[13]H. Scholle, "Eine Doppel-Windom Antenne für Neun Bänder," *cq-DL*, Jul 1984, pp 332-333.
[14]J. Belrose, "Tuning and Constructing Balanced Lines," Technical Correspondence, *QST*, May 1981, p 43.
[15]J. Swail, VE3KF, and W. Loucks, VE3AR, private communications, Apr 1985.
[16]Antenna Engineering, Australia Pty Ltd, PO Box 191, Croydon, Victoria 3136, Australia.
[17]W. Wrigley, "Impedance Characteristics of Harmonic Antennas, *QST*, Feb 1954, pp 10-14.
[18]W. Orr, Ham Radio Techniques, *ham radio*, Jan 1983, pp 68-69.
[19]M. Maxwell, "Some Aspects of the Balun Problem," *QST*, Mar 1983, pp 38-40.
[20]J. Belrose, "The Balun Saga Continued," *QST*, in preparation.
[21]As a less-costly alternative, 10 ≈ 1-inch-long mix-77 beads—with an inner diameter to pass the coax used—*may* serve as a substitute. (The authors do not have experience with beads of this material, however.) Consult your ferrite-bead supplier on the availability of beads of this type.—*Ed.*

APPENDIX

A Double Windom Antenna for Eight or Nine Bands

This work, which originally appeared as two articles in *cq-DL*, was translated from the German by Dr. George Elliott Tucker, WA5NVI.

Part 1: A Double Windom Antenna for Eight Bands

By Hubert Scholle, DJ7SH, and Rolf Steins, DL1BBC***

The asymmetrical dipole antenna developed and described by Windom (W8GZ) in 1929 has been used by many amateurs for many years as the FD4. This has also been the case in Germany.

We discovered in an older periodical (*QRV*) the explanation by F. Spillner (DJ2KY) that this antenna, with the addition of a small one-band Windom for 15 m, can be used as a five-band Windom. After the installation of the additional elements, this antenna worked very well for two years at DL1BBC.

With the opening of new bands (10, 18 and 24 MHz), the thought occurred to try out a new extension of the FD4 to eight bands (3.5 to 29.7 MHz).

What worked for 21 MHz must also be possible for 10 MHz.

So we took off the 21-MHz extension to my antenna and hung two elements of 4.69 and 9.38 m (15.39 and 30.77 ft), respectively, on the FD4 and stretched these downwards from insulators as an inverted V (Fig A).

To calculate the length we used the formula:

$$L/2 = 142.5 \div f \qquad \text{(Eq A)}$$

Whatever would work for 30 m should also work on 15 m.

As suspected, it worked.

As a by-product, it turned out in the measurements that this double Windom resonated just as well on 18 MHz and 24 MHz. So our eight-band Windom came into being with really simple means.

Construction

Thanks to our neighbors, we were able to extend the basic antenna (FD4) to its full length.

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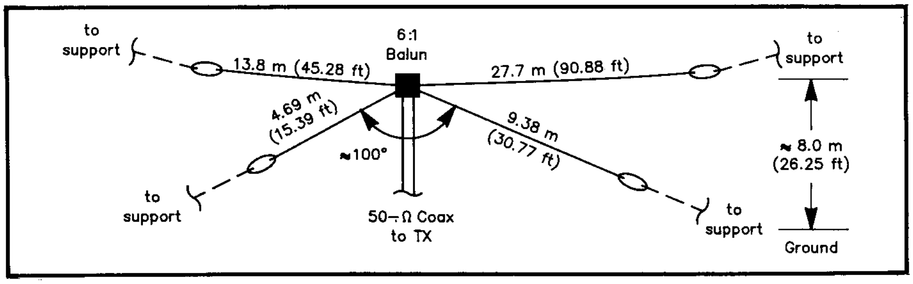

Fig A—Double Windom.

