By Edison Fong, WB6IQN

The DBJ-1: A VHF-UHF Dual-Band J-Pole

Searching for an inexpensive, high-performance dual-band base antenna for VHF and UHF? Build a simple antenna that uses a single feed line for less than $10.

Two-meter antennas are small compared to those for the lower frequency bands, and the availability of repeaters on this band greatly extends the range of lightweight low power handhelds and mobile stations. One of the most popular VHF and UHF base station antennas is the J-Pole.

The J-Pole has no ground radials and it is easy to construct using inexpensive materials. For its simplicity and small size, it offers excellent performance. Its radiation pattern is close to that of an "ideal" dipole because it is end fed; this results in virtually no disruption to the radiation pattern by the feed line.

The Conventional J-Pole

I was introduced to the twinlead version of the J-Pole in 1990 by my long-time friend, Dennis Monticelli, AE6C, and I was intrigued by its simplicity and high performance. One can scale this design to one-third size and also use it on UHF. With UHF repeaters becoming more popular in metropolitan areas, I accepted the challenge to incorporate both bands into one antenna with no degradation in performance. A common feed line would also eliminate the need for a duplexer. This article describes how to convert the traditional single band ribbon J-Pole design to dual-band operation. The antenna is enclosed in UV-resistant PVC pipe and can thus withstand the elements with only the antenna connector exposed. I have had this antenna on my roof since 1992 and it has been problem-free in the San Francisco fog.

The basic configuration of the ribbon J-Pole is shown in Figure 1. The dimensions are shown for 2 meters. This design was also discussed by KD6GLF in *QST*.[1] That antenna presented dual-band resonance, operating well at 2 meters but with a 6-7 dB deficit in the horizontal plane at UHF when compared to a dipole. This is attributable to the antenna operating at its third harmonic, with multiple out-of-phase currents.

I have tested single-band J-Pole configurations constructed from copper pipe, 450 Ω ladder line, and aluminum rod. While all the designs performed well, each had shortcomings. The copper pipe J-Pole matching section would be exposed to the

[1]J. Reynante, KD6GLF, "An Easy Dual-Band VHF/UHF Antenna," *QST*, Sep 1994, pp 61-62.

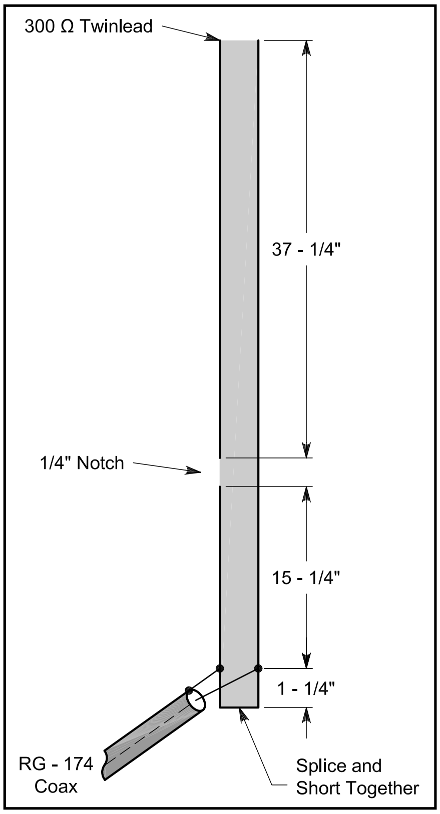

Figure 1—Basic diagram and dimensions for the original 2-meter ribbon J-Pole.

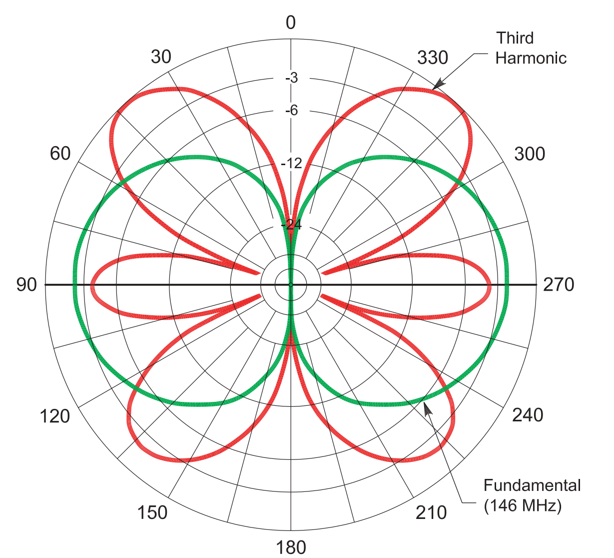

Figure 2—This EZNEC plot shows the difference in the radiation patterns between a vertical half-wave radiator operated at its fundamental (146 MHz) and third harmonic (445 MHz). At the fundamental, most of the energy is directed at right angles to the antenna—and to distant receivers.

