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Hellschreiber via satellit

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HELLSCHREIBER - AN OLD MODE REVISITED

Last year in OSCAR News (137, June 1999) I described a new experimental data mode called PSK-31. At about the same time there was some discussion on amsat-bb about another mode called Hellschreiber. Recently I have looked at this method and have been very impressed with its ease of use and performance. Much of the pioneering work using this mode on satellites has been done by Tony AB2CJ, and I have included some of his postings to amsat-bb and examples of the results he has obtained.

Firstly, what is Hellschreiber? It is a direct printing telegraph system, invented by Dr. Rudolf Hell in the early 1930's. It was manufactured by the Siemens-Halske Company, and later marketed world wide under the name Siemens-Hell. Coincidentally the German word hellschreiber translates to 'bright writer'.

Briefly, the system works by transmitting text as a graphical image. Each character is represented by black dots on a 14 by 7 or 7 by 7 matrix. The outer rows and columns of the matrix are left blank for character separation. Each column of the matrix is then transmitted in turn, dot by dot, in a similar way to morse code. A carrier or tone represents a black dot, silence a white dot. The speed of transmission is 122.5 Baud.

When the text is received each dot is printed twice, separated vertically by the height of the matrix. By printing the text twice the system avoids the need to synchronise the vertical scan of the receiver and transmitter, since one of the lines of text will always be complete. If the speeds of the transmitter and receiver are slightly different the printed text will be sloping, but still readable.

The original Hellschreiber equipment was of course electro mechanical and was in competition with the popular teleprinters of the day. Although considerably slower than the teleprinter, the Hellschreiber was virtually immune to the effects of interference, which just caused a fuzzy background, but never a wrong character.

Recently Amateurs have adapted the Hellschreiber method to modern techniques. Nino Porcino IZ8BLY has written a program for Windows, which uses a sound card for interfacing to the radio. It runs on Windows 95/8 or NT, but not Windows 3.x It may be downloaded from Nino's web page -

http://www.freeweb.org/varie/ninopo/iz8bly/Hell/index.htm

I have tried the program and found it very easy to use. It has excellent documentation and hardly any setting up is required. Initially I recorded the program's output on a cassette recorder, and played it back through the program. This worked first time. Then I tried it on some terrestrial signals which can be found around 14.063 MHz. Again, instant success. Several stations were heard, and their transmissions decoded. It was interesting to observe that when the signals faded, the copy just became less dense. On one occasion I was even able to see text from two stations at the same time!

Tony AB2CJ summed up the advantages of Hellschreiber in his comments to amsat-bb some time ago. He wrote -

"By now many of us are familiar with PSK31 and its outstanding weak signal capability. It's really amazing what this mode can do when working HF DX, especially when narrow filtering is applied. However, it's nearly impossible to utilize this mode with satellites because of doppler shift and the precise tuning requirement needed for this mode.

Hellschreiber is a CW like mode in that it's part digital and part analog, similar to facsimile. The characters are in dot matrix form and appear to paint themselves across the screen as the Hell signal is received. The duty cycle of this mode is 21% so it doesn't tax the satellite like SSTV , RTTY or even CW!

It seems to me that this is one of the best keyboard modes for satellite work in terms of low duty cycle, and the ability to cope with doppler shift. For those who enjoy keyboard ops and satellite work, it's worth looking into. At the very least, the ease of operation and readily available software may generate a bit more activity on the birds.

The Hellschreiber mode has nearly the same weak signal capability and is much less sensitive to doppler tuning. I was surprised at how well this mode works with the large amount of doppler shift that FO-29's 70cm downlink offers. Although automated doppler tuning would make things easier, it's not difficult to retune for doppler by hand... one only needs to keep an eye on the waterfall display built into most Hellschreiber software.

Last night, I experimented with Hellschreiber on OSCAR 10. I used the IZ8BLY soundcard program and recorded my downlink with an analog tape recorder. I then played the recorded Hellschreiber signal back to the

soundcard with the software running. The print was clear and easy to read despite the QRN from the 2 meter downlink. The satellite was at 21,000km and the uplink power was 30 watts. Similar experiments on RS-13, FO 20 and 29 also yielded 100% print."

Tony has sent me some examples of text captured during these experiments with satellites. Figures 1 and 2 show his own signals via FO-20. For this experiment he was able to open two copies of the program, so that one could be used for transmitting, and the other for receiving. A third window was also opened for his NOVA tracking program. Figure 3 shows text copied from Mark KB3CWS during a contact via FO-20, taken near LOS. Further details of Tony's satellite experiments can be found on his web page -

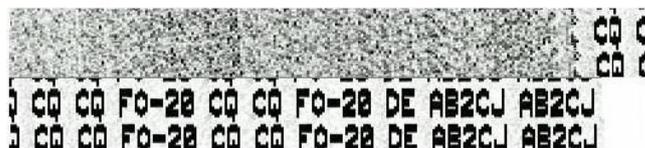http://users.nais.com/~ab2cj/sathell.htm
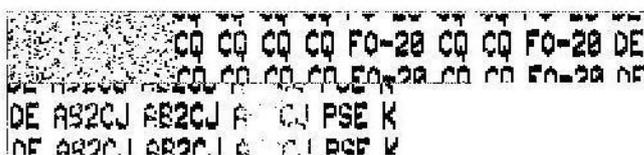

Figure 1.   Text via FO-20

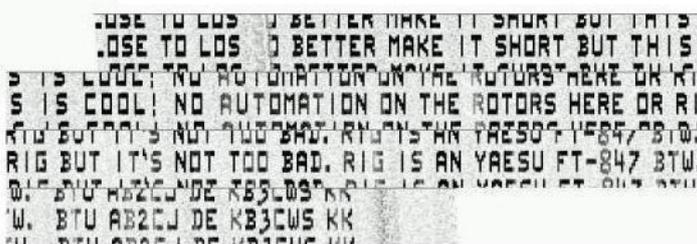Figure 2.   Text via FO-20 Showing the Effects of Fading

Figure 3. Text Received from KB3CWS

There are several different versions of Hellschreiber designed for different types of modulation eg. PSK and FM. The simplest is called Feld Hell which is used with CW. Further information about the method can be found on ZL1BPU's Hellschreiber page -

http://www.qsl.net/zl1bpu/

The original mechanical method is described in Rad Comm, April 1981 by S.A.G. Cook G5XB

Thanks Tony for all the information and screen shots. For anyone without internet access I can supply a copy of Nino's program, and some further documentation on receipt of a floppy disk and return postage.

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