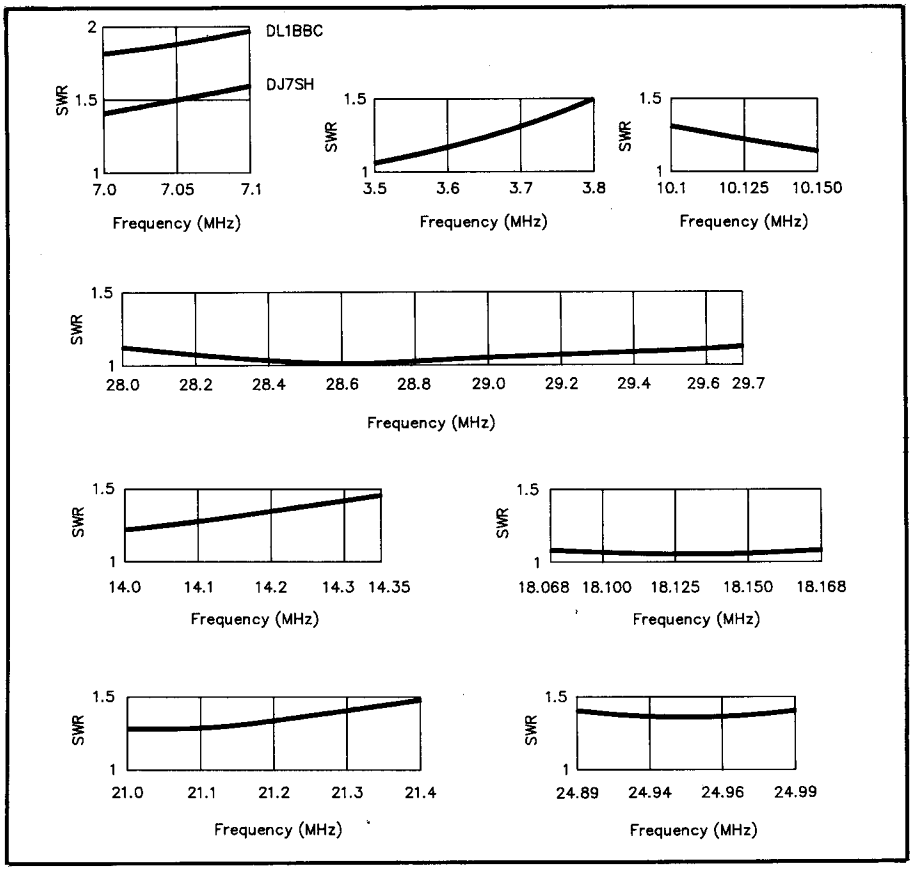

Fig B—SWR curves for the eight-band double Windom. [These curves do not cover all US amateur frequencies because allocations in the FRG differ from those in the US—*Ed.*]

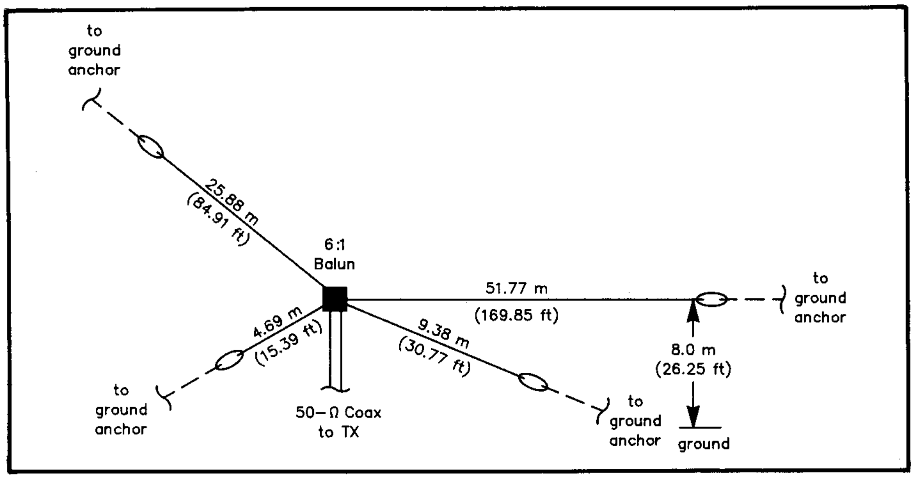

Fig C—A double Windom antenna for nine bands.

