Antenna Proposal for the SBCARA 2026 Winter Field Day

13 January 2026

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www.deloach.net/SBCARA/

Introduction

- In this presentation
  - I introduce my methodology for selecting antennas to match the need of a field exercise
  - I summarize what I believe are the desired antenna characteristics for the SBCARA Winter Field Day
  - I describe one antenna I propose to add to the SBCARA Winter Field Day – the Rhombic Loop Twofer – that meets a lot of the desired Winter Field Day antenna characteristics

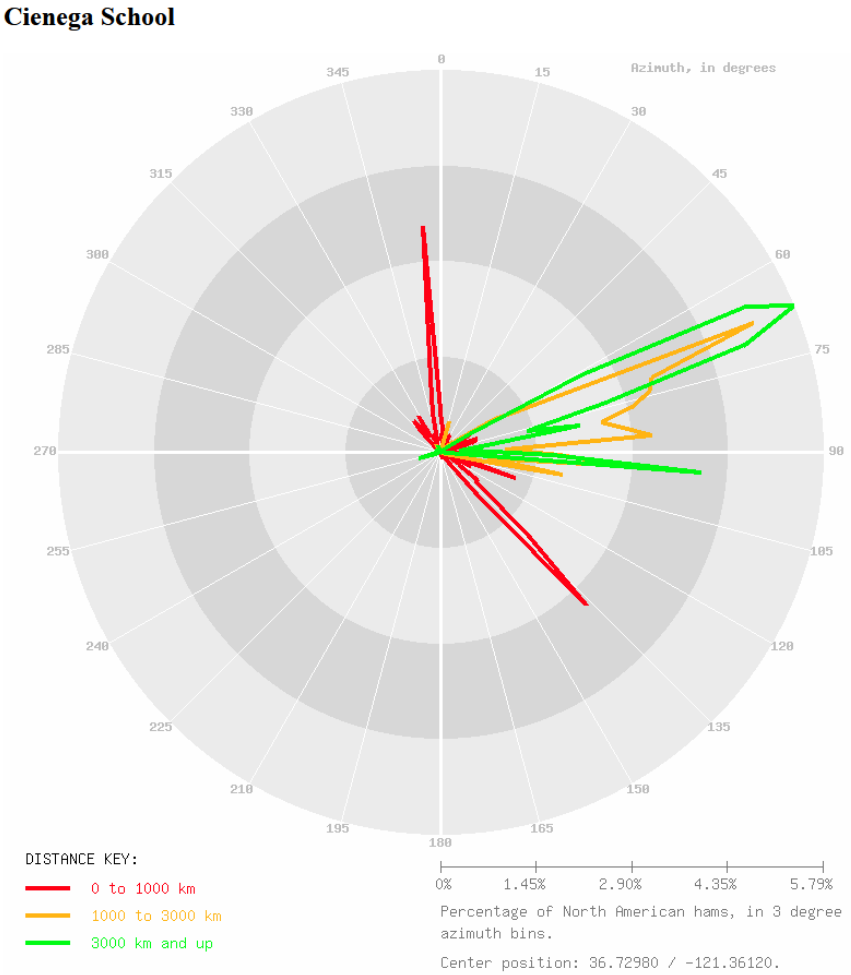
Matching the Antenna(s) to the Need

First Principles

- When choosing antenna(s) for a field event, I first ask: what am I trying to achieve?
  - Where are the stations I hope to work?
    - When would horizontal gain be helpful?
    - What vertical takeoff angle is desired?
  - What bands am I trying to cover?
  - What physical constraints am I working with?
    - Are towers and rotatable beams a possibility?
    - How much space do I have to work with?
    - How could antennas be supported?

Where are the Stations to Work

- For Field Day events, to help me understand desired antenna characteristics, I use this web site to see a distribution of the U.S. & Canadian ham population broken out by azimuth & distance from my specific location
- This distribution – centered on the SBCARA Winter Field Day QTH – suggests there are two main target populations for our Winter Field Day antennas:
  1. By far, the largest concentration of North American hams line up between ~60 and ~95 degrees
     - Includes the Northeast, Mid Atlantic, Eastern Canada, Midwest, and Southeast
     - An antenna pointed at ~70 or 80 degrees with as much horizontal gain as possible and low to medium takeoff angle optimal
  2. West Coast populations line up to the north and southwest
     - An antenna with north and southwest coverage with higher takeoff angle optimal

