



ZR6FD logo

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WATTS

04 - 2007

Year 77+4m

Monthly newsletter of the Pretoria Amateur Radio Club
Maandelikse nuusbrieff van die Pretoria Amateur Radio Klub.



PARC, PO Box 73696 Lynnwood Ridge 0040, RSA



<http://www.zs6pta.org.za> mail:zs6pta@zs6pta.org.za

Bulletins :145,725MHz 08:45 Sundays / Sondag

Relays : 1840, 3700, 7066, 10135, 14200 kHz, 51,4 and 438,825 MHz

Activated frequencies are announced prior to bulletins

Swapshop: Live on-air after bulletin 2m and 40m

Bulletin repeats | herhalings : Mondays 19:45 on 145,725 MHz

ZS6PTA stel stasie op vir die SARL VHF/UHF Wedstryd (16-18 Maart)



Drie maste is opgerig met antennas vir 5 bande deur ons deelnemers:

Pieter ZR6AHT

Hans ZR6HVG

Pierre ZS6PJH

Lynette ZR6LHT

op die terrein by Donkerhoek

(Nog fotos en verslag bladsy. 4)

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Next Meeting 7 April 2007

Time: 13:30 for 14:00
PARC Clubhouse
South Campus
University of Pretoria
SE cnr University and
Lynnwood roads.

PARC Management team / Bestuurspan Aug 2006- Aug 2007:

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	Doreen de Bruyn	ZR6DDB		012-803-7385	

Minutes of the monthly club meeting of the Pretoria Amateur Radio Club held at the South Campus of the University of Pretoria on 7 March 2007

Welcome/Verwelkoming. Almero ZS6LDP declared the meeting open and welcomed all present.

Attendance/Bywoning. The meeting was attended by 25 members and two visitors.

Apologies/Verskonings. Malcolm Newton ZR6OLM, Helen Newton, Edwin Peer ZR6ESP, Hilary Peer ZR6HAP, Bill ZS6KO, Nico van Tonder ZR6VT, Doreen de Bruyn ZR6DDB, Lizette van Wyk ZS6LZT en Lynette Human ZR6LHT.

Personal Matters / Lief en Leed. Lizette ZS6LZT, junior van Pieter ZS6PVW en Magda ZS6MVW sterk steeds tuis aan na haar rugoperasie en Ma Magda berig dat dit baie goed met haar gaan. Bernie ZS6ANU is also recovering after a long illness.

Matters arising from previous minutes/Sake voortspruitend uit vorige notule. None / Geen.

Approval of previous minutes/Goedkeuring van vorige notule.

The minutes of the previous meeting as published in Watts were approved. Proposed by Alf ZS6ABA and seconded by Roy ZS6XN.

Club Activities/ Klub Bedrywighede.

Rallies/Tydrenne. Johan ZS6JHB. Next rally – Sasol Rally 20th /21st April 2007. If you can assist please contact Johan ZS6JHB.

Foxhunts/Jakkalsjag. Richard ZS6UK. The next Foxhunt will be 17 March. Start is at the Botanical Gardens in Silverton 14:00

Social/Sosiaal . Johan ZS6JHB. Bring en braai na afloop van die Jakkalsjag aan huis van Johan ZS6JHB en Doreen ZR6DDB.

Hamnet . Johan ZS6JHB. Lys van toerusting benodig deur Hamnet Gauteng Noord is saamgestel en versend na Francois ZS6BUU vir goedkeuring .Daar word ook gekyk na verskeie persele wat in die toekoms gebruik kan word as ops kamers vir Hamnet Gauteng Noord. Hamnet Gauteng Noord se bulletin vind plaas op Maandagaande om 19.00 op 145,725MHz.

Financial Report / Finansies. Richard ZS6UK. Finances in order .

Technical / Tegnies . Craig ZS6RH. Craig gave a lengthy report on the current repeater status and what they still aim to achieve in the next month or two.

Fleamarket / Vlooiemark . Almero ZS6LDP. 31 Maart 2007 by PARC gronde. Kontak asseblief Almero ZS6LDP vir tafels.

General / Algemeen :

ZS6PTA maandvergaderings//ZS6PTA monthly meetings.

Mike ZS6AFG forwarded a proposal to the committee that the monthly club meetings be moved to a Saturday. The committee discussed and accepted this proposal during the committee meeting on 21 February and meetings would be on the first Saturday of every month. The same proposal was put to the members who attended the club meeting and the voting was as follows:

In favour of moving the meeting. 24 (13 votes at the meeting + 11 proxies) Not in favour of moving the meeting : 10.

Please note that club meetings from April 2007 will thus be on the first Saturday of every month 13:30 for 14:00.

Presentation / Aanbieding. Thank you to Mojalefa Moketsi for his talk on weather effects on the ionosphere using a Global Navigation Satellite System.

Next meeting / Volgende vergadering . 7 th April 2007 .Starting time 13:00

Closure / Sluiting . The meeting closed at 21:45 .

Editorial

Evening club meeting attendance has generally been low due to an apparently never-ending crime risk when travelling by car or leaving the spouse at home alone. Nothing appears to change for the better and having to be in a constant state of alertness should not be necessary for the ordinary citizen. This incurs all sorts of material- and psychological baggage and our attendance has probably never been as relaxed as they should be to enjoy meetings and their hobby.

Hence I welcome the decision to change meetings to the first Saturday of a month at 2pm. It should make members more at ease to come along and spend an hour or more to show support and catch up with fellow hams.

