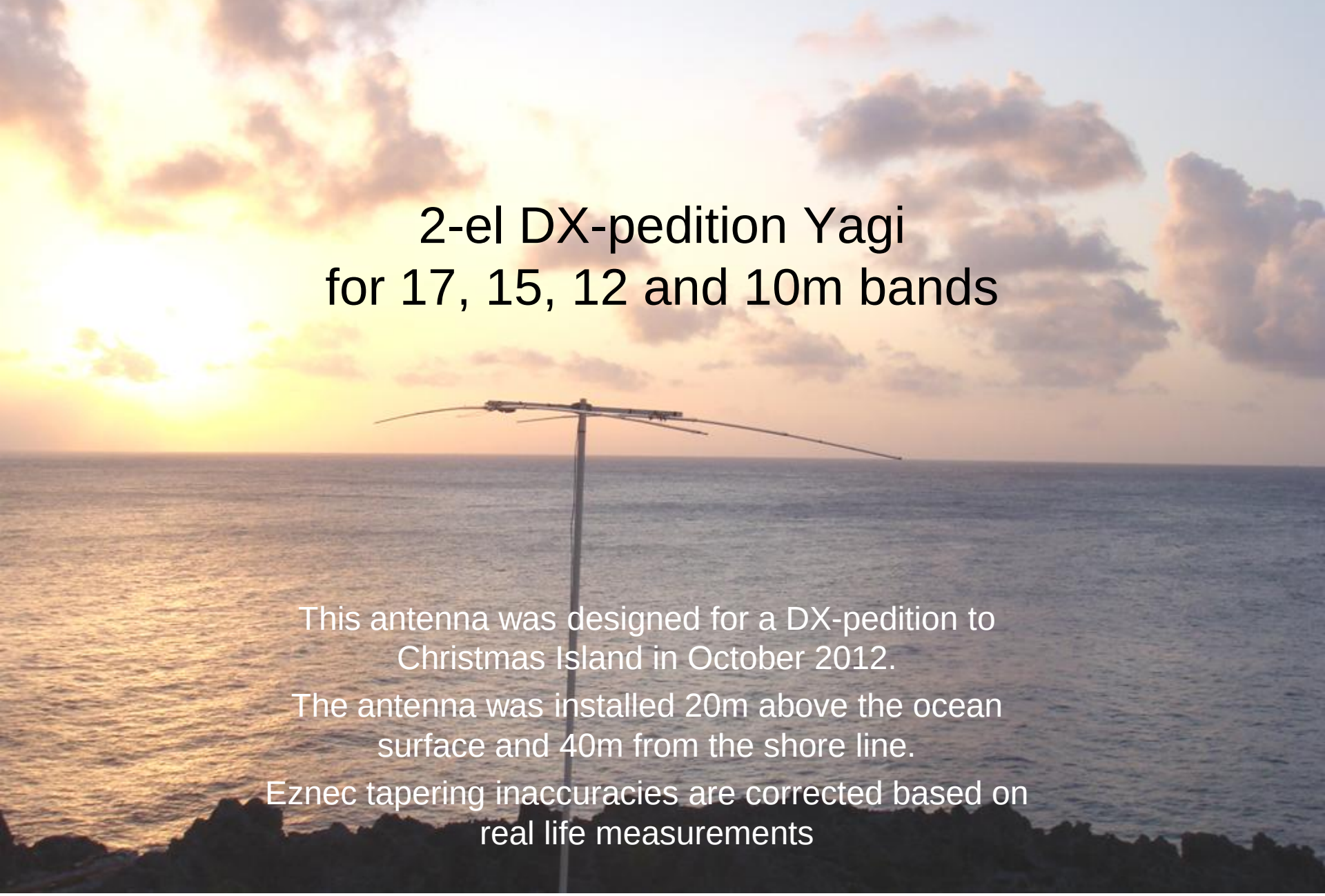


2-el DX-pedition Yagi for 17, 15, 12 and 10m bands

This antenna was designed for a DX-pedition to Christmas Island in October 2012.

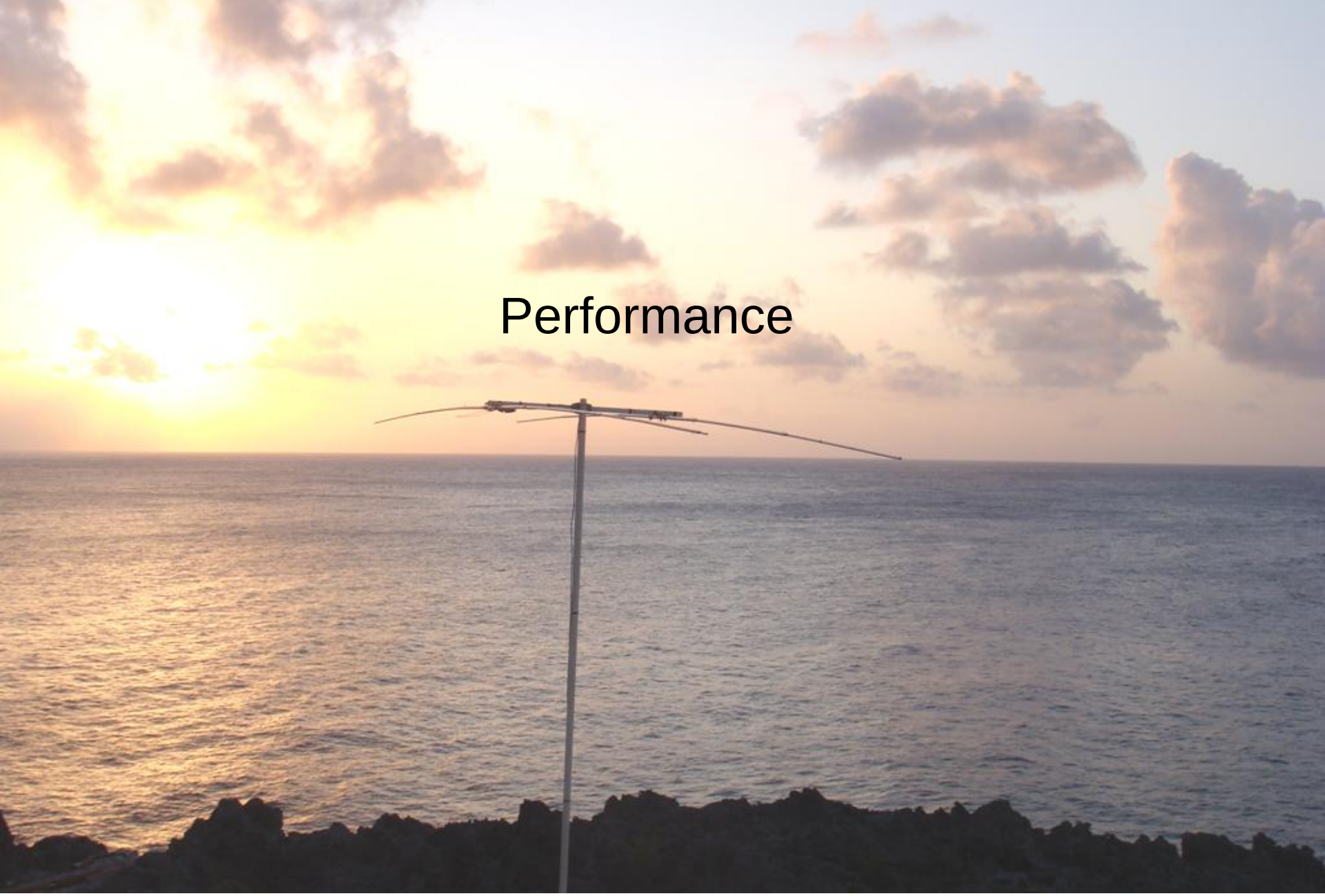
The antenna was installed 20m above the ocean surface and 40m from the shore line.

