## How Does *VOACAP* Compare With These Measurements?

The *VOACAP* ionospheric analysis program has been around in one form or another for three solar cycles. How does its predictions compare to what the Dutch hams measured for mid-November 2001?

I configured the *VOAAREA* area-analysis version of *VOACAP* to be centered on the NERA site, outside of Amsterdam for this exercise. The smoothed sunspot number (SSN) used for November 2001 was 130. Bear in mind that these area plots are "snapshots" of propagation conditions, taken for a particular time slot in mid morning (0930 UTC). The elevation measurements taken by the Dutch hams were made between 0900 and 1200 UTC.

*40 Meters*

Figure A1A shows the takeoff angles predicted by *VOAAREA* for mid-morning (0930 UTC) on 40 meters. This assumes transmitting and receiving stations are using 20-foot-high 40-meter dipoles, a typical kind of NVIS antenna.

All of Holland can be covered using elevation angles between 70º and 89º (the white and gray bands), while a station in Brussels would utilize a takeoff angle close to 70º (almost into the yellow band). A station in Berlin or Copenhagen would require a takeoff angle at the high end of the range between 30º and 40º (orange band). A station in London would arrive at an angle close to 50º (pink band) on 40 meters.

If you compare these numbers with those measured in Figure 2 above, the comparison looks pretty good. Figure A1B shows the predicted signal strengths for a 100 W transmitter on 40 meters at 0930 UTC.

*80 Meters*

Figure A2A shows the elevation angles computed by *VOAAREA* for 80 meters in mid-morning (0930 UTC). Again, each station is assumed to be using 20-foot-high 80-meter dipoles and transmitting at 100 W. The whole of Holland can be covered with elevation angles ranging from about 75º to 89º. Berlin and Copenhagen would come in between 40º and 50º, while London would be closer to 55º, as would Paris on 80 meters.

Once again, the comparison with the measured elevation angles by the Dutch hams looks reasonable, although the single Danish station logged falls just below the expected range of elevation angles. The single Swedish station logged looks like it must be arriving by ground wave at the very low elevation angle measured. Ground wave is, however, very unlikely at the closest possible distance between the stations, about 600 km. (Maybe that Swede was portable from his hotel in Amsterdam?) Single data points, however, don't tell much for either the Danish or the Swedish station logged. What's important, of course, is predicted range of elevation angles for local (that is, Dutch) stations.

Figure A2B shows the predicted signal strengths on 80 meters at 0930 UTC for 100 W transmitters. Dutch signals are strong throughout a small country like Holland, even with a low antenna.

Overall, I'd say that the actual measurements validate what theory says they should be.—*R. Dean Straw, N6BV, Senior Assistant Technical Editor*

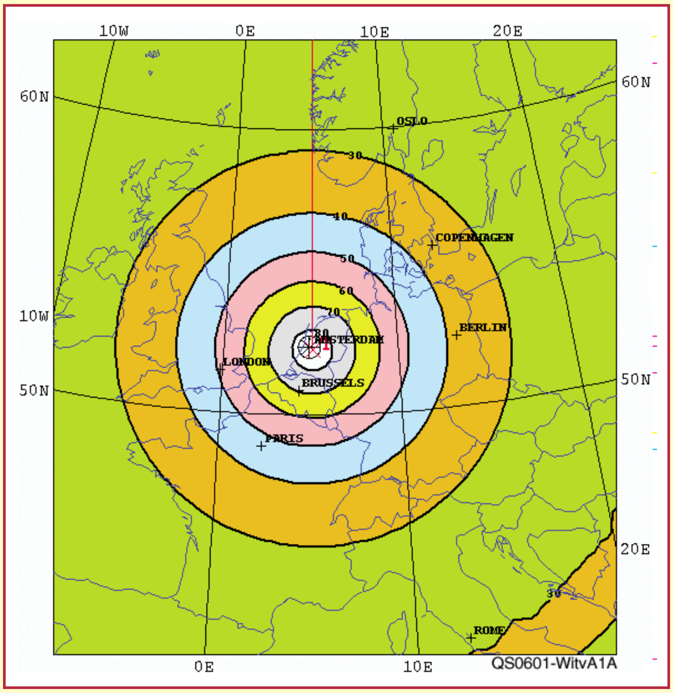


**Figure A1A—40-meter elevation angles versus geographic distance. This plot was generated by the *VOAAREA* program for mid-November, using SSN = 100, 100-W transmitter and 20-foot-high NVIS dipoles in the morning at 0930 UTC. The central location is Amsterdam, Holland. All of the small country of Holland is covered by angles ranging from 70° to 89°.**

