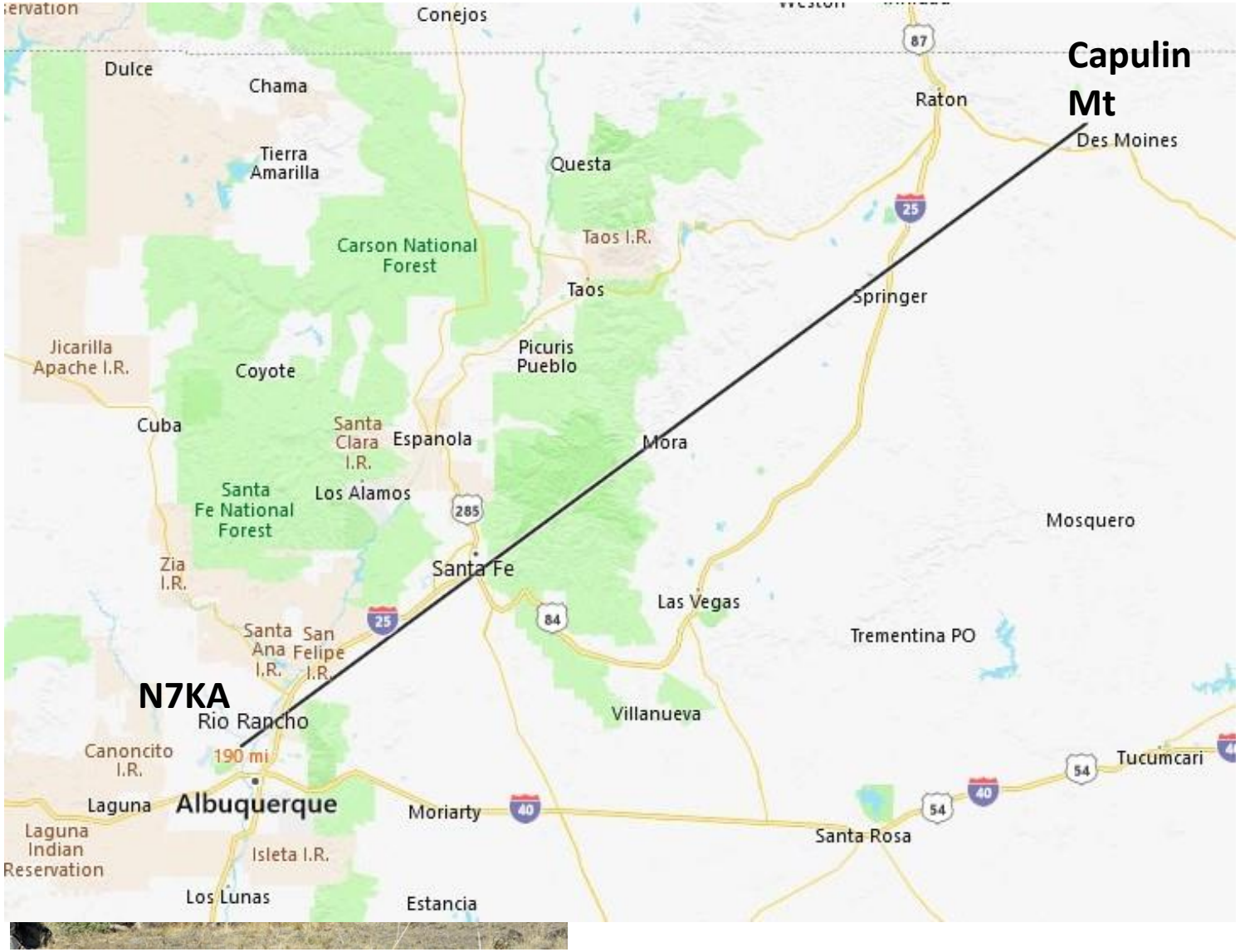
Capulin Mountain SOTA

W5N/SG-009
8182 feet

150 miles to major population area

Worked
N7KA
184 miles
2m CW

Capulin Mountain SOTA



W5N/SG-009
8182 feet

150 miles to major population area

Worked
N7KA
184 miles
2m CW

Mt Herman
WØC/FR-063
9063 feet

Yaesu FT-817

VHF Contest plus SOTA
2016 January VHF Contest (KØNR)
2m & 70cm fm and ssb
17 QSOs in about one hour
Best DX: Wyoming DN71 (140 miles)

David KI6YMZ on Mt Elbert 2015

Steve WGØAT and Guy N7UN

It’s Not Always
Warm and Sunny

Summary:
VHF/UHF, Hiking, SOTA, Contesting and Mountains

Q&A