Eznec tapering inaccuracies are corrected based on real life measurements

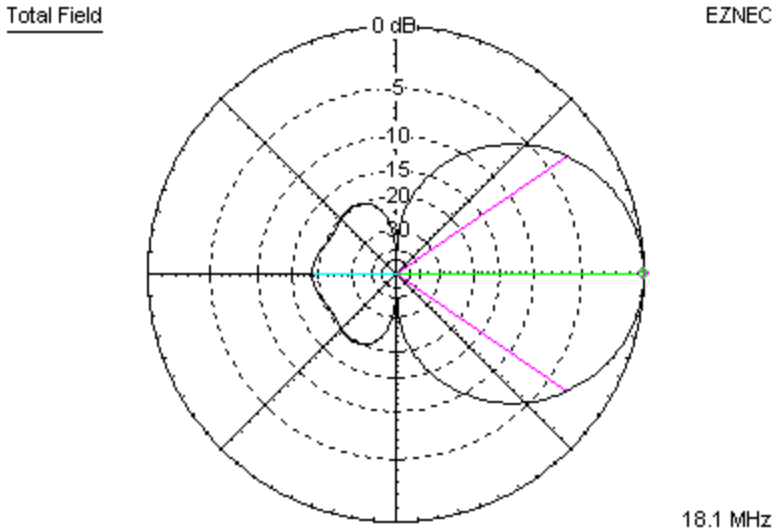
12m configuration

12m configuration at VK9XM

Performance

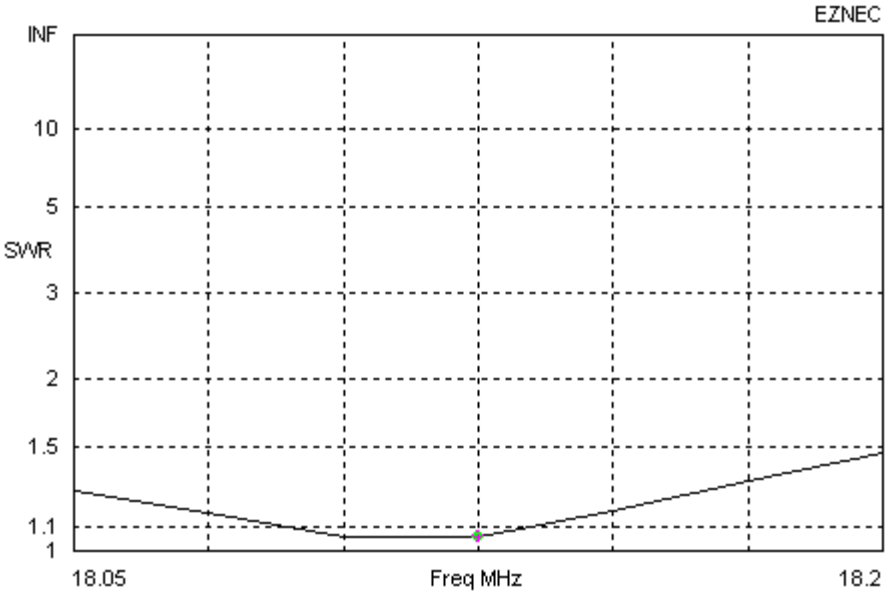


17m, free space



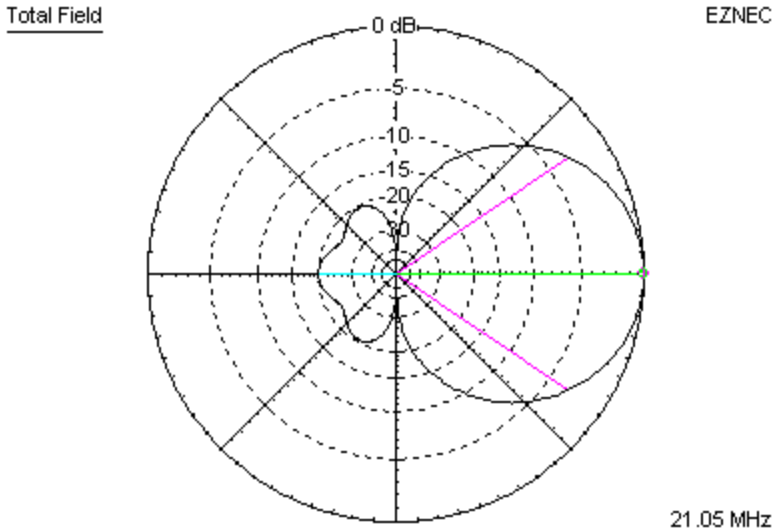
Azimuth Plot		Cursor Az	0.0 deg.
Elevation Angle	0.0 deg.	Gain	6.68 dBi
Outer Ring	6.68 dBi		0.0 dBmax

Slice Max Gain	6.68 dBi @ Az Angle = 0.0 deg.
Front/Back	18.65 dB
Beamwidth	68.4 deg.; -3dB @ 325.8, 34.2 deg.
Sidelobe Gain	-11.97 dBi @ Az Angle = 180.0 deg.
Front/Sidelobe	18.65 dB



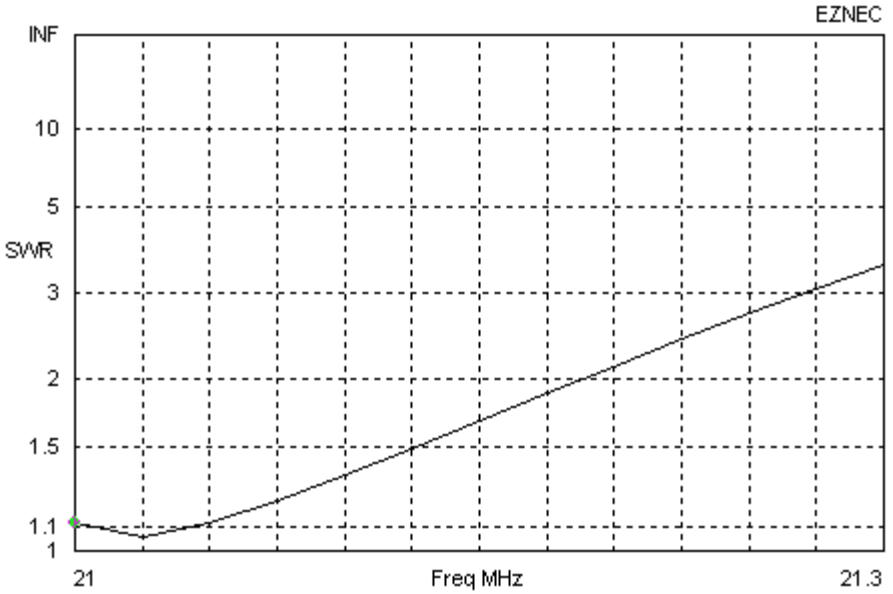
Freq	18.125 MHz	Source #	1
SWR	**1.058**	Z0	50 ohms
Z	48.48 at -2.7 deg.		
	= 48.43 - j 2.28 ohms		
Refl Coeff	0.02813 at -123.24 deg.		
	= -0.01542 - j 0.02353		
Ret Loss	31.0 dB		

15m CW, free space



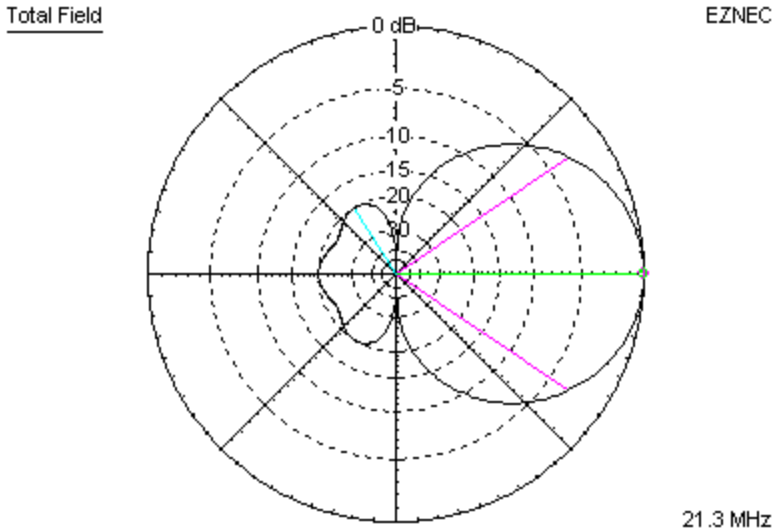
Azimuth Plot		Cursor Az	0.0 deg.
Elevation Angle	0.0 deg.	Gain	6.62 dBi
Outer Ring	6.62 dBi		0.0 dBmax

Slice Max Gain	6.62 dBi @ Az Angle = 0.0 deg.
Front/Back	19.95 dB
Beamwidth	68.0 deg.; -3dB @ 326.0, 34.0 deg.
Sidelobe Gain	-13.33 dBi @ Az Angle = 180.0 deg.
Front/Sidelobe	19.95 dB



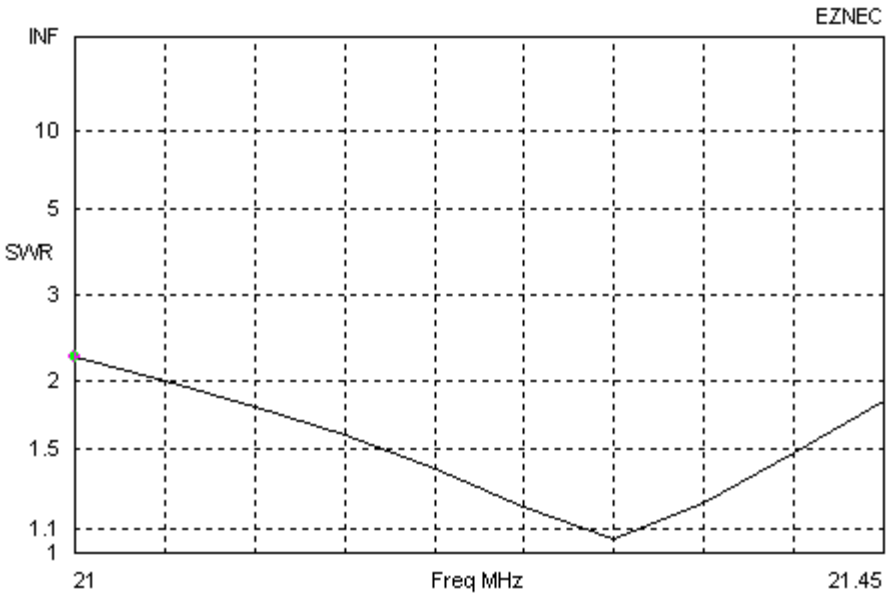
Freq	21 MHz	Source #	1
SWR	**1.11**	Z0	50 ohms
Z	55.58 at 0.79 deg.		
	= 55.57 + j 0.7643 ohms		
Refl Coeff	0.05329 at 7.39 deg.		
	= 0.05285 + j 0.006856		
Ret Loss	25.5 dB		

15m SSB, free space



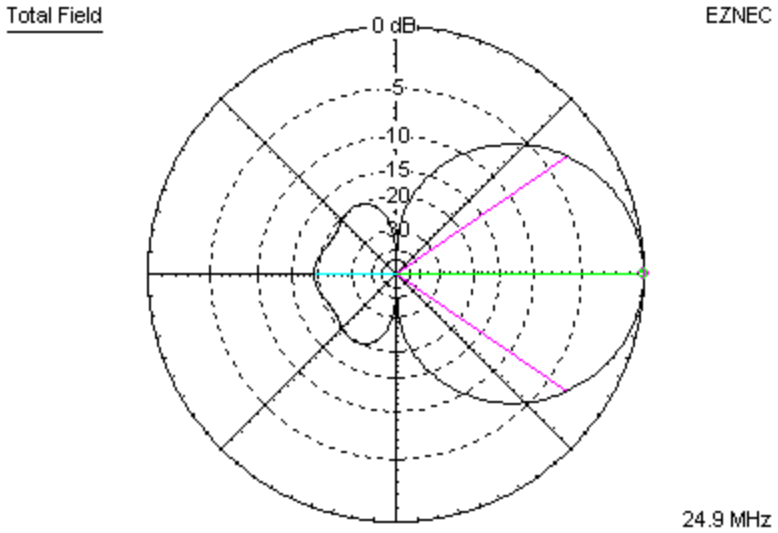
Azimuth Plot		Cursor Az	0.0 deg.
Elevation Angle	0.0 deg.	Gain	6.55 dBi
Outer Ring	6.55 dBi		0.0 dBmax