It however remains to be seen if attendance will improve. All members reading this must seriously consider supporting their club in this new environment.

Redaksioneel

Bywoning van klubvergaderings in die aande was in die algemeen laag as gevolg van die nimmer eindigende misdaad risiko wanneer per motor gereis word of as gades alleen by die huis gelaat word. Niks blyk te verbeter nie en 'n konstante toestand van paraatheid behoort onnodig te wees vir die gewone burger. Dit bring allerhande materiele- en sielkundige bagasie saam wat ons bywoning nie so ontspanne laat as wat dit behoort te wees om ons samesyn en stokperdjie te geniet.

Gevolglik steun ek die besluit om vergaderings na 2nm op die eerste Saterdag van elke maand te skuif. Dit behoort lede meer gemaklik telaat voel om 'n draai te gooi vir 'n uur of wat om ondersteuning te toon en met mede-amateurs 'n praatjie te maak.

Dit moet egter nog beleef word of bywoning gaan verbeter. Alle lede wat dit lees moet ernstig oorweeg om hulle klub te ondersteun onder hierdie nuwe omstandighede.

Birthdays

April

Verjaarsdae

- 01 Melanie, daughter of Peggy and Ed ZS6UT
- 02 Fred ZS6MRA
- 04 Joe ZS6AIC
- 07 Tamzyn, daughter of Gary ZR6GK
- 08 Ronell ZS6BRX, dogter van Susan and Freddie ZS6JC
- 08 Bertha, lv van Hans ZS6KR
- 08 Klasie, seun van Sylvia en Tjerk ZS6P
- 09 Tanya, daughter of Pat ZR6AVC and Frank ZS6GE
- 10 Joey, sw of Graham ZR6GJR
- 10 Callan, son of Phil and Craig ZS6RH
- 11 Susan, dogter van Susan en Freddie ZS6JC
- 12 Marina, dogter van Hennie ZR6HEN
- 12 Jan ZS2LJ
- 13 Liam, son of Heather and Vince ZS6BTY
- 16 Tobie, seun van Margriet en Tobie ZS6ZX
- 19 Anne, sw of Jac ZS6QA
- 21 Wynand ZS6ARF
- 22 Hennie ZR6HEN



April

Anniversaries Herdenkinas

- 02 Annemarie and Bernie ZS6ANU ()
 - 02 Magda ZS6MVW en Pieter ZS6PVW (24)
 - 04 Diana en Louis ZS6LVW (20)
 - 05 Chrissy ZS6JX and Dave ZS6JW ()
 - 06 Lynn en Andre ZS6BRC ()
 - 07 Rae and Mike ZS6AFG (51)
 - 08 Marylin and Derryck ZS6KQ (46)
 - 12 Rika and Errol ZR6VDR (43)
 - 30 Joey and Graham ZR6GJR (24)
-
- 22 Marieta, sw of Roy ZS6MI
 - 24 Antonio ZS6OAJ
 - 25 Erna, dogter van Susan en Freddie ZS6JC
 - 25 Gerhard, son of Sander ZS6SSW
 - 27 Elsie, lv van Albert ZS6JU
 - 28 Tracey, daughter of Rita and Vitor ZS6VG
 - 29 Heather, sw of vince ZS6BTY

Sick Parade | Krukkelys

Tobie ZS6ZX was onder die mes middel Maart maar herstel fluks



Oom Albert ZS6JU (Jong Uil) is op die ouderdom van 90 jaar oorlede. Ons innige meegevoel aan sy lv Elsa en familie.

Diary | Dagboek (UTC times)

- Apr**
- 05 SARL 80m QSO Party
 - 06,08,09 Good Friday, Easter Sunday, Family Day
 - 09 Hamnet Simulated Emergency Contest 17-20:00
 - 12 Closing date for RAE

- 14 SARL AGM**
- 15-16 YU DX Contest
- 18 World Amateur Radio Day 15-16
- 25,27 Marconi Day, Freedom Day
- 27-30 ZS1HELL, The Hell, Gamkaskloof
- 29-30 Helvetia Contest 13:00-12:59

Snippets | Brokkies

- **Selma and Joe ZS6TB** were in VK-land to be at the birth of their 4th grandchild and Joe of course shouted for the Springboks in his spare time.
- **"JB" ZR6YV** received the Pretoria Motor Club Award for his hard work as Radio Marshal and Asst. Clark of the Course.
- The CSIR tower now has a **145,725 repeater**.
- **Doppies ZS6BAQ en Estie ZR6STB** hou tans lekker vakansie in Namibië. Luister vir hulle op 7066kHz.

2m REPEATER DIVERSITY RECEPTION PROJECT UNDER WAY

On 21 March Craig ZS6RH, Johan ZS6JPL and Lourens ZS6KRT installed a listen-only 145,125 RX (88,5Hz tone) coupled to a 434,7375 MHz TX on Waverley Kop. Our main site at Moreletta has a 434,7375 RX and the signal from Waverley Kop is compared to the locally received 145,125 MHz. A "voting system" automatically chooses the best signal for transmission by the 145,725 MHz repeater. All frequencies are NBFM.

This concept will be expanded with another RX site at Keevy Kop to optimize reception coverage from the Greater Pretoria Area and beyond. The Moreletta TX will be at 100W.

Stations that have poor 725 reception will have to improve on antennas or try a receive-only on 434,7375 MHz.

