P5

The newsletter of the
Severnside Television Group

April 2002

From the Chairperson:

This years A.G.M will take place on **Tuesday 23rd April** at Elm Park Pavilion, Filton, Bristol at 8pm, lasting no more than one hour. The committee hope as many of you as possible will attend. Please give some thought to helping us on the committee as some of the present members wish to have a break.
The committee meets four or five times a year, meetings generally last about two hours. Brian Ken Ian & Ivor cannot go on keeping the repeaters running if they get waylaid into admin matters. If any of you have a PC & can spare for few hours a month, I would be very grateful for offers of help to ensure the group continues to function.

Volunteers are required to help Jackie & Dave to man our stand at the B.A.T.C. rally & Longleat, please don't leave it all to them. I am sure we can find members who are willing to give up one hour on the day of the rally to assist, please remember without the profits from the sale of the group aerials, improvements to the repeaters will come to a halt.

As for the repeaters, GB3ZZ has worked without faults for the last year but we still have problems with the weather satellite receiver caused by the close proximity of a radio paging system, hopefully this will be resolved soon. The gales in early February this year took their toll on GB3XG when a video fault developed on the transmitter. It was decided to remove the complete assembly & carry out a long overdue overhaul of the system, replacing it with our low power standby unit. When the work is complete hopefully the receiver and transmitter, which Ian G6TVJ has built, will be of a much better quality.

During 2001 we put together a 2.3GHZ television beacon, which we plan to try out from a good location in South Wales, if there is enough interest shown in this band further developments may well follow.

As for myself I continue to build all the aerials and post them to our customers. I also print and distribute P5 and deal with the day-to-day running of the group affairs.
We are considering reducing the number of times we produce P5, this is due to lack of material from the members and the large costs involved.
Hopefully now the foot & mouth restrictions are over we can get out on the hills again and weather permitting, operate our portable station from the Mendips, Exmoor and Dartmoor.

Regards to you all. I look forward to seeing you at the A.G.M.or at Longleat

Vic, G1IXE

Dates for 2002

S.T.G. A.G.M. Tuesday 23rd April.
Summer fun contest Sat & Sun 8th / 9th June.
B.A.T.C. rally (Shuttleworth) Sun 16th June.
Longleat rally Wiltshire Sunday 30th June.
International contest Sat & Sun 7th / 8th September

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Compliments are few and far between these days so this letter, received from Roger Worth, one of the Clubs founding members was a pleasure to read. With his permission it is reproduced here:

Dear Sir,

First of all I would like to thank you and The team for making P5 a news letter that I still look forward to receiving.

As one of the founder members of the then Bristol FM TV Group (It was only when our test pictures were being received in South Wales that we renamed the group to the Severnside TV Group).

Some of the highlights of those early days were in receiving P5 pictures in Risca using home built equipment, I think built by Shaun G8VPG and using one of the early group antennas developed by myself, whilst working on an Antenna Test range at a well known company in North Bristol (In my lunch hour of course). It is always gratifying to see the antenna sales helping the group profits. I still have the original "Gain/Pattern" plots used for coming up with the optimum spacing for the elements of that antenna, if anybody is interested.

The early "pioneers" of the Bristol TV Repeater, decided on FM because of early experiments between Shaun G8VPG and myself (at the time G8ZQF). Shaun was located in Saltford and myself in Filton. All of our experiments were monitored and "commented" on by the late Len Eastman G8UUE. Initially he was the only other person that could resolve our FM transmissions. At first Shaun and I had to swap equipment at the North Bristol Amateur Radio club on a Friday night so that we could continue with our experiments. i.e. one week Shaun would transmit and the following week he would receive. At that time there was a very active AM net usually on a Sunday evening of which Chris G8GLQ and Ken G4BVK were active members and the experiments on FM were usually the source material for a good debate!. In fact it was not until Shaun and myself mastered the "Pre-emphasis and the De-emphasis techniques" that we actually managed P5 both ways between Saltford and Filton. With that FM was here to stay in the Bristol area.

Part of the "price" for getting the site for GB3ZZZ on the Filton Parish Council buildings at Elm Park, was that I had to agree to video the Twinning Association fete and the Cherry Queen from Filton's Twin Town ,Witzenhausen in Germany. The North Bristol ARC were roped in to set up a two way radio link with the twin town.
Once this "price" was paid Filton Parish Council agreed to the establishment of the repeater, once again I "developed" the original Alford slot aerials and these were installed one very wet and windy day by a group of volunteers led by Ivor

Green G1IXF, Viv, Ivor's wife, G1IXF went on to become "Chairperson" of STG and I see is now once again admirably filling that role.