From February 2003 QST © ARRL

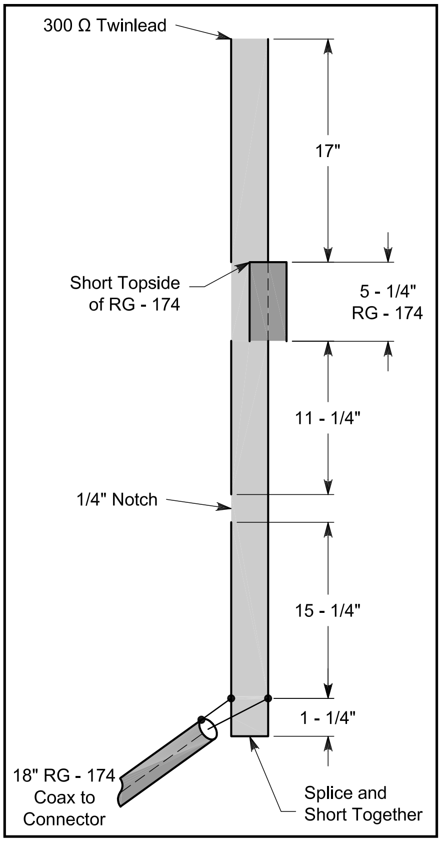

Figure 3—The 2 meter J-Pole modified for both VHF and UHF operation. These measurements are approximate (see text).

air, raising a durability question. The aluminum design would be faced with a similar issue in the salt air of the San Francisco Bay area. I favor the use of 300 Ω twin lead because it is easily obtainable and inexpensive. An advantage of the copper pipe design was an 8 MHz bandwidth—about twice that exhibited by the twin lead version. That was expected, since the copper pipe had a much larger diameter than the twin lead elements used in that version. My final decision was to be based on aesthetics, cost and durability...but the antenna had to be a true dual-band design.

How the J-Pole Works

The basic J-Pole antenna is a half-wave vertical radiator, much like a dipole. What separates this design from a vertical dipole is the method of feeding the half-wave element. In a conventional dipole or groundplane, the radiation pattern can be disrupted by the feed line and there is usually a tower or some other support that acts as a reflector as it is frequently parallel to the antenna. The J-Pole pattern resembles that of an ideal vertical dipole because of its minimal interaction with the feed line. The performance of this J-Pole is, theoretically at least, equal to a ¼ wave radiator over an ideal ground.

The J-Pole also matches the high impedance at the end of a ½ wave radiator to a low feed point impedance suitable for coax feed. This is done with a ¼ wave matching stub, shorted at one end and connected to the ½ wave radiator's high impedance at its other end. Between the shorted and high impedance ends there is a point that is close to 50 Ω. This is where the feed line is attached.

Creating the Dual-Band DBJ-1

So how can one add UHF to the conventional 2-meter J-Pole? First of all, a half-wave 2 meter antenna does resonate at UHF. Resonating is one thing, but working well is another. The DBJ-1 not only resonates, but also performs as a ½ wave radiator on both bands. An interesting fact to note is that ½ wave center-fed dipole-type antennas will resonate at odd harmonics (3rd, 5th, 7th, etc). This is why a 40 meter center-fed ½ wave dipole can be used on 15 meters. Similarly, a 150 MHz antenna can be used at 450 MHz. However, the performance of the antenna at the third harmonic is poor when it is used in a vertical configuration. At UHF (450 MHz) the ½ wave radiator becomes $^3/_2$ wavelengths long. Unfortunately, at UHF, the middle ½ wavelength is out of phase with the top and bottom segments and the resulting partial cancellation results in approximately 2 dB less gain in the horizontal plane compared to a J-Pole operating at its fundamental frequency. Maximum radiation is also directed away from the horizon. Thus, although the J-Pole can be made to work at its third harmonic, its performance is poor, often 6-8 dB below that of a groundplane. Figure 2 shows a polar plot of a vertical ½ wave radiator operating at its fundamental (146 MHz) and third harmonic (445 MHz) frequencies. Note the difference in energies of the two frequencies.

What is needed is a method to decouple the extra length of the 2 meter radiator at UHF in order to create independent ½ wavelength radiators at both VHF and UHF. The DBJ-1 accomplishes this by using a coaxial stub, as shown in the antenna drawing of Figure 3.