OK-OM contest
Well done
Ivan!

Single Op. 15m LP

Call	QSO	Pts	MuI	Total
1 UA9SAW	108	312	74	23088
2 ZS6CCW	81	237	60	14220

2007 BHF / UHF Kompetisie (16, 17 en 18 Maart) – ZS6PTA Veldstasie

Verslag van Pieter ZR6AHT

Vrydag oggend 11h00 vertrek Pieter ZR6AHT, Lynette ZR6LHT, Hans ZR6HVG en Pierre ZS6PJH na die plaas Kleinfontein, ongeveer 20km oos van Pretoria. By KG44FE op 'n hoogte van 1571m word ankers uitgegooi. Maste en antennes word opgestel en teen 17h45 word die radio's aangeskakel. Om 18h00 word daar in alle erns begin om op 2m, 4m, 6m, 70cm & 23cm kontakte te maak. Gou word daar besef dat ZS6MRK, Magalies ARK, baie naby aan ons moet wees. GPS koördinate bevestig die vermoede, slegs 1,3km reg oos van ons. Ons presiese posisie word egter nie bekend gemaak nie! (ZS6MRK het stasie op geslaan by die Radio Pretoria kampterrein en ZS6PTA by die aangrensende plaas). Vir die volgende 42 uur word daar ongeveer 200 kontakte gemaak op al die verskillende bande. Die langafstand kontakte wil maar net nie realiseer nie, maar Pierre slaag daarin om met ZS6BTL kontak te maak naby Lichtenburg op 2m syband. Op 23cm slaag ons daarin om 'n kontak te maak met 1watt oor 'n afstand van presies 20km met Louw, ZS6LME. Sondag oggend 12h00 is alles verby en die groot afbreek en oppak begin. Ek is oortuig daarvan dat die 1838 Groot Trek slegs erger was omdat daar hoenders en skape by was – ons'n was net gevries! Teen 17h00 Sondag middag was ons terug by my QTH.

Baie dankie aan al die stasies wat kontak gemaak het en aan die ZS6PTA span waar sonder dit nie moontlik sou gewees het nie. Die algemene deelname was egter teleurstellend, veral deur lede van Klub PTA. Hoekom - weet ons nie? Ons kan maar net bespiegel, baie amateurs was nie eers bewus van die kompetisie nie. Persoonlik, miskien is 42 uur te lank en die logika om die kompetisie reeds op die Vrydag 18h00 te begin, in plaas van Saterdag 12h00 soos in die verlede, ontwyk my nog steeds.

Onthou die volgende been van die BHF / UHF kompetisie sal plaasvind op die naweek van die 14, 15 en 16de September 2007. Weet nog nie wat ek beplan nie, maar die idee van 'n "roving" veldstasie bly in my gedagtes opkom. Daar is 'n aantal berge spitse wat hoër as 2000 meter bo seespieël is, binne 'n radius van 350km rondom Pretoria. Hierdie tipe stasie verg egter baie beplanning en tegniek aangesien dit slegs effektief kan punte bydra en verdien wanneer daar genoeg deelname is van plaaslike stasies en veldstasies in en om die Pretoria /Johannesburg omgewing.

Ek kan almal verseker - al is dit harde werk en lang ure in die warm son - dit bly QSL- lekker!

73 en 88. ZR6AHT

Veldstasie Spesifikasies

Radio's

2m Kenwood TR 715
 4m Tait 2020 komersiele radio
 6m Icom 551
 70cm Kenwood TS 2000X
 23cm Kenwood TS 2000X

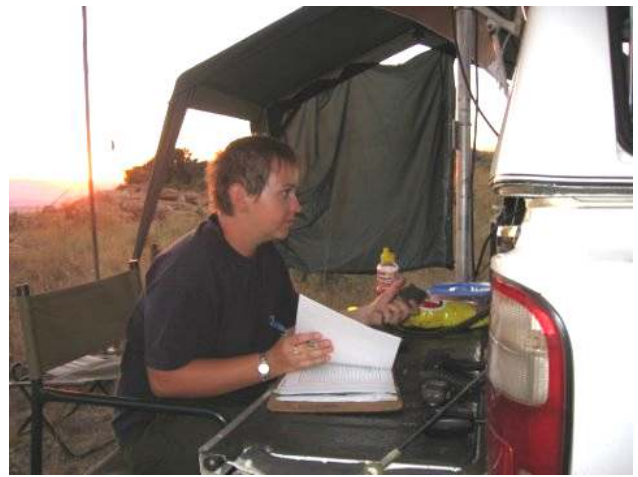
Kragstelsel

4 x 200A / 6volt batterye gekoppel in 2x 12volt stringe.
 4 x 75W Sonpanele.

