Ballarat Amateur Radio Group Inc. #69537

August Monthly Newsletter

Box 1261, Mail Centre, Ballarat, Victoria, 3354, Australia

Next Meeting

29th August 2014 @ 19:30 hours
(7.30pm)

Volume No: 37 **Issue 8** **August 2014**

Index

Monthly Calender

Construction Night: 1st September 2014 @ 19:30 hours
Committee Meeting: 17th September 2014 @ 19:30 hours
General Meeting: 26th September 2014 @ 19:30 hours
VHF Net: Every Tuesday night at 20:00 hours
HF Net: Every Thursday night at 20:00 hours

Special Events

Hamvention: Sunday 19th October 2014 @ 10:00 hours

General News

ACMA Licence Fees

ACMA have just announced the Amateur Licence Fee has risen to $74 per annum and if you are making some variation to your licence, ie taking a new callsign on a whim or doing a licence callsign upgrade and wish to "trade in" the old callsign then that cost is still $49. Whether you wish to do this may depend on how much time is left on the present licence before need to renew. I have seen many just let the old callsign run out and just pay up [$74] for the new licence. Bit hard to operate two callsigns at the same time though.!

QST Technical Article—April 2014

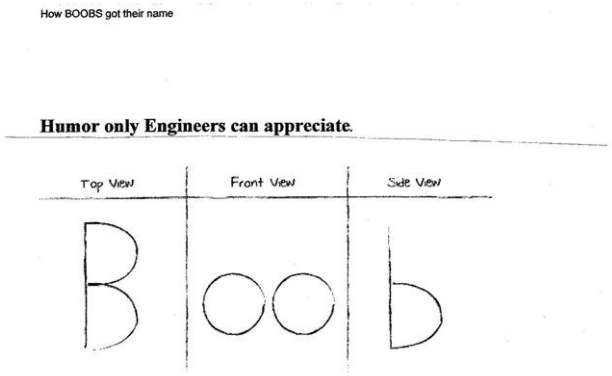
A new coax cable has been developed whereby we eliminate SWR.
Its called Mono directional Coax or MONAX for short. It has been discovered and developed as the bi-product of other technical researches.
While other coax show losses this coax termed RG-58M shows gain..
Discovered by Drs Hiram Fred Minimum and Guglielmo Macaroni where they temporarily substituted a jumper coax with ferrite beads for the Dielectric. The resulting effect was a surprise.
The ferrite beads blocked all the reflected power on the line thus allowing RF to flow only one way on the line and giving a perfect 1:1 SWR reading.

The however have located a minor problem as the MONAX only works on the transmitter side and all received signals were blocked.. This effect is overcome however by placing a second coax paralla with the test unit BUT directionally reversed The system then is like normal coax except for its perfect 1:1 SWR reading..

Dr Macaroni goes onto explain further in mathematical form with operator "j" analysis how this works out.
Further information and contact details can be found in the April edition of QST magazine on page 45 with an arrl.net web site.

73 Craig VK3KG

Jokes and Bits and Pieces



There were three Indian squaws. One slept on a deer skin, one slept on an buffalo skin, and the third slept on a hippopotamus skin. All three became pregnant. The first two each had a baby boy. The one who slept on the hippopotamus skin had twin boys. This just goes to prove that... the squaw of the hippopotamus is equal to the sons of the squaws on the other two hides. (Some may need help with this one). ----------

Prime Focus Dish for Microwave

So you need a prime focus dish for microwaves? Why don't you build one! Here is an article in Solar Energy, Volume 27, Number 6, 1981 published by Pergamon Press on a method of forming parabolic dishes from sheet metal up to about 1.2 meters in diameter. Originally the article is about concentrating solar energy but the same principles apply for microwaves. The article can be found at http://www.scribd.com/doc/24219989/Elsevier-Parabolic-Dish-Solar-Concentrator so it is freely available. See next 3 pages. This item was submitted by Dave VK3KQT, hope you find it interesting.

Solar Energy Vol. 27, No. 6, pp. 535–537, 1981
Printed in Great Britain.

