DATV – Down Under

By Richard L. Carden VK4XRL

December the 3rd saw the first DATV transmissions from VK4XRL, the first in Brisbane and properly the first in Australia. Was it worth it and what were the results, then please read on.

Over the past couple of issues of CQTV we have seen many articles on DATV, some using DVB-T (mostly ex-commercial equipment) while others have used DVB-S. DVB-T uses the CODFM modulation system and from a amateur point of view the costs associated with such an undertaking would be prohibited at this stage. The road taken after many hours of discussions was that of DVB-S, our evaluation was at the time based on costs associated with CODFM and the uncertain future of the 70cm band at least here in Australia. Our belief was that unless you were going to use 70cm then the slight shortcomings of DVB-S could be tolerated on the higher bands where most of the time it was at line of sight. Also DVB-S units were available now, so tests could be carried out to ascertain if this was the way to go.

What system

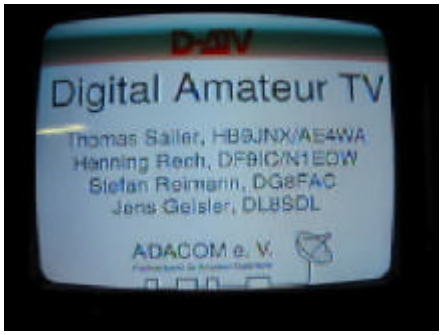
Three systems using DVB-S have been developed one by the Dutch and two in Germany. The first system to be developed was that from the Bergische University by Prof. Dr-Ing. Uwe E. Kraus DJ8DW and his team. This system produced an output in the 70cm band. The second system available was that from SR-Systems. The output from this system allowed dual operation in the 23cm and 13cm Band. Also separate 23cm and 13cm units were available. The Dutch system was not available at the time we made a decision, however there web site is worth a look at as it has lots of valuable information on the DVB-S system. From the above we decided to go for the system from SR-Systems. With thanks to Stefan we managed to arrange for a set of boards to be purchased, which arrived in early December 2002.

DVB-S System

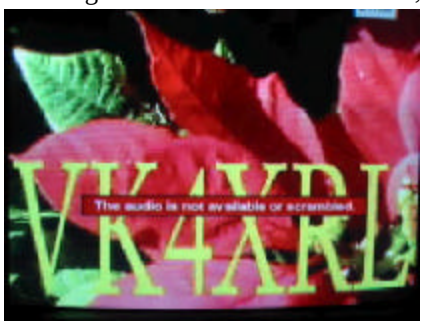
What did we receive for our outlay. Thanks to SR-Systems we were able to trace the package right throughout its travel. The box duly arrived and two

boards were unwrapped, the third board the modulator was already mounted on the Baseband Board. No other information was included with the boards. The system as received was configured for 1291mhz, FEC ¾ and

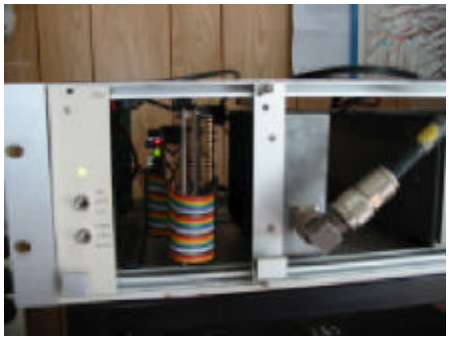
Symbol rate of 6000. The first test was just in the shack to make sure things worked and also the frequency was not one of our ATV allotted frequencies. The unit was duly connected to the spectrum analyser with power and video connected. The satellite receiver used for the initial tests was a Hyundai HSS-100C and the required perimeters were entered as required. At switch on the satellite receiver came to light and there was a received digital picture.