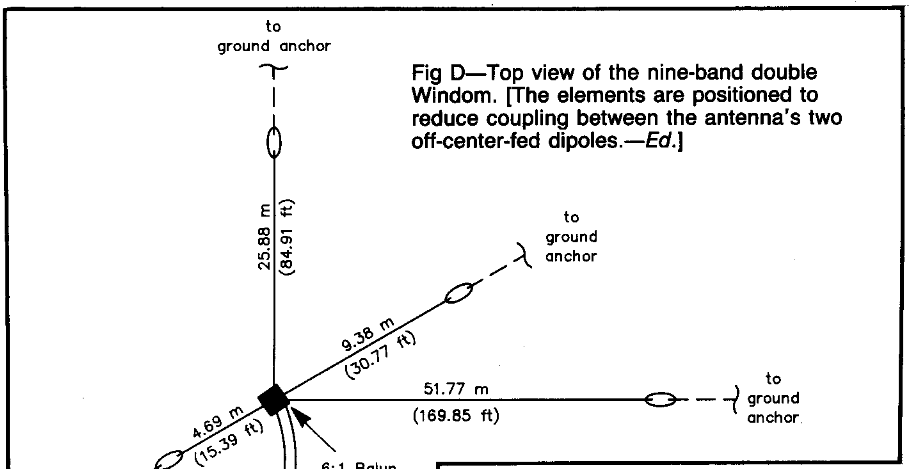

Fig D—Top view of the nine-band double Windom. [The elements are positioned to reduce coupling between the antenna's two off-center-fed dipoles.—*Ed.*]

At DL1BBC it was installed about 6.9 m (22.63 ft) above the ground, rising to about 8 m (26.25 ft) at each support point. At DJ7SH it hung about 5 m (16.4 ft) above the ground and partly ran over a garage roof. Both extension legs were stretched downwards as an inverted **V** with an angle of about 100°. Changing this angle allows the whole antenna to be easily tuned during final adjustments.

After construction, the first measurements showed that because of the length of the 30-m elements, the 80, 40 and 20-m bands each had a resonance point that was shifted towards the low end of the band. This effect was eliminated by lengthening slightly the 30-m section, so the resonance points fell more in the middle of the bands.

With this adjustment, the resonance point on 30 m shifted slightly towards the end of the band, but this can be tolerated.

With all measurements of the Windom, it was very clear that how the feed line ran played a decisive role.

According to our results, it must be stressed that the feed line must run first vertically downwards from the feed point to the ground and only then to the shack, as otherwise the entire antenna may be detuned. This is especially the case when the height of the antenna is under 10 m (32.8 ft). The 50-ohm-coax feed at DL1BBC was pulled through an old garden hose and then buried under the lawn.

The lower antenna height at DJ7SH had the result that, with the first construction attempt, the precalculated length of the 30-m elements was exactly right. The antenna delivered on all eight bands at the first go.

As can be seen from the SWR charts (Fig B), at DL1BBC the match on 40 m turned out somewhat less favorable. However, this was immediately fixed by changing the antenna height slightly. At DJ7SH, no resonance curve ran above 1.5:1, which was the goal since neither station uses an antenna tuner.

Performance

First contacts were made with both antennas. These showed that the antennas had a good degree of performance for a long wire. Especially the downwards sloping extension elements have a clear advantage over the horizontal basic antenna for DX.

With the first try on 30 m, many contacts were made with the US (East and West coasts), with signal reports between S6 and S7 while running 100 W.

At present, we cannot make a concrete statement about contacts within Europe.

This article makes no scientific claims, but intends to stimulate the long-wire enthusiast, and especially the friends of CW.

Part 2: Adding Another Band

Because the response was unexpectedly great to the publication of the above in *cq-DL*, we went to work again on an extension, as it was worthwhile to add 160 m.