Antennas

2m 5/8 Collinear omni
 2m 7Element vertikaal
 2m 5 Element horisontaal
 4m J-Pole
 6m 5 Element horisontaal
 70cm Blade antenna omni
 70cm 10 Element vertikaal
 23cm Helical – sirkulêr





Compression

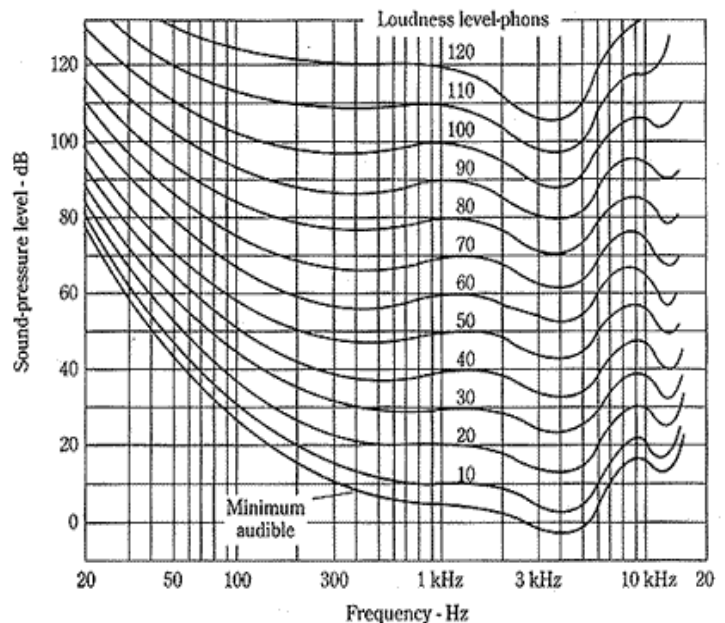
Edited by Adam Farson VA7OJ/AB4OJ (ex-ZS1ZG, ZS6XT)

Based on an article by Dr. Brian Austin, GØGSF (ex-ZS6BKW)
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Permission to publish obtained

Introduction The SSB operator should not be afraid of a little compression. We learned very early in our RF-engineering careers, designing military and commercial HF radio equipment, that approximately 6 dB of compression is required to push the loudness contour of the received signal up to the next curve in the [Fletcher-Munson](#) family of loudness curves (see **Fig.1**). This is a good compromise, as excessive compression can give rise to unacceptable distortion - especially on *plosive* sounds and at the beginning of a voice transmission.

Compression as a means of improving S/N at the receiver

One of the pioneering developments in HF-SSB radio technology in the 1960's was a method of modifying the speech waveform in the transmitter to produce a marked improvement in the signal-to-noise ratio at the receiver without also causing any significant increase in distortion products, either in-band or out-of-band. ([Ref.1](#))



Since RF speech processing was the key to the performance of low-power HF-SSB radio sets - and is now recognized almost as sine qua non in SSB transmitters - the principles involved will be described briefly.

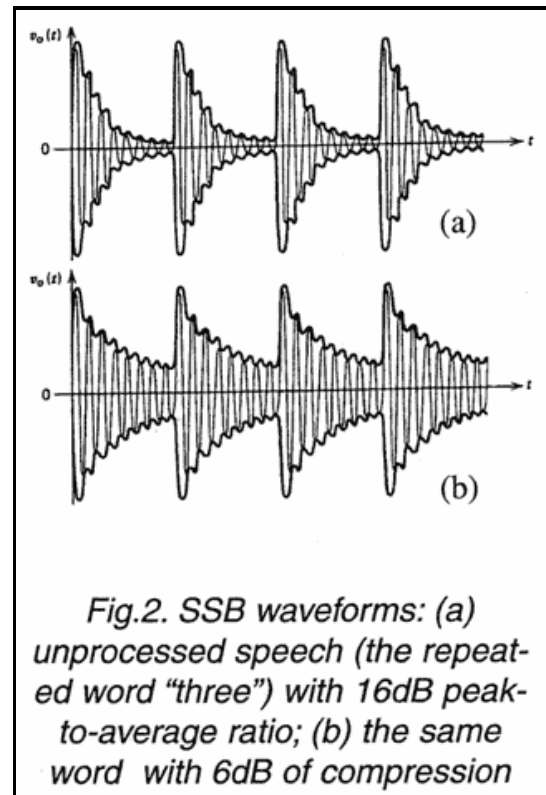
Typically, unprocessed speech has a ratio of instantaneous peak to average power of about 16dB (see **Fig.2**). In a peak-power-limited system, such as an SSB transmitter, this represents a considerable loss of potential output power, so some means of compressing the dynamic range of the speech signal is required before transmission. It is now well known that clipping (or hard limiting) the peaks of an SSB waveform, and then filtering by a second bandpass filter similar to that in a filter-type SSB generator to remove the resulting harmonic and high-order products, can markedly improve the articulation index of the transmitted signal. Ways of doing this were just being developed in the early 1960s. [Ref.1](#) describes a very elegant alternative compressor design.

In modern, DSP-based HF-SSB transmitters and transceivers, the DSP executes the compression function at IF, and wholly in the digital domain. There is a detailed discussion of this in [Ref.2](#), Section 5-5, "Speech compressor", p.16.

Compression is implemented in conjunction with suitable pre-emphasis of the voice frequencies, provided by the type of microphone used, to ensure the appropriate balance between vowel sounds and sibilance.

The acid test of its effectiveness is to compare two transmitters of equal peak envelope power (PEP); one processed, the other not. If specifications matter more than performance, then a spectrum analyser will produce all the "numbers" but say nothing about the quality of communications. However, such instruments are rare in the ham-shack.

Thus, the enterprising radio amateur will use simpler measuring techniques. These methods are highly ingenious, and will yield a useful quantitative and qualitative picture. Most often, the test instruments consist of an in-line RF power meter and a selective receiver.



Whistling into the microphone (by sucking not blowing) produces a very good sine-wave. This signal will then drive the transmitter to its maximum PEP output. Replacing the whistle by a long "aaaah" sound, of no intelligibility but considerable utility to both man and beast, simulates well a continuous waveform containing a range of speech frequencies. When used to drive an unprocessed SSB transmitter it produces an output 10 to 15dB below the whistle, which clearly emphasises the point made above. By contrast, the same whistle and primeval "aaaah", when fed through the processed (compressed) system, might differ by less than a decibel in output level.