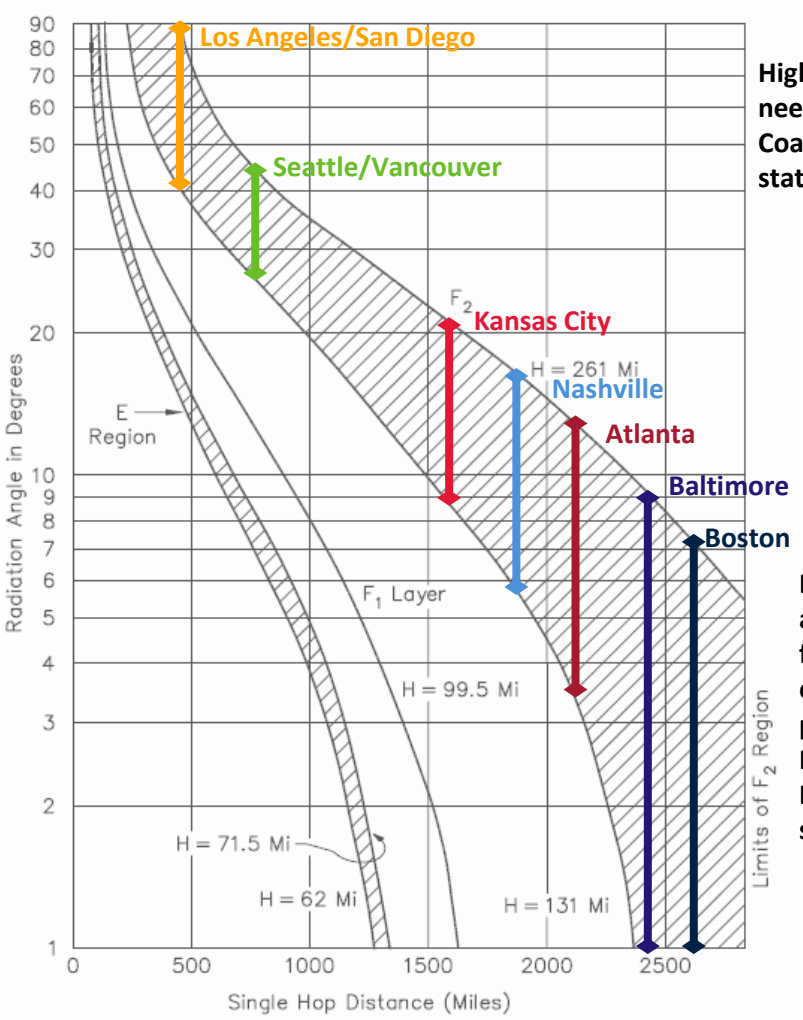


Distribution of North American Hams from the SBCARA Winter Field Day location. Source: www.deloach.net/PointYourFieldDayAntenna/

Don’t Forget About Antenna Takeoff Angle!

- To get a sense of desired antenna takeoff angles, I use the *Radiation Angle vs. Single Hop Distance plot* from the ARRL Antenna Book*
  - Assume single hop F2 layer the primary mode
  - High takeoff angle needed for West Coast & Southwest stations
  - Lower takeoff angles needed for Midwest & Eastern stations, particularly the Northeastern and Eastern Canada stations

