A Quad Loop Revisited

Call it what you like, but this design makes a good antenna for the space-limited amateur.

Floyd Koontz, WA2WVL

The antenna I am describing is known by many names depending on its shape, orientation with respect to ground and feed-point location. To some it is a delta loop, to others a three sided quad loop while others view it as a 1 λ loop. In the configuration described, with the horizontal section on top, it radiates very much like a dipole. I thus choose to view it as a shortened dipole fed at the ends. For 75 meters the total wire length is about 264 feet. The width and height vary with different installations. Figure 1 shows the configuration and Table 1 shows how the width and height are related, along with other key data.

This configuration has many advantages over a conventional center-fed dipole.

- The feed-point is near ground eliminating the hanging feed line and allowing the horizontal portion of the wire to be pulled to maximum height.
- This design works at heights of 40 to 100 feet with a feed impedance similar to, but a little higher than, the center-fed dipole.
- The width is reduced as the height increases, since the total wire length remains nearly constant. The width is down to 56% at 100 feet.
- All adjustment is at ground level without the need to lower the antenna. If a small L network is desired to obtain a perfect match, it can be mounted at eye level for easy adjustment.
- The antenna can easily be retuned from 3800 kHz to 3550 kHz with a 10 µH inductance and a relay located at ground level.
- The end-fed dipole may have reduced pickup of precipitation static since it has no open ends and can be dc grounded at all times.

Table 1
Characteristics of Loop at 3800 kHz and Retuned for 3550 kHz

		3800 kHz		3550 kHz		
Height (feet)	Width (feet)	Impedance (Ω)	Gain at 30° (dBi)	Impedance (Ω)	Gain at 30° (dBi)	Inductance (µH)
100	71.7	69+*j* 0	5.53	55.3+*j* 0	5.11	8.95
90	83.75	100+*j* 0	5.09	78+*j* 0	4.76	9.28
80	94	124.7+*j* 0	4.69	95.7+*j* 0	4.45	9.66
70	102.5	135.8+*j* 0	4.38	103.5+*j* 0	4.19	10.07
60	110	131.4+*j* 0	4.15	100.2±*j* 0	4.02	10.47
50	116.6	113.7+*j* 0	4.04	87.3+*j* 0	3.94	10.76
40	126	86.4+*j* 0	4.10	71.5+*j* 0	4.06	7.22

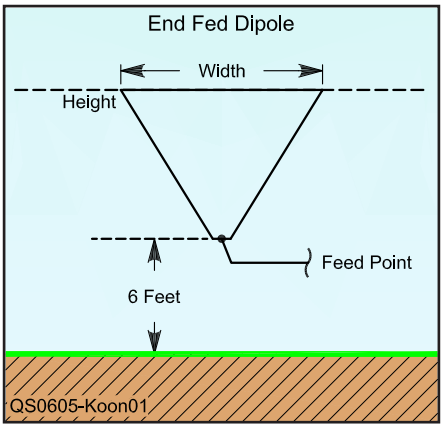

Figure 1 — Delta loop or end-fed dipole configuration.

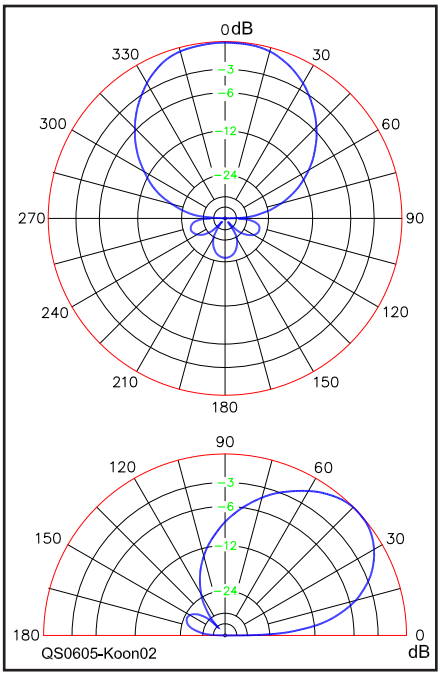

Figure 2 — Predicted performance at 3 element loop Yagi at 3800 kHz. At top, azimuth pattern at 30°. At bottom, elevation pattern at peak of main lobe.

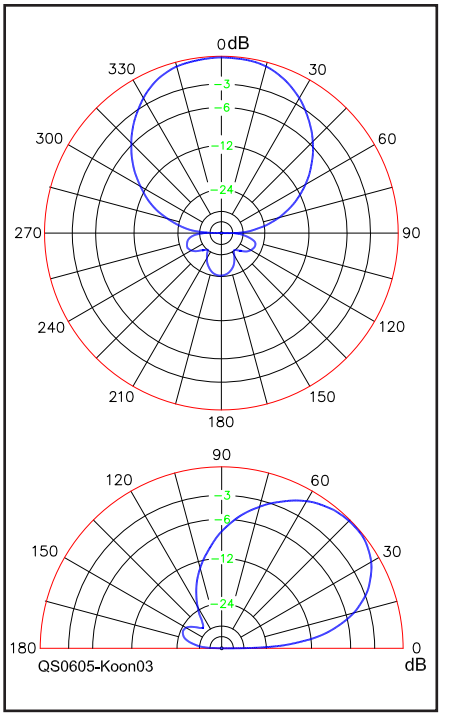

Figure 3 — Predicted performance a three element loop Yagi retuned for 3550 kHz.

