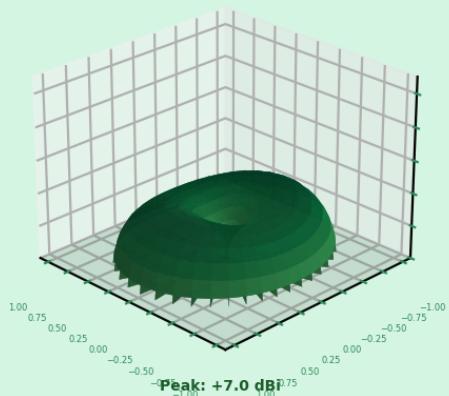


Efficiency-Optimized NVIS Fan Dipole

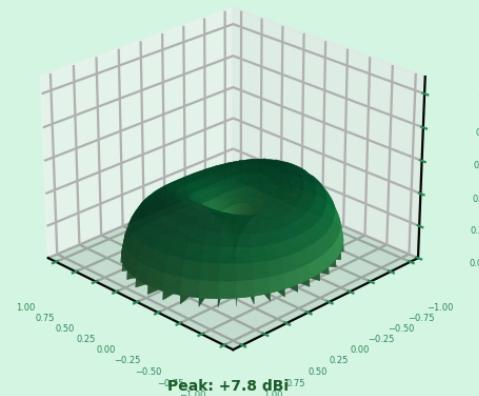
Efficiency-Optimized NVIS Fan Dipole | 80m + 40m Dual-Band

Radiation Patterns & VSWR Response

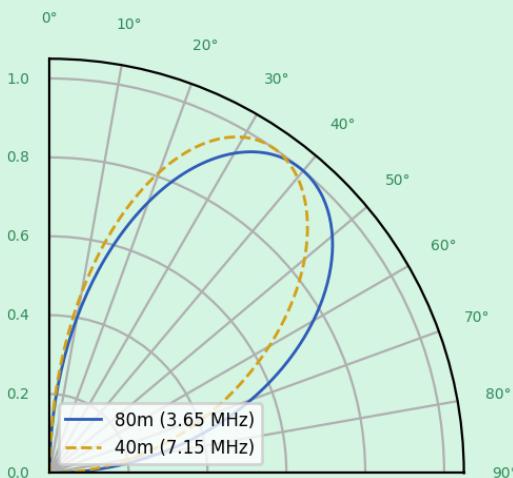
80m 3D Pattern



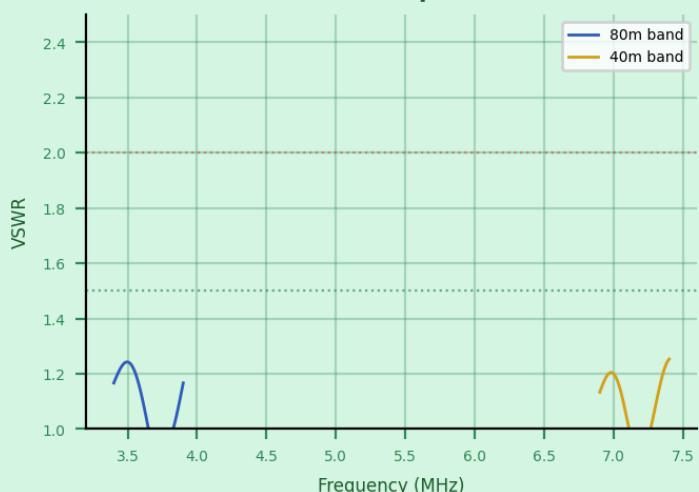
40m 3D Pattern



Elevation Pattern



VSWR Response



Key Design Parameters:

Apex Height: 12 m | Included Angle: 160 deg | Wire: #10 AWG (2.59 mm) Hard-drawn copper