0038-092X/81/060535-03$02.00/0

PARABOLIC REFLECTORS FORMED BY INFLATION

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Department of Electrical Engineering, Stanford University, Stanford, CA 94305, U.S.A.

(*Received* 2 *February* 1981; *accepted* 20 *May* 1981)

Abstract—Paraboloids of revolution over 1 meter in diameter have been formed from flat sheets by inflation without the use of a mold or template. Quality is adequate for microwave use and for most high-concentration applications for focusing solar energy. The process is suitable for making reflectors in ones or twos to special focal lengths and diameters, but could also be automated for production runs.

INTRODUCTION

Parabolic reflectors a few meters in diameter are required for a number of purposes such as microwave relay antennas, solar concentrators, searchlight mirrors and astronomical telescopes. The cost is extremely high for telescope mirrors where surface accuracy of a fraction of an optical wavelength is required, but even where surface tolerance may be relaxed to 1 mm or so, as with centimeter-wave antennas, the cost is not low. For example, the cost will generally be orders of magnitude higher than the material cost. The reason for this lies with the mode of manufacture. Several techniques depend upon the construction of a steel mold or dies, as with vacuum forming and pressing (sheet metal), a graphite mold (glass slumping) or a mold made from plaster or other soft material (fiberglass). The initial cost of the mold is substantial and has to be spread over the number of reflectors manufactured. An unattractive feature of a valuable mold is that the focal length is frozen so that no flexibility is gained that might allow the mold to be adapted to other focal lengths later. Templates are cheaper than molds and have been used for spinning microwave antennas from sheet metal.

Composite paraboloids up to 5 m in diameter have been built from identical spherical segments in cases where one or two optical reflectors have been needed, and even machining from solid metal has been the economical way to go in some cases. Even so, when only a few reflectors of special dimensions are needed, there has been no really economical process available. In some fields, such as solar energy, economic considerations are paramount.

We have therefore looked into a moldless clamp-and-inflate fabrication method for sheet metal reflectors. First we describe the method, then we study the design parameters and report on tests that have been carried out.

BASIC METHOD

In Fig. 1, we see two pieces of sheet metal M clamped between two circular steel rings R. Fluid under pressure is introduced between the plates through a valve V, forcing the sheets apart. The stress in the sheet metal rises beyond the elastic limit and plastic flow sets in as the assembly inflates like a balloon. When the desired amount of dishing is reached, the valve is closed, and the pressure is released. This procedure is more direct than inflation of collapsible molds [1], inflation of membranes to which solidifiable substances can be applied [2], or pumping up of a membrane that shapes epoxy resin to which hardener may be added [3].

DESIGN PARAMETERS

At first sight it might seem that rather high pressures might be needed to plastically deform a substantial volume of sheet metal, but in fact readily available and relatively safe tire-inflation pressures are found to suffice.

Let D = reflector diameter; F = focal length; β = rim slope angle = arctan $(4F/D)$; α = semiangle subtended at focus = arcsin $\{F/D\ [0.125 + 2(F/D)^2]\}$; and δ = depth of parabola = $F - D/(2\tan\alpha)$. The foregoing quantities specify the parabolic geometry (Fig. 2). In the example worked out we consider a 1.12 m diameter reflector with a 1.12 m focal length. For this case, $\beta = 76°$, $\alpha = 28°$ and $\delta = 7$ cm.

Further quantities are as follows: t = sheet metal thickness; p = fluid pressure; f_y = yield stress of sheet metal; L = axial load; and T_1 = tension in sheet metal per unit length at rim. The pressure p acting on a circular area of diameter D produces an axial load L given by

$$L = (\pi/4)D^2p. \tag{1}$$

In equilibrium this must also equal the axial component $T_1 \sin\beta$ acting on the perimeter πD, so

$$\pi D T_1 \cos\beta = L, \tag{2}$$

and, if the yield stress is just reached,

$$f_y = T_1/t. \tag{3}$$

Combining these equations we find that the pressure required to take the metal into plastic deformation is

$$p = 4f_y(t/D)\cos\beta. \tag{4}$$

If we use 1100-O aluminum, whose yield stress is 35 MPa

†ISES member.

