AWA Newsletter

#78

July 2012

A Member of the SARL

Antique Wireless Association of Southern Africa

Inside this issue:

AWA Committee:

- President—Richard ZS6TF
- Technical Advisor—Rad ZS6RAD
- Secretary/PRO—Andy ZS6ADY
- Western Cape—John ZS1WJ

Reflections:

Another year has flown by for me, and as we headed out on our annual pilgrimage to distant shores, this year the Garden Route, I was once again quite happy to get my HF mobile up and running using my Icom 706 MkIIG.

This rig has never let me down when called on to perform in the mobile and works fantastically with ATU neatly tucked away in the boot and the separate head in the cabin of the car.

I have often looked at my KWM2-A and wondered how people managed to use it as a mobile rig. For the uninitiated, Collins specially designed a 12v power supply to run the KWM as a mobile rig.

Its predecessor, the KWM1, was also designed as a mobile rig, but Collins never thought anyone would want to work 40m mobile, so it only came out with 10,15 and 20m bands.

I am sure there were some others like Hallicrafters that came out in similar modes and voltages, but I am unaware of them.

My only difficulty in this whole issue is that one would need a Ford F250 truck, with a massive expanse under the dashboard, to house something like these 2 radios as a mobile installation.

I could not imagine hacking away a large portion of the centre console of my car to put a radio in there.

There is of course the option to leave the XYL at home and place the radio nicely in a home brew rack on the front passenger seat and wire it from there, but then I think that Yaesu and Icom had the XYLs in mind when they brought out the modern multi frequency, multi mode radios they have and to keep us guys from going through divorces, which cost a lot more than one of these radios today.

So as much as I would like to take my KWM2-A on holiday with me as a mobile rig, I do enjoy the advantages of having the XYL and the radio with me in the car.

I mean who else am I going to get to pull the long wire antenna up so that I can work out of the mobile when stationary ?

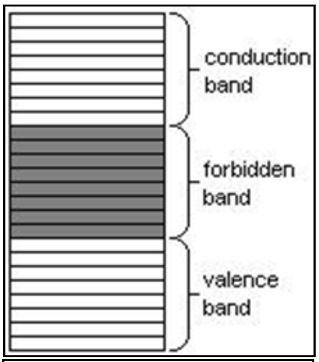
If my wife ever reads this, I'm in trouble.

Best 73

DE Andy ZS6ADY

WIKIPEDIA

Band theory simplified



Electron energy levels in an insulator

Quantum mechanics states that electrons in an atom cannot take on any arbitrary energy value. Rather, there are fixed energy levels which the electrons can occupy, and values in between these levels are impossible. When a large number of such allowed energy levels are spaced close together (in energy-space) i.e. have similar (minutely differing energies) then we can talk about these energy levels together as an "energy band". There can be many such energy bands in a material, depending on the atomic number (number of electrons) and their distribution (besides external factors like environment modifying the energy bands). Two such bands important in the discussion of conductivity of materials are: the **valence band** and the **conduction band** (the latter is generally above the former). Electrons in the conduction band may move freely throughout the material in the presence of an electrical field. In insulators and semiconductors, the atoms in the substance influence each other so that between the valence band and the conduction band there exists a forbidden band of energy levels, which the electrons cannot occupy. In order for a current to flow, a relatively large amount of energy must be furnished to an electron for it to leap across this forbidden gap and into the conduction band. Thus, even large voltages can yield relatively small currents.

CW Net:

At long last, I have got an electronic keyer coupled up to my KWM2-A again and am able to do CW.

It has taken me a while to get back to this stage again and now need to find the time to get back on to the bands playing some CW.

I still do not have the opportunity to join in the AWA CW net on a Saturday, but at least when I am able to be there, I will be able to get my teeth in to playing some CW.

I can see that I am probably going to have to start from scratch again and the mistakes are going to be plentiful, but knowing the CW operators as I do, they will all be quite forgiving and only too willing to have a good ole rag chew using the key.

Some may ask, but why an electronic keyer ?

Well my hands are not what they used to be and I am unable to use a straight key for any period of time without doing myself some serious injuries. It’s the frustration that causes me to go into a frenzy and I throw myself on the floor kicking and screaming.