There is 18 inches of RG-174 transmission line connecting the bottom RF connector to the radiating element. Eighteen inches was chosen so that the bottom portion of the antenna housing can be used to mount the antenna without disturbing its electrical characteristics. [The use of RG-174 coax in this design limits the power the antenna can handle to less than 60 W at low SWR. By substituting RG-213, RG-8 or RG-58 cable, power ratings can be improved considerably. However, the length of the decoupling stub at the UHF antenna may have to be recalculated, because of the change in velocity factor (VF) of the different cable.—*Ed.*]

The 16½ inch matching stub of 300 Ω twin lead works like a ¼ wave stub at VHF and a ¾ wave stub at UHF with virtually no penalty, except for a slight 0.1 db loss from the extra ½ wavelength of feedline. By experimentation, the 50 Ω point was found to be 1¼ inches from the shorted end of the stub. Although the impedance at this point is slightly inductive, it is still an excellent match to 50 Ω, with an SWR of approximately 1.3:1.

Connected to the open end of the matching stub, the radiating element for UHF is 11¼ inches long. The stub and radiator are constructed of a single piece of twin lead, separated from the matching stub by a ¼ inch notch in one conductor, as shown in Figure 3. The extra wire in the twin lead radiator sections radiates along with the driven wire, creating a thick element that is shorter than its free-space equivalent. To terminate the UHF radiating section, a shorted stub, using RG-174 coaxial cable, is used. As with the input matching stub, the open end presents a high impedance and is connected to the upper end of the UHF radiating section. Note that the stub is only an open-circuit at UHF, acting as a small inductance instead, at VHF.

The RG-174 stub connects to the upper section of 300 Ω twin lead and that completes the VHF radiating element. Note that the total length of the UHF and VHF radiating elements plus the coaxial stub do not add up to a full ½ wavelength at VHF because the inductance of the coaxial stub acts to shorten the antenna slightly.

Construction Details

The dimensions given in Figure 3 should be considered a starting point for adjustment, with final tuning requiring an SWR analyzer or bridge. During the antenna's construction phase, I started at the feed point (see Figure 3) and after each section was assembled, the input SWR was checked. After the ¼ wave VHF matching section is connected to the 11¼ inch UHF ½ wave section, check the SWR at UHF. Then add the ¼ wave UHF shorted RG-174 stub. The stub will require trimming for minimum SWR at UHF. Start with the stub 10–15% long and trim the open end for lowest SWR. As a last step, add the 17 inch section of twin lead. Again, this section should be trimmed for the lowest SWR at your frequency of choice in the 2 meter band.

To weatherize the antenna, enclose it in ¾ inch schedule-200 PVC pipe with end caps. These can be obtained from your local hardware or building supply store. When sliding the antenna into the PVC tubing, I found no need to anchor the antenna once it was inside. [If larger coaxial

Table 1
Measured Relative Performance of the Dual-Band Antenna at 146 MHz

	VHF ¼ Wave Mobile Reference	*VHF Flex Antenna (“Rubber Duck”)*	*Standard VHF J-Pole*	*DBJ-1 J-Pole*
Received Signal Strength	–24.7 dBm	–30.5 dBm	–24.3 dBm	–23.5 dBm
Difference from Reference	0 dB	–5.8 dB	+0.4 dB	+1.2 dB

Table 2
Measured Relative Performance of the Dual-Band Antenna at 445 MHz

	VHF ¼ Wave Mobile Reference	*VHF Flex Antenna (“Rubber Duck”)*	*Standard VHF J-Pole*	*DBJ-1 J-Pole*
Received Signal Strength	–38.8 dBm	–45.3 dBm	–45 dBm	–38.8 dBm
Difference from Reference	0 dB	–6.5 dB	–6.2 dB	0 dB

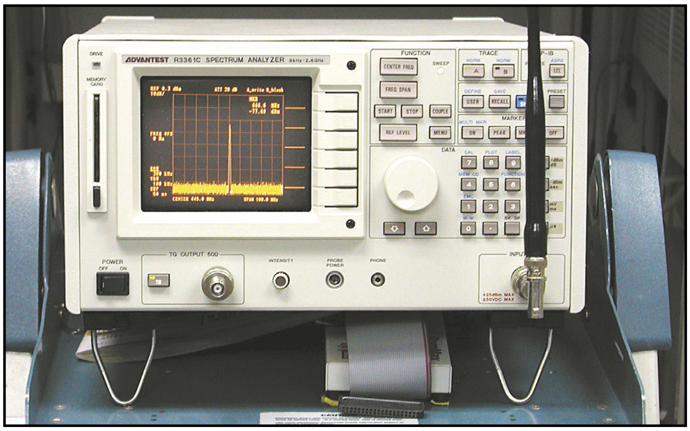

Figure 4—The Advantest R3361 spectrum analyzer used in the test.

