

# ANODE

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## Editor's Comments

**February 2006  
Volume 6, Issue 7**

From an almost "maritime mobile" establishment in Roodekrans, we have various news and commentary this month. Its been so wet the Roodepoort Record arrived on my driveway this week in a plastic cover. The picture on the front page had me in stitches. It's a double-decker bus driven under a low

bridge. It used to be an "Irish Joke" but surely this can't be translated into a "van de Merwe" joke?

The space litter problem is to be made worse by the throwing away of an "old spacesuit" disguised as a ham radio experiment.

The Amsat bulletin mentions this and some SA Amateurs below.

Also an electronic enthu-

siast asks for help finding a suitable toroid for his wideband amplifier.

### A Screwing Problem

I have some stainless screws stuck in some aluminium blocks, I tried removing one and it stripped of, any suggestions?

I have thought that maybe if I heat the ali, the stainless won't heat as quick, then I should

*(continued on page 2)*

## Impedance of a random length antenna

Several parameters must be established to provide input for this calculation. There are the wire size and its height above ground, from which the characteristic impedance of the wire as a length of transmission line parallel to the ground is computed. The height above ground must also be expressed in terms of wavelength to establish the radiation resistance of a typical half-wave dipole. This information is found in many texts from Terman, (*Radio Engineers' Handbook*) to

publications such as the ARRL *Antenna Book* or *Handbook*.

A change from one band to another will have a major effect on this last parameter. So as a starting point, to illustrate the method, I decided to consider a No. 12 (2.1 -mm) wire, 37.5 feet (11.4 meters) above ground, which yields the convenient characteristic impedance of 600 ohms. The 20-meter band was chosen, where the height of 0.57 wavelength results in a

radiation resistance to a half wave dipole of 68 ohms. This number was divided by two, assigning 34 ohms to each quarter wavelength.

After all these preliminaries we have two numbers: 600 ohms and 34 ohms as the wire characteristic impedance; and we have the radiation resistance of a quarter wavelength (68 ohms). We now shift our attention to the Smith chart (fig. 3). If the length of our wire is

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**Special points of interest:**

- Contact details on back page (updated)
- New email address for Anode and ZS6WR. See back page

## Editors Comments & News

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be able to remove it?

Hi Gonz,

As peter has pointed out, there is a strong bond.

Two suggestions,

1. Try placing the screw driver in the screw and then give it quite a few sharp hits with a hammer before trying to turn the screw.

2. I once had a stud shear in an aluminium cylinder head. I then broke an "Ezy out" in the remains of the stud. I used a Dremel tool with a small carbide bit to carve out the Ezy out and the remains of the stud.

Hope this helps, Graeme...

Without making anyone laugh too hard, there is a penetrating oil called Mouse Milk which is absolutely amazing at shifting screws and nuts. Used in the Aviation industry, amongst others.

Brad.

It is a good bet that the stainless screws are not 316 or food grade and thus are subject to corrosion etc although perhaps not as quickly as steel ones.

The aluminium block will have either have a corrosion build-up around the thread or more likely, have metallic molecular migration and bonding from the aluminium to the screw.

This is not uncommon where aluminium is held in a pressure contact with another metal and considering that its surface on the thread would have been cleaned well by the turning of the screw when it was done up.

If this is the case and the screw is bonded sufficiently so that it shears off in a removal attempt, then there is little you can do to break the molecular bond.

There are a number of proprietary thread lubricants that should be used when screwing into aluminium which reduce the ability for this bonding. If the thread is really tight initially, then the chance of bonding occurring is much higher.

A lot of heat may break a corrosion seizure if you are very lucky and never a molecular bond.

Peter

From: "JoAnne Maenpaa" <wb9jej\_no-spam@earthlink.net>  
Subject: ANS-022 AMSAT News Service Weekly Bulletin  
Date: 23 January 2006 17:32

### AMSAT NEWS SERVICE ANS-022

ANS is a free, weekly, news and information service of AMSAT North America, The Radio Amateur Satellite Corporation. ANS reports on the activities of a worldwide group of Amateur Radio operators who share an

active interest in designing, building, launching and communicating through analogue and digital Amateur Radio satellites.

Please send any amateur satellite news or reports to: [ans-editor@amsat.org](mailto:ans-editor@amsat.org)

### AMSAT 2006 Space Symposium

The AMSAT web team has posted informational pages on the AMSAT web site.