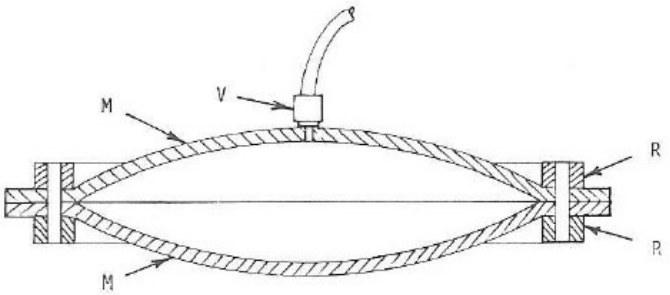

Fig. 1. Fluid admitted under pressure through valve V inflates sheet metal M held between clamping rings R.

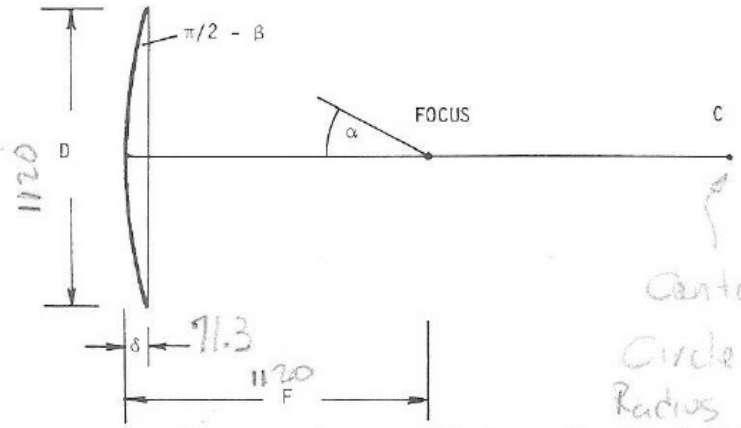

Fig. 2. Geometry of a paraboloid. The center of curvature of the sphere touching the paraboloid at its vertex is at C.

and a thickness of 3 mm, we find that the pressure p needed is 100 kPa (15 psi). On the other hand if we use 1.5 mm cold-rolled steel sheet with a yield stress of 262 MPa, then we need a pressure of 360 kPa (52 psi). On the basis of these modest calculated pressures we were encouraged to make experimental trials.

FABRICATION TESTS

Two tests will be described in detail. The first used a pair of 0.9 m (35-in.) diameter steel clamping rings made of 12.7 mm square bar bent into rings by passing through rollers and welding. Material was 6061-0 aluminum 2 mm (0.080 in.) thick. The rings were held together with 44 high strength 4.83 mm (10–32) steel screws. The two sheets were each inflated to a height of 5 cm. Overpressure is convenient to speed up the inflation forming, and gasket cement was found necessary in order to counter leakage. Two satisfactory dishes resulted which were very stiff and could be walked on without damage. Thus the possibility of fabricating reflectors with such modest tooling as a pair of clamp rings was confirmed.

In order to investigate the method itself in more detail a more elaborate fixture was constructed in the form of a 1.2 m (48-in.) diameter circular table 22.4 mm thick with 36 bolt holes for 19 mm (3/4 in.) bolts and a valve. A clamping ring 5 cm wide by 1.9 cm thick and 1.2 m outside diameter was provided. This new installation bypasses effects due to flexibility of the clamping system itself and to the insertion of the valve in one sheet. Several satisfactory 1.12 m (44-in.) reflectors were formed with a height of 7.5 cm from 6061-O aluminum 2 mm thick and 1100-O aluminum 3 mm thick.

SHAPE MEASUREMENTS

Very smooth shapes were produced which in the radial cross sections examined showed root-mean-square departures of about 0.5 mm from the paraboloid of best fit. At a wavelength of 30 mm, rms errors of about 3 mm are tolerable, so for microwave antenna applications the shape is essentially perfect. Some astigmatism resulted from the fact that the yield stress was higher in the direction in which the aluminum sheet was rolled in the course of manufacture, and with hardened alloys this effect was even more noticeable. A paraboloid is soft against deflection of the rim into an ellipse and for this reason needs a stiff mounting ring at or near the rim. The astigmatism is easily taken out as the reflector is fixed to its mount.