Slice Max Gain	6.55 dBi @ Az Angle = 0.0 deg.
Front/Back	19.98 dB
Beamwidth	68.2 deg.; -3dB @ 325.9, 34.1 deg.
Sidelobe Gain	-13.28 dBi @ Az Angle = 122.0 deg.
Front/Sidelobe	19.83 dB



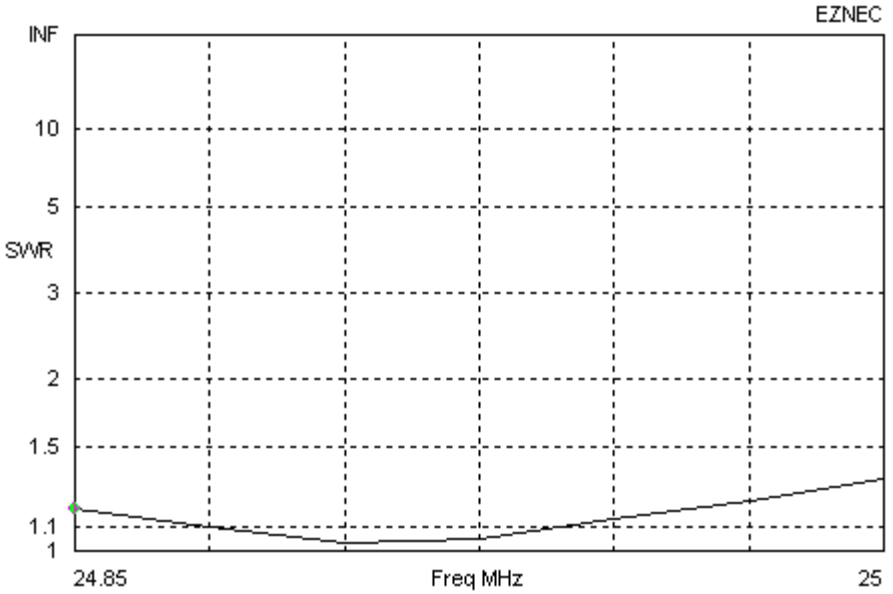
Freq	21 MHz	Source #	1
SWR	**2.22**	Z0	50 ohms
Z	75.63 at 35.48 deg.		
	= 61.59 + j 43.89 ohms		
Refl Coeff	0.3786 at 53.74 deg.		
	= 0.2239 + j 0.3053		
Ret Loss	8.4 dB		

12m, free space



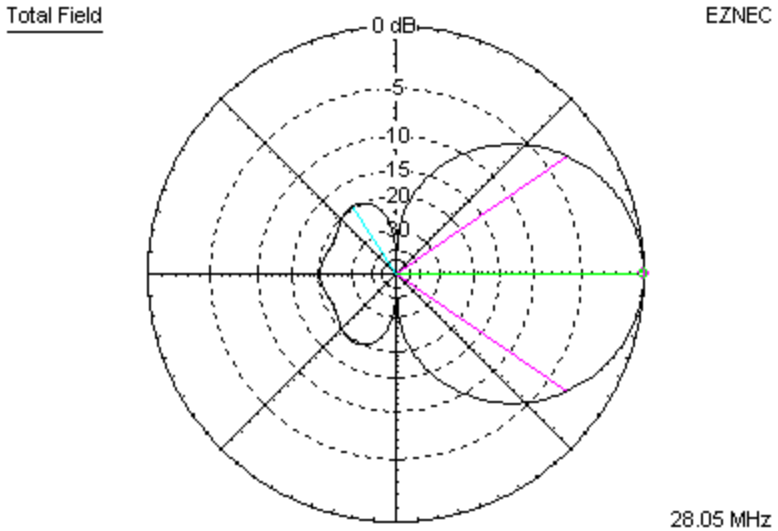
Azimuth Plot		Cursor Az	0.0 deg.
Elevation Angle	0.0 deg.	Gain	6.54 dBi
Outer Ring	6.54 dBi		0.0 dBmax

Slice Max Gain	6.54 dBi @ Az Angle = 0.0 deg.
Front/Back	19.08 dB
Beamwidth	68.4 deg.; -3dB @ 325.8, 34.2 deg.
Sidelobe Gain	-12.54 dBi @ Az Angle = 180.0 deg.
Front/Sidelobe	19.08 dB



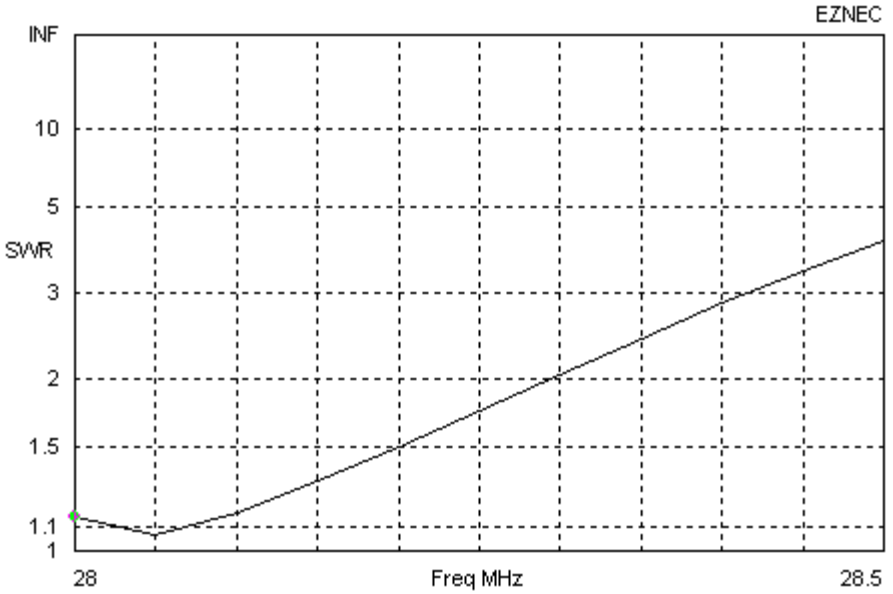
Freq	24.85 MHz	Source #	1
SWR	**1.17**	Z0	50 ohms
Z	56.22 at 6.31 deg.		
	= 55.88 + j 6.176 ohms		
Refl Coeff	0.08037 at 43.09 deg.		
	= 0.05869 + j 0.05491		
Ret Loss	21.9 dB		

10m CW, free space



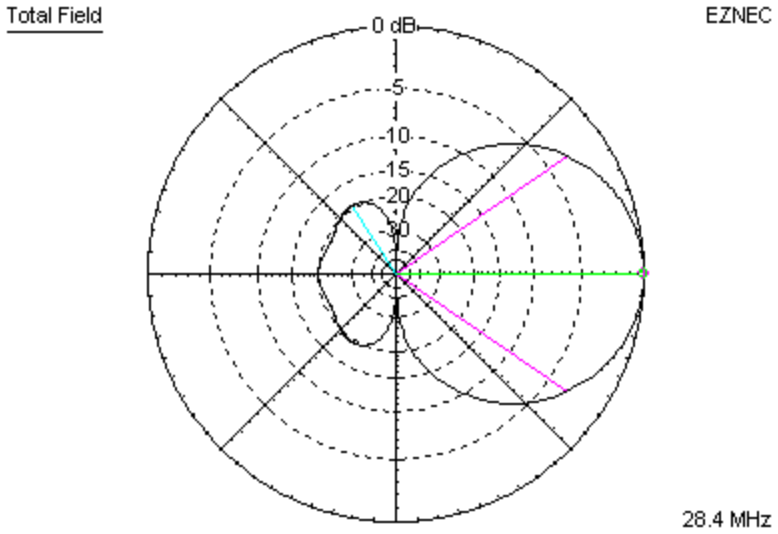
Azimuth Plot		Cursor Az	0.0 deg.
Elevation Angle	0.0 deg.	Gain	6.5 dBi
Outer Ring	6.5 dBi		0.0 dBmax

Slice Max Gain	6.5 dBi @ Az Angle = 0.0 deg.
Front/Back	20.35 dB
Beamwidth	68.4 deg.; -3dB @ 325.8, 34.2 deg.
Sidelobe Gain	-12.89 dBi @ Az Angle = 123.0 deg.
Front/Sidelobe	19.39 dB



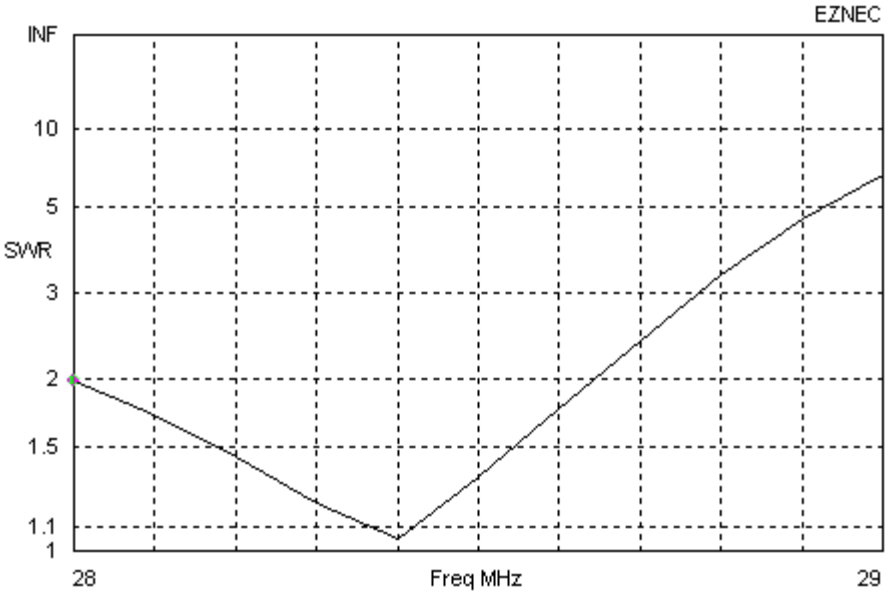
Freq	28 MHz	Source #	1
SWR	**1.14**	Z0	50 ohms
Z	56.89 at 0.87 deg.		
	= 56.88 + j 0.8675 ohms		
Refl Coeff	0.06488 at 6.72 deg.		
	= 0.06443 + j 0.007594		
Ret Loss	23.8 dB		