You can find the announcement with many links at:

<http://www.amsat-org/amsat-new/symposium>

Future announcements including the Call For Papers, Online Registration and Online Hotel Registration will be available approximately 1 April 2006.

In this edition:

- ☞ Astronaut Bill McArthur Scores WAC on UHF and WAS on VHF
- ☞ AO-7 Enters Period of No Eclipse
- ☞ AO-7 Control Electronics Still Functioning After 30+ Years in Space
- ☞ Satellite DX is Still Happening
- ☞ New Photos From the XI-V Cubesat Available
- ☞ AMSAT Journal Articles Needed - Deadline Nears
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## Editors Comments & News

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☐ NASA Prepares For February 3 Spacewalk

☐ OSCARLocator Photo Gallery Invites Contributions

SB SAT @ AMSAT \$ANS-022.01  
**Astronaut Bill McArthur Scores WAC on UHF and WAS on VHF**

AMSAT News Service Bulletin  
 022.01 From AMSAT HQ SILVER  
 SPRING, MD. January 22, 2006  
 To All RADIO AMATEURS  
 BID: \$ANS-022.01

Last weekend, January 14-15 UTC, Astronaut Bill McArthur aboard the International Space Station operated on the UHF band exclusively. A report received from Keith, **ZS6TW** in South Africa indicates that Bill has completed a sweep of Working All Continents on UHF.

Keith wrote on the ISS Fan Club site, <http://www.issfanclub.com>, "Bill was active on UHF voice over RSA on the January 14, 20:00 UTC pass.

Bill contacted me followed by Gerald, **ZS6BTD** in Johannesburg. He said that our contacts had just completed his worked all continents. It was a pleasure speaking to him again. 73's Keith, **ZS6TW**."

The UHF frequency NA1SS is 437.55 MHz simplex when this mode is active.

This is the first time an ISS crew member has worked all 7 conti-

nents on the 430 MHz band. McArthur had previously worked all continents on 145 MHz to be the second ISS crew member to complete that feat. Mike Fincke worked all 7 during his tour as Science Officer on Expedition 9.

Be sure to send in your QSL cards so Bill can claim his award. Refer to the ARISS QSL page for information on how to QSL:

<http://www.rac.ca/ariss/oindex.htm#QSL's>

On January 21, Ed, KL7UW; Dale, KL7XJ; and Kevin, KL0RG worked NA1SS on pass #41012 so Bill has now completed WAS from space on the 2 meter band.

Congratulations Bill and thank you for all the time you give to talk on the radio!

[ANS thanks Kenneth, N5VHO for the above information]

/EX

SB SAT @ AMSAT \$ANS-022.02  
 AO-7 Enters Period of No Eclipse

AMSAT News Service Bulletin  
 022.02 From AMSAT HQ SILVER  
 SPRING, MD. January 22, 2006  
 To All RADIO AMATEURS  
 BID: \$ANS-022.02

AO-7 has entered into a period where it does not go into eclipse. The orbit is precessing and at this time of the year it is at (and over) the grey line

on the western edge. Contrary to previous years, AO-7's orbit has precessed to the point where it does not go into an eclipse.

This is the first time since it "awoke" that this has happened.

Emily Clarke, W0EEC has published some charts on the AO-7 log website that illustrate the progression over the past few years that include a chart of AO-7s eclipse durations and the latitude of when eclipse happens. You can see them at:

<http://www.emilyshouse.com/expertams/ao7/Eclipse.php>

Although not drawing any conclusions about mode of operation Emily states that this is going to be an interesting period, "Since AO-7 will operate in full sun without any power loss it will be interesting to see if and when it's mode changes".

Comments to her directly are invited at her email via AMSAT.ORG.

Emily also wants to thank all those who have been loyal contributors to the website and indicates that the increased logging on the AO-7 log is helping to enhance the ability to collect data.

"It has been very helpful to collect information about this in-trepid satellite, and hopefully the data will help enhance fu-

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## Editors Comments & News

(Continued from page 3)  
ture designs.

AO-7 is breaking the mould, and the more data we can collect the better we can improve our understanding of the space environment"

AO-7 was launched in 1974 and was a multi-national project between the US, Canada, Germany and Australia. It is the oldest operational amateur satellite.