Radiation Angle vs. Single Hop Distance from Hollister



High takeoff angle needed for West Coast & Southwest stations

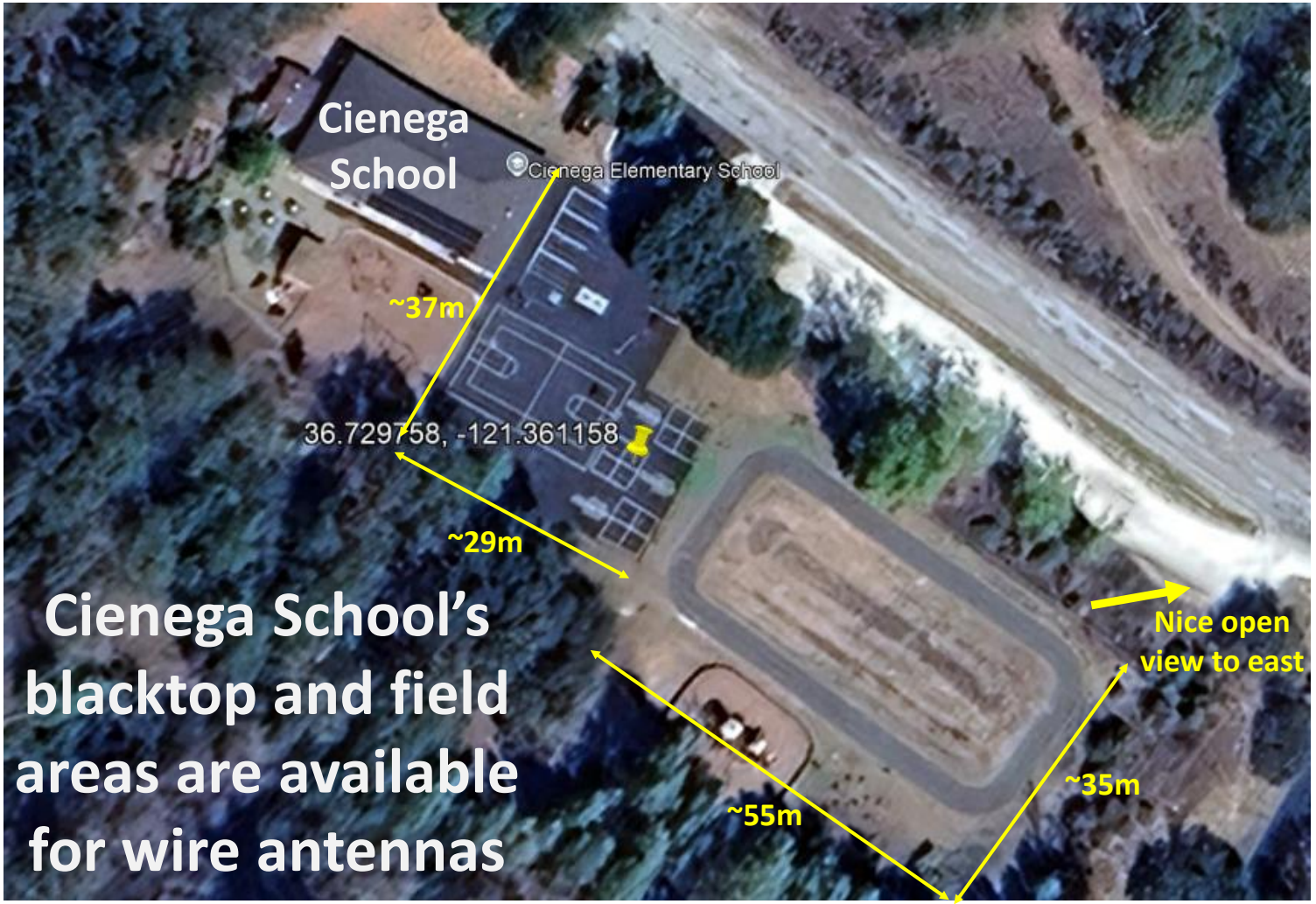
Lower takeoff angles needed for Midwest & eastern stations, particularly the Northeastern & Eastern Canada stations

** ARRL Antenna Book for Radio Communications, 23rd Edition, Figure 4-29, page 4-34.*

Target Daytime & Nighttime HF Bands

	Daytime	Nighttime
Medium to Long Distances to Northeast, Mid Atlantic, Eastern Canada, Midwest, and Southeast	• 15 and 20 meters are the likely money bands • With luck, 10-meters may also open up • Gain to east with low to moderate takeoff angle optimal	• 20 and 40 meters are the likely money bands to the east • Gain to east with low to moderate takeoff angle clearly beneficial • 80 meters could work too if low enough takeoff angle antenna available
Shorter Distances to Pacific Northwest, California, Southwest	• 40-meters is the money band • NVIS and other high takeoff angle antennas with broad coverage to the north and southwest optimal • 20-meters omnidirectional medium takeoff angle useful for more distant Western US	• 80-meters is the money band • Near Vertical Incidence Skywave (NVIS) and other high takeoff angle antennas with broad coverage to the north and southwest optimal

Space We Have to Work With



Space We Have to Work With (Cont.)