There is no reason to think that plastic deformation under fixed pressure will lead to a paraboloidal shape, in fact a spherical shape would be the equilibrium axisymmetric surface for homogeneous isotropic material in the absence of flexural rigidity. However, there is not much difference between a sphere and a paraboloid in our shape range as may be verified by comparing the parabola $y^2 = 4.48x$ with the circle $(x - 2.24)^2 + y^2 = (2.24)^2$. For example, at the rim $y = 0.56$ m, we have $x = 7.00$ cm for the parabola and $x = 7.12$ cm for

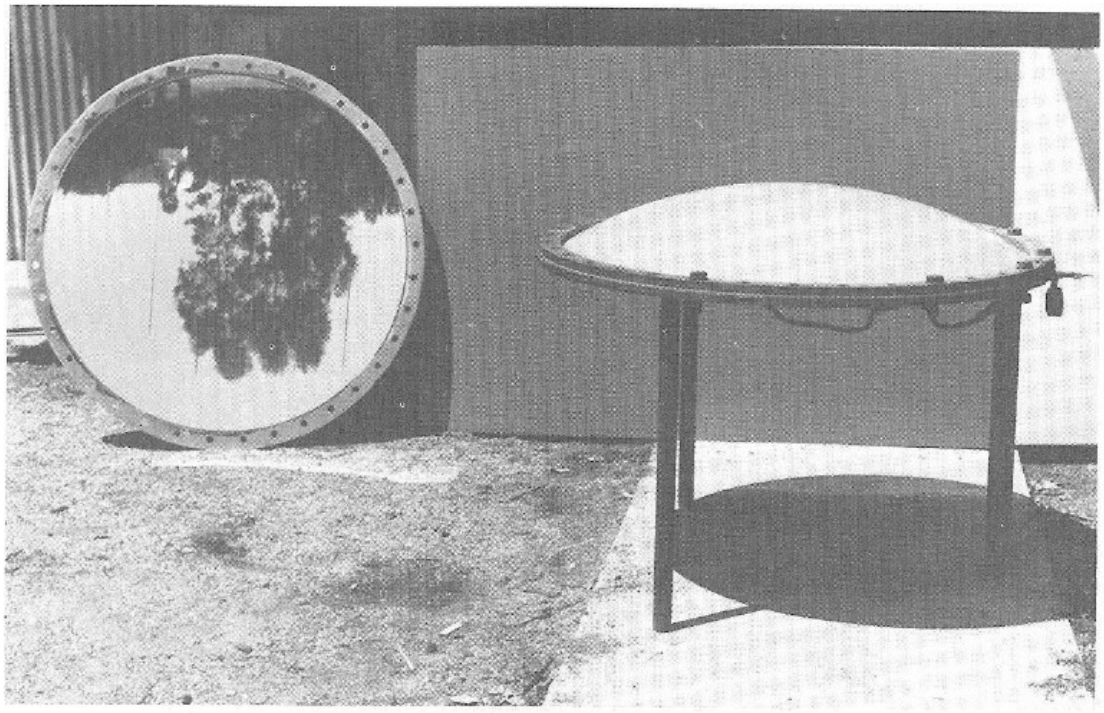

Fig. 3. A finished reflector (left) and a reflector about to be released from its clamping ring (right).

the circle, a discrepancy of only 1.12 mm. The parabola of *best fit* to the given circle would agree even more closely with an average departure of only about 0.3 mm. Although we have made our surface shape measurements to within 0.3 mm, it is clearly a matter of some refinement to ascertain the exact shape achieved by clamp-inflate forming.

OPTICAL PERFORMANCE

The 1.12 m reflector of 1100-O aluminum 3 mm thick was covered with Scotchcal chrome film 0.13 mm (0.005 in.) thick. The very smooth surface achieved is apparent in Fig. 3. Exposure to incident sunlight revealed a hot focal area 1 cm in diameter and essentially all light was received on a 2 cm circle. Ideal theoretical area concentration† for a paraboloid with $F/D = 0.9$ would be 9000.

