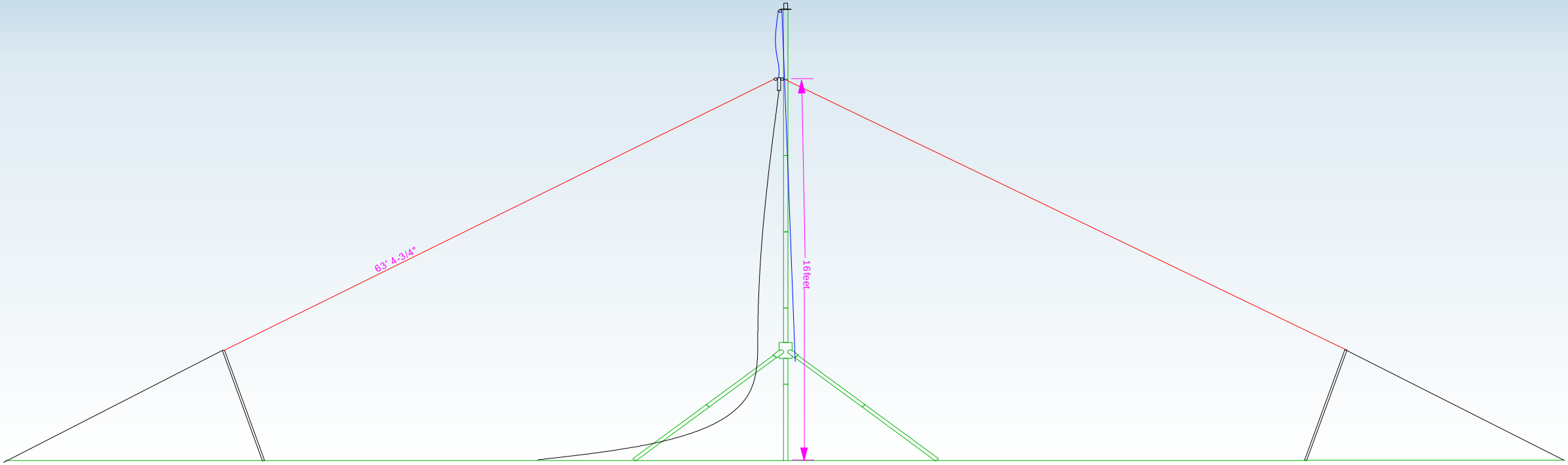
A Multi-Band Resonant NVIS Plug and Play Dipole

for 20,20 digital, 40, 40 digital, 60 80 and 80 digital

Reasons to build a full size plug and play tuned NVIS dipole:

- Full size antennas put out full size signals!
  Maximum power and voltage transfer occurs when the antenna chain has matched elements
- This antenna uses one central suspension point with two elevation stakes and two attachment stakes
- This antenna is cut specifically for an elevation of 16 feet at center and 5-6 feet on the ends.
- Uses simple, easy to find components that can easily be replaced repair. Flexweave wires is very robust and easy to handle. A balun is probably unnecessary due to using a well tuned antenna but I would use it anyway.
- A tuner is unnecessary. The smaller radios don't have tuners. Tuners can be a point of signal loss.
- This antenna is particularly designed with easy-up portability in mind.


63' 4-3/4"
16feet

A 7 band full size NVIS antenna resonant on both the voice portions and the digital portions of the bands as well as 60 meters.

Five sections of aluminum military poles with 1:1 current balun raised to 16 feet.

85 feet 3/16 para-cord suspends antenna on each half of the dipole

Seven foot stake used to elevate ends to about 5-6 feet. Balance of cord runs to a stake driven in the ground. A handy tree is even better.

