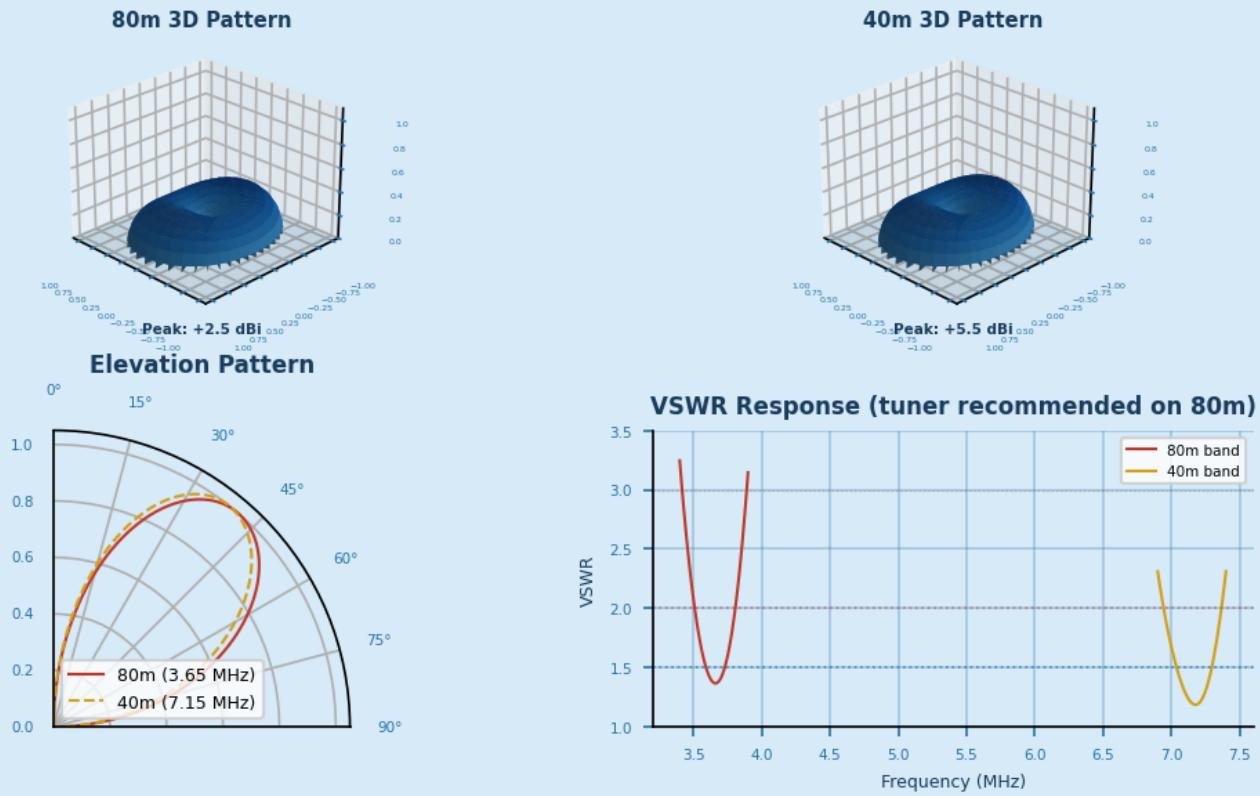


# Small-Size NVIS Fan Dipole

Small-Size NVIS Fan Dipole | 80m + 40m | Center-Loaded Compact Design

## Radiation Patterns & VSWR Response



### Key Design Parameters:

Apex Height: 8 m | Included Angle: 140 deg | Wire: #14 AWG (1.63 mm) Stranded copper

Loading: 4x center-loaded air-wound coils (80m: ~30 uH, 40m: ~8 uH)

Ground: 4x4 m mesh + 8 radials x 5 m | Balun: Single FT-240-43 | Feed: RG-58 (50 ohm)

80m Span: 18.8 m | 40m Span: 9.4 m | Footprint: 19 x 8 m

80m Gain: +2.5 dBi (75% eff) | 40m Gain: +5.5 dBi (86% eff)

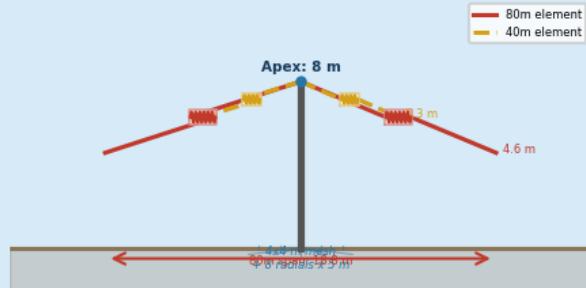
Coverage: 0-250 km | Cost: \$80-\$150 | Tuner recommended on 80m