- Very nice downward-sloping open view to the east from lower portion of the field area
  - Slope really helps to lower takeoff angle

My Proposal

- I propose to deploy a "Rhombic Loop Twofer" antenna at the bottom end of the Cienega School field for SBCARA's Winter Field Day
  - Rhombic antennas are big, but this 'small' rhombic will just fit
- It meets many (though not all) of SBCARA's needs for a Winter Field Day antenna
  - Strong horizontal gain on 20m, 15m, and 10m with low to moderate takeoff angle for contacts to the Northeast, Mid Atlantic, Eastern Canada, Midwest, and Southeast
  - Strong 40m and 80m NVIS performance for West Coast contacts
  - Decent 40m moderate takeoff angle performance for Midwest and East nighttime contacts
- I've used variants of this antenna design for several events now, and it has always performed well

The Rhombic Loop Twofer Antenna

What is the “Rhombic Loop Twofer”?

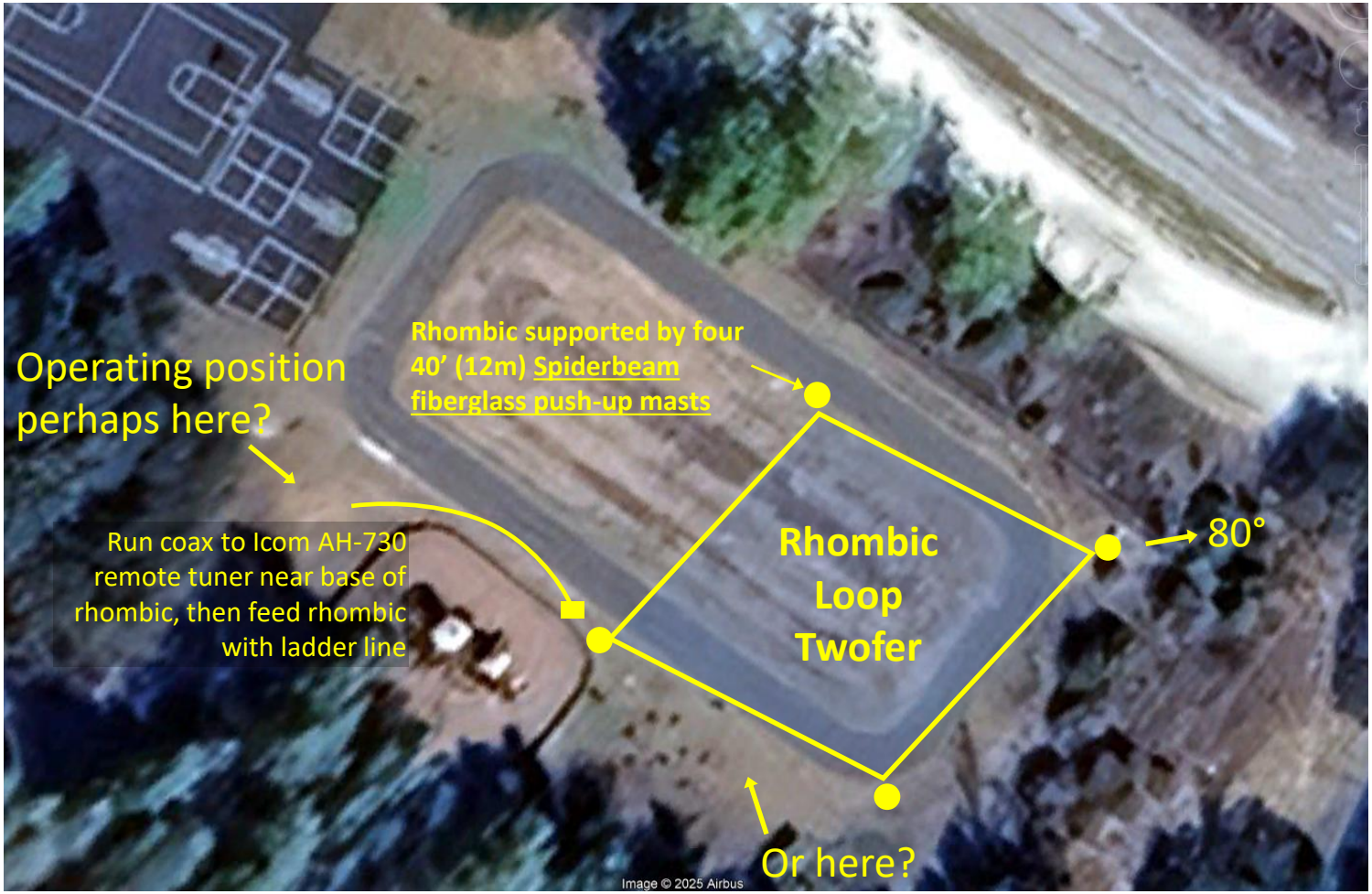
- The Rhombic Loop Twofer is two antennas in one – a small but potent rhombic[1] by day, and a Loop Skywave[2] by night
- The ‘mode’ of operation is controlled by connecting or disconnecting the wires at the apex of the antenna:
  - When the wires at the apex are disconnected, it’s a ‘small’ rhombic – a high gain, bidirectional, naturally broad-banded, dimensionally un-fussy antenna on 20 meters and up
  - When the wires at the apex are connected, it’s a ‘Loop Skywave’ – a horizontal full wavelength loop with near-vertical incidence skywave (NVIS) properties on 80 meters, with decent bidirectional gain on 40 meters
- More information about the Rhombic Loop Twofer, including the NEC files can be found at www.deloach.net/RhombicLoopTwofer or in my June 2017 QST article