[ANS thanks Emily, WOEEC for the above information]

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SB SAT @ AMSAT \$ANS-022.03  
AO-7 Control Electronics Still Functioning After 30+ Years in Space

AMSAT News Service Bulletin 022.03 From AMSAT HQ SILVER SPRING, MD. January 22, 2006 To All RADIO AMATEURS BID: \$ANS-022.03

With the AO-7 satellite experiencing sunlit conditions for the next several weeks radio amateurs have had an opportunity to determine additional functionality of this 30+ year old satellite. With its batteries long dead, AO-7 is only operational when its solar cells are adequately illuminated by sunlight.

John, LA2QAA noted, "After checking the log on 'The AO-7 Resource Page', I estimated the switchover between modes on AO-7 to be at approximately

08:30 UTC daily. However, on the 17th of January, I noticed the changeover happened at precisely 08:57 in the middle of a Mode-B QSO with UA9CP. I immediately switched to mode-A and carried on the QSO thereby confirming the time of the mode change on that particular day. This shows that the 24 hour timer is functioning as it was designed to do 31 years ago!"

One of the AO-7 pioneers, Jan W3GEY brings us up to speed on AO-7's internal timer, "If telemetry channel 2C seems to increment about every 15 minutes then the clock is still working."

Mike, N1JEZ, AO-7 Control Operator, suggests, "So what we really want to do is monitor the telemetry and see if Channel 2C is really incrementing and that the switch occurs near 95 in the cycle. One other thing I'd like to try is to command the satellite to reset the timer. This should be fun!"

Stay tuned as more is learned of the oldest operational amateur satellite in orbit.

For more information refer to The AO-7 Resource Page at:

<http://www.planetemily.com/ao7/>

[ANS thanks John, LA2QAA, Jan, W3GEY and Mike, N1JEZ for the above information]

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SB SAT @ AMSAT \$ANS-022.04  
Satellite DX is Still Happening

AMSAT News Service Bulletin 022.04 From AMSAT HQ SILVER SPRING, MD. January 22, 2006 To All RADIO AMATEURS BID: \$ANS-022.04

In this period prior to the launch of the next high earth orbit amateur radio satellites reports of satellite DX show that there are still exciting opportunities for long-range contacts. Timing and location are key factors.

AO-7, in a polar orbit approximately 900 miles above the earth has provided some DX. Ron, K8DID in Michigan reports that he worked Victor, YL2LW in Latvia on AO-7 in Mode B this past week. The land distance between these stations is 7316 km.

Drew, KO4MA in Florida has had a past AO-7 contact with Andre, PH7AT in the Netherlands. The land distance between these stations is 7511 km.

Andre, PH7AT says a prior AO-7 contact with Randy, WB4LHD in Tennessee is at a distance 7408 km.

[ANS thanks Emily, WOEEC for the above information]

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## Editors Comments & News

*(Continued from page 4)*

SB SAT @ AMSAT \$ANS-022.05

### **New Photos From the XI-V Cubesat Available**

AMSAT News Service Bulletin 022.05 From AMSAT HQ SILVER SPRING, MD. January 22, 2006

To All RADIO AMATEURS  
 BID: \$ANS-022.05

Mineo, JE9PEL says new photos from space from the camera aboard the XI-V cubesat can viewed on-line at:

<http://www.ne.jp/asahi/hamradio/je9pel/xivpict2.htm>

These photos were taken when the satellite was over Canada, 64.5053N and 99.6834W. You can see the sunrise near the earth.

[ANS thanks Mineo, JE9PEL for the above information]

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SB SAT @ AMSAT \$ANS-022.06

### **AMSAT Journal Articles Needed - Deadline Nears**

AMSAT News Service Bulletin 022.06 From AMSAT HQ SILVER SPRING, MD. January 22, 2006

To All RADIO AMATEURS  
 BID: \$ANS-022.06

Ed, WA4SWJ, Editor of The AMSAT Journal reminds members that the deadline for the next edition is drawing near.

Ed says, "Don't forget I need your Journal articles soon. I've received a couple so far but can always use more. Time is running out. I'd like to have them by this coming Saturday if at all possible. Of course I'll take them late but that doesn't help me get it to the printer on time. Thanks for your great support!"