Figure 5—The completed antenna mounted to the roof.

cable is used for the stub, it is likely that the top of the antenna will require some glue or foam to hold the antenna in place because of the additional cable weight. —*Ed*.] The 300 Ω twin lead is sufficiently rigid so as not to bend once it is inside the pipe. Install an SO-239 connector in the bottom end cap. Once the antenna is trimmed to the desired operating frequency, glue both end caps and seal around the SO-239 connector. Presto! For a few dollars, you’ll have a dynamite antenna that should last for years.

The antenna should be supported only by the lower 12 inches of the housing to avoid interaction between the matching stub and any nearby metal, such as an antenna or tower. The results from the antenna are excellent considering its simplicity.

Measured Results

Brian Woodson, KE6SVX, helped me make measurements in a large parking lot, approximating a fairly good antenna range, using the Advantest R3361C spectrum analyzer shown in Figure 4.

The transmitter was a Yaesu FT-5200 located about 50 yards from the analyzer. The reference antenna consisted of mobile ¼ wave Motorola ground plane antennas mounted on an NMO connector on the top of my vehicle. The flex antenna (“rubber duck”) was mounted at the end of 3 feet of coax held at the same elevation as the groundplane without radials. The J-Pole measurements were made with no groundplane and the base held at the same height as the mobile ground plane. Table 1 gives performance measurements at 146 MHz, while Table 2 gives those same measurements at 445 MHz.

As can be seen in the UHF results, the DBJ-1 outperforms the standard 2 meter J-Pole by about 6 dB (when used at UHF), a significant difference. The standard 2 meter J-Pole performance is equivalent to a flex antenna at UHF. Also note that there is no significant difference in performance at 2 meters between the DBJ-1 and a standard J-Pole. The flex antenna is about 6 dB below the ¼ wave mobile antenna at both VHF and UHF. This agrees well with the previous literature.

The completed antenna can be seen mounted to the author’s roof in Figure 5.

If you do not have the equipment to construct or tune this antenna at both VHF and UHF, the completed antenna is available from the author, tuned to your desired frequency. The cost is $20. E-mail him for details.

Ed Fong was first licensed in 1968 as WN6IQN. His Extra Class came with WB6IQN. He obtained the BSEE and MSEE degrees from the University of California at Berkeley and his PhD from the University of San Francisco. A Senior Member of the IEEE, he has seven patents and two-dozen published papers in the area of communications and integrated circuit design. Presently, he is employed by the University of California at Berkeley teaching graduate classes in RF design and is a Senior Member of the Technical Staff at Foveon Corporation in Santa Clara, California. You can contact the author at 1163 Quince Ave, Sunnyvale, CA 94087; **edison_fong@hotmail.com**.

FEEDBACK

◊ In "The DBJ-1: A VHF-UHF Dual-Band J-Pole" [Feb 2003, p 40], replace "VHF" with "UHF" in the headings of Table 2, columns 1 and 2. Column 3 remains "VHF," as it refers to the use of a 2 meter VHF J-Pole on its third harmonic. Also, the area immediately to the left of the RG-174 stub should not be shaded. The decoupling stub is in series with two separate pieces of twin-lead.

◊ In "The DBJ-1: A VHF-UHF Dual-Band J-Pole" (Feb 2003, pp 38-40), the length of the RG-174 matching stub should be shortened a bit to get the antenna closer to a 1:1 SWR. Using the formula for line length versus frequency and wavelength,

$L = (VF \times 984 \times N) / f$

where

L = length (in feet),
VF = velocity factor,
N = number of wavelengths and
f = frequency in MHz

The DBJ-2: A Portable VHF-UHF Roll-Up J-pole Antenna for Public Service

WB6IQN reviews the theory of the dual band 2 meter / 70 cm J-pole antenna and then makes detailed measurements of a practical, easy to replicate, "roll-up" portable antenna.

Edison Fong, WB6IQN

It has now been more than three years since my article on the dual band J-pole (DBJ-1) appeared in the February 2003 issue of *QST*.[1] I have had over 500 inquires regarding that antenna. Users have reported good results, and a few individuals even built the antenna and confirmed the reported measurements. Several major cities are using this antenna for their schools, churches and emergency operations center. When asked why they choose the DBJ-1, the most common answer was value. When budgets are tight and you want a good performance-to-price ratio, the DBJ-1 (*D*ual *B*and *J*-pole*–1*) is an excellent choice.