[1] The ARRL Antenna Book provides a good discussion of the theory behind rhombics and other ‘traveling wave’ antennas.

[2] See J. Hallas, W1ZR, “Another Look at the Full-Wave HF Loop Antenna,” QST, May 2016, pp 42-45, for a good description of loop antennas and the Loop Skywave.

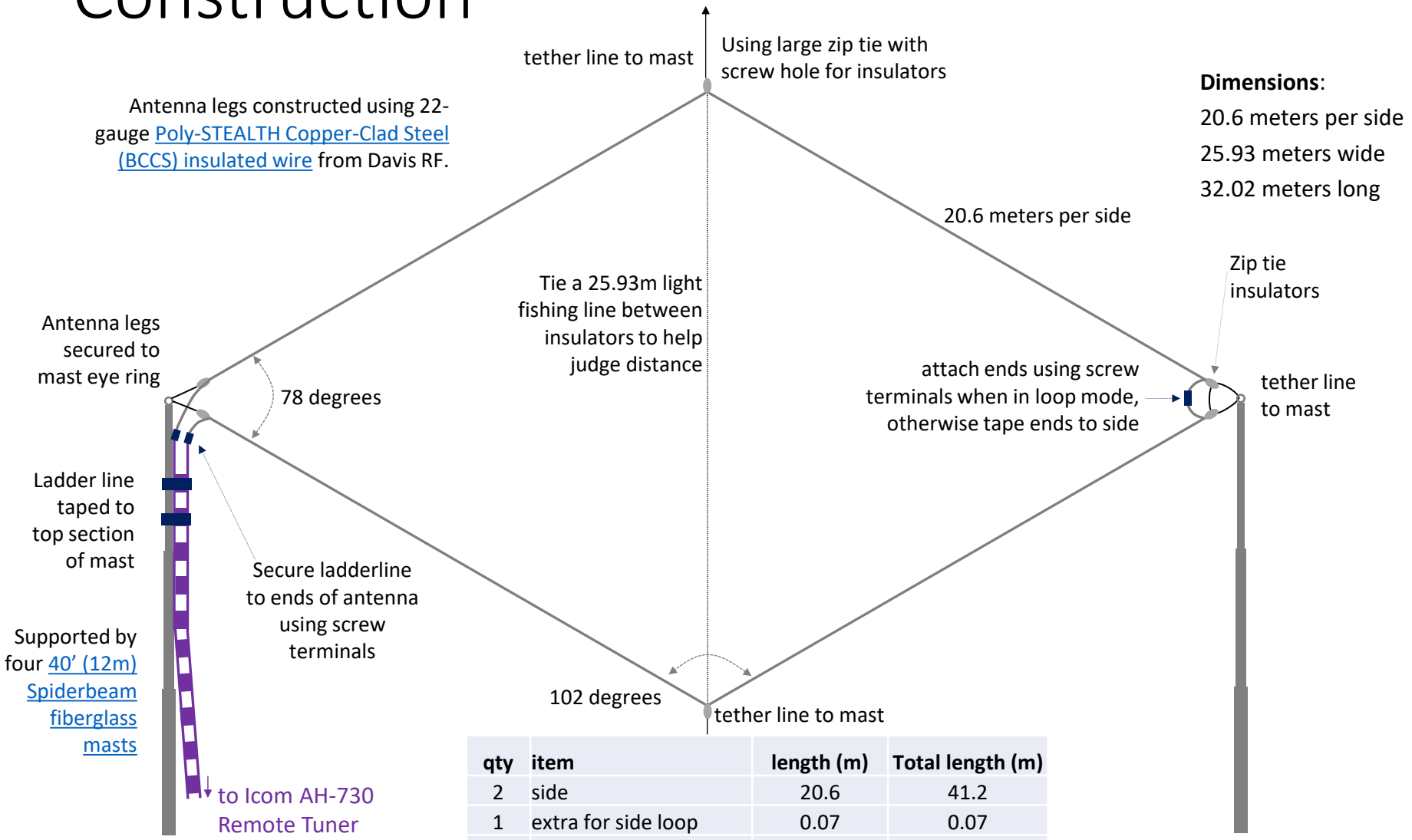
Antenna Position

Looks like the Rhombic Loop Twofer will just fit at the bottom end of the field!



Magnetic Declination is **12.5 degrees EAST** per NOAA Magnetic Field Calculator as of January 2026.

Rhombic Loop Twofer Dimensions & Construction



qty	item	length (m)	Total length (m)
2	side	20.6	41.2
1	extra for side loop	0.07	0.07
2	extra for end loops	0.07	0.14
2	extra for end pigtails	0.15	0.3
	Total Cut Length for One Leg of the Rhombic Loop Twofer (m)		**41.71**

Fiberglass Mast Support Method

Four 12m (40') Spiderbeam fiberglass push-up masts used to hold up antenna

Short (~1m) micro-paracord rope & 100-lb fishing snap swivel connects antenna to mast eyelet