Cutting Chart for 20-80 Meter Plug and Play NVIS Antenna

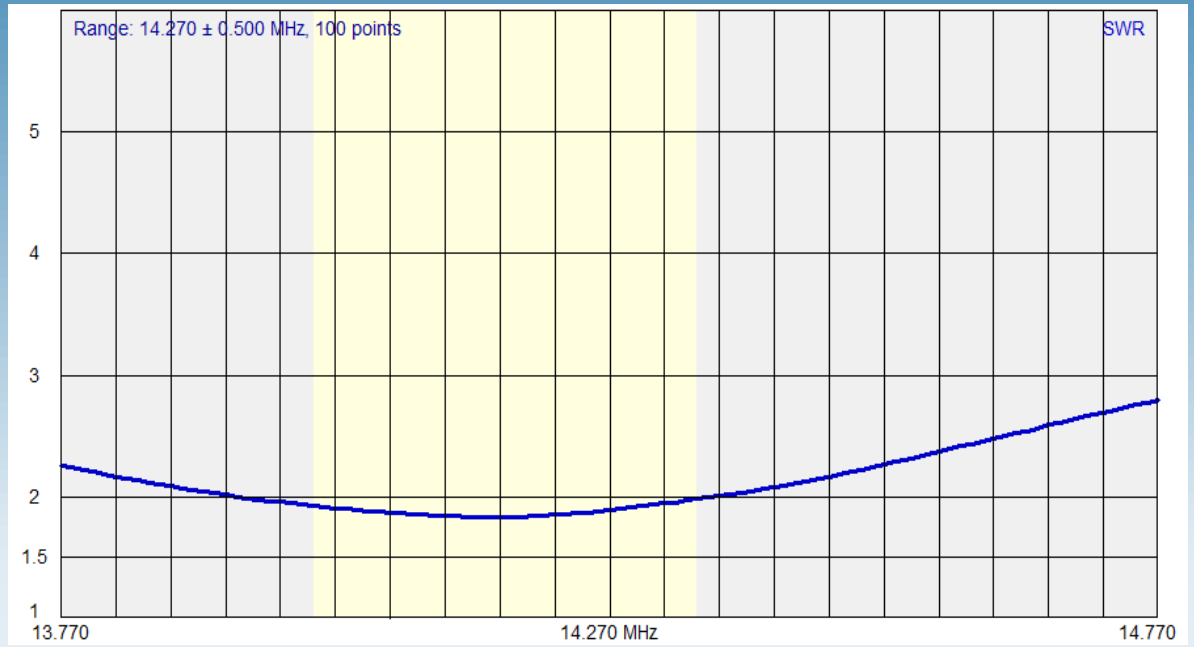
Cut to be resonant at center height 16 feet with ends at 6 feet