The unit came also with a pre-loaded test picture and this was also received. I next contacted Stefan in which via return e-mail a new file was made available with the required changes. Also a surf of the net at this stage brought to light some extra information on the units supplied by SR-Systems. Arthur Lambriex had a very nice lot of information on setting up the software, also Rob Krijsman had an article regarding his first experiments. Both these articles were in English and I am indebted to these gentlemen as well as Stefan for the help I received. Upon loading the software I found I had a corrupt cygwin1.dll file, Stefan then resent this file and all was OK. Next problem was to replace the testpic with one of my own. The program TMPGE was downloaded from the Web and following the information from Arthur,



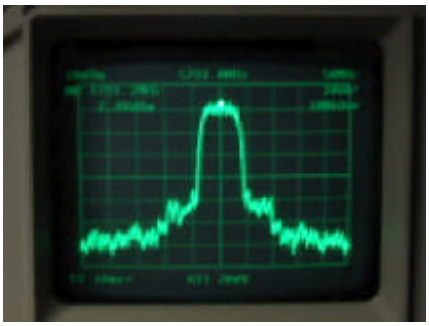
a new testpic was up-loaded successfully. Before any tests could begin a rack system was built to house the system in to save any wrongly placed items causing a major problem.



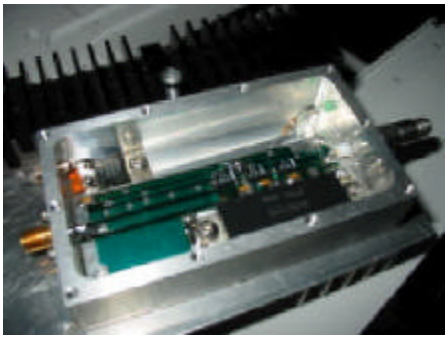
Test Results

Tests from the modulator output produced an output of +6dbm with shoulders sitting at –40dbc at 1250mhz. Bandwidth was at 8mhz, which is right for the parameters used. Next a M67715 power module was used for some extra output. A pad of around 8db to 9db was used at the input to keep the shoulders at least around –30dbc. This produced an output of around 24dbm. A second unit was built and the level was around 26dbm. Information on the

net indicated that varying results would be obtained using these devices. From this humble beginning we transmitted to VK4KI about 2 to 3 km away. Perfect pictures being received using a Nokia 5400 series satellite receiver. We were also able to test the Teletext system using this receiver. As yet we haven't tackled updating the teletext software, as the Nokia is the only receive that has teletext. The Humax also gave great results however both receivers switched the testpic on and off. According to the handbook for the Humax, teletext should have worked via the teletext decoder in the television receiver but we couldn't seem to make that work.

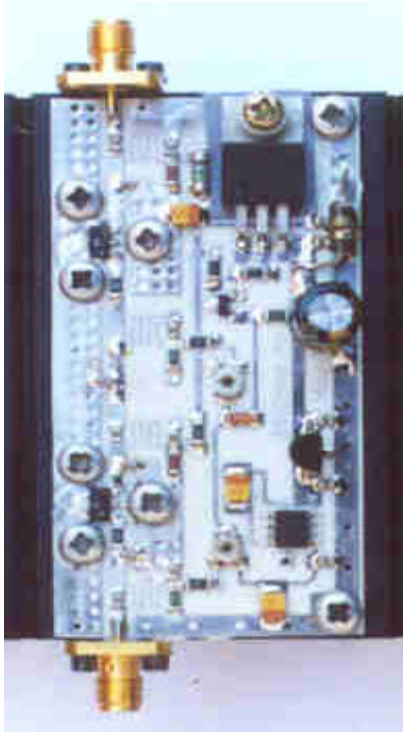


Further tests were then conducted from our repeater site at Ocean View about 54km north of my QTH here in Brisbane. This produced astounding pictures especially as we were only using +26dbm from the transmitter. The transmit antenna used was a 36 element yagi while the repeater receive antenna was a quad loop. Pictures were exchanged in both directions with the repeater also retransmitting on 426.25mhz AM. It maybe possible in

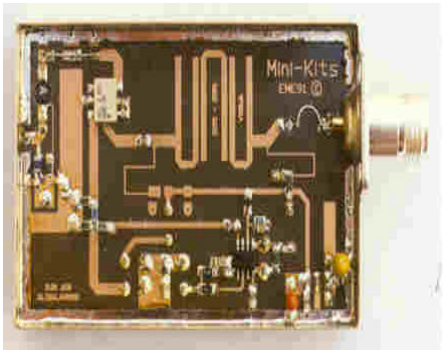


the future to combine two M67715 power modules to provide some extra output while still maintaining the shoulders at around –28dbc. It was decided not to use the M67762 power module due to poor intermod performance as is. Although I have seen some mention on the Web using this device with modifications to the bias circuit for an output power of around 3w. No modification details were available.