With a half wavelength at 1.835 MHz, we calculated the basic length of the antenna to be 77.65 m (254.75 ft). We tapped the antenna at 25.88 m (84.9 ft) from one end and fed it with 50-ohm coax through a 6:1 balun. The basic antenna of this length was installed horizontally as a reclining **L** at DL1BBC. The additional elements, with lengths of 4.69 and 9.38 m (15.39 and 30.77 ft), were attached at the balun. This additional Windom for 10 and 21 MHz was again stretched downwards as an inverted **V** with an angle of about 100°. Here the additional Windom was mounted so that its elements were not extended in the same direction as those of the reclining **L**, which gave sufficient decoupling (Figs C and D).

For the feed, the Fritzel company made available for testing a new 6:1 balun, series 83, which can also handle high power. The SWR charts (Fig E) were obtained with the wire lengths given in the preceding paragraph. In case builders experience slight resonance shifts, these can be balanced out by lengthening or shortening the additional Windom.

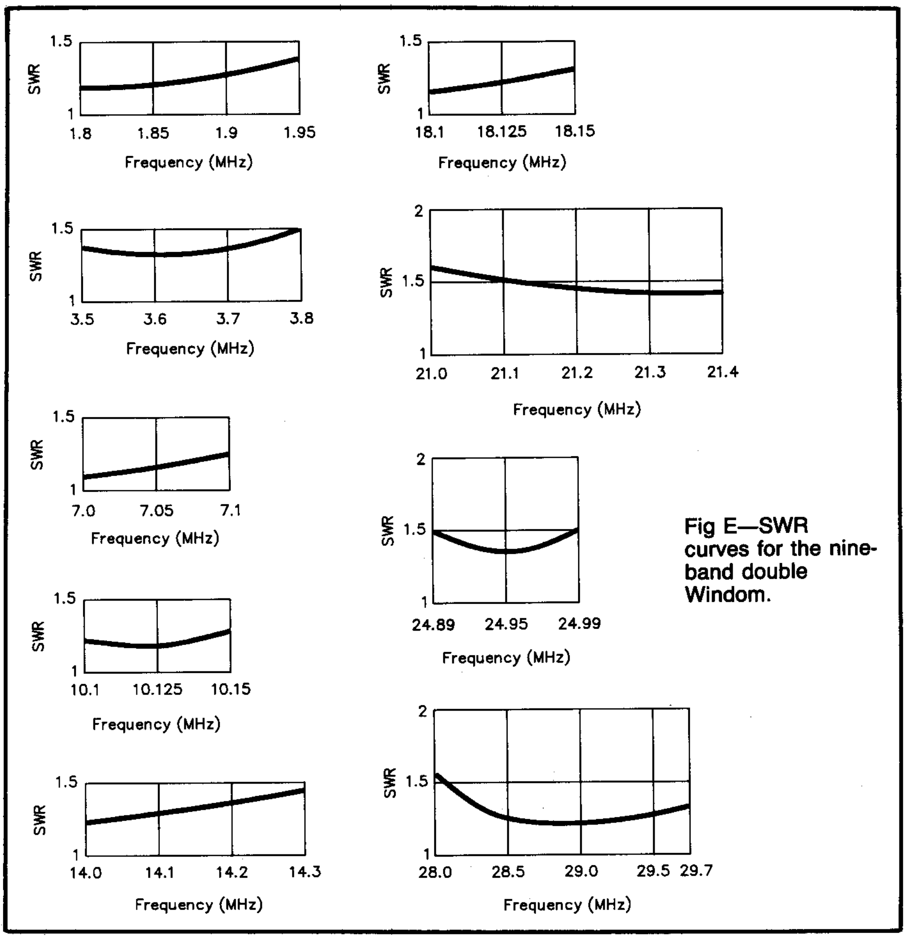

Fig E—SWR curves for the nine-band double Windom.

Performance

First contacts were made with the antenna installed at DL1BBC. Here it was once again shown that the antenna has a good degree of performance for a long wire, especially for 1.8 and 3.6 MHz within Europe. The additional Windom again had the degree of performance described in the first part of this article.

The authors welcome questions and exchange of information. (When writing, please include return postage.)