CONCLUSION

Clamp-inflate forming of parabolic reflectors has been demonstrated as a feasible and economical method of fabrication. The quality achieved is immediately adequate for microwave antennas and some solar energy applications. The highest possible concentrations as may be required for thermophotovoltaic conversion of sunlight to electricity [5–9] may also be reachable. More tests under controlled conditions with accurate surface shape measurements will be necessary to establish the full potentiality for high precision. For small numbers, ring clamps are suggested, but for production runs of a certain length the convenience of a table and one ring would pay. Fittings such as vice grips could be used instead of screws to speed things up. For long production runs an automatic ring clamping press and guillotine can be imagined together with automatic inflation and a height measuring microswitch to halt inflation.

Acknowledgements—Mechanical construction of the tooling described was carried out by Mr. Carl Crisp. Funds were provided by Professor John G. Linvill, Chairman of the Electrical Engineering Department, and by Professor William C. Reynolds, Chairman of the Mechanical Engineering Department, Stanford University.

REFERENCES

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2. U.S. Patent 3,337,660.
3. U.S. Patent 3,251,908.
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9. R. M. Swanson, A proposed thermophotovoltaic solar energy conversion system, *Proc. IEEE* **67**, 446 (1979).

†Area concentration is defined as the ratio of the concentrator aperture area to the receiver area. At high concentration, area concentration may differ substantially from the commonly quoted "flux concentration", the ratio of the flux density at a point in the receiver plane to the flux density in the aperture plane [4].

MICROWAVE CORNER

There is a small group of members and others in the Ballarat area that have been building and using some of the amateur microwave bands for sometime and in recent times there has been a surge in making transverters for both 3.4G, 5.7G and 10G bands. Kits are available from Graham VK3XDK so have a look at his website for details.

Craig VK3KG and John VK3AIG have almost completed their 3.4G setups and will be testing in the next few weeks. This will make 3 members operational and I'm told that another member is showing some interest in joining in the fun. Unfortunately Nic VK3COW is unable to continue his 3.4G endeavours due to other commitments however I understand another member is keen to take Nic's project over so we look forward to that happening soon.

These challenges are not for everyone but for a little outlay you get great satisfaction when having called another station you hear the reply you eagerly want to hear.

Antenna's are relatively easy to obtain mainly from the scrap metal dealers having ex pay tv offset dishes for a few dollars. There are plenty of designs on the internet to make you own dish feeds from tin cans or copper pipe so it's not difficult.

With the warmer weather on the way I'm sure there will be plenty of activity from nearby hilltops for test days and the Spring and Summer VHF/UHF Field Day events.

If you are interested in this aspect of out great hobby then come along to the construction nights or get in contact with any of the group listed below.

Known microwave club members are listed below for interest. There maybe others missed so if you have the capability please let us know.

VK3WN – 1296, 2.4G 10G
VK3BNC – 1296, hopefully 2.4G
VK3AIG – 2.4G, 3.4G and 10G
VK3KG – 3.4G and 1296/2.4 progressing
VK3AXH – 1296, 2.4G, 3.4G 5.7G and 10G

There is a microwave test day in November at the EMDRC for 3.4G to check out the performance of their equipment prior to the coming summer season.

I have attended a couple of these events for 2.4G and 10G and it's well worth the visit to firstly check the performance of your own equipment and secondly see what and how others are doing it.

Another consideration when using these bands is frequency accuracy. There will be a number of members looking into GPS locking the frequency of both their I.F. and transverters so that when you call CQ or are looking for any other stations they are easy to find.

73, Ian – VK3AXH

QST Review June 2014

By Craig VK3KG

P9 Editorial Spectrum pollution, Grow lights and line noise. FCC action

P13 ARRL Print publications for members.

P24 Letters:

P30 Portable Two element Quad antenna for 6M uses PVC tubing Vertical or Horizontal polarisation.

P33 A Vacuum Variable Antenna Coupler. From ZL2AL.

P36 Low profile Two Element 40 Meter wire Beam.

P38 Windows Software for Improved Transmission Line calculations.

P41 The J Factor. Complex Impedance isn't complicated.

P43 Product Review: Zeus ZS1 SDR Transceiver for MF/HF.

P48 Review: Portable Oscilliscope by Oscium. B

P51 SteppIR Portable HF and VHF Monopole.