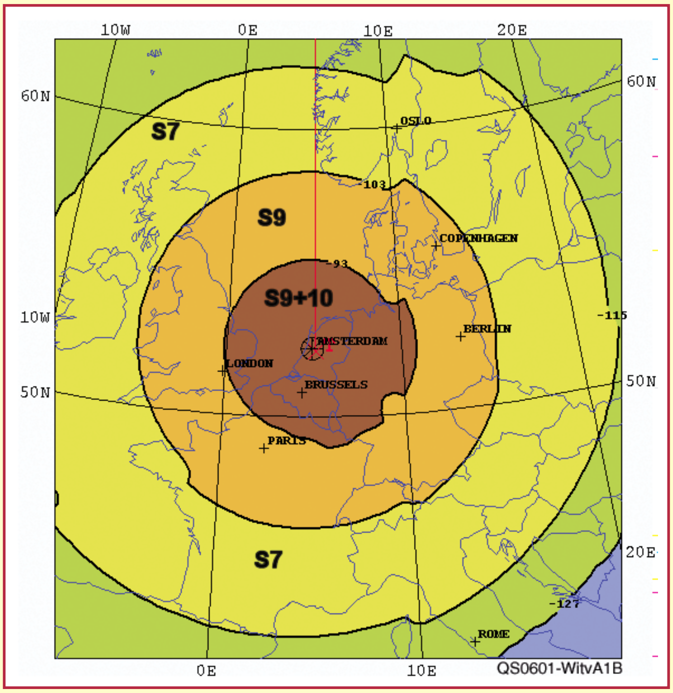


**Figure A1B—Predicted 40 meter signal strengths in S units and dBW across the same geography at 0930 UTC.**

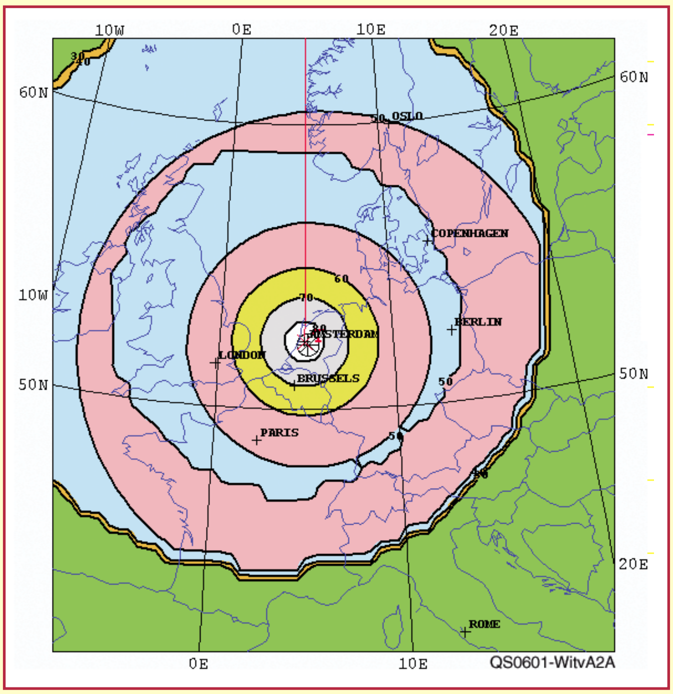


**Figure A2A—80-meter elevation angles versus geographic distance using same conditions as Figure A1A, also in the mid-morning at 0930 UTC. Again, all of Holland is covered by angles ranging from 70° to 89°.**

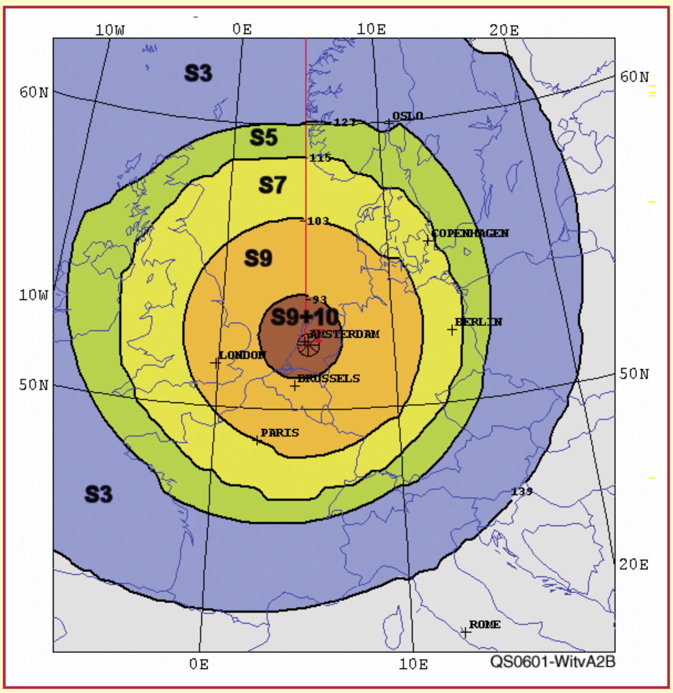


**Figure A2B—Predicted 80 meter signal strength in S units and dBW at 0930 UTC. Most of Europe can be covered with S9 signals using 100 W and a modest 20-foot-high dipole.**