10m SSB, free space



Azimuth Plot		Cursor Az	0.0 deg.
Elevation Angle	0.0 deg.	Gain	6.47 dBi
Outer Ring	6.47 dBi		0.0 dBmax

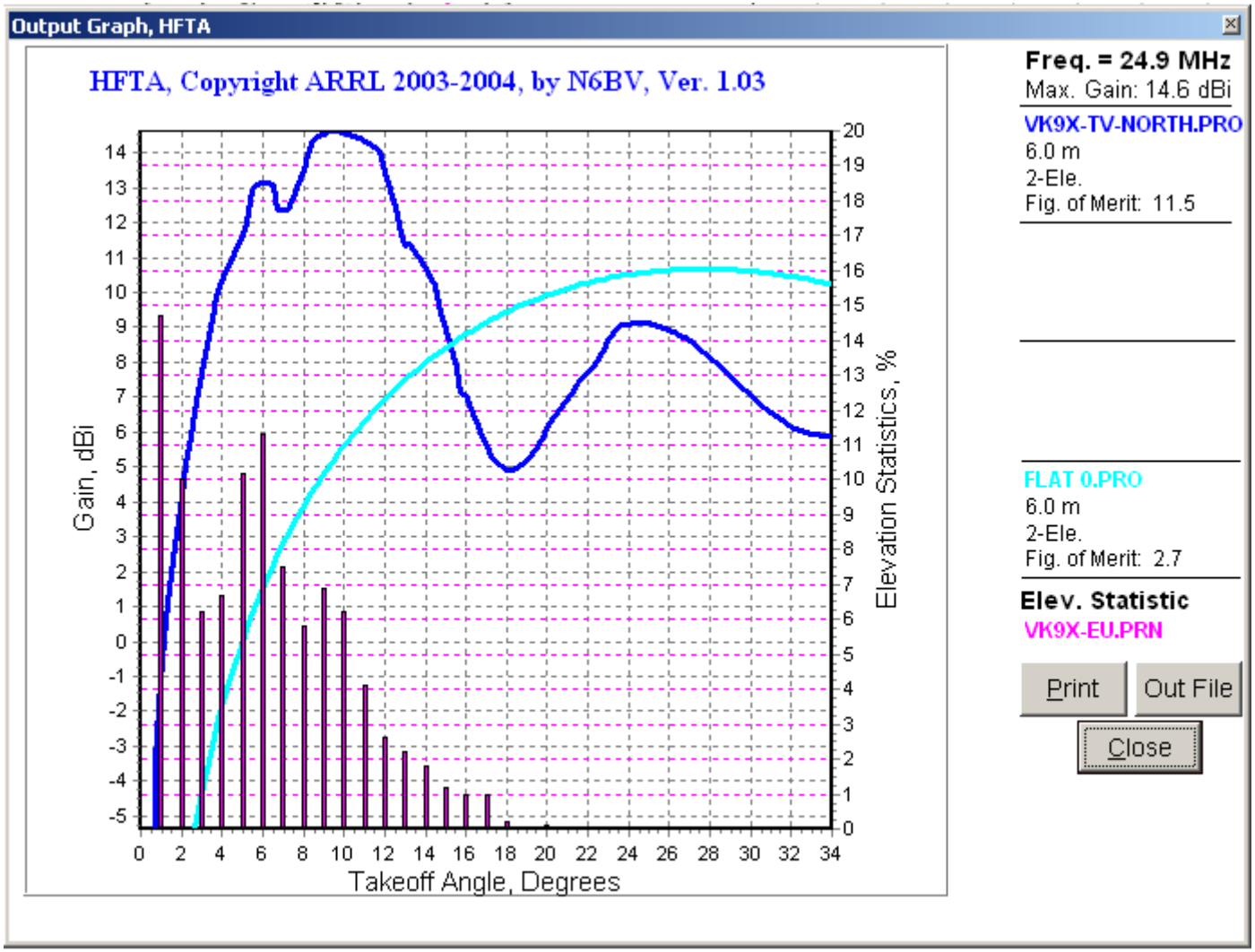
Slice Max Gain	6.47 dBi @ Az Angle = 0.0 deg.
Front/Back	19.96 dB
Beamwidth	68.4 deg.; -3dB @ 325.8, 34.2 deg.
Sidelobe Gain	-12.7 dBi @ Az Angle = 123.0 deg.
Front/Sidelobe	19.17 dB



Freq	28 MHz	Source #	1
SWR	**1.97**	Z0	50 ohms
Z	74.37 at 29.48 deg.		
	= 64.74 + j 36.6 ohms		
Refl Coeff	0.3276 at 50.37 deg.		
	= 0.209 + j 0.2523		
Ret Loss	9.7 dB		