Table 2
Design of Wire Beam with Delta Loop Elements
At 60 Feet and 50 Foot Element Spacing

Element	*Width (feet)*	*Inductor (µH)*
Driven element	111	10.5
Reflector	116	9.5
Director	106	11.5

Table 3
Calculated Performance of Three Element Loop Beam

Parameter	*3800 kHz*	*3550 kHz*
Impedance (Ω)	63.8 – *j* 0.8	47.3 – *j* 0.1
SWR	1.28: 1	1.06: 1
Wire Losses (dB)	0.38	0.50
Efficiency (%)	91.6	89.2
Forward Gain at 30° (dBi)	10.11	9.92
F/B (dB)	25.08	24.65
Peak Elevation (°)	41	43

- This configuration is excellent for wire beam (Yagi) designs since all elements have their feeding and tuning points near ground.

A Three Element Wire Beam

Figures 2 and 3 and Tables 2 and 3 describe a three element wire beam using end-fed dipole elements. The basic design is centered at 3800 kHz and inductors are used to retune for 3550 kHz, if desired. It could also have been designed for 3550 kHz with capacitors used to retune to 3800 kHz. Results at both frequencies are nearly identical.

The fine points of the design and construction are left to the reader.

Floyd Koontz, WA2WVL, is a retired electrical engineer with 40 years' experience designing communications systems, radio transmitters and antennas. He was first licensed in 1955 as WN9JQA and has been WA2WVL since 1961. He has written numerous QST *articles about antennas over the years. An ARRL life member, he can be reached at 8430 W Park Springs Pl, Homosassa, FL 34448, or* **wa2wvl@gowebco.com**. QST

Strays

FAMOUS STAMP HAS HAM LEGACY

◊ The January 2006 issue of *Leatherneck* ("Magazine of the Marines") includes an article by Major Jack Elliott, USMC (Ret) entitled, "Marine Corps Aircraft Made their Airmail Stamp on Nicaragua." Turns out that the first Nicaraguan airmail stamp, dating from 1929, has its basis in a QSL card. In a recounting of a 1927 Marine expedition to Nicaragua to quell an insurgency, the article states:

> VO4M was dispatched from Quantico, Va., on 12 May to augment VO-1M already at Managua. In addition to six 02B-2 (reworked DH-4B) aircraft, the squadron took along its "Ham Radio" station. For a short time, official messages were transmitted to Washington via the Ham Radio until the unit was notified that such procedures were not legal.
>
> Amateur radio was still in its infancy, and to be able to correspond with distant radios was a subject of pride. To verify these contacts, a postcard known as a QSL, to acknowledge receipt of its transmission, was sent to each station contacted. The Marines of VO-4M, of course, wanted a distinctive QSL card.

The article goes on to describe how the squadron photographic officer produced the photo for the QSL card using the same aircraft twice, superimposed over Mount Momotombo and Lake Nicaragua. The station call sign, NN1NIC, was placed below the photo.

"Due to [the Nicaraguan president's] close association with Marine aviation," the article continues, "it was the QSL card Nicaragua chose as the design for its airmail stamp when an airmail service was inaugurated." — *tnx Jack Troster, W6ISQ*

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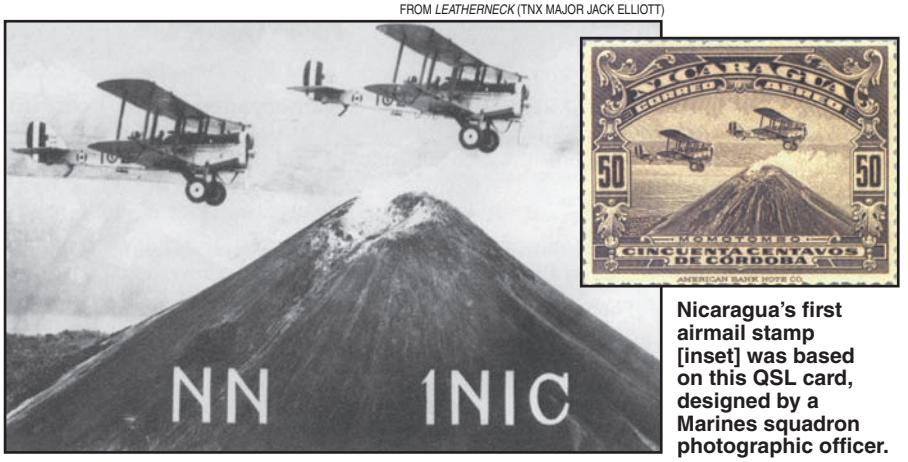
FROM *LEATHERNECK* (TNX MAJOR JACK ELLIOTT)



Nicaragua's first airmail stamp [inset] was based on this QSL card, designed by a Marines squadron photographic officer.