All of this was in the 80's and it is really pleasing to see how the STG has progressed over the past decade or more. It is truly one of the leading amateur Television Repeaters Groups in Europe and all credit is due to those that helped Shaun and myself get things started all those years ago plus the dedicated team of people that have over those years have not only been capable but willing to give their time and effort so that others may enjoy what is a great hobby, by not only extending the facilities on the existing GB3ZZ but by introducing the new repeater on Dundry.

Best Regards

Roger Worth. ***Thanks Roger!***

Changes in the Committee.

Most of you know by now that Pat and I are planning to move out of the area in a few months time. Although we plan to remain members of STG and to serve on the Committee if elected, living over 100 miles away will prevent us performing our present duties.

At the moment we both fill two Committee posts, Pat is the clubs secretary and acting treasurer and I am membership secretary and, in theory at least, chief engineer. Obviously, the secretary needs to be available at committee meetings so Pat can't keep that job up. As for myself, I will not be able to monitor or reach either repeater within a reasonable time so I will have to relinquish that position too. We can still be available for membership secretary and treasurer positions if nominated and accepted for those posts.

In case we are not re-elected, I have made the task of keeping accounts and membership rolls up to date as simple as possible. Both are now computerised and very simple to maintain, right down to pressing a key to print out all the P5 address labels. Anybody taking these positions should be able to run the systems without any difficulty. We can both be contacted quite easily if needed for advice.

This is the last P5 I will be producing. Quite apart from the time I need to complete the new repeater unit, I need time to finish renovating the new home and of course to prepare for the actual upheaval. I will be available to help the new editor should the need arise. It isn't strictly necessary for the editor to hold a committee position although in the past this has always been the case.

Brian. GW6BWX.

Included in this P5 is a summary of the Club accounts for the last financial year. The audited accounts which contain more detail will be circulated at the AGM on Tuesday 23rd April 2002.

G6TVJ 2.5 GHz TV Exciter/ 10 GHz Transmitter
by Ian F Bennett G6TVJ

Here is a design for a high performance TV exciter operating at 2.51625 GHz. The design was originally intended as a 2.4 GHz/13cm unit but with the addition of a X4 multiplier a stable 10.065 GHz transmitter can be realised. This design operates with a synthesiser which ensures that the final frequency stability and accuracy is better than that of gunn oscillators and also simple DRO devices. The exciter adopts a series of frequency deviders in a synthisiser chain, this allows the use of a moderate range frequency counter for precise setting up even though the final output frequency is beyond normal counters. The modulation linearity and frequency response is also superior to that of gunn devices.

This design also incorporates a synthesised 6 MHz sound subcarrier generator. Over the past few years the author has experienced difficulties in obtaining components for building subcarrier VCOs. Instead of the normal varactor tuned colpitts type oscillator, this design uses a 4046 PLL chip VCO.

The exciter consists of two basic systems, a video modulator with synthesiser and an audio modulator with synthesiser.

Video Modulator- Circuit Description

The video signal enters the exciter and is first pre-emphasised to CCIR 405 specification. Video pre-emphasis is standard practise in FM systems and helps to reduce the effects of group delay variations over the passband. An added benefit of pre-emphasis is that it improves the video signal to noise ratio by 2 dB.

The video signal is combined with an audio subcarrier and buffered by a video op-amp. The combined baseband signal is again resistively combined with a DC voltage. The DC voltage is provided by a synthisiser loop filter. The signal is applied to a 2.5 GHz VCO mounted inside a special microwave frequency module. The combined action of the DC voltage and the presence of the video baseband signal on the VCO results in an FM modulated signal being produced. The deviation is determined by the amplitude of the video baseband signal and the frequency is set by the DC voltage.

The microwave frequency module consists of a number of components. The output of the VCO is attenuated to improve return loss, isolation and pulling, it is then split by a passive resistive splitter into two paths. Each path suffers a 6dB splitting loss, one path feeds a VNA25 amplifier the other feeds a pre-scaler via a second attenuator. The VNA25 amplifier provides an output level of approximately +17 dBm. The pre-scaler devides the signal frequency by 256 so that it can be handled by a standard low frequency synthesiser. All the active microwave components are decoupled by chip and wire-ended capacitors.