Ground Screen: 10x10 m mesh + 20 radials x 15 m | Balun: Triple-core FT-240-43

Feed Cable: LMR-400 (50 ohm) | Coverage: 0-500 km | Efficiency: 97-99%

80m Element Span: 39.4 m | 40m Element Span: 19.7 m

80m End Height: 8.5 m | 40m End Height: 10.3 m

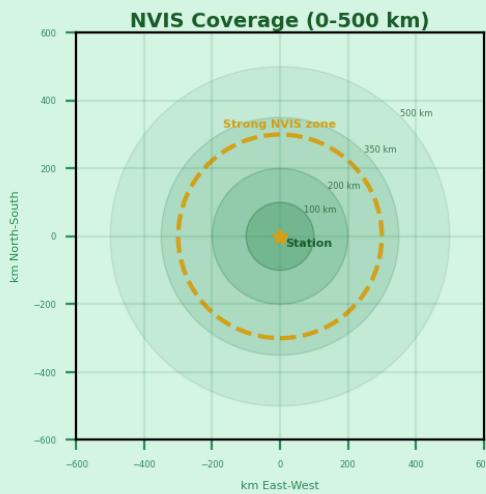
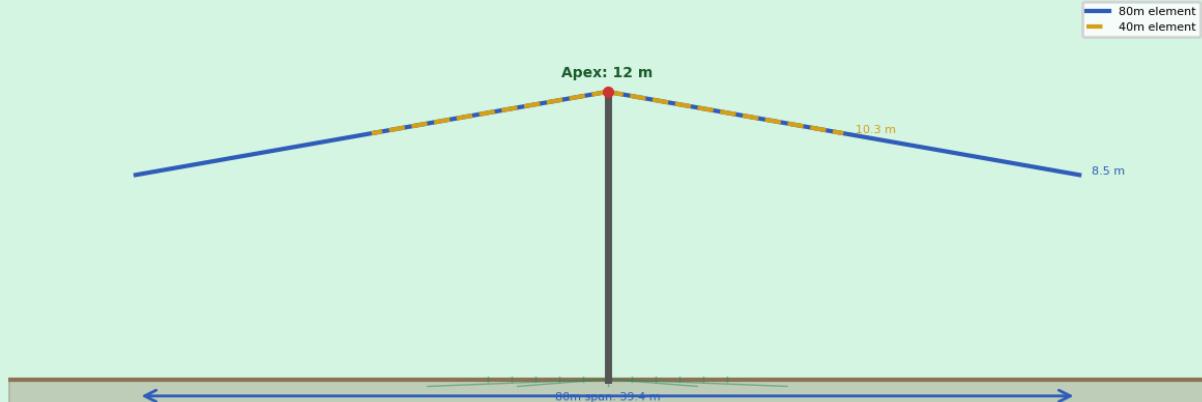
Estimated Cost: \$280-\$450 (premium components)

Antenna Geometry & Performance

Efficiency-Optimized NVIS Fan Dipole | 80m + 40m Dual-Band

Physical Layout, Coverage & Performance Data

Antenna Geometry (160 deg included angle)



Performance Summary

Freq (MHz)	Gain (dBi)	Eff (%)	VSWR	BW (kHz)	h/lam
3.500	+6.8	97	1.2	170	0.140
3.650	+7.0	97	1.1	180	0.146
3.800	+7.2	98	1.3	180	0.152
7.000	+7.6	98	1.3	230	0.280
7.150	+7.8	99	1.1	240	0.286
7.300	+7.9	99	1.4	240	0.292

Design Philosophy:

This design maximizes radiation efficiency through premium, low-loss components throughout the system. The 160 deg included angle (nearly flat) provides maximum horizontal current distribution for NVIS gain. #10 AWG hard-drawn copper wire minimizes ohmic losses; LMR-400 coax reduces feed line losses by ~50%. The 10x10 m ground screen with 20 radials at 15 m provides near-perfect ground reflection. Triple-core FT-240-43 balun handles 1.5 kW with minimal core loss and excellent balance. Combined system efficiency of 97-99% with full 0-500 km NVIS coverage footprint.

Bill of Materials & Construction Notes

Efficiency-Optimized NVIS Fan Dipole | 80m + 40m Dual-Band

Component List

Component	Quantity	Est. Cost
#10 AWG hard-drawn copper wire	80 m (260 ft)	\$45-\$65
LMR-400 coaxial cable	30 m (100 ft)	\$75-\$120
FT-240-43 ferrite cores (x3)	3 pcs	\$30-\$45
Galvanized ground mesh (10x10 m)	100 sq m	\$40-\$60
Copper ground radials (#14 AWG)	20 x 15 m = 300 m	\$35-\$50
Centre mast (aluminium/fibreglass)	12 m telescoping	\$25-\$50
End support poles/trees	2 pcs	\$0-\$20
Insulators, connectors, hardware	1 set	\$15-\$25
PL-259 / N-type connectors	4 pcs	\$10-\$15
	TOTAL	\$280-\$450

Construction Notes:

1. Cut 80m elements: 2 x 20.0 m (total 40.0 m) #10 AWG hard-drawn copper.
2. Cut 40m elements: 2 x 10.0 m (total 20.0 m) #10 AWG hard-drawn copper.
3. Wind triple-core balun: 12 turns bifilar on 3 stacked FT-240-43 cores.
4. Solder elements to balun output. Connect LMR-400 with N-type connectors.
5. Lay 10x10 m galvanised mesh centred under mast. Attach 20 radials at 18 deg spacing.
6. Raise mast to 12 m. Adjust element angles for 160 deg included angle.
7. Use antenna analyser to verify VSWR < 1.5:1 across both bands.
8. Trim element tips if needed (1 cm at a time) for best match.

SAFETY: Observe all applicable regulations. Ensure mast is properly guyed.
Keep away from overhead power lines (minimum 2x mast height clearance).

Comparison with v2 Design:

Parameter	v2 (Max-Eff 350km)	Efficient (this)
Included angle	150 deg	160 deg
Wire gauge	#12 AWG	#10 AWG (2.59mm)
Wire type	CCS + stranded	Hard-drawn copper
Ground screen	8x8 m + 16 radials	10x10 m + 20 radials
Balun	Dual-core FT-240-43	Triple-core FT-240-43
Feed cable	RG-213	LMR-400
80m gain	+6.8 dBi	+7.0 dBi
40m gain	+7.5 dBi	+7.8 dBi
Efficiency	96-98%	97-99%
Coverage	0-350 km	0-500 km
Cost	\$213-\$370	\$280-\$450