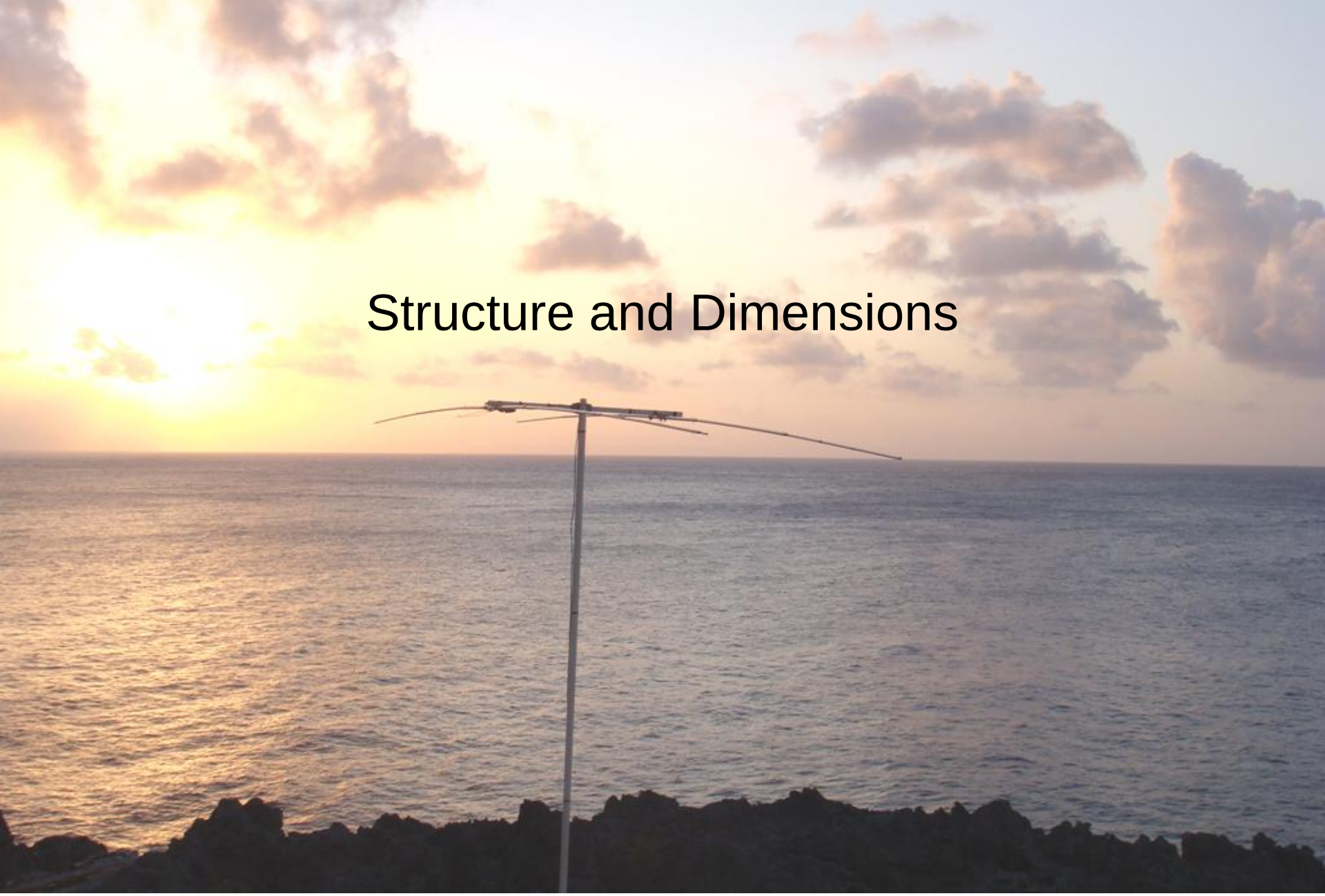
Gain and TOA at VK9XM in October 2012

antenna 6m above ground, on a 15m high cliff



Flat ground reference

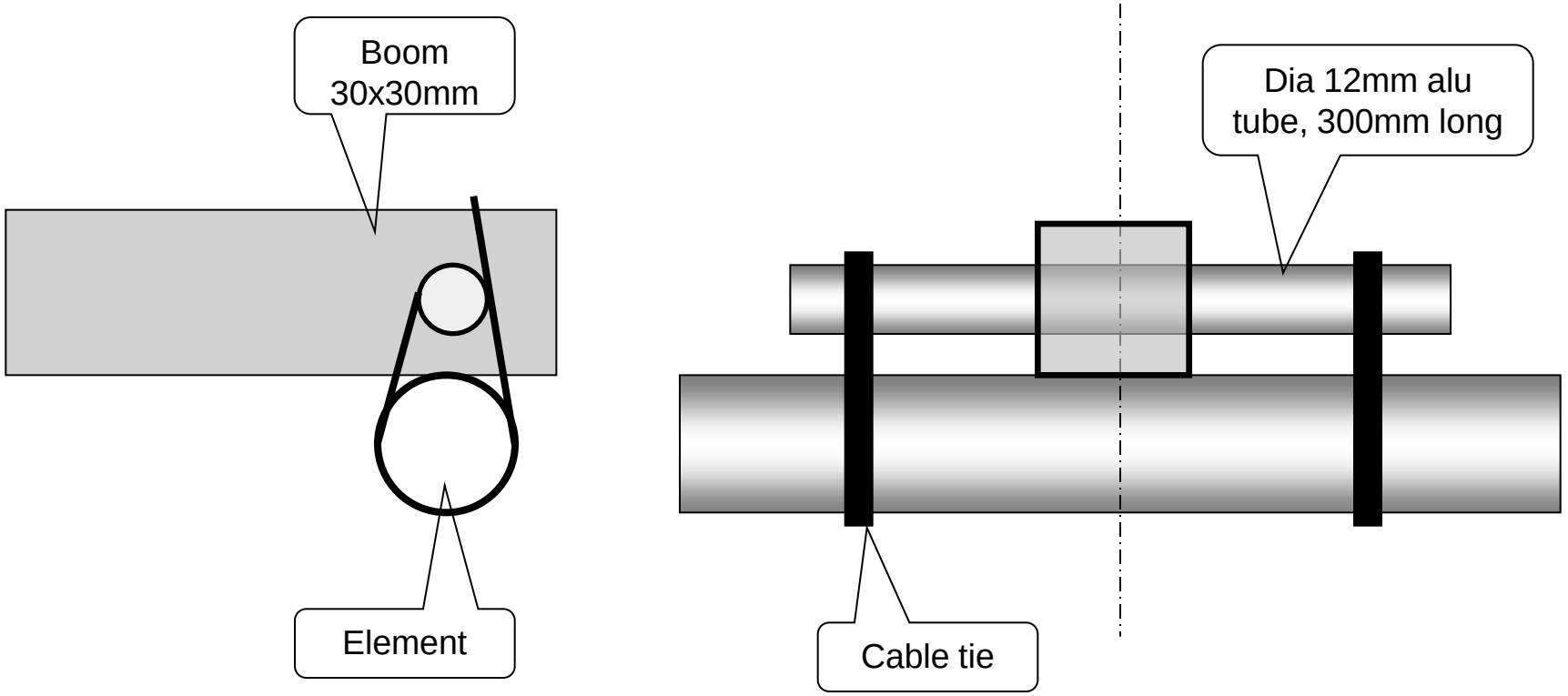
Structure and Dimensions

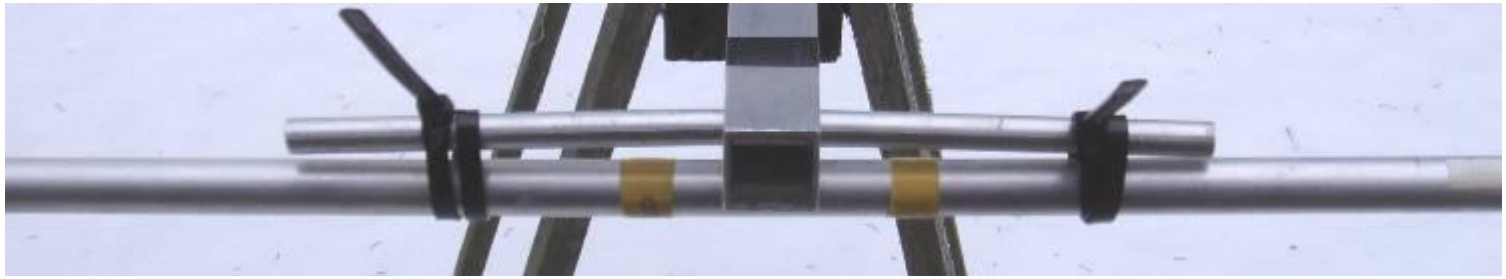


Structure

- 2-element Yagi, the parasitic element is director
- When assembled the antenna is mono-bander
  - Bands: 17m, 15m CW,15m SSB, 12m, 10m CW, 10m SSB
- Element spacing about 0.085 λ on all bands
- Impedance matching to 50 ohm is with hairpin
- Element to boom mounting is with cable ties
- Element sections are locked with split pins
- For transportation the longest components are 1250mm
- This antenna is for light wind conditions only