Comparative listening tests

Many would argue that an "on the air" comparison is the only meaningful arbiter of effectiveness. Such comparative listening tests, of which we conducted a good few in our time, have confirmed that the increased "talk power" of the processed signal brought about a marked improvement in the received signal-to-noise ratio (SNR), while not introducing significant distortion products either within the audio passband or in its adjacent channels. In fact, it was so good in this respect that one commercial customer used to run two independent radio nets on the same carrier frequency, one on LSB the other on USB!

The increase in SNR is equivalent to that obtained by increasing the power output of an unprocessed 5W transmitter by as much as 10dB to 50W. Since every watt on a man's back (or in a vehicle) matters - as more power always means larger batteries and heavier sets - this is not to be sneezed at. In addition, short, inefficient whip antennas are often obligatory for both practical and tactical reasons; therefore optimum transmitter performance is vital. Even in a fixed station operating on mains power, compression can often make the difference between "barefoot" operation and a hefty linear amplifier.

Note by Bob Lombardi, W4ATM

In the avionics world, we use compressors with a break point. Below the break point in amplitude, there is no compression; above it, there is about 10 dB. This keeps the background noise from being cranked up too much. This is all done in DSP now.

Further reading

For those who wish to explore this topic in greater depth, [Ref.3](#) gives a very extensive treatment of speech processing in HF-SSB radio systems.

References

1. Dr. Brian Austin G0GSF (ex-ZS6BKW), "The SSB Manpack And Its Pioneers in Southern Africa", [Radio Bygones](#), No. 93, February/March 2005.
2. [IC756Pro II Technical Report](#), Icom Inc., 2003, Section 5.5, p.16
3. ["HF Radio Systems & Circuits"](#), Sabin & Schoenike, editors. Noble, 1998, pp. 13-25, 271-290

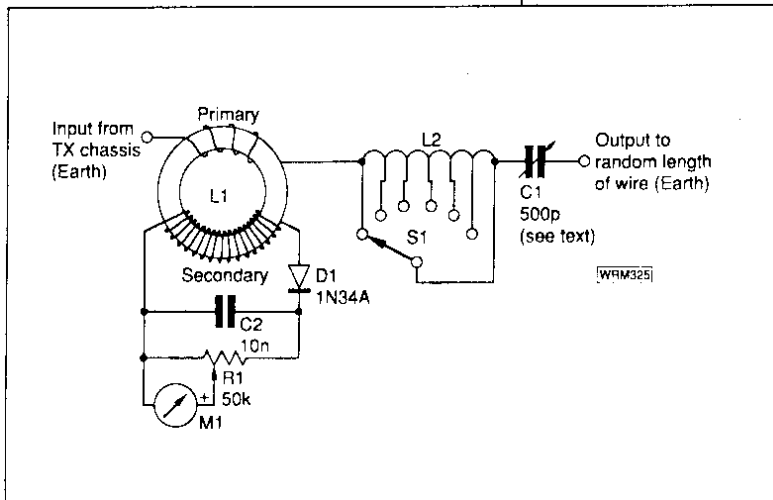
Build an Earth tuner

from Practical Wireless Oct 1990

Purpose: All amateur stations must have a good earth system in order to prevent live chassis and reduce BCI, TVI and RFI. Although equipment should be connected to the earth of the mains socket, which of course provides protection in the event of the chassis becoming live due to a power supply fault, such an earth cannot be considered good enough as a radio frequency earth. The conductivity of the ground varies from location to location depending on the weather etc. and amateurs might think they have a good earth, but in fact they have not.

With some antennas a good low resistance ground is essential for efficient operation since the antenna is tuned against this 'perfect' ground. Most transmitters are, due to circumstances located some considerable distance from real ground especially when the existing domestic earth point is used. This is then a random earth lead passing through the house and can even have a resonance at some particular frequency but not all frequencies.

The circuit shown consists of an RF current indicator and a series resonant LC circuit. All that needs to be done is that, at the frequency in use, to tune the controls for maximum current indication and you have your minimum impedance path to ground.



Construction tips: The tuning capacitor must be insulated from earth and chassis by the use of stand-off pillars or such like. Also the tuning shaft and knob must be insulated by a shaft extension made of a plastic potentiometer shaft. The rotary switch shaft and body is generally safe from this problem but inspect its construction to make sure. The toroid L1 can be of type T50-2 (1/2 inch, see p7). The secondary winding consists of 10-12 turns 0.5mm copper wire and L2 consists of 12 turns of 2mm dia copper wire with 6 taps on a 40mm white PVC tube. The tapping points are easily made by inserting a pencil or other tool under the wire as it is being wound to make it proud of the main body of the coil. Keep a 'tail' of this wire to use as the primary of L1 (about 2 turns). The meter M1 should be a 50 or 100µA type.