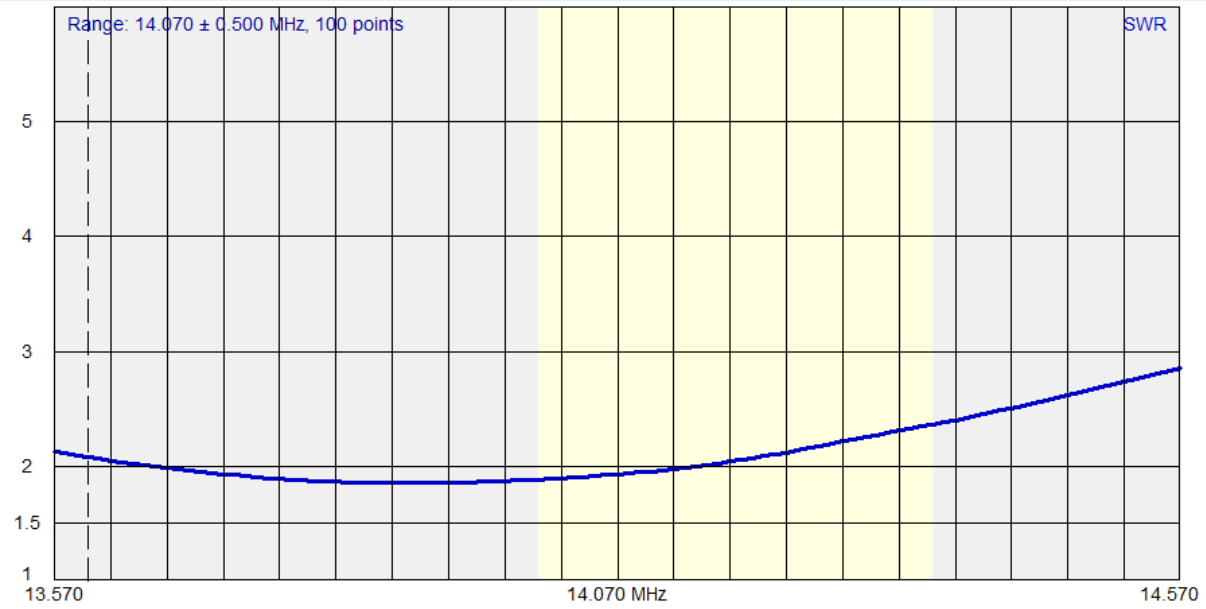
20 meters 16’ 1 ½ inches
20-meter digital 16’ 4 ¼ ‘. Jumper 2 ¼ ‘
40-meter phone 32’ 3 ½”
40-meter digital 32’ 9 ½” Jumper 6”
60 meters 43’ 2”
80-meter phone 58’ 3”
80-meter digital 63’ 1 ½” Jumper 4’ 7 ½”

Start with female bullet connectors of the 20 section and plug and play as you go female to male. This puts the rain cap superior in position.

Terminal disconnects are insulated bullet connectors. Each section is serially connected and disconnected to give the exact resonant length. Antenna wire is #14 Davis Flexweave which is super flexible and UV resistant.

Sections are attached with 4 inch zip ties every 18 inches. Be sure and stretch the Dacron super tight and allow a little belly at the connectors when connecting the zip ties





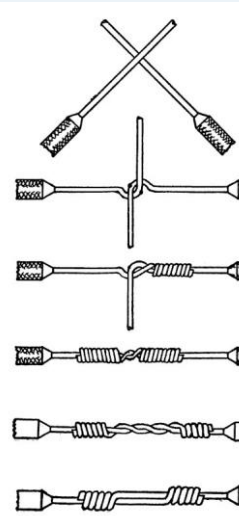
Twenty meter screw-up! And the worst of it is: the whole antenna is based sequentially on each segment.

Intensive 4th grade math to the rescue!

13.9 MHz = 16’ 10.1”
-14.070 MHz= 16’ 7.6”
2.5”~
14.170= 16’6.2”
-14.270= 16’ 4.8”
1.4”

Solution: cut 2 inches off 20 meter phone
Splice 2” on after the digital jumper using the Western Union soldered splice with heat shrink

Preserves the other bands unchanged. BTW, I only added 20 meters b/c Jeff asked me to☺



Tools used to construct.

- Wheel and tape for measure
- Stripper
- Cutter
- Crimper
- AA-600 to sweep bands
- Bullet connectors
- Davis Flexweave #14, 150 ft. (HRO)
- Coax.
- Two 85 foot lengths 3/16” Dacron para-cord
- Not shown 4 inch mini tie wraps
- 100 foot tape for precision.

Guidelines and pitfalls:

- Stretch Dacron tightly before attaching wire! Due to some stretch connectors will be unplugged.
- Use 85 feet of Dacron per side to give you plenty of tail to secure antenna
- Allow some slack as in belly at the connectors.

- Work from balun or center connector out measuring checking and tuning each section as you go. The sections are serially dependent.
- Short jumpers between voice and digital sections are attached with a single tie wrap.
- Use 4 inch mini tie wraps every 18”.
- Don’t overtighten tie wraps as you may have to adjust length.
- Check each length carefully! Measure twice, cut once☺ The accuracy of the entire antenna is dependent on each section.
- Measurements of the sections are based on 16 feet center elevation. Resonant frequency drops as the ground is approached.
- Try raising a bit higher to see if vertical aperture is improved.
- Have fun! Antenna building is very rewarding!