A Motorola cmos parallel synthesiser is used to control the exciter output frequency. Inside the synthesiser chip the pre-scaled frequency is further devided down and compared to a crystal derived reference frequency. A desriminator circuit compares the two frequencies and provides an error signal. The error in the form of a differential signal, is combined in an op-amp loop-filter circuit which produces the DC voltage mentioned earlier. The discriminator circuit operates at approximately 1220 KHz (10 MHz/8192), the crystal reference frequency is 10 MHz. A trimmer capacitor is used to "Pull" the crystal frequency slightly which can be used to set the exciter output frequency over a small range. The basic sythinsiser step size is a multiple of the descriminator frequency and so the final step size is 312 KHz. (@2.5 GHz). All this allows the required frequency of exactly 10.065 GHz (4X 2.51625 GHz) without the need to cut crystals to odd frequencies etc.

The loop-filter components are chosen to provide a relative slow stable lock up time and to prevent de-modulation of the video low frequencies (A fault of many amateur designs). It was found that multiplying the exciter output emphasises any loop-filter response problems, such as bouncing effects after abrupt video Average Picture Level (APL) changes. Some extra loop-filter decoupling is provided to prevent breakthrough of the discriminator signal onto the video signal which would cause horizontal lines to appear on the picture.

Audio Modulator- Circuit Description

The exciter accepts a signal of around domestic line level i.e. 500mV rms. The audio signal enters the exciter and is first buffered by an op-amp biased to operate on a single rail supply. The audio signal is then combined with a DC voltage and fed to a VCO IC operating at 6 MHz. The combined action of the audio signal and DC voltage produces an FM modulated carrier at 6 MHz. A simple potentiometer level control is provided at the audio input to provide a means of setting the modulation sensitivity and hence the deviation of the VCO.

The VCO is formed by using the VCO section of a 74HCT4046 PLL IC. The onboard VCO is suitable for operation at 6MHz and obviates the need to use coils and variable capacitance diodes which are either obsolete or difficult to obtain. The VCO is primarily intended for digital applications and provides an output in the form of a square-wave. This signal is passed through a band pass filter tuned to 6MHz, the filter removes the harmonics above 6 MHz and makes it suitable for the inclusion in a video signal.

The Filtered 6MHz subcarrier signal is buffered by a two transistor amplifier and a video op-amp. The op-map provides a low impedance source so that the subcarrier may be resistively combined with the video signal without altering the overall frequency response/equalisation.

A cmos parallel synthesiser is used to control the audio subcarrier frequency. A crystal reference of 5.12 MHz is devided down by 512 inside the synthesiser chip and is compared to a devided (F/600) version of the 6 MHz VCO signal. A discriminator operating at 10 KHz provides a differential error signal which is combined with a loop-filter op-amp IC. The loop-filter provides a DC error voltage which is combined with the audio signal mentioned earlier. Some extra loop-filter decoupling is provided to prevent discriminator breakthrough onto the audio signal.