[ANS thanks Ed, WA4SWJ for the above information]

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### **SB SAT @ AMSAT \$ANS-022.07 Get Ready For SuitSat**

AMSAT News Service Bulletin 022.07 From AMSAT HQ SILVER SPRING, MD. January 22, 2006  
 To All RADIO AMATEURS  
 BID: \$ANS-022.07

Miles, WF1F sends the following International Space Station ARISS SuitSat Project Status Report.

ARRISS to activate a new hand launched educational satellite project from the International Space station. The new educational experiment is called SuitSat. The SuitSat project is on-board the International Space Station and is being prepared for activation very soon. The SuitSat project has a tentative activation date of February 3, 2006. The SuitSat activation will take place during the ISS crew space walk. SuitSat will be a hand launched by the ISS crew during their early February SpaceWalk.

Since we have determined that the batteries in SuitSat may last only a few days, it is suggested that radio amateurs prepare now to receive the first transmissions so as not to miss out on this Historical event!

The current expected life of the SuitSat project is approximately 2 to 6 days. If you delay in setting up your station you may miss out on this educational experiment.

### **What is SuitSat:**

In short, the crew will toss an Old spacesuit out the airlock and let it fly away as its own satellite. The Space Station crew have attached an Amateur Radio beacon transmitter to the spacesuit. The SuitSat project will broadcast telemetry and voice messages to earth for as long as the batteries last. There are no solar cells on this satellite.

Anyone with a simple FM receiver or VHF police scanner should be able to hear the signals from SuitSat on 145.99 MHz as it orbits around the earth 15 times a day.

### **Voice Telemetry:**

The SuitSat project will be transmitting on 145.990 MHz FM and will consist of Voice Telemetry, giving Mission Time, Suit Temperature and Battery Voltage, Voice Greet-

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## Editors Comments & News

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ing messages in multiple languages, and an SSTV image using Robot 36 format. This entire transmission cycle will repeat every 9 minutes until the batteries discharge.

SuitSat Transmitter:

The SuitSat transmitter is a Kenwood TH-K2, a small hand held radio, which will transmit a 1 watt FM signal from SuitSat on 145.990 MHz FM Downlink only. There is no uplink for this satellite.

The ARISS team is also planning on using the Kenwood D700 transceiver aboard the ISS to rebroadcast the SuitSat signal on 437.800 MHz FM. This will allow you to hear SuitSat while ISS is in range of your station.

For more specific details on the SuitSat project, please review the AMSAT and related links below.

AMSAT SuitSat information:

<http://www.amsat.org/amsat-new/articles/SuitSat/>

ARISS SuitSat Details:

<http://www.amsat.org/amsat-new/articles/BauerSuitsat/index.php>

ARISS video on SuitSat September 2005 <mms://media.wmfd.com/amsat/SuitSat.wmv>

[ANS thanks Miles, WF1F for the above information] /EX

SB SAT @ AMSAT \$ANS-022.08  
**NASA Prepares For February 3 Spacewalk**

AMSAT News Service Bulletin 022.08 From AMSAT HQ SILVER SPRING, MD. January 22, 2006 To All RADIO AMATEURS BID: \$ANS-022.08

NASA is hosting a preview session about the next spacewalk by the International Space Station Expedition 12 crew at 2 p. m. EST, Friday, January 27 from NASA's Johnson Space Center, Houston. The event airs live on NASA TV with questions from media at participating agency locations.

The spacewalk by station Commander Bill McArthur and Flight Engineer Valery Tokarev is Feb. 3. It airs live on NASA TV with coverage starting at 4:30 p. m. EST. The six-hour spacewalk starts at 5:20 p.m. EST. (SuitSat is likely to be released during this spacewalk.)

For digital downlink information and access to NASA TV's Public Channel on the Web in RealPlayer, RealAudio, or Windows Media Player, visit:

<http://www.nasa.gov/ntv>

[ANS thanks NASA for the above information]

SB SAT @ AMSAT \$ANS-022.09  
**OSCARLocator Photo Gallery Invites Contributions**

AMSAT News Service Bulletin 022.09 From AMSAT HQ SILVER SPRING, MD. January 22, 2006 To All RADIO AMATEURS BID: \$ANS-022.09

Emily, WOEEC has set up a temporary photo gallery for people to upload photos of their OSCARLocators and other early satellite tracking systems.