Gwinnett ARES

Portable Antenna Calculations

Band	Freq	Feet (decimal)	Feet	Inches
80 digital	3.5830	126.6983	126	8 1/2
80 voice	3.9750	117.1472	117	2
60	5.3335	86.8698	86	10 1/2
40 digital	7.0700	65.8642	65	10 1/2
40 voice	7.1650	64.6643	64	8
20 digital	14.0700	32.7633	32	9
20 voice	14.2700	7.1800	7	2

Excel spread sheet with antenna calculations. I adjusted factorial multipliers to match measured numbers. Obviously the these numbers are for the full halfwave not a side.

The reflection is a measurement of how much energy incident to a device is being reflected back and, therefore, not entering the system. When measured in dB, the following values can be used as indicative:

- **Reflection 0dB**: all RF energy is being reflected. This is an *ideal* open or short circuit, equivalent to VSWR=infinite.
- **Reflection -3dB**: half of the RF energy is being reflected, and thus half of the energy is being received by the device. This is equivalent to VSWR 5.8.
- **Reflection -10dB**: 1/10th of the RF energy is being reflected. Usually this is the threshold when most devices are considered to be tuned and have a reasonably good impedance matching. This is equivalent to VSWR 1.9.
- **Reflection -20dB**: 1/100th of the RF energy is being reflected. This is a very good matching, expected for good designed and matched filters. This is equivalent to VSWR 1.2.
- **Reflection -30dB or less**: 1/1000th or less of the RF energy is being reflected. This is considered exceptionally good matching, and usually found in lab grade devices such as precision attenuators and filters. This is equivalent to VSWR 1.07 or less.

Why does NVIS work well only in certain bands?

Near vertical incidence skywave, or **NVIS**, is a skywave radio-wave propagation path that provides usable signals in the range between groundwave and conventional skywave distances—usually 30–400 miles (50–650 km). It is used for military and paramilitary communications, broadcasting,[1] especially in the tropics, and by radio amateurs. The radio waves travel near-vertically upwards into the ionosphere, where they are refracted back down and can be received within a circular region up to 650 km from the transmitter.[2] If the frequency is too high (that is, above the critical frequency of the ionospheric F layer), refraction fails to occur and if it is too low, absorption in the ionospheric D layer may reduce the signal strength.

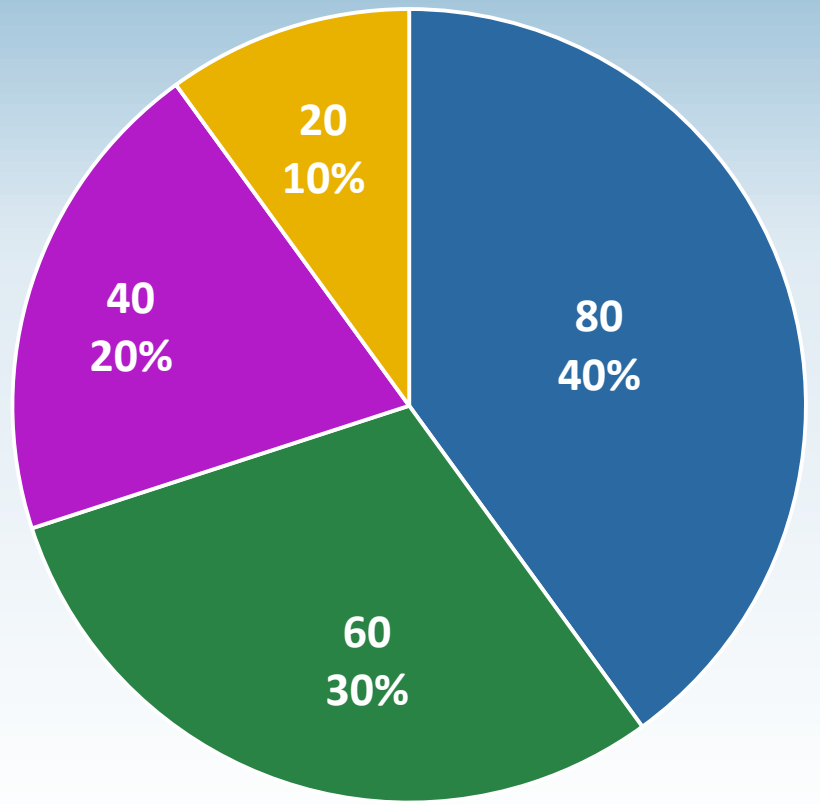
GAARES MAT deployment as K4SDF testing our Plug and Play antenna. AB4HF and AB4NX with the RV/ham shack