It’s not really that bad, but I do have great difficulty using a straight key and much prefer the Iambic paddle through a keyer.

Even so, the frustration levels do rise quite a bit when I make mistakes, as I am prone to do. I love doing CW, but I am afraid that CW does not love me.

I am sure there are many CW operators who share my frustrations, but I have decided I will not give up. I know the secret to perfection is practice, practice, practice,

as Gary Player would say. So I will continue to pound away, or is it swipe away, until I achieve that aura of greatness. I am not too sure if I have enough years left to achieve this, but we shall certainly try.

Keep in touch and listen out for the lone CW caller on the bands. It may just be me.

SSB activity:

Once again we seem to going in to that time where 40m is becoming particularly unstable. Most Saturdays, 40 only seems to really open from about 09:00 in the morning and then still presents itself with masses of QSB.

The unfortunate thing is that 80m is not proving to be too much better than 40m. Although local stations are heard a lot easier on 80m than on 40m conditions are still not great.

I am afraid I have never really understood too much about Solar Flares and their effects on the radio spectrum, and now days its even more confusing when the flares are up and there is still no improvement in band conditions. Maybe someone would like to write an article on the effects of sunspots in layman's language that we can put in print and hope that many of us will be able to grasp it.

That being the case, we still have many people calling in on the SSB nets again and this is really pleasing.

Our average call in on a Saturday is around 20 to 25, which is a lot more than it used to be. The stations from the Western Cape still have a great deal of trouble getting through, but those that do manage, still come through with a good readability, even though they may not be too strong.

Our friends in Div 3 and 4 seem to have fallen by the wayside, but one day I am sure they will come back to join us and call in again.

Hallicrafters HT37

AM:

The AM nets are still quite well attended on a Saturday morning and there are usually about 7—8 stations on Frequency. Now this might not sound like a lot, but considering each caller takes a 3min MF plus the bit of talking that comes in, the average length of one over will take about 5 min. Taking this into consideration, once you have had your turn, you can sit back and take in all the news, views and MF from 6 other stations which could take about 30 min before it gets back to you again.

Fortunately not everyone plays MF’s, so one will normally end up with about a 20min break between each over.

This makes for a very short time you actually spend transmitting AM on the net.

Winter times are really so much more difficult to do the nets as the band only opens late, around 06:40 and the SSB net starts at 08:30.

Then one still has to get breakfast and 2 cups of tea squeezed in between all that.

Summer of course, makes life a l;ot more interesting, with the band opening from around 05:30, this gives a whole additional hour, which means at least another 2, maybe 3 overs.

Please don’t feel that because of the time factor we do not want any more members to join in the AM net. That is really not the case.

We welcome as many as possible who have a love for AM, to come and join us in the morning. You will discover a whole new mode when you do, and it is really quite exciting.

Go ahead and try it, you will be surprised.

Hallicrafters SX28

Traditional Radio Valve Fabrication.

(From an article by Ronald Dekker, "The EF50, the valve that helped to win the war")

What makes the EF50 special is that it was the first all-glass valve that was designed in such a way that it could be produced in very high volumes at low-costs. People have talked about the "invention of the EF50," but invention is not really the correct term to be used here. The EF50 was merely one of the milestones in the development process of radio tubes that started in the mid thirties, and eventually ended in the miniature Noval radio tubes we are all so familiar with. After the invention of the triode, the manufacturers of incandescent light bulbs were the obvious candidates to take this new invention into mass production. Like the incandescent light bulb, the radio tube also required a vacuum glass envelope, a filament and wires sealed into the glass envelope. By the end twenties highly automated production lines for the production of incandescent light bulbs had been developed, and it was only natural that those machines and techniques were adopted for the fabrication of radio valves.