In quantity, the materials cost about $5 per antenna and what you get is a VHF/UHF base station antenna with λ/2 vertical performance on both VHF and UHF bands. If a small city builds a dozen of these antennas for schools, public buildings, etc it would cost about $60. Not for one, but the entire dozen!

Since it is constructed using PVC pipe, it is UV protected and it is waterproof. To date I have personally constructed over 400 of these antennas for various groups and individuals and have had excellent results. One has withstood harsh winter conditions in the mountains of McCall, Idaho for four years.

The most common request from users is for a portable "roll-up" version of this antenna for backpacking or emergency use. To address this request, I will describe how the principles of the DBJ-1 can be extended to a portable roll-up antenna. Since it is the second version of this antenna, I call it the DBJ-2.

Principles of the DBJ-1

The earlier DBJ-1 is based on the J-pole,[2] shown in Figure 1. Unlike the popular ground plane antenna, it doesn't need ground radials. The DBJ-1 is easy to construct using inexpensive materials from your local hardware store. For its simplicity and small size, the DBJ-1 offers excellent performance and consistently outperforms a ground plane antenna.

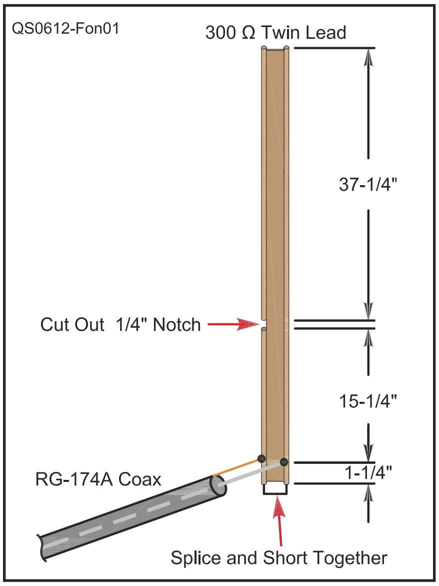

Figure 1 — The original 2 meter ribbon J-pole antenna.

Its radiation pattern is close to that of an ideal vertical dipole because it is end-fed, with virtually no distortion of the radiation pattern due to the feed line. A vertically polarized, center-fed dipole will always have some distortion of its pattern because the feed line comes out at its center, even when a balun is used. A vertically polarized, center-fed antenna is also physically more difficult to construct because of that feed line coming out horizontally from the center.

The basic J-pole antenna is a half-wave vertical configuration. Unlike a vertical dipole, which because of its center feed is usually mounted alongside a tower or some kind of metal supporting structure, the radiation pattern of an end-fed J-pole mounted at the top of a tower is not distorted.

The J-pole works by matching a low impedance (50 Ω) feed line to the high impedance at the end of a λ/2 vertical dipole. This is accomplished with a λ/4 matching stub shorted at one end and open at the other. The impedance repeats every λ/2, or every 360° around the Smith Chart. Between the shorted end and the high impedance end of the λ/4 shorted stub, there is a point that is close to 50 Ω and this is where the 50 Ω coax is connected.

By experimenting, this point is found to be about 1¼ inches from the shorted end on 2 meters. This makes intuitive sense since 50 Ω is closer to a short than to an open circuit. Although the Smith Chart shows that this point is slightly inductive, it is still an excellent match to 50 Ω coax. At resonance the SWR is below 1.2:1. Figure 1 shows the dimensions for a 2-meter J-pole. The 15¼ inch λ/4 section serves as the quarter wave matching transformer.

A commonly asked question is, "Why 15¼ inches?" Isn't a λ/4 at 2 meters about 18½ inches? Yes, but twinlead has a reduced velocity factor (about 0.8) compared to air and must thus be shortened by about 20%.

A conventional J-pole configuration works well because there is decoupling of the feed line from the λ/2 radiator element since the feed line is in line with the radiating λ/2 element. Thus, pattern distortion is minimized. But this only describes a single band VHF J-pole. How do we make this into a dual band J-pole?

Adding a Second Band to the J-pole

To incorporate UHF coverage into a VHF J-pole requires some explanation. (A more detailed explanation is given in my February 2003 *QST* article.) First, a 2 meter antenna does resonate at UHF. The key word here is

[1]Notes appear on page 40.