#	Band	Call Sign	Name	Location	Signal Report	
					Theirs	Ours
1	80	KK4KHS	Mike	Gwinnett	5-9	5-9
2	80	KG7IUP?	Mike	Dougherty	5-9	5-9
3	80	W4DTX	Dave	Cherokee	5-9	5-9
4	80	W4DEL	Del	Newton	5-9	5-7
5	80	KJ4CMY	David	Gwinnett	5-9	5-8
6	80	WB2PSB	Zargon	DeKalb	5-9	5-7
7	80	W4TGA	Barry	DeKalb	5-9+	5-9
8	80	AD4PZ	Joe	Gwinnett	5-5	5-8
9	80	K4GCR	Leon	Dougherty	5-5	5-7
10	80	N4KP	Frank	Jackson	5-9	5-9+
11	80	K4SDJ	Steve	Chatham	5-6	5-7
12	80	KM4RKT	Greg	DeKalb	5-9	5-9
13	80	KG4WQZ	Tom	Dodge	5-4	5-7
14	80	N7BU	Roger	Cobb	?	5-7
15	80	KN4QJ	Frank	Walton	5-9+	5-9
16	80	KS4XR	Paul	Jackson	5-9	5-9+
17	80	KK4ZPS	Ken	Jackson	5-9	5-7
18	80	K4JPN	Steve	Houston	5-5	5-7
19	80	KA4YZR	Paul	Gwinnett	5-6	5-5
20	80	K4CRO	Mike	Jackson	?	5-6
21	80	W4HBS	Bret	Fannin	5-9	5-9
22	80	KK4SGF	Gary	Dougherty	?	5-7
23	80	K4VCM	Tom	Catoosa	?	5-7
24	80	K4ODC	Roger	Lanier	?	5-5
25	80	WB4NFG	Jimmy	Wilkerson	?	5-9
26	80	WD4BWW	Eddie	Evans	?	5-7
27	80	W4MSY	Pete	Cherokee	?	5-7
28	80	KG4XR	Paul	Jackson	?	5-9+
29	60	AC4MG	Matt	Coweta	5-9+	5-9
30	60	KS4XR	Paul	Jackson	5-6	5-9
31	60	KN4QJ	Frank	Walton	5-5	5-8
32	60	K4TXQ	John	Fayette	5-9	5-8
33	60	W4HNG	Neil	Gwinnett	5-9	5-9