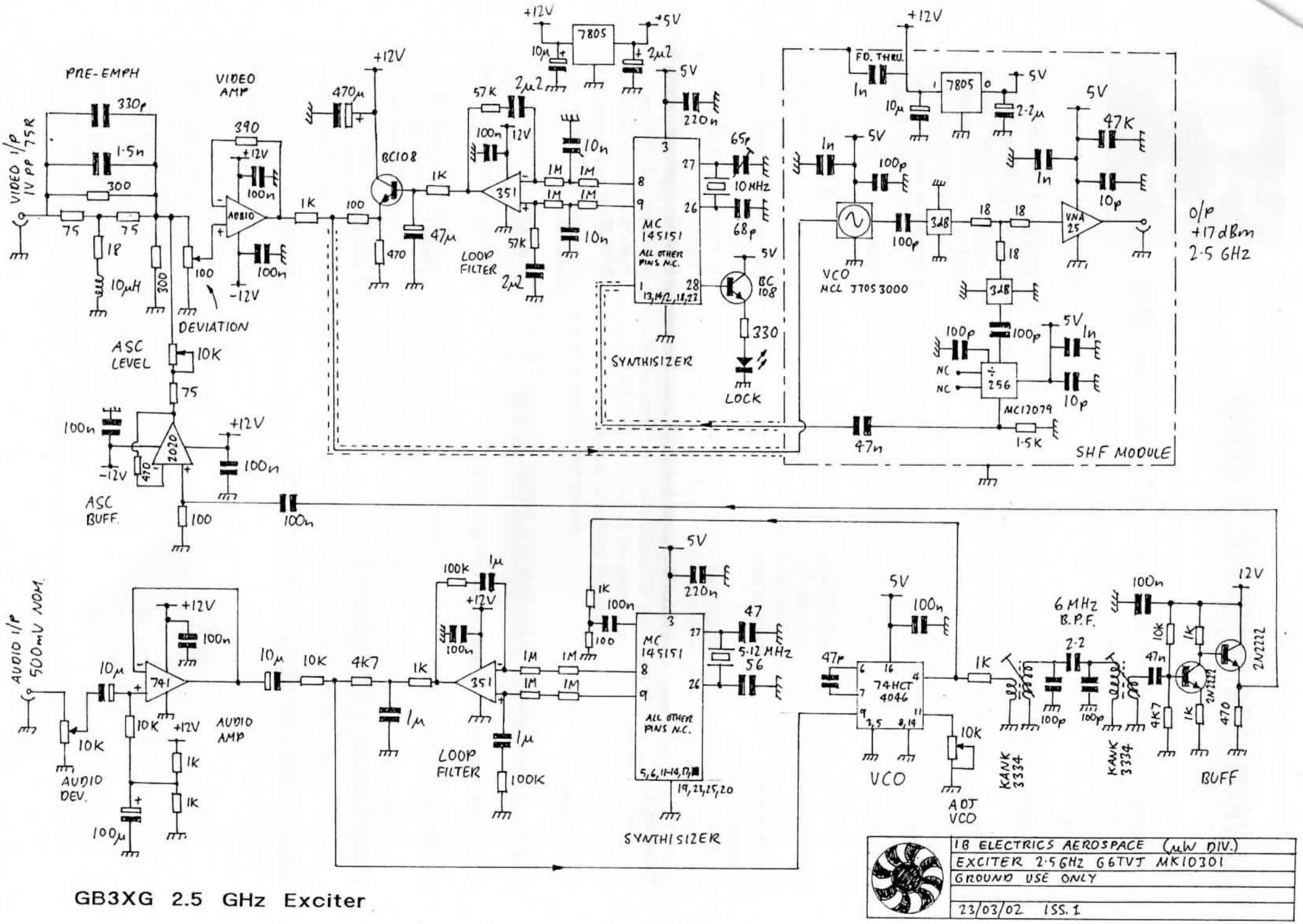
10 GHz Multiplier

The output of the 2.5 GHz exciter may be connected to a X4 multiplier unit to provide a signal of 10 GHz in the 3cm band. The RSGB Microwave Committee G3WDG X4 unit has been found to produce good results. It is possible to use the multiplier remotely from the exciter as it has sufficient RF output to over come cable losses (e.g. 30ft of Westflex 103) up masts etc. The multiplier expects an input level of around 0-10 dBm so an attenuator of around 10 dB should be used if the units are to be connected directly together.

It should be noted for a standard amateur TV deviation of around 7 MHz/V the exciter should be set to one quarter of this figure. The exciter exhibits a sufficiently good video signal to noise ratio so that the multiplication does not degrade the video S/N. Many other 13cm designs when operating at less than 2 MHz/V may introduce noise and interference effects if multiplied up to 10 GHz.

It is the intention to install this exciter system as the transmitter for the GB3XG ATV repeater.
The exciter will provide a signal including audio which will be sent up a mast at 2.5 GHz, then multiplied and amplified before entering the antenna. Most adjustments and alignment can be done in the shack which will simplify checks and maintenance on the equipment. A frequency counter reading the pre-scaler output can be used to determine the exact radiated frequency (Preferably with the modulation removed).

The X4 multiplier features a relatively high Q cavity filter tuned to the output frequency. Should the synthisiser go out of lock, the resulting frequency will be outside the pass band of the cavity and so little or no energy will be radiated. This provides a fail safe mechanism to prevent out of band radiation during a fault condition.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BUFF
GB3XG 2.5 GHz Exciter
IB ELECTRICS AEROSPACE (µW DIV.)
EXCITER 2·5GHz G6TVT MK10301
GROUND USE ONLY
23/03/02 ISS. 1

Severnside Television Group

Statement of Account. Year ending 28th February 2002.

Income

Subscriptions	£228.00
Sales	£2,229.95
Donations	£56.00
Auctions	£103.00
Interest	£0.00
Sundries	£20.00
Total income	**£2,636.95**

Expenditure

Stock Purchases	£968.66
Stationary/Postage	£276.68
Rent/Hire	£127.00
Insurance	£30.00
Advertising	£100.00
Social events	£0.00
Equipment/Maintenance	£748.85
Sundries	£188.16
Total expenditure	**£2,439.35**
Income over expenditure 1st March 2001 to 28th February 2002	**£197.60**
Balance carried forward from year ending February 2001	£727.33
Current account balance	**£924.93**
Value of Assets at 28th February 2002	**£1,228.10**
Value of Stock holding at 28th February 2002	**£211.68**