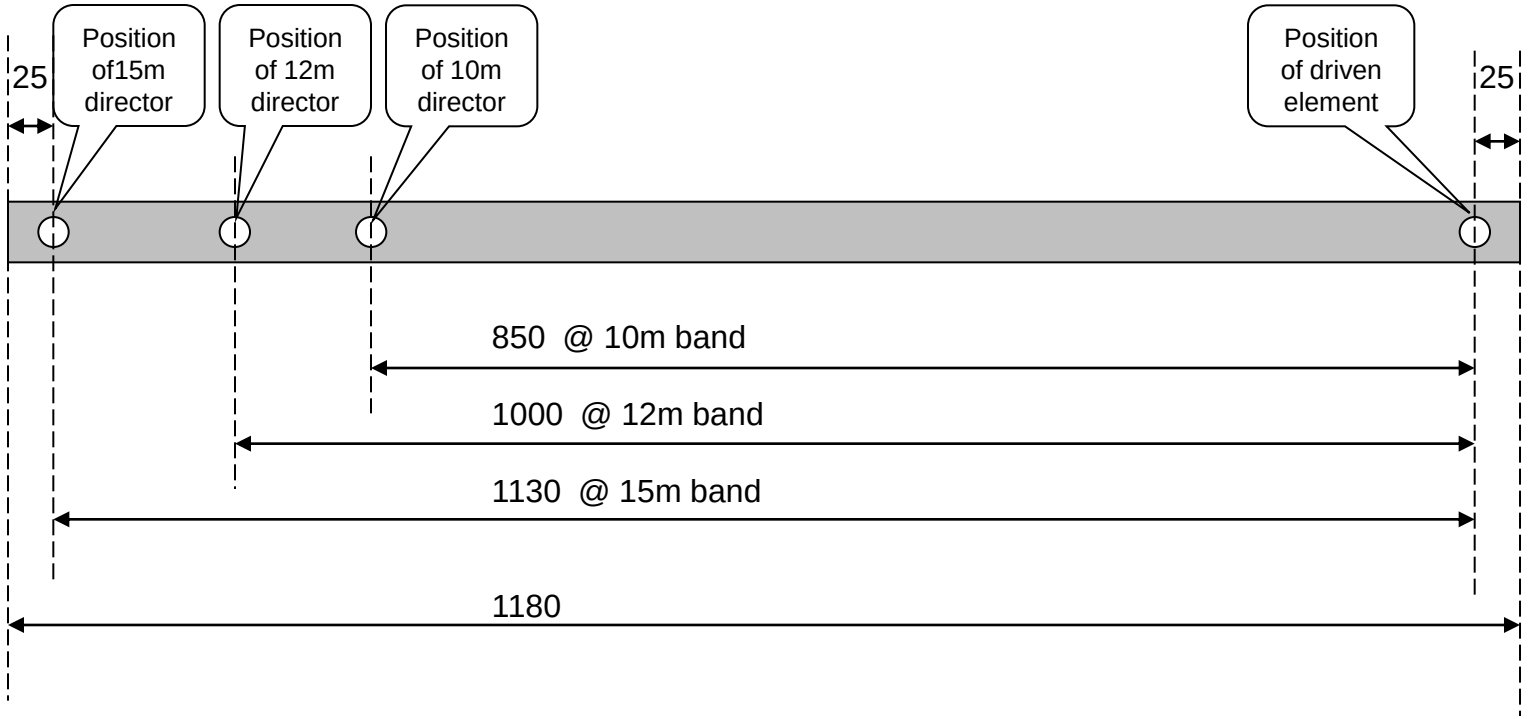
Element to boom





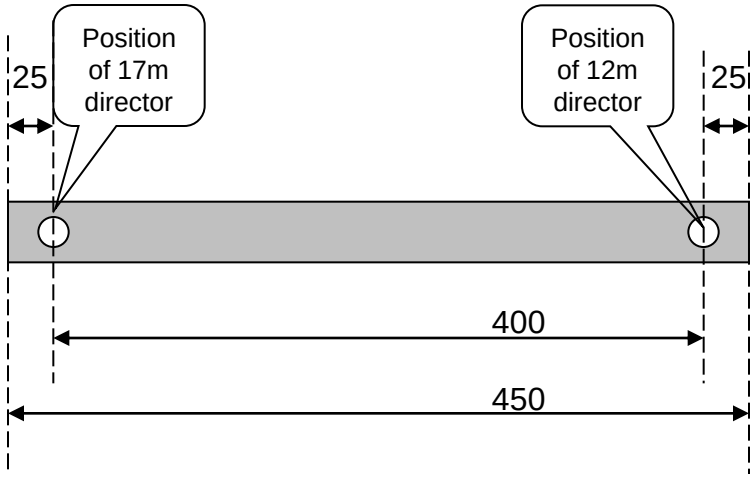
Boom for 15, 12 and 10m bands

Material dia 30x30mm square aluminum tube, wall 1.5mm
4 holes dia 12mm in line

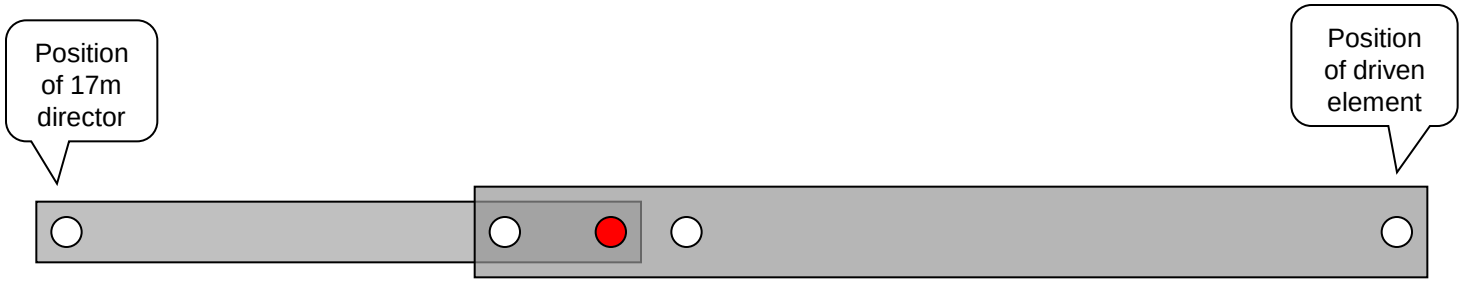


Boom extension for 17m band

Material dia 25x25mm square aluminum tube, wall 1.5mm
2 holes dia 12mm in line

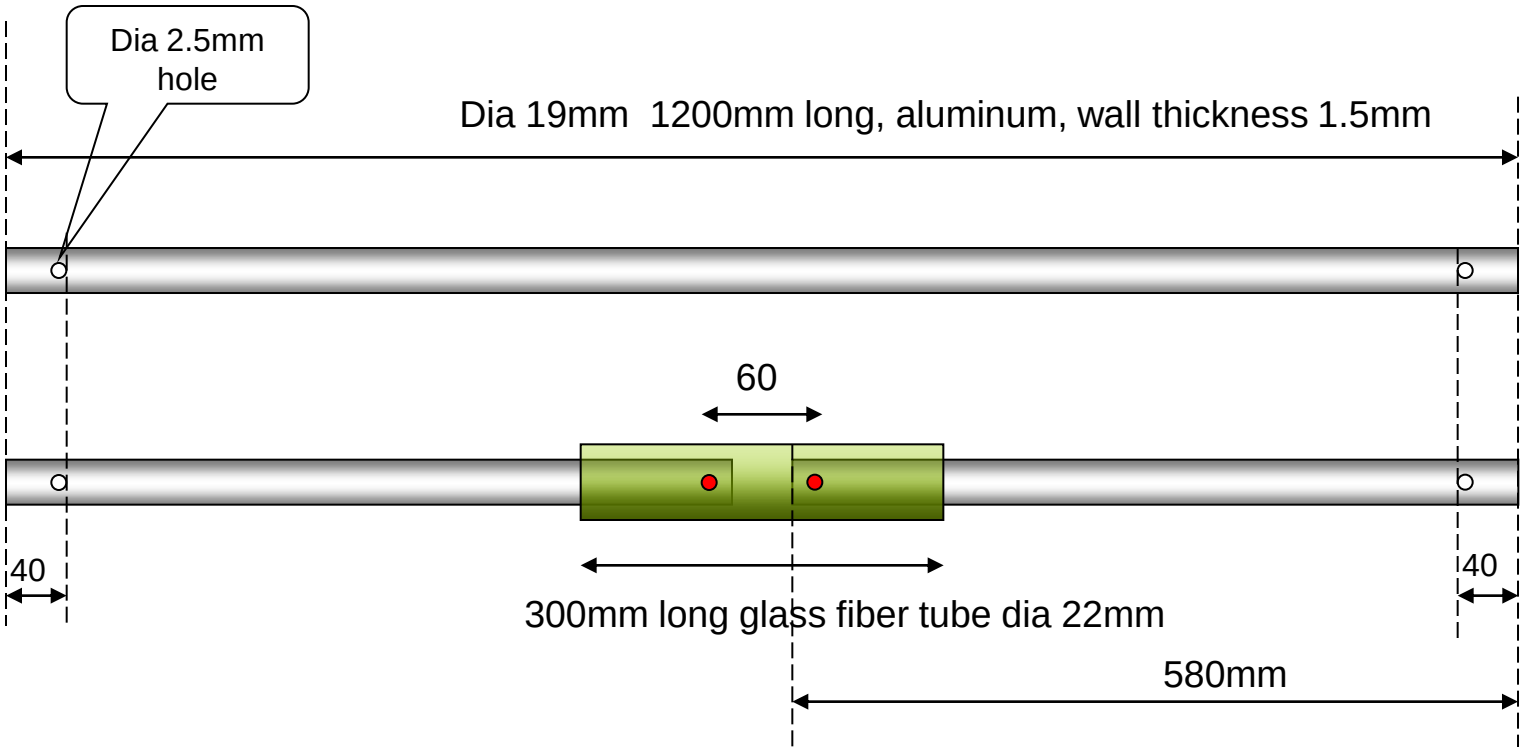


- With this boom extension 17m band director is brought 1400mm from the driven element
- It is locked to the main boom by inserting a dia 12mm alu tube at 12m director location, 1000mm from the driven element, see below