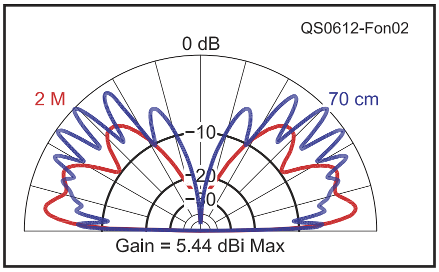

Figure 2 — Elevation plane pattern comparing 2 meter J-pole on fundamental and on third harmonic frequency (70 cm), with the antenna mounted 8 feet above ground. Most of the energy at the third harmonic is launched at 44°.

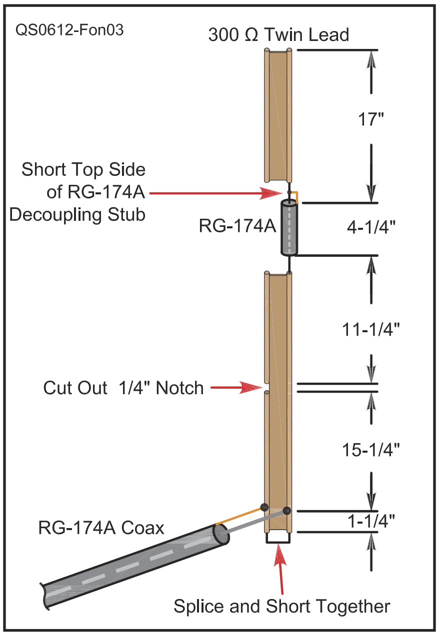

Figure 3 — The original DBJ-1 dual-band J-pole. The dimensions given assume that the antenna is inserted into a ¾ inch Class 200 PVC pipe.

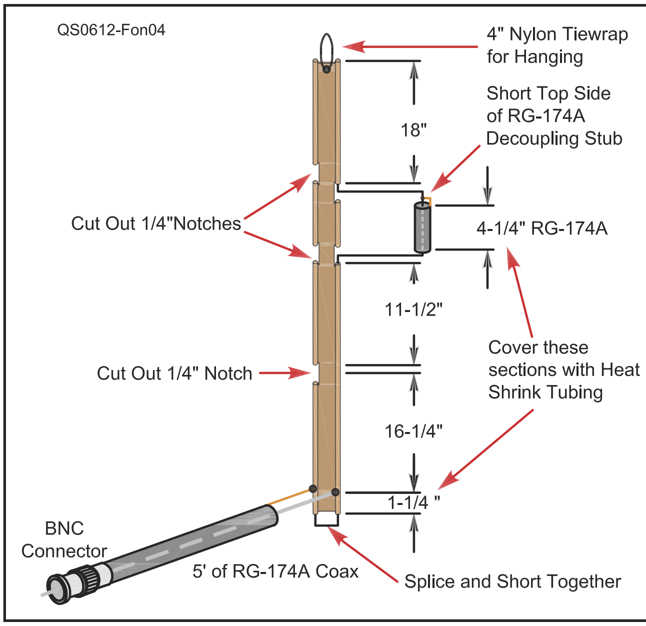

Figure 4 — The dual-band J-pole modified for portable operation — thus becoming the DBJ-2. Note that the dimensions are slightly longer than those in Figure 3 because it is not enclosed in a PVC dielectric tube. Please remember that the exact dimensions vary with the manufacturer of the 300 Ω line, especially the exact tap point where the RG-174A feed coax for the radio is connected.

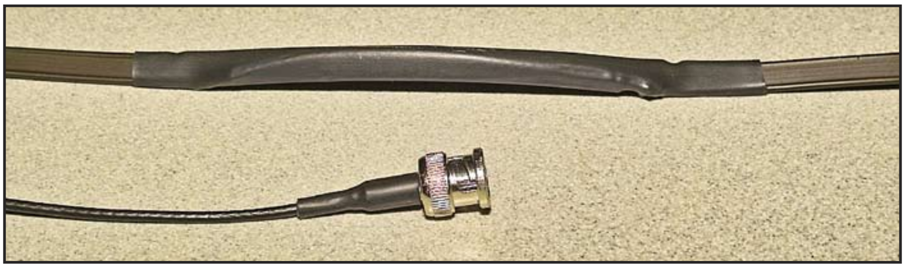

Figure 5 — The λ/4 UHF decoupling stub made of RG-174A, covered with heat shrink tubing. This is shown next to the BNC connector that goes to the transceiver.

resonate. For example, any LC circuit can be resonant, but that does not imply that it works well as an antenna. Resonating is one thing; working well as an antenna is another. You should understand that a λ/4 146 MHz matching stub works as a 3λ/4 matching stub at 450 MHz, except for the small amount of extra transmission line losses of the extra λ/2 at UHF. The UHF signal is simply taking one more revolution around the Smith Chart.