P53 The Doctor: Looks at a Verticals height or Electrical length for a story. Shutdowns with high SWR

P55 Hands on Radio. Ex 137. Choosing a Feed line.

P57 Eclectic Technology looks at Cube Sats and Field days

P58 Hints & Kinks. Ant pulley from CD's. Bow & Arrow tips, Remote RFI, Wire ant winder and using a laser to pinpoint faulty component on a pcb.

P63 Polar Expedition to Arctic 1923.

P66 High performance Antenna Systems for the Motivated Amateur.

P70 Field Days. Keeping safe on the site. Tower safety and Fatigue is a large factor.

P72 FCC Policies and Processes. Grow Light Ballast interference violations.

P75 Public Service: Look at Emergencies and Disasters.

P86 How's DX.? FT5ZM Amsterdam Is [Indian Ocean] Expedition.

P88 World above 50 Mhz. Lightning strikes again on 6 M.

P93 UK Amateurs Losing access to Part of 2.3 GHz and 3.4GHz Bands.

P95 Vintage Radio. The Hammarland HQ100A Receiver. Still a classic after five decades.

P99 QST Index, 75, 50 and 25 years ago.

P156 Index of Advertisers this month.

QST Review
July 2014

By
Craig VK3KG

SILICON CHIP MAGAZINE for August 2014.

FEATURES:

P14 Article about earth connections in your houses electrical wiring.
Well worth reading .

P20 Do you wonder what all those different Audio file formats really mean?

P28 Did you realise that some Radio Microphones will be Illegal after 31 December.
Would you buy one if offered cheaply. Buyer beware. New frequency bands.

P88 REVIEW of a new Semiconductor Analyser. Atlas DCA75. Allows plotting of characteristic curves to a computer direct.

ROJECTS:

P32 That old chestnut arises again. Are valves better than transistors in an HiFi audio amplifier. Build this valve sound simulator and make own decision.

P42 Build this new 44pin Micromite microcontroller. It is more generous than the earlier 28pin unit described in the May-June edition.

P62 Do you need a electronic thermostat to control a fridge/freezer/heater. Here is the latest Tempmaster Mk3. Be aware its operating at 240V AC potential though. Experienced users only should tackle this one.

P76 Need a substitution RESISTOR or CAPACITOR box for servicing work or designing circuits.? This may be a worthy project.

SPECIAL COLUMNS:

P57 The servicemans log. Alsways find some interesting tales from "Mr Fixit man"

P84 Circuit Notebook. Designs sent in by the readers.
Temp control using Fridge thermometer. Simple 10.00V precision reference, an RS232 to TTL interface for the Micromite measure leakage current of a capacitor, telephone status indicator.

P92 Vintage radio Looks at radios from the past being refurbished. Some interesting history evolves from these articles.

DEPARTMENTS:

Includes letters from readers, mailbag, Product showcase and advertisements.

Good reading.

Craig
VK3KG

B.A.R.G Items For Loan

Antenna Analyser MFJ249 HF/VHF
Antenna Analyser MFJ269 HF-VHF-UHF
Antenna Analyser VHF. Autek
Antenna Gin Pole.
Grid Dip Oscillator.
Oscilloscope BWD 509.
Receiver Drake SSR-1
Receiver FRG-7.
Safety Belt.
Transceiver TS-530.
UHF Antenna Analyser

Notices from the Editor

The cut off date for articles to be submitted for the September newsletter, will be 22nd September 2014 by 12:00 hours. This will allow me time to produce the newsletter, and send hard copies to the members by 18:00 hours mail. Anything that is received after this time will be placed into the next newsletter unless it comes to me marked urgent then i will endeavour to put it into the current newsletter. Items can be sent to me by email on news_editor@barg.org.au or by post to the address on the front of the newsletter. Thanks All.

A little fun for everyone! Who noticed the mistake in last months Newsletter there is a block of chocolate at stake for the person who can email me with the answer.

Signed the newsletter editor.

Disclaimer: I have attempted to produce a fair and accurate newsletter from the information provided to me. If I have failed by error or omission, I apologise.
The newsletter editor.