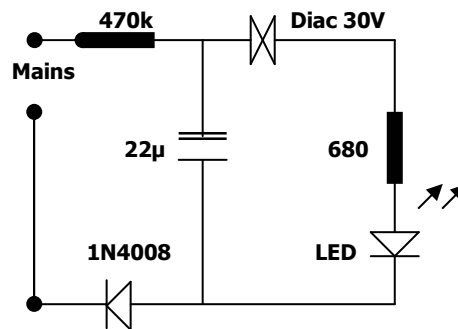
Kosher? IRLP contact but misleading QSL

XVIII Commonwealth Games Melbourne, Australia

This major sporting event held 15-26 March 2006, united the 71 nations of the Commonwealth as 4,500 athletes took part in 16 sports. Melbourne, Australia's sporting and cultural capital, has a long history of hosting major events, from the Olympic Games in 1956, to major annual sporting events such as the Australian Open Tennis Tournament and the motor racing Formula 1 Grand Prix. Its 3.5 million citizens support all sports, in particular Australian Rules Football that began in the city and is now a national competition and the first Tuesday in November which sees the running of the world's greatest handicap horse race, the Melbourne Cup, that began in 1861 and virtually 'stops a nation'. In their own way, the two Special Event call signs AX3MCG and AX3GAMES put to air by members of Amateur Radio Victoria, echoed the success of the XVIII Commonwealth Games Melbourne.

ZS6KR Confirming QSO of 3/18/2006 at 2015Z on 70cm FM. Your signals were 59

Flashing night light

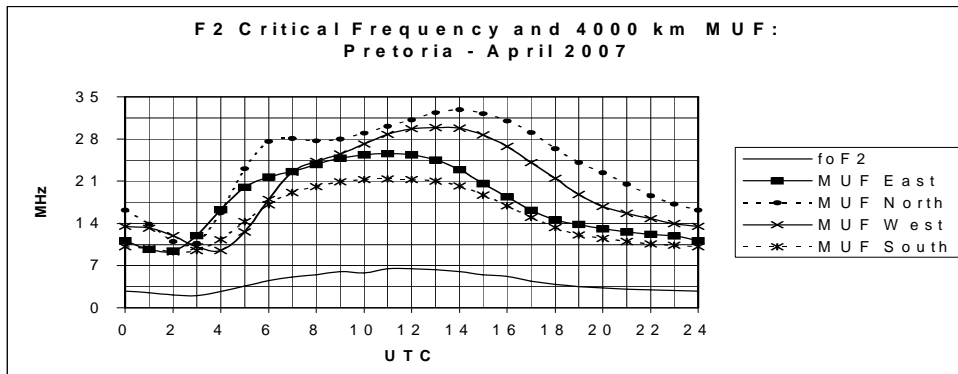


Long Term HF Propagation Prediction for April 2007

Vince ZS6BTY

DX Operating
The graph shows the 4000 km maximum useable frequency (MUF) to the East, North, West and South from Pretoria for the first hop using the F2 layer.

Local Operating
The F2 critical frequency (foF2) is the maximum frequency that will reflect when you transmit straight up. E-layer reflection is not shown.

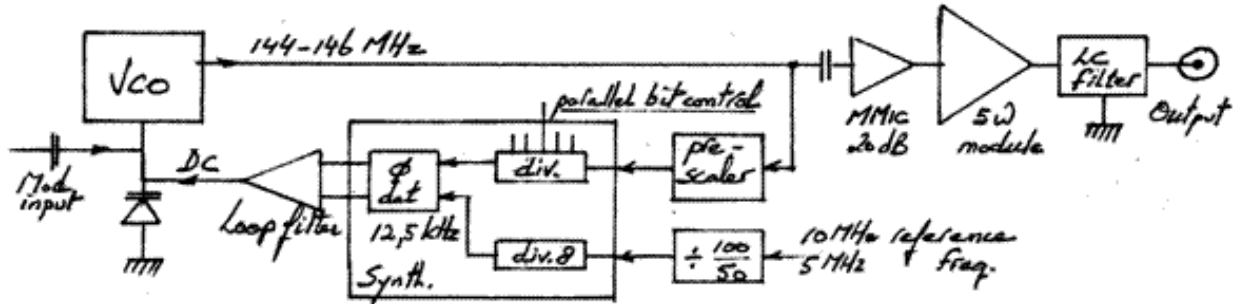


An accurate on-air frequency standard

ZS6KR

Today it is possible to use the atomic standard derived 1pps received from GPS satellites to discipline oscillators as high as 10MHz and maintain extreme timing/frequency accuracy. Various manufacturers offer ready-made units that do the job and find applications such as replacing standard references in counters and other instruments in laboratories and calibration centres. Having obtained such a unit courtesy of Nico ZR6VT, the author wanted to apply it for the benefit of radio amateurs by applying it to create an accurate carrier frequency in the 2m band and continue the service of the late Hofie ZS6CC who also had a similar set-up for several years.

The design aim this time was to have no mixers like in radios, but to have a PLL controlled VCO running directly in the 2m band. A simplified diagram is shown below. The objective was also to cover the entire 2m band in 12,5kHz steps and output at least 5W.



The VCO design was cribbed from a Plessey publication and uses a piece of UT-141 transmission line as an inductor. The transistor is the well-known J310 FET in common-gate configuration and the source the output. This then feeds a prescaler which in turn feeds a Motorola MC145152 synthesizer IC, (thanks Vince ZS6BTY) which offers parallel control of the internal dividers. These bits can be set with a DIP switch such that 2 bits control 500kHz segments upward from 144,000 MHz and the remaining 6 bits control 40x12,5kHz=500kHz in each. This means the internal phase detector runs on 12,5kHz from this divider and 12,5kHz from the reference. The latter comes from the GPS disciplined 10MHz (or 5MHz) source. The detector has an up and down output smoothed by an op-amp integrator which provides DC control of the VCO varicap.