#	Band	Call Sign	Name	Location	Signal Report	
					Theirs	Ours
34	40	N4TUA	Colin	Houston	?	5-9+
35	40	KG4WQZ	Tom	Dodge	?	5-9
36	40	KB1WEI	Pat	Chatham	?	5-9
37	40	K4GCR	Floy	Dougherty	5-9	5-9
38	40	KE8BMB	Greg	State of Ohio	5-9	5-9
39	40	W4LID	Cy	State of Kentucky	5-9	5-7
40	40	WA0CGZ	Charles	Long	5-7	5-7
41	40	AC4MG	Matt	Coweta	5-9	5-9
42	40	K4KHV	James	Marianna, FL	5-9	5-9
43	40	N4BQQ	Mike	Calhoun, SC	5-7	5-7
44	40	KI4TYO	Ken	Effingham	5-9	5-7
45	40	KJ4GTI	Doug	Bulloch	5-9	5-9
46	40	N8YYB	Rich	Charleston, WV	5-7	5-9
47	40	KA4AQM	Randall	Chesapeake, VA	5-9	5-9
48	40	KC3HJP	Curt	Elizabeth, PA	5-7	5-7
49	40	KG4MLM	Gary	E. Lake Weir, FL	5-9	5-9
50	40	NO3K	Richard	Columbia	5-9	5-9
51	20	NP2ML	Hubert	Virgin Islands	5-9	5-2
52	20	K4BTA	Lewis	Cobb	5-9	5-9+
53	20	W7NTD	Floyd	State of Washington	5-9	5-7
54	20	WA1JXD	Dave	State of Connecticut	5-9	5-9
55	20	W4FEB	Randy	State of Massachusetts	5-7	3-5
56	20	CO9BGA	?	Cuba	5-9+	5-9
57	20	W1DVZ	JD	State of Texas	5-9	5-7
58	20	WA4ZXV	Norm	Gwinnett	?	5-7
59	20	KA1TWX	Bruce	State of New Hampshire	5-9+	5-9+
60	20	K1ILR	Francis	State of Massachusetts	5-9	5-6
61	20	N1NSE	Rick	State of New Hampshire	5-8	5-7
62	20	KC5FAA	Bobby	State of Texas	5-9	5-6
63	20	W1CSI	Jim	State of Massachusetts	5-9	5-8
64	20	N9PZR	Scott	State of Wisconsin	?	5-7
65	20	CO3DSE	?	Cuba	?	5-9
66	20	WP4PRS	Juan	Puerto Rico	?	5-5
67	20	AD6LV	Ray	State of California	?	5-7