- **NOTE: pull rope from ground *NOT* used**

Antenna

Natural bowing of mast used to tension antenna, rather than downward force from a pull rope

- Mast positioned 1 or 2 meters back from where the antenna corner is desired to be, causing modest bowing which keeps the antenna taunt

12m

Guyed in three directions at the top of the 1st and 7th sections

- Clamp used for top of 1st section
- Slip-on cloth ring used for top of 7th section

Use 100-lb 1.12mm micro-paracord for guy ropes

guy rope lengths:

- Lower: 8m
- Upper: 11m

Secure guy ropes to three heavy-duty tent stakes

Velcro mast at base to a center stake

Rope tensioners used to tighten guy ropes

~ 6m

NOTE: Masts can be lowered in high winds

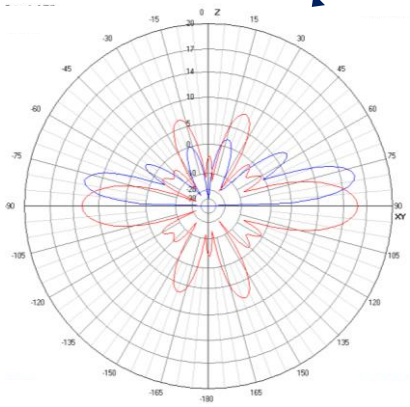
4NEC2-modeled Rhombic Loop Twofer Patterns

Rhombic Mode

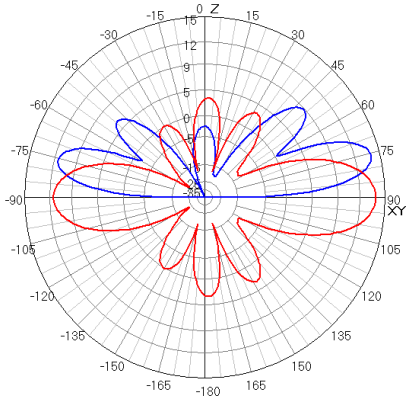
15m & 10m gain even stronger, though takeoff angle narrows and fragments

20m performance easily better than a 3-el Yagi, with strong, broad horizontal gain and low takeoff angle

