

# DR. SETI'S STARSHIP

Searching For The Ultimate DX

"Then I'd Have To Kill You."

"We're getting a carrier, all right," confirmed Trevor, who was barely able to conceal his excitement.

Ken's fingers flew over the keyboard, his eyes never leaving the monitor. "Frequency?" he asked.

"Fourteen seventy-one point five," answered Trevor, tweaking the tuning dial on the ICOM 7000 receiver. "It's steady at S2. I've marked the local sidereal time. Shall I ring up the BBC?"

"Are you daft, man? Let's not forget the verification protocols! Check for modulation, and be quick about it."

"It's CW. . . . No, there are sidebands. Looks kind of like modem tones. Low baud."

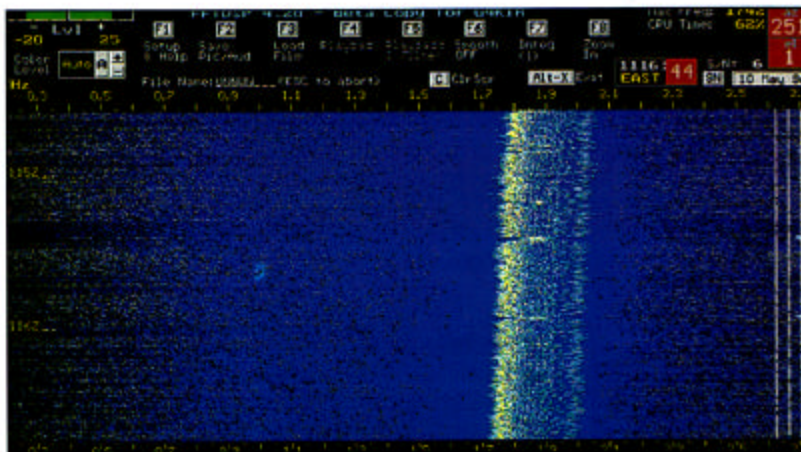
The two English radio amateurs were manning their radio telescope, much as they had during every spare waking hour for the past three weeks, in search of an intelligent signal from the stars. As UK Co-Coordinator for *Project Argus*, the all-sky survey launched by The SETI League on Earth Day, April 21, 1996, their job was to assist other British hams in building sensitive microwave listening posts. Their 3.5-meter diameter dish and associated electronics were put together as a demonstration station, and now they were demonstrating the patience and deliberation for which their 100 combined years had uniquely prepared them. They were systematically analyzing an anomaly.

"Doppler's kind of high. Tens of Hertz per minute. I'm betting it's a LEO."

Ken's colleague knew that Low Earth Orbit satellites were the bane of SETI, the scientific Search for Extra-Terrestrial Intelligence. Fortunately, their Doppler shift, a change in radio frequency caused by their motion relative to the Earth, made such manmade sources readily distinguishable from signals of interstellar origin. Still, there was something odd about this particular signal.

The *Argus* concept had been born in the States a year and a half earlier, in response

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*Anomalous signal detected by SETI League members Ken Chattenton, G4KIR, and Trevor Unsworth, G0ECP, on May 10, 1996, at 1471.5 MHz, using a surplus 3.5-meter dish. The signal exhibited clearly audible digital modulation, with a 270-Hz bandwidth. Its Doppler shift of -25 Hz/min. marks it as RFI from a Low Earth Orbit (LEO) satellite. Though clearly not of extra-terrestrial origin, this signal gave Project Argus its first real workout, testing both the sensitivity of our receiving stations and our ability to recognize terrestrial and satellite interference. (G0ECP image)*

to Congress canceling all of NASA's SETI funding. For just a couple of years NASA had conducted a modestly funded SETI effort from headquarters at the Ames Research Center in Mountain View, California. Consuming just one tenth of one percent of NASA's science budget, or about five cents per American per year, NASA SETI promised to be one of the best scientific bargains of all time. Then the budget-balancers axed it, reducing the US national debt in the process—by point zero zero zero six percent.

A group of American microwave experimenters was not about to let the search die for lack of intelligence in Washington. Ken Chattenton, G4KIR, and Trevor Unsworth, G0ECP, had heard about their amateur effort at the World Science Fiction Convention in Glasgow the previous summer, and they were the first Europeans to sign on. Now their many months of effort and training were being put to the test.

"Save to disk," commanded Trevor unnecessarily, for Ken was already doing so. "Let's get a GIF, and also maybe a WAV file. We're going to have to Internet this one."