1. Element center sections

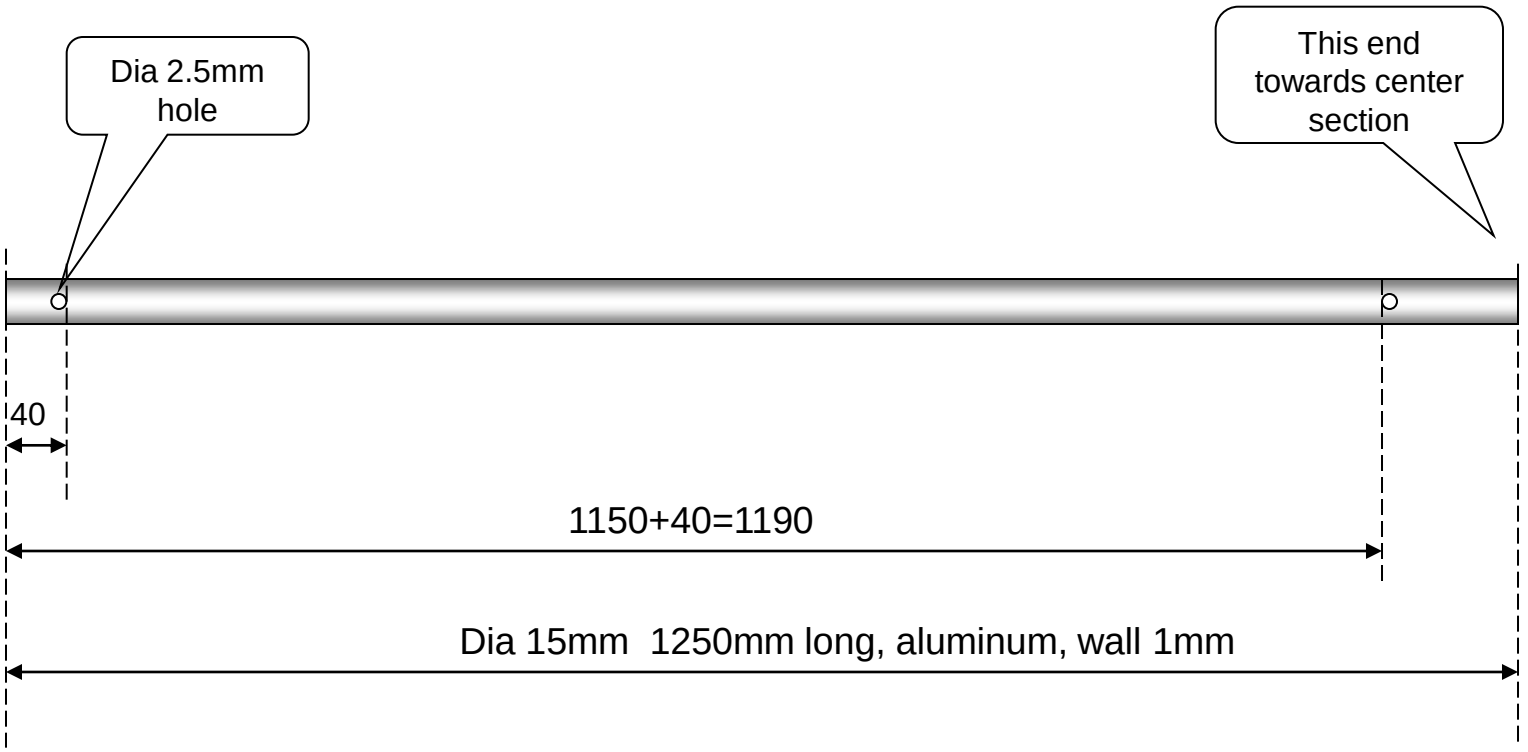
Director and driven element



Glass fiber tube glued with epoxy, Araldit or similar

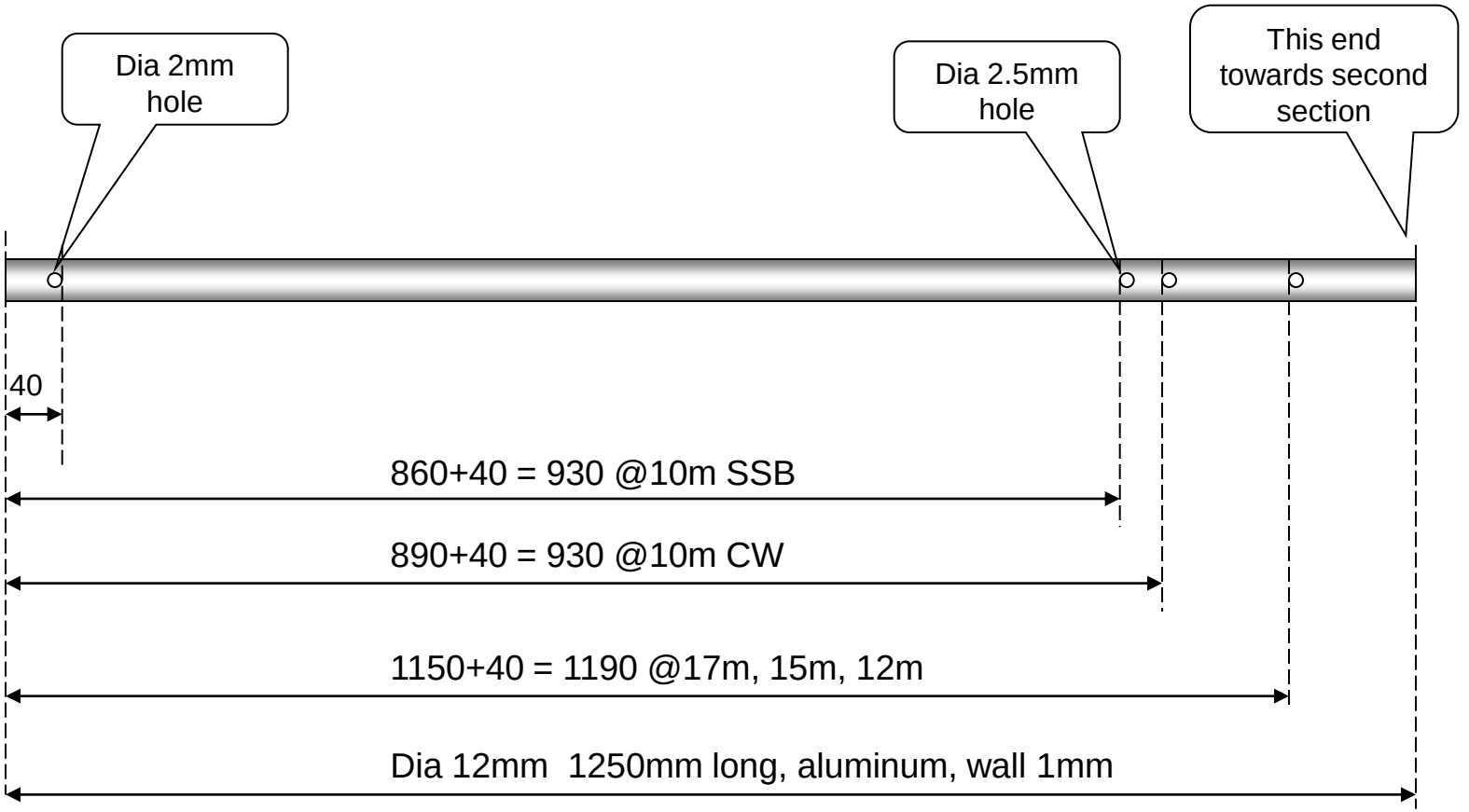
2. Second sections

Director and driven element, all 4pcs similar



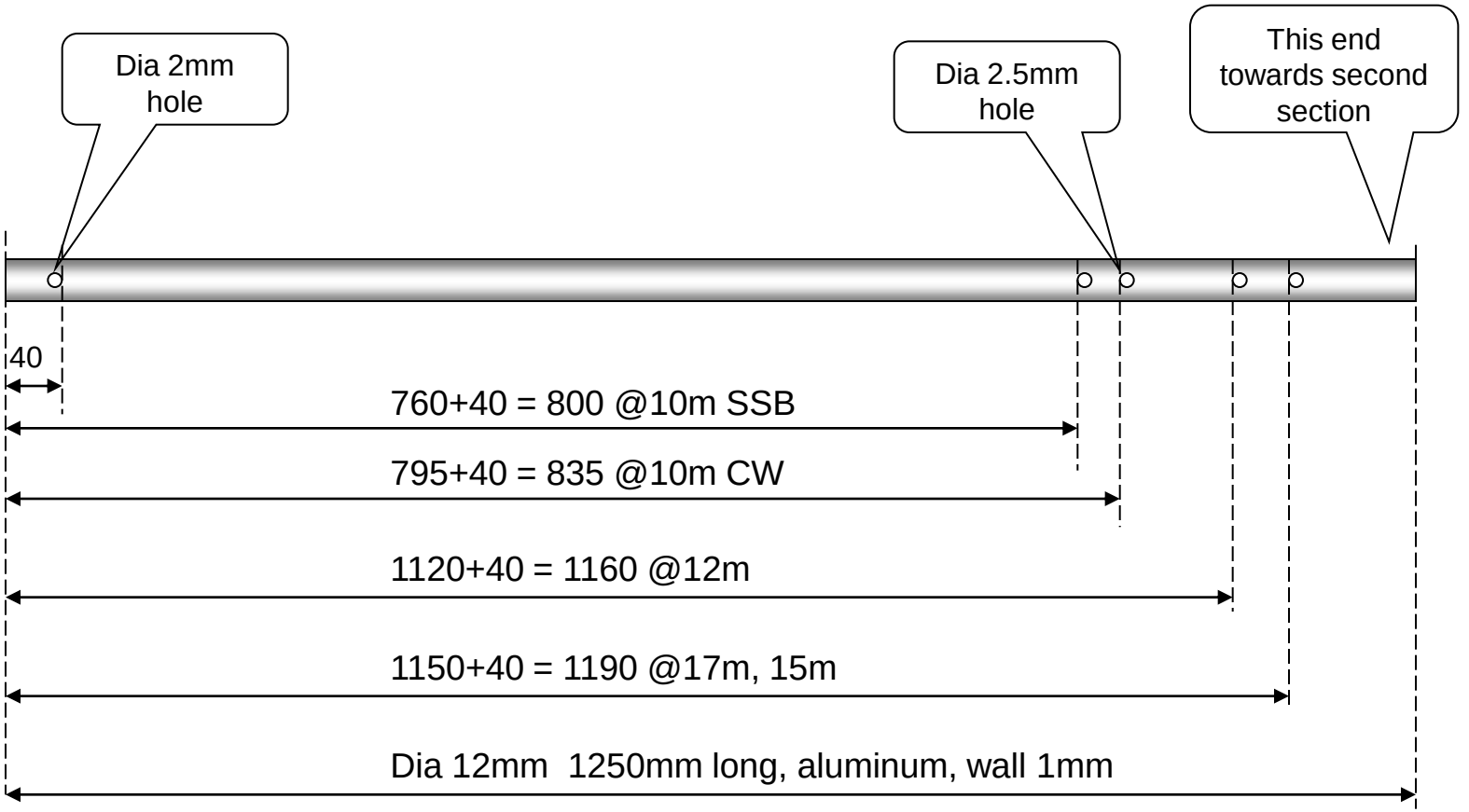
3a. Third sections

Driven element, 2pcs



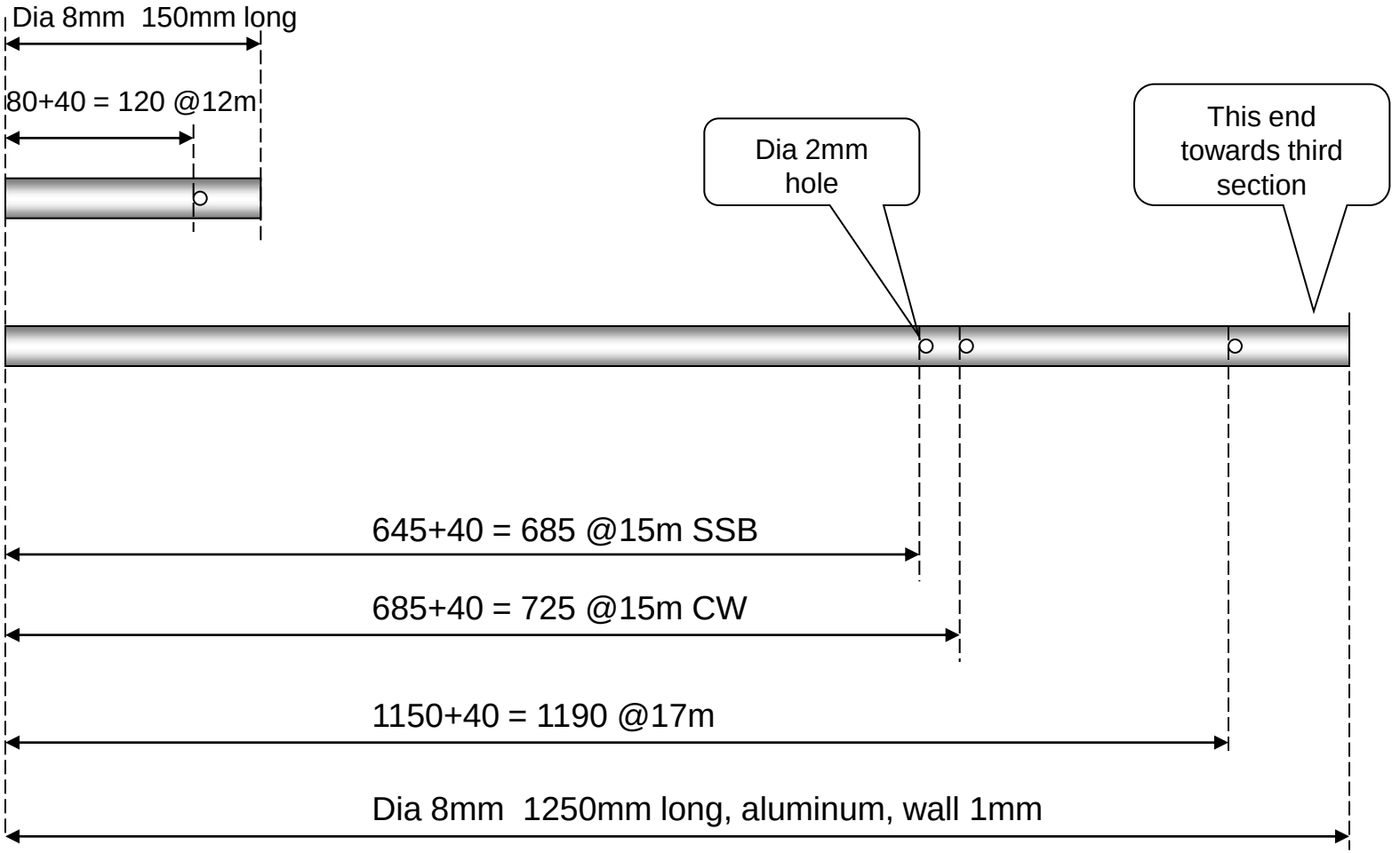
3b. Third sections

Director, 2pcs



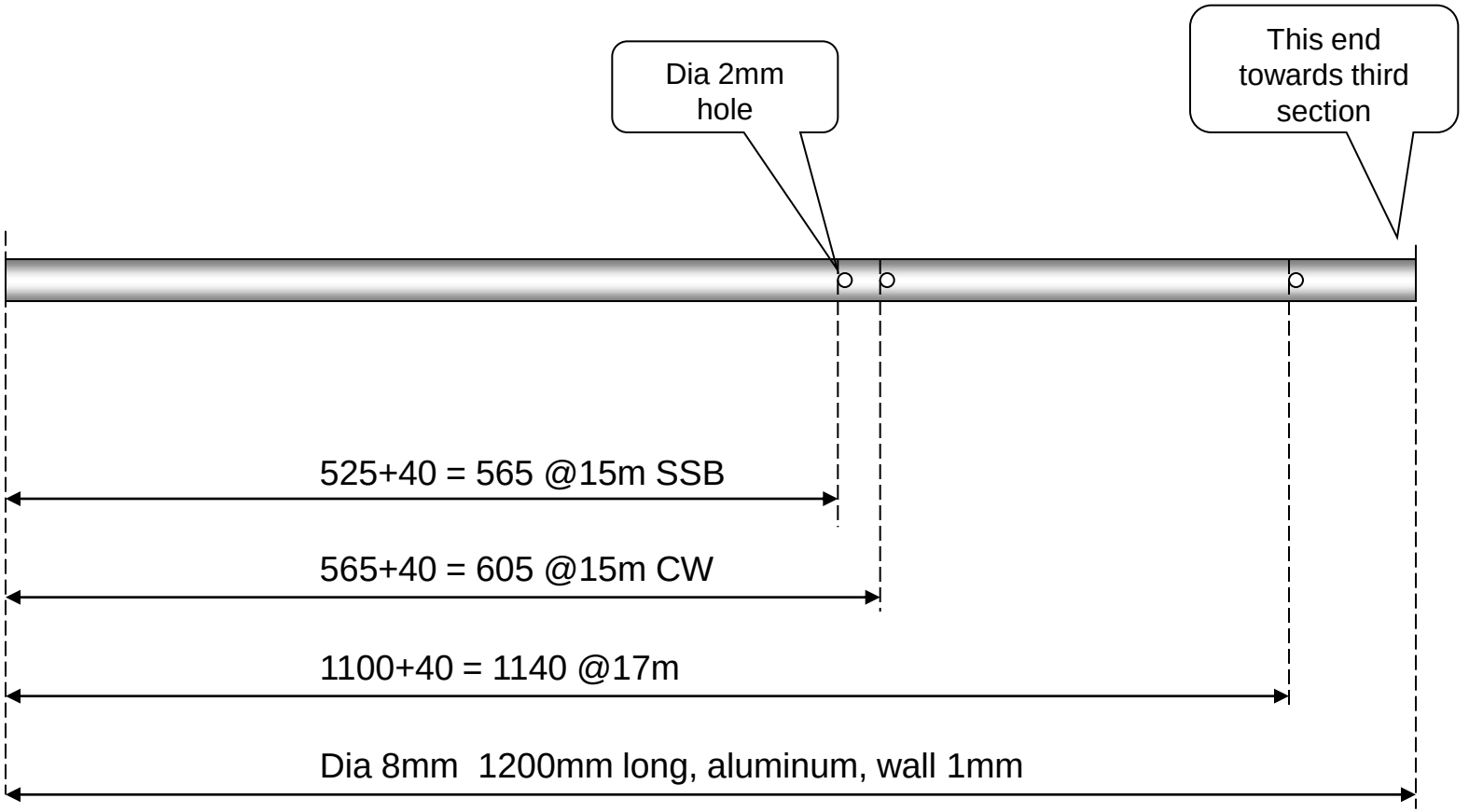
4a. Fourth sections

Driven element, 2pcs



4b. Fourth sections

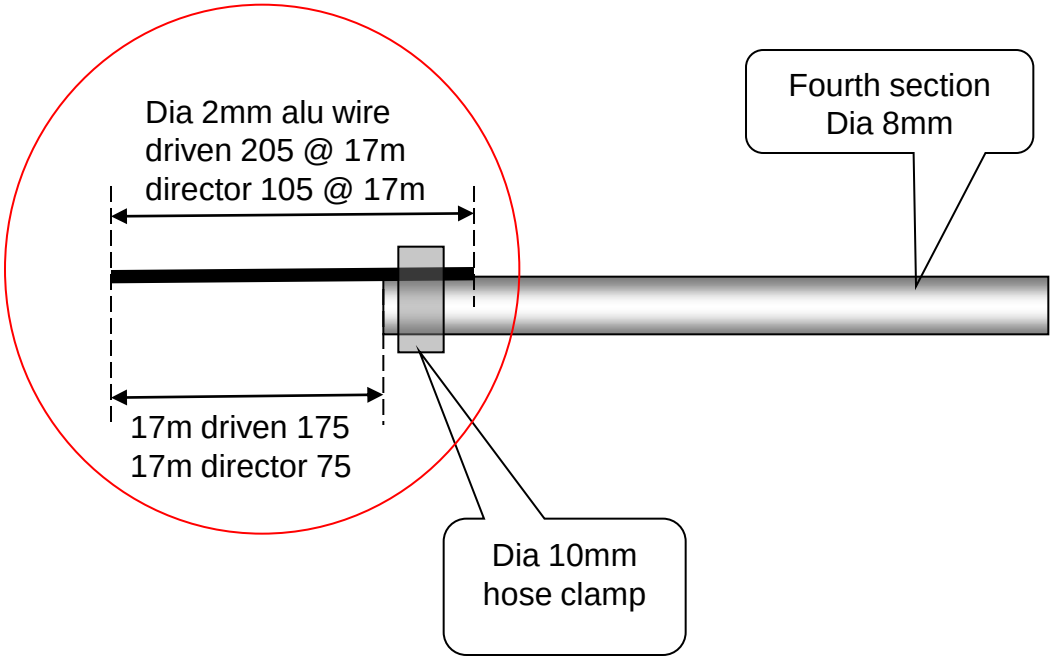
Director, 2pcs



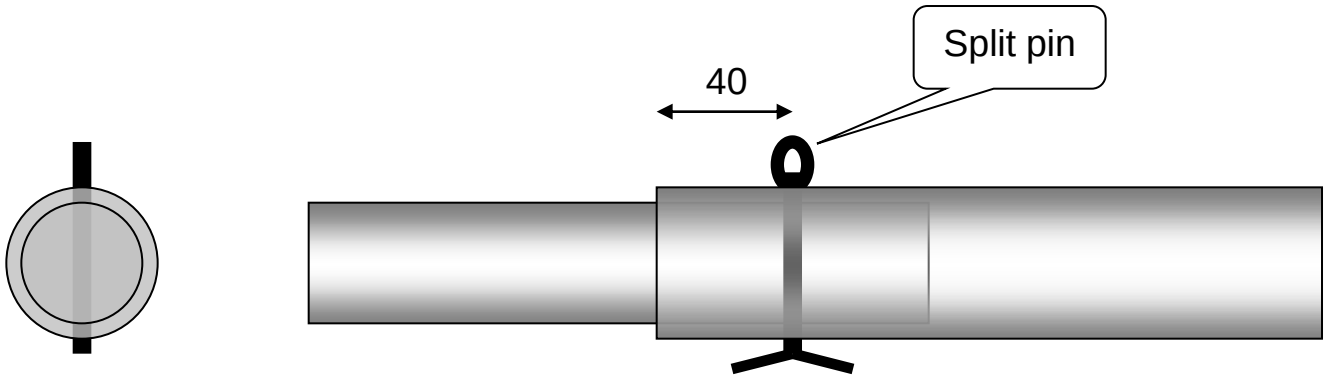
5. Fifth sections

On 17m band only

Driven and Director, 2pcs each



Element construction



Dimensions (half element)

Frequency **kHz**		Tube **19mm**	Tube **15mm**	Tube **12mm**	Tube **8mm**	Wire **2mm**	Element **Spacing**	Hairpin **L / uH**	Fine tuning **mm/50kHz**
18100	driven	600	1150	1150	1150	175			11.4
	total	600	1750	2900	4050	**4225**		0.38	
							1400		
	director	600	1150	1150	1100	75			
	total	600	1750	2900	4000	**4075**			
21050	driven	600	1150	1150	685				8.5
	total	600	1750	2900	**3585**			0.32	
							1130		
	director	600	1150	1150	565				
	total	600	1750	2900	**3465**				
21300	driven	600	1150	1150	645				8.2