We also took the time to test a couple of class A amplifiers intended for UHF AM transmitters. These were TEKO units and the first unit consisted of a BFQ68 and a BFQ34 this had a gain of around 23db in normal operation. Checking on the data sheets revealed useable gain of 8.5db and 8.8dd respectively, an overall gain of 17db. Test results however showed only a gain of +11db with an output of +17dbm for +6dbm input. The second unit was fitted with a BFW34 and a useable gain at 1200Mhz of +7db according to the data sheets. With +6dbm input an output of only +9dbm was produced a gain of only +3db. Total output from both units combined was +20dbm for +6dbm input a total gain of only 14db. Further tests maybe required to determine if better results can be obtained. One pleasing result was that the shoulders were at –38dbc that being due of course to the use of Class A type transistors which run on a +28v supply. As a matter of interest the Marconi power-measuring unit showed an output power level of around +29dbm where as all other measurements were done on the Spectrum Analyser.



Further tests in the next few weeks will be carried out on 13cm using a 2w-power amplifier and down-converter from Minikits here in Australia.



Audio

The requirements in regards to what audio levels to use was non existent. The specification sheet for the PM1800 indicates (incorrectly stated as Analog Output) that FS (Vin=0DB) or 2.828Vp/p. From my understanding FS = Full Scale and refers to the maximum level ie. analog clip level. It is also known as FSD, Full Scale Digital. From what information that I have, the system should be operating at around –18db which is the EBU standard. There seems to be quite some confusion in this area. I am now in the process of making an audio interface board with +/- 3db level control with LED readouts etc. for each transport system in use. Maybe someone could design a LCD screen with readouts using a PIC.

Sending 0vu from my audio desk was causing distortion, which was around 1.2v P/P. We set up a test using the local satellite Optus B3 which has a test channel with reference audio tones. This level was monitored on the CRO and noted. Then our transmission was monitored and the audio level adjusted for the same reading using the same receiver. The required input level was found to be .5v P/P that is around –10dbV. This confers with levels noted by Rob Krijsman. However now reflecting on this method it may not be correct, as B3 is an analog Satellite.

Conclusions.

Overall the tests have been very impressive with most people agreeing they were the best ATV pictures ever seen commenting on the quality and lack of noise. The power amplifiers will be the biggest challenge especially going up to the higher frequencies.

One minor point was the use of testcards or colour bars for testing. Since we are using digital transmission

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either the picture is there or not there, therefore the receiver can lock on as a still picture. I built a test generator using a PIC with scrolling ident and uses the program called Monoset (V1.2) to change the scrolling text and callsign. Also by use of the push buttons the callsign and clock can be alternatively switched. The encoder uses the Motorola MC1377 because I had one, however future designs would use the AD722 as this has inbuilt filters. Also it would have been nice if the line and sub-carrier relationship could have been locked. I found this more annoying then viewing it in analog. Likewise the Cropedy or the newer version from G3RFL can be made to switch several cards in an animation sequence.

One of the problems now encountered is the use of the computer to download required changes. Maybe a small microprocessor for control of minor functions with readout would be nice. While abdicating the use of the computer around the shack for ATV activities we now have to control DATV transmitters, Character Generators, OSD units, switchers etc. how can we now control all these devices from the one computer?

I would like to take this opportunity to thank Stefan Reimann from SR-Systems, Arthur Lambriex EA5FIN and Rob Krijsman PE1CHY for there valued help and understanding during this period.

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