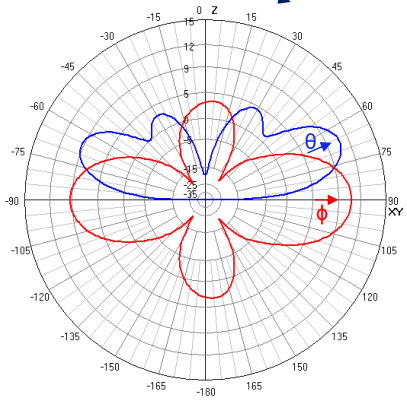
10m



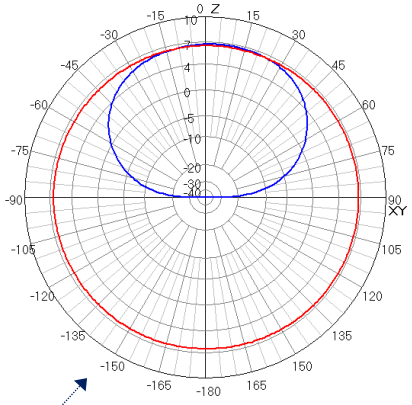
15m



20m



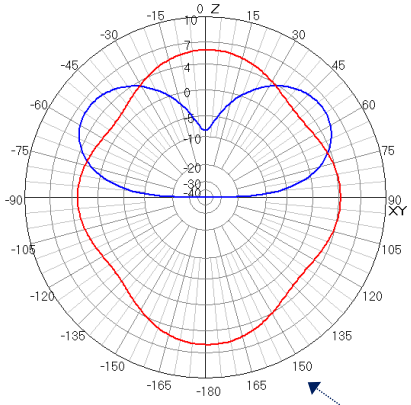
40m



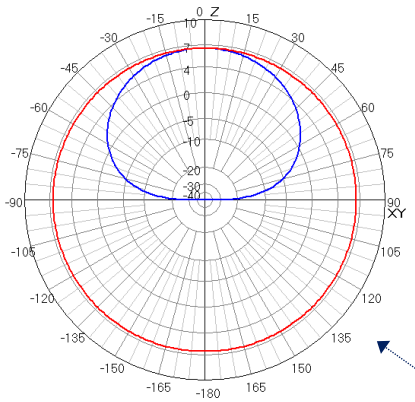
Interestingly, in Rhombic Mode on 40m, a well-performing NVIS pattern is present, perfect for West Coast daytime contacts

Loop Mode

40m



80m



40m Loop Mode pattern gain has low enough takeoff angle to be useful for nighttime more distant stations

80m Loop Mode NVIS pattern perfect for West Coast contacts but takeoff angle too high for nighttime more distant stations

KEY:

- Horizontal Pattern (at elevation Theta)
- Vertical Pattern (at azimuth Phi)

My 4NEC2 files are available at: www.deloach.net/RhombicLoopTwofer/.

Which Desired Antenna Characteristics Does the Rhombic Loop Twofer Provide?

	Daytime	Nighttime
Medium to Long Distances to Northeast, Mid Atlantic, Eastern Canada, Midwest, and Southeast	√ √ • 15 and 20 meters are the likely money bands √ • With luck, 10-meters may also open up • Gain to east with low to moderate takeoff angle optimal	√ √ • 20 and 40 meters are the likely money bands to the east • Gain to east with low to moderate takeoff angle clearly beneficial X • 80 meters could work too if low enough takeoff angle antenna available
Shorter Distances to Pacific Northwest, California, Southwest	√ • 40-meters is the money band • NVIS and other high takeoff angle antennas with broad coverage to the north and southwest optimal X • 20-meters omnidirectional medium takeoff angle useful for more distant Western US	√ • 80-meters is the money band • Near Vertical Incidence Skywave (NVIS) and other high takeoff angle antennas with broad coverage to the north and southwest optimal

Questions?