	total	600	1750	2900	**3545**			0.32	
							1130		
	director	600	1150	1150	525				
	total	600	1750	2900	**3425**				
24900	driven	600	1150	1150	80				6.0
	total	600	1750	2900	**2980**			0.27	
							1000		
	director	600	1150	1120					
	total	600	1750	**2870**					
28050	driven	600	1150	890					4.8
	total	600	1750	**2640**				0.25	
							850		
	director	600	1150	795					
	total	600	1750	**2545**					
28400	driven	600	1150	860					4.6
	total	600	1750	**2610**				0.25	
							850		
	director	600	1150	760					
	total	600	1750	**2510**					

Hairpins

0.38 - 0.32uH 12-17m

Copper terminal lugs are soldered to both ends of dia 2mm copper wire.
Distance from terminal hole center to center is 460mm

When rounded to circular form, inductance is 0.38uH, good for 17m band

When formed like a shortcircuited paraller line 6cm wide, inductance is 0.32uH, suitable for 15m band
This works fine also on 12m.

0.27 - 0.25uH 10-12m

Copper terminal lugs are soldered to both ends of dia 2mm copper wire.
Distance from terminal hole center to center is 380mm

When rounded to circular form, inductance is 0.27uH, good for 12m band

When formed like a shortcircuited paraller line 6cm wide, inductance is 0.25uH, suitable for 10m band

Driven element and hairpin

Top view

Bottom view