The gallery is located at:

<http://www.emilyshouse.com/gallery/OSCARLocators>

A few tips and rules:

- 1) To upload photos you must login (not required to view the gallery). The login is OSCAR (all upper case) and the password is seven (all lower case).
- 2) Before uploading photos it's a good idea to resize them to 800 x 600. This will make sure that the upload time (2min) isn't exceeded.

- 3) After uploading, edit the caption. Please include your name and description.

New photos are added to the end of the gallery so you might have to page back to find your upload.

This is self-policing, so if you find any uploads that are inappropriate please let me know

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## Editors Comments & News

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via email (w0eec@amsat.org)  
so I can remedy the situation.

/EX

In addition to regular membership, AMSAT offers membership in the President's Club. Members of the President's Club, as sustaining donors to AMSAT Project Funds, will be eligible to receive additional benefits.

Application for.m.s. are available from the AMSAT Office.

73,

This week's ANS Editor,  
JoAnne Maenpaa, WB9JEJ  
WB9JEJ at amsat dot org

From: "Mike"

<nomtrxspam@comcast.net

**Subject: Help finding suitable toroid core.**

Date: 31 January 2006 14:02

I'm wanting to build this active antenna, but can't find the core to wind the output coupling transformer.

<http://www.elecdesign.com/Articles/Index.cfm?AD1&ArticleID6244>

This is the authors description of the transformer.

"The toroidal transformer's primary is 36 turns of No.24 enamelled wire wound on a core from a Sony 1-421-302 line choke. Its secondary is nine turns of No.24 telephone wire."

And this is his description of the performance of the amplifier.

The frequency response at low gain is very flat ( $\pm 0.2$  dB) from 200 kHz to 35 MHz, and is only 0.4 dB down at 60 MHz. At standard high gain, the response is very flat to 25 MHz and -3 dB at 50 MHz. The maximum output level in all gain configurations is over 500 mV r.m.s. into a 75ohm load.

Does anyone have any idea what type of core that would work as well?

Thanks  
Mike

Mike wrote:

Well, It appears that I'm not the only one confused about core types.

I do have some FT50-43 cores, so I think I'll try that first and see what happens.

Thanks to all for the suggestions.

Those are type 43 ferrite (Fair-Rite designation), the most common kind. Your cores will be just fine for this and similar applications.

You're definitely not the only one confused about core types. Very few people seem to understand what the requirements are for cores used in various applications and therefore what cores are suitable for

a given application.

Roy Lewallen, W7EL

Mike wrote:

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This is the authors description of the transformer.

"The toroidal transformer's primary is 36 turns of No.24 enamelled wire wound on a core from a Sony 1-421-302 line choke. Its secondary is nine turns of No.24 telephone wire."

With that turns ratio, I would use a smaller wire for the primary, probably No. 30 silver plated Kynar insulated wire wrap wire.

And this is his description of the performance of the amplifier.

The frequency response at low gain is very flat ( $\pm 0.2$  dB) from 200 kHz to 35 MHz, and is only 0.4 dB down at 60 MHz. At standard high gain, the response is very flat to 25 MHz and -3 dB at 50 MHz. The maximum output level in all gain configurations is over 500 mV r.m.s. into a 75 ohm load.

Does anyone have any idea  
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## Editors Comments & News

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what type of core that would work as well?

I would try a core ordinarily used as a medium frequency noise suppression core, with enough window area to allow non overlapped turns around the hole. Perhaps a Steward 28B0870-000, 22mm OD, 13.7mm ID, 6.4mm thick. This is made of 850u material, flat permeability out to about 2 MHz, and then rolling off with increasing loss as frequency rises.

[http://www.steward.com/web\\_part\\_no.asp?](http://www.steward.com/web_part_no.asp?)

There is also one twice as thick, if you want to lower the turns count a bit. 28B0870-100.

But if the goal is to have optimum response at the low frequency end, and to absorb the higher frequency end, a core made of the 5000u material would be even better. Type 35 (Steward's low frequency bead material) has flat permeability to only 300kHz. A usable example might be LFB220140-000, 22mm OD, 14mm ID, 12.7mm thick.

[http://www.steward.com/web\\_part\\_no.asp?line3DEMC/EMI Board Level and Cable Core Products&family3DFerrite Cores for Cables - Wiring Harnesses - Connectors&product3DLow Frequency %0FerriteCores&progroup3D1. Round and Cylindrical Cores&part3DLFB220140-000](http://www.steward.com/web_part_no.asp?line3DEMC/EMIBoardLevelandCableCoreProducts&family3DFerriteCoresforCables-WiringHarnesses-Connectors&product3DLowFrequency%0FerriteCores&progroup3D1.RoundandCylindricalCores&part3DLFB220140-000)

This one could probably work with fewer turns, but the same ratio.