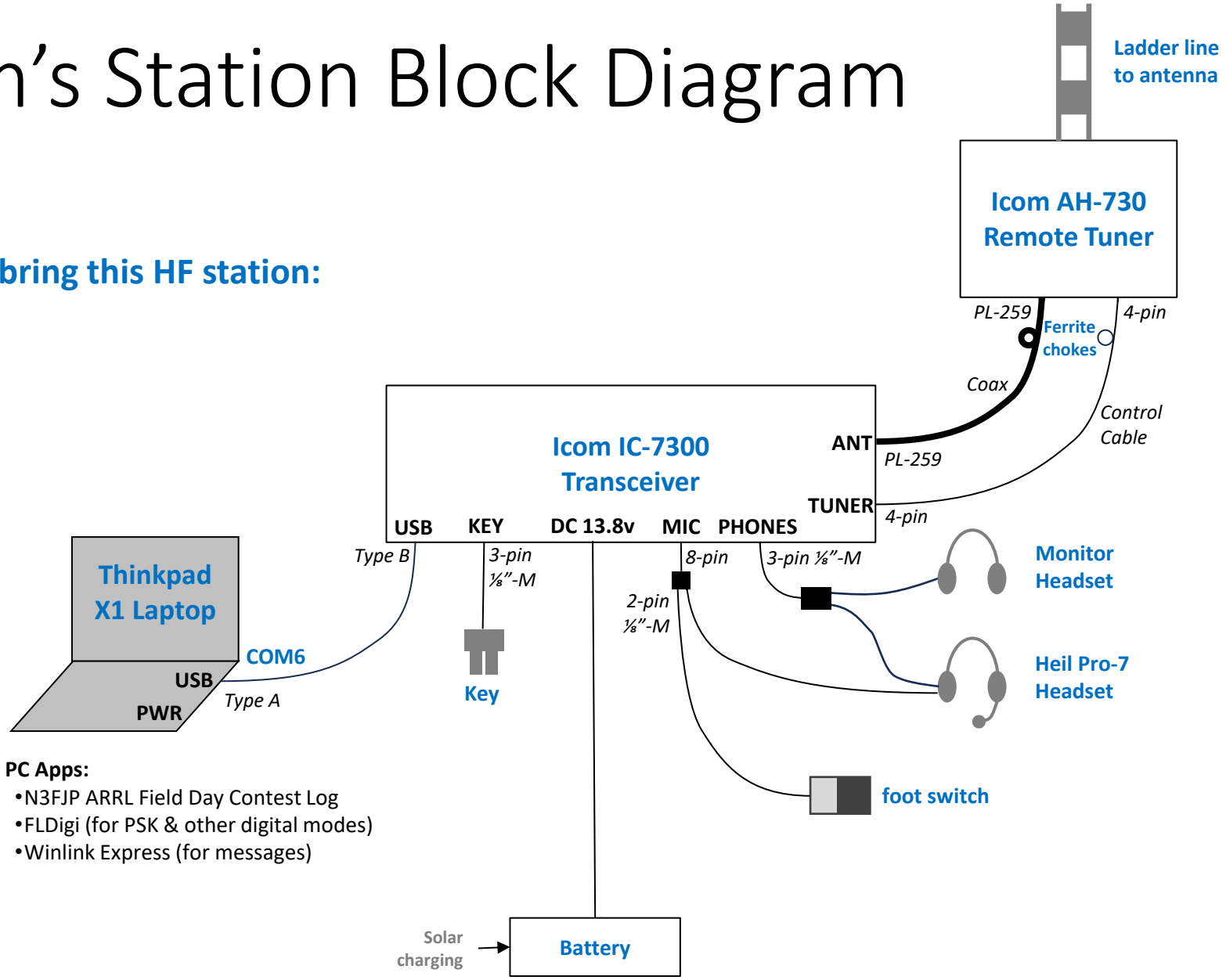
Thank You!

www.deloach.net/SBCARA/

Backup Slides

Jim's Station Block Diagram

I can bring this HF station:



PC Apps:

- N3FJP ARRL Field Day Contest Log
- FLDigi (for PSK & other digital modes)
- Winlink Express (for messages)

Winter Field Day Basics

- **Call Sign:**
  N6SBC
- **Winter Field Day Class/Section:**
  ??O, SCV
- **Location:**
  - Cienega Elementary School
  - lat/lon/hae: 36.729758, -121.361158, 311m
  - Grid Square: CM96
  - CQ zone 3, ITU zone 6
- **Operating Times**:
  - 8am Saturday, 24 January to 2pm Sunday, 25 January PST
    (1600 UTC Saturday to 21:59 UTC Sunday)
  - Setup can begin 8am Friday PST; when is the site accessible?

2026 Winter Field Day “Objectives”

Objective	Objective Multiplier
Operate 100% on alternative power	1
Operate away from home	3
Deploy and make at least one contact on multiple antennas	1
Make an FM satellite contact	2
Make a SSB or CW satellite contact	3
Send and receive at least one Winlink email	1
Copy the Winter Field Day Special Bulletin	1
Make three contacts on at least six (6) different bands	6
Make three contacts on at least twelve (12) different bands	6
Use multiple modes (at least two)	2
Operate the event QRP	4
Operate six continuous hours during the event	2