The notion of radio amateurs bouncing signals off the Moon and receiving detectable echoes back here on Earth is a familiar one to many readers of this column. Ham moonbounce is a notable space communications accomplishment to be sure, but how about expanding it on an interplanetary scale? That’s what a team of German amateurs did on March 25, 2009, when they used the Bochum 20-meter dish to recover their 2.4-GHz transmissions bounced off the planet Venus. The 100-million-km round trip took some five minutes and required two minutes of integration before echoes could be discerned in their digital-signal-processing (DSP) display. DSP is the key here.

I first began contemplating the Earth-Venus-Earth path (EVE, or Venus-bounce) in the 1980s after a visit to the 2-meter EME superstation of WSUN in Texas. Noting the strength of my friend Dave Blashke’s lunar echoes, I ran some back-of-the-envelope calculations to determine whether his station could possibly hear its own echoes bounced off Venus. The disappointing result was that this EME “big gun” fell about 30 dB short of closing the loop. In other words, its kilowatt transmitter would have to be increased to a megawatt in order to achieve successful Venus-bounce.

However, transmitter power is not the only way to improve link margin. An improved antenna pays double dividends, because its gain benefits both transmission and reception. Thus, increasing antenna gain by a mere 15 dB would have made Dave’s station EVE-capable. Of course, that “mere” 15 dB translates to a mind-boggling 30-fold increase in the size of the already monstrous WSUN antenna. There had to be an easier way.

How about increasing receiver sensitivity by 30 dB? If we could reduce the receiver’s bandwidth by a factor of a thousand, we could reduce background noise (and hence increase signal-to-noise ratio) by the required 30 dB. If memory serves, Dave was using a 200-Hz correct IF filter in his receiver to produce the EME echoes I heard. If only we could decrease that bandwidth to 200 mHz, or .2 Hz, I reasoned, Venus-bounce would become possible.

The only way I could figure out how this might be accomplished was by employing DSP. However, at the time no digital-signal-processing hardware or software was available to provide the needed 30-dB boost. “But it will become available some day,” I assured Dave.

“Some day” is now here, as the Bochum group ably demonstrated last March.

Although a first for amateur radio, the German team’s EVE was not unprecedented. On November 19, 1962, three scientists from the Russian Institute of Radio Engineering and Electronics (IRE RAS)—Drs. Vladimir F. Morozov, Oleg N. Rzhiga, and Vladimir M. Dubrovint—succeeded in bouncing the word “Mir” (Russian for “peace” and also for “world”) in slow-speed Morse code off the surface of Venus and received their own echoes.

Their station was hardly a typical ham rig. They used the 50-kW transmitter of the Evpatoria Planetary Radar in Crimea.

Figure 1. On November 19, 1962, three scientists from the Russian Institute of Radio Engineering and Electronics succeeded in bouncing the word “Mir” in slow-speed Morse code off the surface of Venus and received their own echoes. They used the 50-kW transmitter of the Evpatoria Planetary Radar in Crimea, Ukraine, into an array of eight 16-meter parabolic dishes.
Ukraine, into an array of eight 16-meter parabolic dishes (see figure 1). They accomplished this feat at a frequency of 769 MHz (wavelength of 39 cm), integrating 10-second "dits" and 30-second "dahs," and recovering their echoes on a strip-chart recorder, as seen in a newspaper account of the time (figure 2). All of this was without today’s advanced DSP technology!

What does all of this have to do with SETI, the reputed subject of this column? Simply this: Every interplanetary transmission is also an interstellar one. In 2002, Segey E. Gurianov calculated the November 1962 position of Venus and determined that this first EVE signal was sent in the direction of the star HD131336, in the constellation Libra, some 2160 light years distant. This means that if any SETI scientists are listening, they might just send a reply our way. Thus, be sure to listen for it—in the year 6284 AD!

73, Paul, N6TX

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Figure 2. The feat described in figure 1 and the text was accomplished at a frequency of 769 MHz (wavelength of 39 cm), integrating 10-second "dits" and 30-second "dahs," and recovering the echoes of the three scientists on a strip-chart recorder as seen in this newspaper account of the time.