These cores go for less than a dollar each from Digikey.

The material curves are in the toroid manual:

<http://www.steward.com/pdfs/ToroidCatalog-rev11-C.pdf>

Mike wrote:

I'm wanting to build this active antenna, but can't find the core to wind the output coupling transformer.

<http://www.elecdesign.com/Articles/Index.cfm?AD3D1&ArticleID3D6244>

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And this is his description of the performance of the amplifier.

The frequency response at low gain is very flat (B10.2 dB) from 200 kHz to 35 MHz, and is only 0.4 dB down at 60 MHz. At standard high gain, the response is very flat to 25 MHz and -3 dB at 50 MHz. The maximum output level in all gain configurations is over 500 mV r.m.s. into a 75ohm load.

Does anyone have any idea what type of core that would work as well?

It sounds like a conventional broadband transformer. The ARRL Handbook has some guidelines on how to design the things, it's quite simple, if you select a suitable ferrite core.

On Tue, 31 Jan 2006 12:44:28 -0800, Roy Lewallen <[w7el@eznec.com](mailto:w7el@eznec.com)> wrote:  
Highland Ham wrote:

Assuming the freq range intended is 1 - 30 MHz an Iron powder core made of Mix No 2 material (permeability 10) , colour code : RED , would be suitable.

Size T50 has outer diameter 0.5 inch and inner diameter 0.30 inch hence T50-2

Size T68 has outer diameter 0.69 inch and inner diameter 0.37 inch hence T68-2

Size T80 has outer diameter 0.795 inch and inner diameter 0.495 inch hence T80-2

If the frequency range is to be from 0.02 - 30 MHz the above type of Iron core can be combined with a same size core of Mix no 3 material ,colour code : GREY eg the 2 types of ring glued together and wound together.

There is also a ferrite type core  
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## Editors Comments & News

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which covers the frequency range 0.02 -30MHz made from Mix No 61 material ( permeability 125) ;colour code : GREY ; designations FT50-61 ; FT68-61 ; FT80-61.

Frank GMOCSZ / KN6WH

I disagree with this advice. It would be appropriate for a narrowband, tuned transformer, but that's not what the schematic indicates. It's a broadband transformer which has different requirements for a core. What you need is high winding impedance, not the high Q and relatively low impedance provided by the cores Frank is recommending. An appropriate core is a "low frequency" ferrite such as Fair-Rite (and Amidon) type 70-series (72, 73, 77, etc), or type 43 which is very widely used for EMI filtering applications.

You can easily identify "low frequency" ferrites because they're the only ones which give you any continuity (although the R might be high) when probed at two points with an ohmmeter. Type 43 can't be identified this way -- they'll show an open circuit. As for core size, the number of turns specified on the diagram will provide enough impedance with any core of size half inch diameter or so, or larger, and with normal geometry. You could probably get by with a core smaller than that if necessary.

High frequency ferrites (which aren't suitable) like 61 are relatively rare, so if you have any ferrite cores in your junk box, they're likely to be ok. Powdered iron cores won't give you enough winding impedance.

Roy Lewallen, W7EL

Well, It appears that I'm not the only one confused about core types. I do have some FT50-43 cores, so I think I'll try that first and see what happens.

Thanks to all for the suggestions.

Mike

Highland Ham wrote:

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There is also a ferrite type core

which covers the frequency range 0.02 -30MHz made from Mix No 61 material ( permeability 125) ;colour code : GREY ; designations FT50-61 ; FT68-61 ; FT80-61.

Frank GMOCSZ / KN6WH

The frequency response at low gain is very flat ( $\pm 0.2$  dB) from 200 kHz to 35 MHz, and is only 0.4 dB down at 60 MHz. At standard high gain, the response is very flat to 25 MHz and -3 dB at 50 MHz. The maximum output level in all gain configurations is over 500 mV r.m.s. into a 75 Ohm load.

Does anyone have any idea what type of core that would work as well?