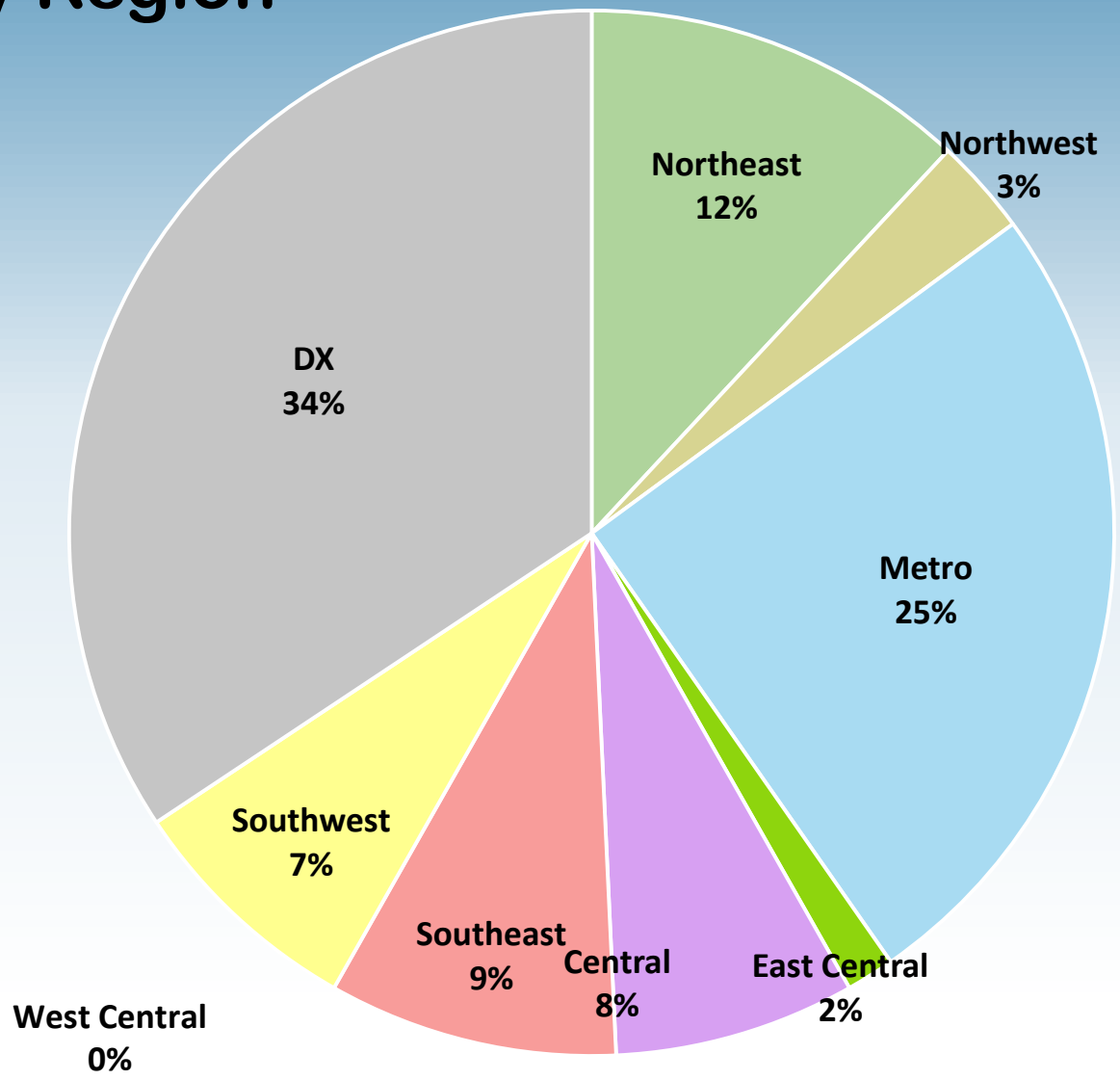
By Band

Band	#
80	28
60	5
40	17
20	17



By Region

Region	#
Northeast	8
Northwest	2
Metro	17
East Central	1
Central	5
Southeast	6
Southwest	5
DX	23