This filter is a very important component in the loop and needs careful design taking into account VCO sensitivity, damping factor, capture time, lock-in range and suppression of 12,5kHz components whilst keeping enough modulation bandwidth available.

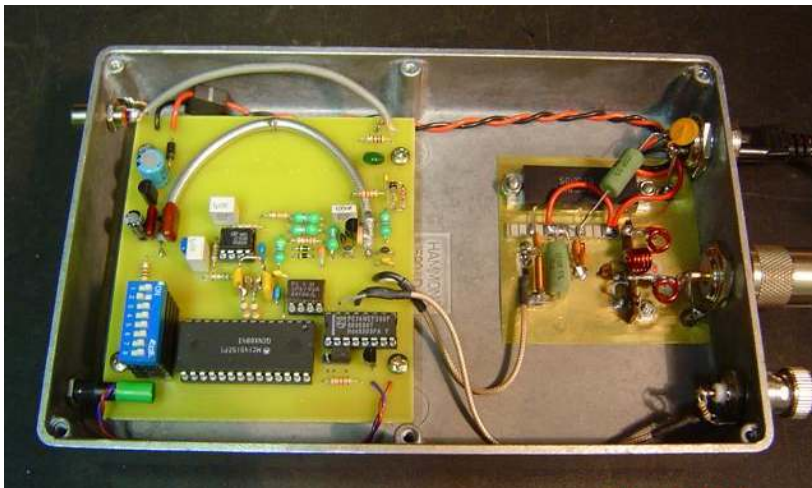
The signal amplification chain comprises an ERA-5 Mini-Circuits MMIC and an ICOM ICH-16 hand-held SC-1046 "Brick" capable of 7W output. Last but not least, a harmonic filter precedes the output socket. This was designed with "Elsie" software that came with my ARRL Handbook.

Herewith are pictures of my prototype/final version as very little tweaking was required. The VCO is on the top half of the PCB on the left with the transmission line bent into a semi-circle. DC is fed into the left end and the FET is at the right end.

The lower 3 IC's and the DIP switch comprise the complete synthesizer. On the RHS is the amplifier chain and LC output circuit built on a piece of hobby-brass foil as ground plane.

What can we do with it?

Well, when connected to an antenna I guess it firstly favours anyone with a comms-analyzer or VFO receiver to calibrate it on-air for frequency accuracy. Secondly, counters can be checked at VHF frequency if brought near enough. If modulated with an accurate 1KHz derived from the same standard, you can create your own 10MHz standard in the shack with a simple PLL. (any volunteers?) Further thoughts will be appreciated!



The inductance page

RF MAGNETIC MATERIALS EXPLAINED

(Compendium of three articles originally published in 2002)

Confused by references to **toroid types** and **manufacturer's codes**? Keep this page as your reference. American manufacturers use the designation **T-xxx-yy** where xxx=hundredths of an inch outer dia and yy=material mix. For eg T-100-2 is a toroid 1,0 inch dia using type 2 material.

Powdered iron mixes: RF applications almost always employ **carbonyl irons** that have moderately low permeabilities (μ) and do not saturate easily. Applications are thus broadband transformers and baluns etc. **Hydrogen reduced irons** have higher permeabilities which implies usefulness where high inductances are required such as in power transformers, EMI filters etc. Frequency range is much poorer and similar to **ferrites** which have μ values 150-850 and are composed of either nickel or manganese zinc with a typical working range of 1kHz-1000kHz. **Colour codes** identify the mix. Different mixes also differ in temperature behaviour. Check the table below where all important properties are summarized apart from available physical sizes.

FREQUENCY RANGE	COLOUR CODE	MIX CODE	COMPOSITION	μ	TEMP STAB ppm/deg C
< 1MHz	Yellow-white	26	H-reduced	75	825
0,05-0,5MHz	grey	2	Carbonyl-HP	35	370
0,1-2MHz	Red-white	15	Carbonyl-GS6	25	190
0,5-5MHz	Blue	1	Carbonyl-C	20	280
2-30MHz	Red	2	Carbonyl-E	10	95
3-35MHz	White	7	Carbonyl-TH	9	30
10-50MHz	Yellow	6	Carbonyl-SF	8,5	35
30-100MHz	Black	10	Carbonyl-W	6	150
50-200MHz	Green-white	12	Synthetic oxide	4	170
40-180MHz	Blue-yellow	17	Carbonyl	4	50
100-300MHz	Tan	0	Phenolic	1	0

SOLENOIDAL AND TOROIDAL COIL FORMULAS

Some heavy theory precedes most formulas for inductance and we thank Harold A Wheeler again for his paper in 1942 *Formulas For the Skin Effect* where he derives simple formulas that are sufficiently accurate for all applications:

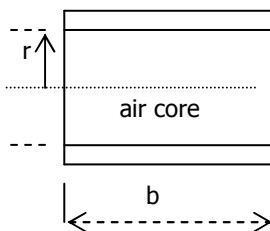
Solenoidal shape

The original formula was for inch dimensions:

$$L = \frac{N^2 r^2}{9 r + 10 b} \quad \mu\text{H}$$

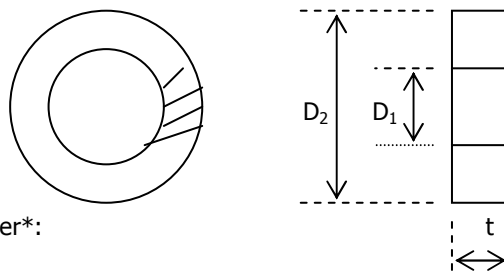
$$= \frac{N^2 d^2}{18 d + 40 b} \quad \mu\text{H}$$

Using mm: $L = \frac{N^2 d^2}{51 (9d + 20b)} \quad \mu\text{H}$ \longrightarrow true within 1% for $b > r$



Toroidal shape

Most toroids have a square cross-section as shown.