JB 2006

## Impedance of a random length antenna

(Continued from page 1)

zero, its impedance must be infinite. This is plotted on the Smith chart as point 0. The 34-ohms radiation resistance of a quarter wavelength, when normalized to 600 ohms, is 0.05666, which was rounded off to 0.057 and plotted on the real axis of the Smith chart as point 1. Points between zero and a quarter wavelength lie on a spiral connecting these two points, which, for simplicity, was approximated by a semicircle centred on the real axis and passing through those two points lying in the left-hand, or capacitive, side of the chart.

The VSWR of point 1 is the inverse of 0.05666, or 17.65. From this number, the reflection coefficient, Rho, is computed as 0.893. (see equation 1 below)

The wire length is now increased to two-quarter wavelengths. The reflection coefficient is now the second power of 0.893 or 0.797, corresponding to a VSWR of 8.85. This is plotted as point 2, and is connected to point 1 by a semicircle, centred on the real axis as before, but this time lying in the right-hand half of the chart because it is inductive.

In a like manner, successive values for Rho are computed, as the length of wire is increased by successive quarter wavelength additions, and connected by semicircles, as before.

Although this method is only an approximation, it does afford considerable insight into the characteristics of a long- or random-length wire antenna. For example, suppose you're considering erecting a full-wave antenna fed a quarter wavelength from one end. The quarter-wave end section will have a radiation resistance of about 34 ohms, while the three-quarter-wave end section will present a radiation resistance of about 100 ohms. Your chances of balancing your feed system to prevent feed line radiation have just gone out the window! It will still radiate effectively, but the opportunity for complications is enhanced.

$$\text{Rho} = \text{VSWR} - 1 / \text{VSWR} + 1 \quad (1)$$

$$\text{Zo} = 138 \log (4 h / d)$$

Where h = height above ground  
d = diameter of wire

Using a chart of this type is simple enough. You might become confused with the markings of wavelength on the circumference of the Smith chart if you're not careful. Suppose, for example that you want to make an educated guess about this wire at a length of, say 1.2 wavelengths. This point would lie between four and five quarter wavelengths and would be located by a radius from the centre of the chart to where the inner scale reads 0.05 wavelength. Unfortunately, our starting point (0) is marked 0.25 wavelength, rather than 0, and you must be aware of the possi-

ble foul-up. A straight edge marking out this radius intersects the spiral at about 0.296 - j0.296. Multiplying these values by 600 ohms gives 177.6 - j177.6 as our estimate of what we would have to match to load such an antenna. All of this may seem merely academic, but it should put us in the ballpark when it comes to designing a matching network.