The uniqueness of the DBJ-1 concept is that it not only resonates on both bands but also actually performs as a λ/2 radiator on both bands. An interesting fact to note is that almost all antennas will resonate at their third harmonic (it will resonate on any odd harmonic 3, 5, 7, etc). This is why a 40 meter dipole can be used on 15 meters. The difference is that the performance at the third harmonic is poor when the antenna is used in a vertical configuration, as in the J pole shown in Figure 1. This can be best explained by a 19 inch 2 meter vertical over an ideal ground plane. At 2 meters, it is a λ/4 length vertical (approximately 18 inches). At UHF (450 MHz) it is a 3λ/4 vertical. Unfortunately, the additional λ/2 at UHF is out of phase with the bottom λ/4. This means cancellation occurs in the radiation pattern and the majority of the energy is launched at a takeoff angle of 45°. This results in about a 4 to 6 dB loss in the horizontal plane compared to a conventional λ/4 vertical placed over a ground plane. A horizontal radiation pattern obtained from *EZNEC* is shown in Figure 2. Notice that the 3λ/4 radiator has most of its energy at 45°.

Thus, although an antenna can be made to work at its third harmonic, its performance is poor. What we need is a simple, reliable method to decouple the remaining λ/2 at UHF of a 2 meter radiator, but have it remain electrically unaffected at VHF. We want independent λ/2 radiators at both VHF and UHF frequencies. The original DBJ-1 used a combination of coaxial stubs and 300 Ω twinlead cable, as shown in Figure 3.

Refer to Figure 3, and start from the left hand bottom. Proceed vertically to the RG-174A lead in cable. To connect to the antenna, about 5 feet of RG-174A was used with a BNC connector on the other end. The λ/4 VHF impedance transformer is made from 300 Ω twin lead. Its approximate length is 15 inches due to the velocity factor of the 300 Ω material. The λ/4 piece is shorted at the bottom and thus is an open circuit (high impedance) at the end of the λ/4 section. This matches well to the λ/2 radiator for VHF. The 50 Ω tap is about 1¼ inches from the short, as mentioned before.

For UHF operation, the λ/4 matching stub at VHF is now a 3λ/4 matching stub. This is electrically a λ/4 stub with an additional λ/2 in series. Since the purpose of the matching stub is for impedance matching and not for radiation, it does not directly affect the radiation efficiency of the antenna. It does, however, suffer some transmission loss from the additional λ/2, which would not be needed if it were not for the dual band operation. I estimate this loss at about 0.1 dB. Next comes the λ/2 radiating element for UHF, which is about 12 inches. To

Table 1
Measured Relative Performance of the Dual-band Antenna at 146 MHz

VHF λ/4 GP 4 radials	*VHF Flexible Antenna*	*Standard VHF J-Pole*	*Dual-Band J-Pole*
0 dB reference	–5.9 dB	+1.2 dB	+1.2 dB

Table 2
Measured Relative Performance of the Dual-band Antenna at 445 MHz

UHF λ/4 GP 4 radials	*UHF Fexible Antenna*	*Standard VHF J-Pole*	*Dual-Band J-Pole*
0 dB reference	–2.0 dB	–5.5 dB	0.5 dB

make it electrically terminate at 12 inches, a λ/4 shorted stub at UHF is constructed using RG-174A. The open end is then connected to the end of the 12 inches of 300 Ω twinlead. The open circuit of this λ/4 coax is only valid at UHF. Also, notice that it is 4½ inches and not 6 inches due to the velocity factor of RG-174A, which is about 0.6.

At the shorted end of the 4½ inch RG-174A is the final 18 inches of 300 Ω twinlead. Thus the 12 inches for the UHF λ/2, the 4½ inches of RG-174A for the decoupling stub at UHF, and the 18 inches of twinlead provide for the λ/2 at 2 meters. The total does not add up to a full 36 inches that you might think. This is because the λ/4 UHF RG-174A shorted stub is inductive at 2 meters, thus slightly shortening the antenna.

Making it Portable

The single most common question that people asked regarding the DBJ-1 is how it could be made portable. The original DBJ-1 had the antenna inserted into Class 200 PVC pipe that was 6 feet long. This was fine for fixed operation but would hardly be suitable for portable use. Basically the new antenna had to have the ability to be rolled up when not in use and had to be durable enough for use in emergency communications.