For a non-magnetic coil former*:

$$L = \frac{N^2 t}{51} \ln(d_1/d_2) \quad \mu\text{H} \quad \longrightarrow$$

Skin effect:

Wheeler quantified this by defining a physical skin depth " δ " where 67% of the surface current concentrates, and beyond which it quickly becomes negligible. δ and the surface resistivity R_s ($\mu\Omega/\text{square}$) are respectively directly, and inversely proportional to \sqrt{f} . Values of R_s for common conductors are:

Ag: 253 x $\sqrt{\text{MHz}}$
Cu: 261
Au: 310
Al: 322

This can be translated to Ω/m for any shape of conductor. Taking

1,6mm \varnothing Cu wire as an example:
 $R_{\text{HF}} = 52000 \cdot \sqrt{f} \cdot \mu\Omega/\text{m}$ and, when applied to amateur frequencies:

MHz	δ (μm)	R_{HF} ($\mu\Omega/\text{m}$)
1,8	53,9	0,064
7	24,9	0,138
21	14,4	0,238
50	9,33	0,368
145	5,48	0,626
432	3,18	1,08
1296	1,83	1,87

***Effect of magnetic core materials:** The inductance value increases or alternatively less turns are needed for the same inductance. **The above formulas must be multiplied by μ_r =relative permeability of the magnetic material used (see above table).** The inductance value will only remain constant with frequency if the correct material properties are selected for the application.



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For particulars apply to any of the following:—

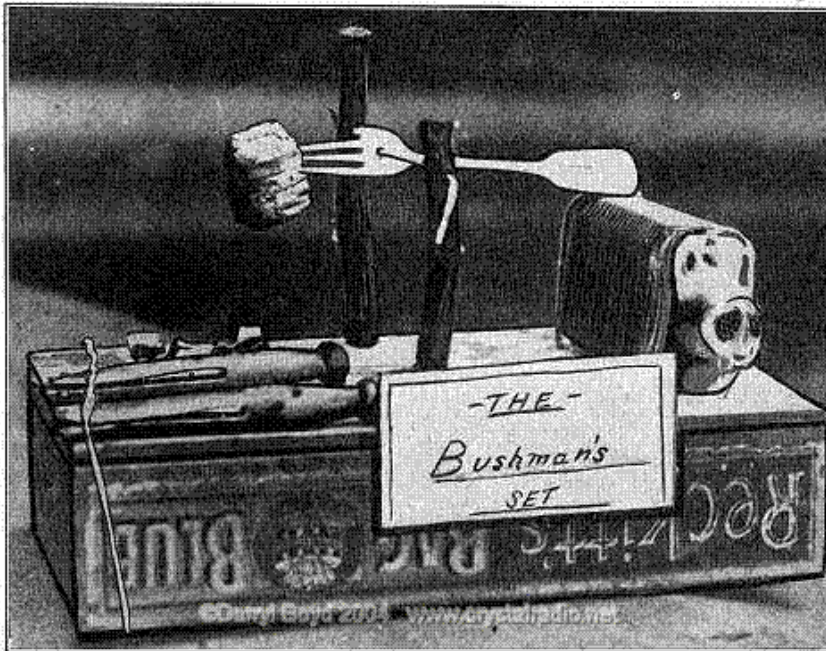
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10

RADIO WORLD

CRUDE SET DRAWS CROWD



(International Newsreel)

A CRYSTAL SET, called "the Bushman's set," was exhibited at a radio show in Sydney, Australia. The set consisted of an old flask, a broken fork, two clothes pins, an inductance around the flask and two output clips. Not exactly the thing for Windsor Castle, one might say, but crowds viewed the crude set.

Better words for old situations:

Bozone: The substance surrounding stupid people which prevents bright ideas from reaching them.

Cashtration: The financial impotent condition of a person who just bought a house or new car.

Ignoramus: Someone who is both stupid and an asshole.

Intaxication: The euphoria that starts when a tax refund is received, and ends when the realization dawns that it was your own money anyway.

DE words

Debate: De stuff that catches de fish.

Despise: De men that look through de windows.

Detail: De ting that hangs on the back of de cat

Detain: De place where de flowers grow.

SMART ASS ANSWER A truck driver was driving along on the freeway. A sign comes up that reads, "Low Bridge Ahead." Before he knows it, the bridge is right ahead of him and he gets stuck under the bridge. Cars are backed up for miles. Finally, a police car comes up. The cop gets out of his car and walks to the truck driver, puts his hands on his hips and says, "Got stuck, huh?" The truck driver says, "No, I was delivering this bridge and ran out of gas."

Beter Afrikaanse woorde:

Bekotsenswaardig: As iets regtig sleg is

Gemoedsbekakking: Depressiviteit

Aansteker: vingergeactiveerde-gasaangedrewe-tabakrolletjie-brandmaaktoestel

Wolfdrol: Lekker woord vir patat

Flaterwater: Tippet