# Antenna Geometry & Performance

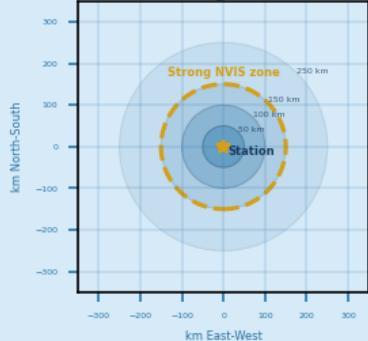
Small-Size NVIS Fan Dipole | 80m + 40m | Center-Loaded Compact Design

## Physical Layout, Coverage & Performance Data

### Antenna Geometry (140 deg, center-loaded)



### NVIS Coverage (0-250 km)



### Performance Summary

Freq (MHz)	Gain (dBi)	Eff (%)	VSWR	BW (kHz)	h/λ
3.500	+1.8	70	1.8	45	0.093
3.650	+2.5	75	1.3	50	0.097
3.800	+2.8	77	2.0	50	0.101
7.000	+5.0	83	1.5	80	0.187
7.150	+5.5	86	1.2	90	0.191
7.300	+5.8	86	1.6	90	0.195

### Design Notes - Center Loading:

Center-loading coils allow 50% physical shortening of each element while maintaining resonance.

Trade-off: reduced bandwidth (80m ~50 kHz, 40m ~90 kHz) and lower efficiency (72-86%).

An antenna tuner is strongly recommended for 80m operation across the full band.

40m performance remains good with  $h/\lambda = 0.191$ , near-optimal for NVIS.

The 140 deg included angle with 8 m apex gives a 19 x 8 m footprint - fits most suburban lots.

Total weight under 3 kg - suitable for portable/field deployment with push-up mast.

# Bill of Materials & Loading Coil Construction

Small-Size NVIS Fan Dipole | 80m + 40m | Center-Loaded Compact Design

## Component List

Component	Quantity	Est. Cost
#14 AWG stranded copper wire	30 m (100 ft)	\$10-\$15
RG-58 coaxial cable	20 m (65 ft)	\$10-\$20
FT-240-43 ferrite core (x1)	1 pc	\$10-\$15
Galvanized ground mesh (4x4 m)	16 sq m	\$10-\$15
Copper ground radials (#14 AWG)	8 x 5 m = 40 m	\$5-\$8
PVC pipe: 50 mm (80m coil formers)	2 x 10 cm	\$2-\$3
PVC pipe: 40 mm (40m coil formers)	2 x 8 cm	\$2-\$3
#14 AWG enamelled wire (coils)	10 m	\$3-\$5
Push-up mast (aluminium/fibreglass)	8 m telescoping	\$15-\$30
Insulators, connectors, hardware	1 set	\$10-\$20
PL-259 connectors	2 pcs	\$3-\$5
	<b>TOTAL</b>	<b>\$80-\$150</b>

## Loading Coil Construction

### 80m Coils (x2):

-30 uH | 35 close-wound turns #14 AWG enamelled on 50 mm PVC | Q~200 | Coil length ~55 mm  
Position at center of each 80m half-element (5 m from feedpoint). Secure with cable ties.

### 40m Coils (x2):

-8 uH | 18 close-wound turns #14 AWG enamelled on 40 mm PVC | Q~250 | Coil length ~30 mm  
Position at center of each 40m half-element (2.5 m from feedpoint). Secure with cable ties.

### Tuning:

1. Assemble antenna. Sweep 3.4-3.9 MHz; adjust 80m coils (+/- 1 turn).
2. Sweep 6.9-7.4 MHz; adjust 40m coils. Re-check 80m. Fine-tune tips +/- 10 cm.
3. Target VSWR < 2:1 at band center. Use antenna tuner for band edges (especially 80m).

### Comparison: Efficient vs Small-Size:

Parameter	Efficient (full)	Small-Size (this)
Apex height	12 m	8 m
Included angle	160 deg	140 deg
80m half-element	20 m (full)	10 m (50% short)
40m half-element	10 m (full)	5 m (50% short)
Wire	#10 AWG hard-drawn	#14 AWG stranded
Loading coils	None	4x air-wound PVC
Ground	10x10 m + 20 radials	4x4 m + 8 radials x 5 m
Balun	Triple FT-240-43	Single FT-240-43
Feed cable	LMR-400	RG-58
80m gain	+7.0 dBi / 97%	+2.5 dBi / 75%
40m gain	+7.8 dBi / 99%	+5.5 dBi / 86%
Coverage	0-500 km	0-250 km
Footprint	39 x 12 m	19 x 8 m
Cost	\$280-\$450	\$80-\$150