The challenge was to transfer the concepts developed for the DBJ-1 and apply them to a durable roll-up portable antenna. After much thought and experimenting, I adopted the configuration shown in Figure 4.

The major challenge was keeping the electrical characteristics the same as the original DBJ-1 but physically constructing it from a continuous piece of 300 Ω twinlead. Any full splices on the twinlead would compromise the durability, so to electrically disconnect sections of the twinlead, I cut small ¼ inch notches to achieve the proper resonances. I left the insulating backbone of the 300 Ω twinlead fully intact. I determined the two notches close to the λ/4 UHF decoupling stub by experiment to give the best SWR and bandwidth.

Because this antenna does not sit inside a dielectric PVC tube, the dimensions are about 5% longer than the original DBJ-1. I used heat shrink tubing to cover and protect the UHF λ/4 decoupling stub and the four ¼ inch notches. Similarly, I protected with heat shrink tubing the RG-174A coax interface to the 300 Ω twinlead. I also attached a small Teflon tie strap to the top of the antenna so that it may be conveniently attached to a nonconductive support string.

Figure 5 shows a picture of the λ/4 UHF matching stub inside the heat shrink tubing. The DBJ-2 can easily fit inside a pouch or a large pocket. It is far less complex than what would be needed for a single band ground plane, yet this antenna will consistently outperform a ground plane using 3 or 4 radials. Setup time is less than a minute.

I've constructed more than a hundred of these antennas. The top of the DBJ-2 is a high impedance point, so objects (even if they are nonmetallic) must be as far away as possible for best performance. The other sensitive points are the open end of the λ/4 VHF matching section and the open end of the λ/4 UHF decoupling stub.

As with any antenna, it works best as high as possible and in the clear. To hoist the antenna, use non-conducting string. Fishing line also works well.

Measured Results

I measured the DBJ-2 in an open field using an Advantest R3361 Spectrum Analyzer. The results are shown in Table 1. The antenna gives a 7 dB improvement over a flexible antenna at VHF. In actual practice, since the antenna can be mounted higher than the flexible antenna at the end of your handheld, results of +10 dB are not uncommon. This is the electrical equivalent of giving a 4 W handheld a boost to 40 W.

The DBJ-2 performs as predicted on 2 meters. It basically has the same performance as a single band J-pole, which gives about a 1 dB improvement over a λ/4 ground plane antenna. There is no measurable degradation in performance by incorporating the UHF capability into a conventional J-pole.

The DBJ-2's improved performance is apparent at UHF, where it outperforms the single band 2 meter J-pole operating at UHF by about 6 dB. See Table 2. This is *significant*. I have confidence in these measurements since the flexible antenna is about –6 dB from that of the λ/4 ground plane antenna, which agrees well with the literature.

Also notice that at UHF, the loss for the flex antenna is only 2.0 dB, compared to the ground plane. This is because the flexible antenna at UHF is already 6 inches long, which is a quarter wave. So the major difference for the flexible antenna at UHF is the lack of ground radials.

Summary

I presented how to construct a portable, roll-up dual-band J-pole. I've discussed its basic theory of operation, and have presented experimental results comparing the DBJ-2 to a standard ground plane, a traditional 2 meter J-pole and a flexible antenna. The DBJ-2 antenna is easy to construct, is low cost and is very compact. It should be an asset for ARES applications. It offers significant improvement in both the VHF and UHF bands compared to the stock flexible antenna antenna included with a handheld transceiver.

If you do not have the equipment to construct or tune this antenna at both VHF and UHF, the antenna is available from the author tuned to your desired frequency. Cost is $20. E-mail him for details.

Notes

[1]E. Fong, "The DBJ-1: A VHF-UHF Dual-Band J-Pole," *QST*, Feb 2003, pp 38-40.

[2]J. Reynante, "An Easy Dual-Band VHF/UHF Antenna," *QST*, Sep 1994, pp 61-62.

Ed Fong was first licensed in 1968 as WN6IQN. He later upgraded to Amateur Extra class with his present call of WB6IQN. He obtained BSEE and MSEE degrees from the University of California at Berkeley and his PhD from the University of San Francisco. A Senior Member of the IEEE, he has 8 patents, 24 published papers and a book in the area of communications and integrated circuit design. Presently, he is employed by the University of California at Berkeley teaching graduate classes in RF design and is a Principal Engineer at National Semiconductor, Santa Clara, California working with CMOS analog circuits. You can reach the author at **edison_fong@hotmail.com**.