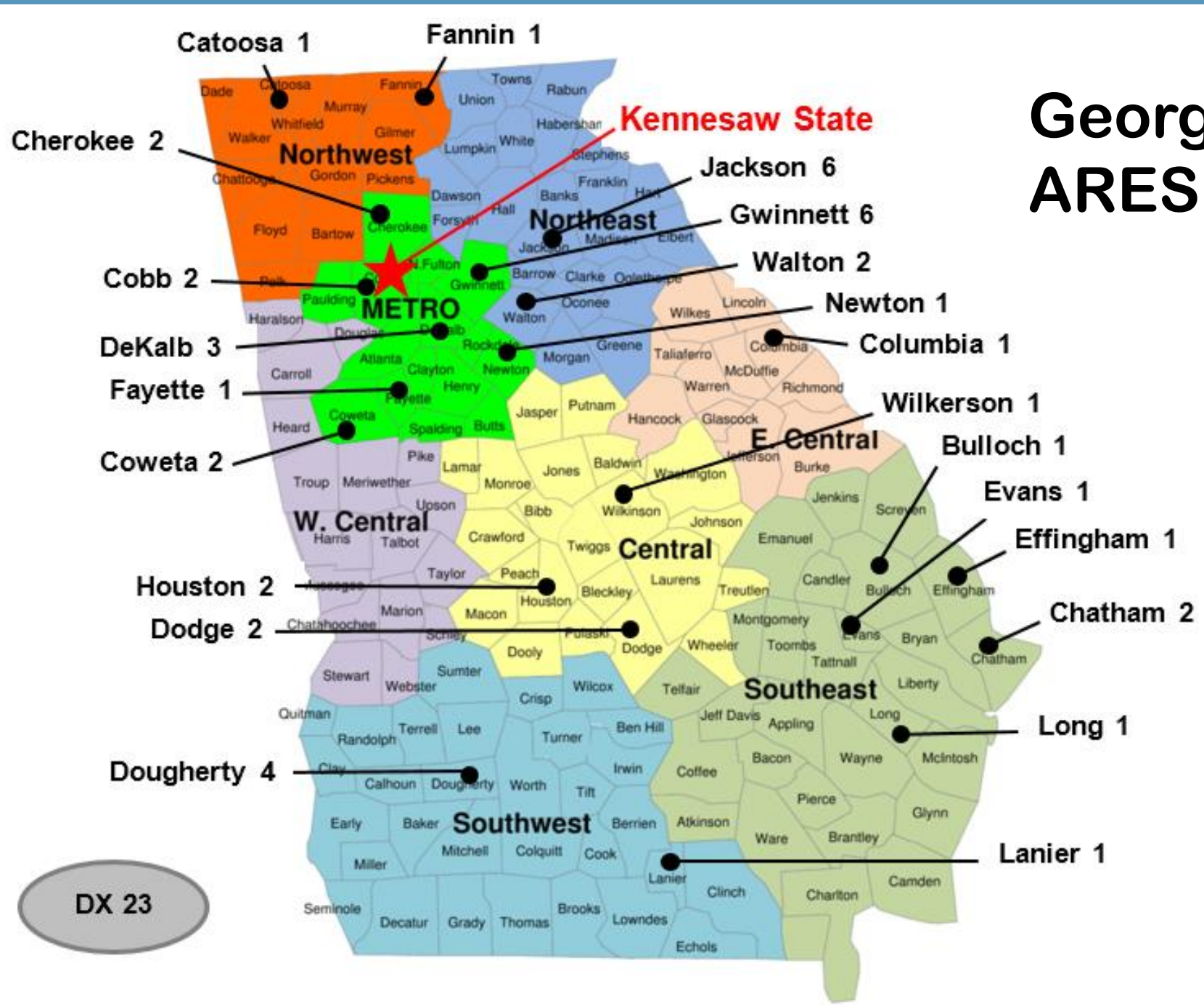


Total Contacts = 67

Region	County	#
Northeast	Jackson	6
Northeast	Walton	2
Northwest	Catoosa	1
Northwest	Fannin	1
Metro	Cherokee	2
Metro	Cobb	2
Metro	Coweta	2
Metro	DeKalb	3
Metro	Fayette	1
Metro	Gwinnett	6
Metro	Newton	1
Central	Dodge	2
Central	Houston	2
Central	Wilkerson	1
East Central	Columbia	1
Southeast	Bulloch	1
Southeast	Chatham	2
Southeast	Effingham	1
Southeast	Evans	1
Southeast	Long	1
Southwest	Dougherty	4
Southwest	Lanier	1

Region	Location	#
DX	Calhoun, SC	1
DX	Charleston, WV	1
DX	Chesapeake, VA	1
DX	Cuba	2
DX	E. Lake Weir, FL	1
DX	Elizabeth, PA	1
DX	Marianna, FL	1
DX	Puerto Rico	1
DX	State of California	1
DX	State of Connecticut	1
DX	State of Kentucky	1
DX	State of Massachusetts	3
DX	State of New Hampshire	2
DX	State of Ohio	1
DX	State of Texas	2
DX	State of Washington	1
DX	State of Wisconsin	1
DX	Virgin Islands	1

Georgia Section ARES Districts



AB4HF operating K4SDF in the RV ham shack


ICOM
HF / VHF / UHF TRANSCEIVER IC-7100
14.322.40
MFJ DELUXE HF
PEAK READING SWR/WATTMETER
MODEL MFJ-815B
SWR
REFLECTED
LAMP
METER
ON
OFF
HI
LO
PEAK
AVG
Uniden