The signal amplitude rose smoothly, then fell. "Wow!" exclaimed Ken.

"Let's not be hasty," cautioned Trevor. "I think it's time to Ask Dr. SETI."

It was a moment of great excitement, for this "Wow!" event exhibited many of the characteristics we would expect of an intelligently generated microwave signal from space. Still, restraint was the order of the day. The two SETI hams sent their signal file to Dr. SETI (that's me).

The signal looked for all the world to have originated from space, but its Doppler shift (that artifact of relative motion which makes railroad whistles and radio signals alike change in frequency over time) was suggestive of *near* space. This appeared to be a Low Earth Orbit satellite that Ken and Trevor had snared. Still, it was a worthy detection, for three reasons:

1. This was an extremely weak signal, which spoke well for the sensitivity of our participants' homebuilt receiving equipment—thus validating the hardware.

2. The Doppler shift was instantly evident in the computer printout, which gave

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**GS-36B:** At 2.6 inches tall, this tube (photo 34) is similar to (and sold by Svetlana as) the 4CX400A. It is specified to have full ratings through 500 MHz, with a design life over 1000 hours. I only have a Svetlana tech bulletin which presents information about it. With proper attention to power-supply voltages and socket pinouts, it would appear to be an excellent candidate to replace 8122 tetrodes in existing PAs.

**GU-43B:** With 1000 watts of anode dissipation rating to 100 MHz and a design life over 1000 hours, this tetrode (photo 35) is an excellent candidate for a full legal-limit PA for HF through 6 meters. It is a large tube, at 5 inches tall

and weighing 3.3 pounds. An article in a Russian-language radio publication shows an HF PA application, the only GU-43B information found by this author (to date).

**GU-74B:** Generally considered equivalent to, and sold by Svetlana as, the 4CX800, the original Russian military tube manual rates the GU-74B (photo 36) at 600 watts of anode dissipation through 250 MHz. Hams who use it say it performs more like a 900- to 1000-watt anode dissipation tetrode. It plugs into a bare (no grid rings, etc.) 4CX250B socket.

It is capable of full legal limit on 2 meters, and it seems to be standard practice to run the screen at 320 to 340 volts



Photo 36. The GU-74B tube.



Photo 37. The GU-78B tube.

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us confidence in the capabilities of our signal-analysis techniques—thus validating the software.

3. Most important, our amateur SETIers did not ring up *The Times* of London, the BBC, or (heaven forbid!) *The Sun* (that bastion of journalistic excellence), and proclaim, "ET is calling me." Rather, they opted to abide by The SETI League's Signal Verification Protocols and *Ask Dr. SETI*. As a result, we had our first solid evidence that non-professionals were indeed capable of shunning sensationalism and conduct-

ing credible science. This validated the wetware—the substance between the ears of our erstwhile amateurs.

I showed an image of the candidate signal to a room full of radio astronomers at the National Radio Astronomy Observatory in Green Bank, West Virginia, home of the world's first SETI search in 1960. One professional observer exclaimed, "You landed that one on 1470.5 MHz, didn't you?"

"How did you know that?" I asked, stunned.

"Oh, we've seen this baby before. She's a classified US Navy satellite."

"Can you tell me more about it?"

"Well, yes, I could," my colleague grinned, "but then I'd have to kill you."

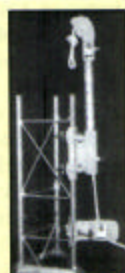
in spite of specifications of 300 volts as maximum, and 2500 volts on the anode, with maximum specified as 2000 volts.

The grid-driven, single GU-74B VHF PAs present neutralization challenges. The passive, resistively swamped input circuits seem to be preferred to solve the PA oscillation problem. Another solution would seem to be using two tubes, as no reports of instability have been noted in such PAs, e.g. the rock-crusher built and sold by Marko Cekow, LZ2US, and described at <http://www.nd2x.net/lz2us-3.html>. The GU-74B is available for as little as \$50 plus shipping, but the most common price seems to be \$70 delivered. Russian sockets can also be found for \$20 to \$45 each.

**GU-78B:** Although information is beginning to trickle in with respect to the GU-78B (photo 37), I have no significant war stories or rumors to relay regarding this tube. Joe Bell, G4PMY, owns a Russian ZIL communications truck with a GU-78B transmitter. His two picture-filled articles about this truck make fasci-

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