**Henry S. Keen, W5TRS**

From: September 1980 Ham Radio

# Impedance of a random length antenna

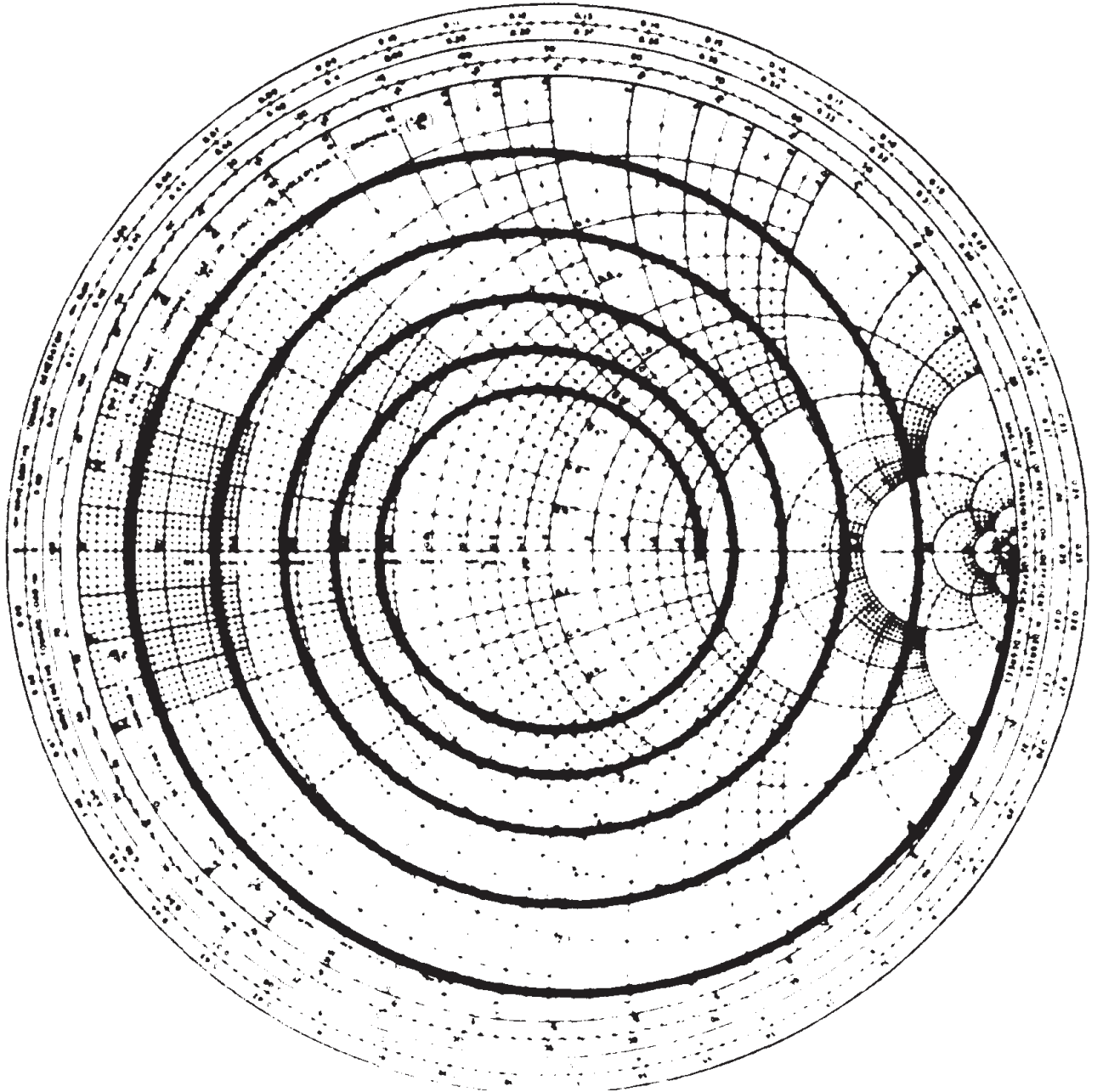


Figure 3

**The West Rand Amateur Radio Club**  
26.14122 South - 27.91870 East

P.O. Box 562  
Roodepoort  
1725

Phone: +27 11 475 0566

Email: [zs6wrmail@mweb.co.za](mailto:zs6wrmail@mweb.co.za)  
[NEW EMAIL ADDRESS]

**Bulletins** (Sundays at ...)  
11h15 Start call in of stations  
11h30 Main bulletin start

**Frequencies**  
439.000MHz 7.6MHz split  
(West Rand Repeater)  
145,625 MHz (West Rand Repeater)  
10,135 MHz (HF Relay)

## Radio Amateurs do it with more frequency!

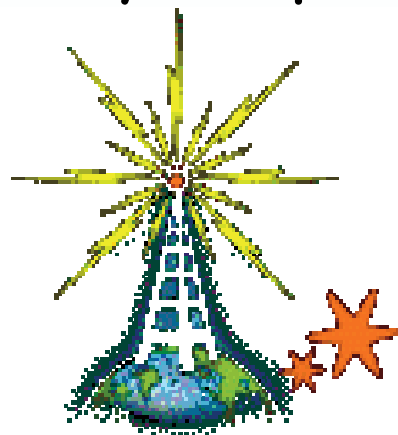
Chairman/Treasurer	Dave	ZR6AOC	475 0566 (H)	<a href="mailto:zr6aoc@mweb.co.za">zr6aoc@mweb.co.za</a>
Vice Chairman	Keith	ZS6AGF	675 1604 (H)	<a href="mailto:Mwbronie@iafrica.com">Mwbronie@iafrica.com</a>
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Member	Craig	ZR6CRW	795 1550 (H)	<a href="mailto:craig.woods@absamail.co.za">craig.woods@absamail.co.za</a>

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Please send plain text with no formatting to the email address below.

In July 2003, we re-published an Anode Compendium on CD. It has the issues from July 2000 until June 2005. This included the new Adobe reader. It has been updated, check with the chairman for details.



**We need your input! Email us articles, comments and suggestions please.**  
[John\\_brock@telkomsa.net](mailto:John_brock@telkomsa.net)