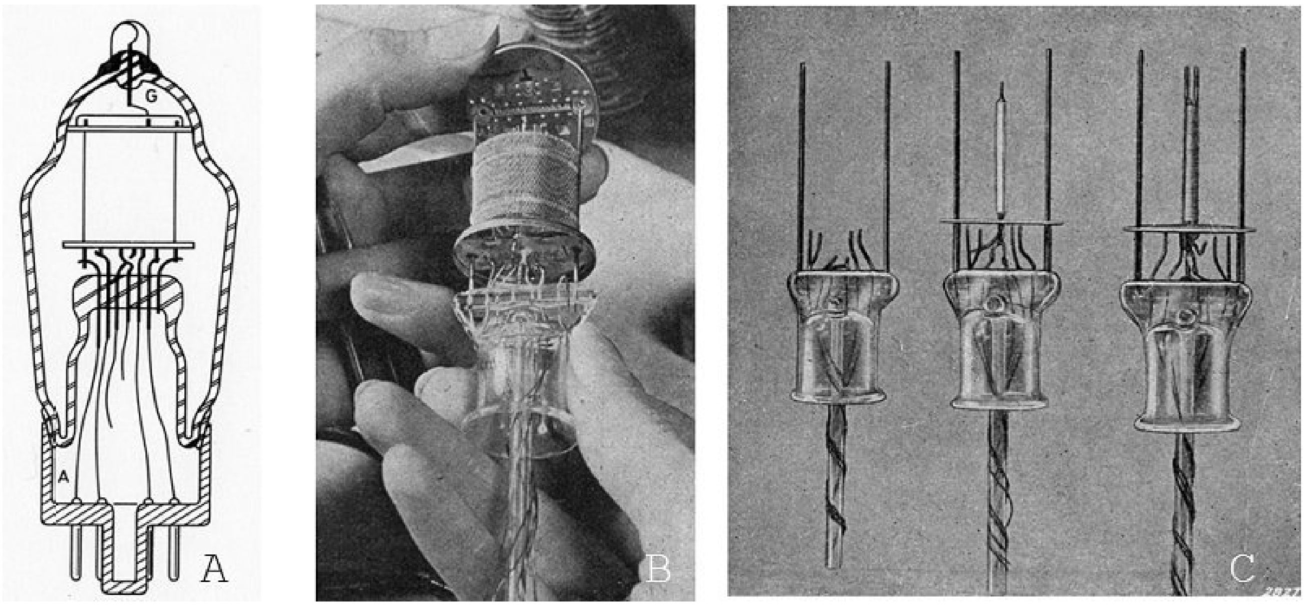


Figure 4.1 The glass pinch which formed the base for tubes developed in the twenties and thirties.

These early radio valves were all based on what is called "a pinch." The pinch is the central part of the tube where the lead-in wires are fed through and which mechanically supports the electrode system. Figure 4.1 schematically shows a cross-section of a valve manufactured in a pinch based technology and it shows some photographs of glass pinches together with the glass exhaust tube.

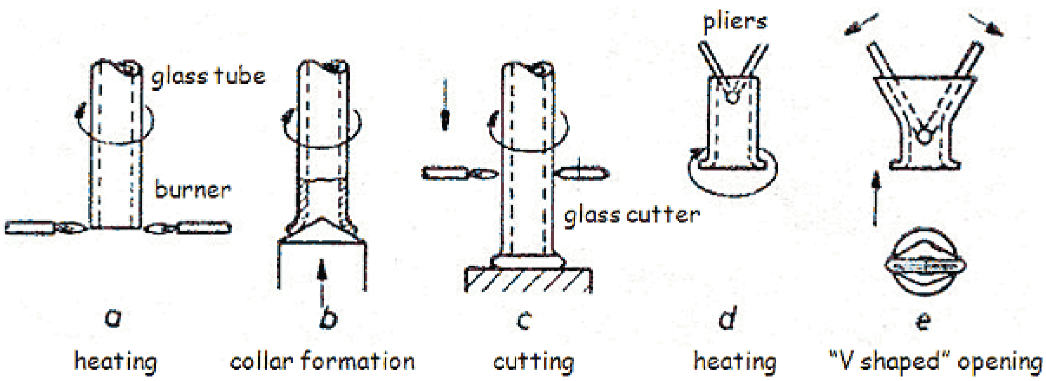


Figure 4.2 First stages in the fabrication of the glass pinch.

The fabrication sequence of the pinch based tubes starts with the cutting of pieces of glass tube. On one side of the glass tube a small collar is formed by heating the edge and pressing the tube against a conical shape (Fig. 4.2b). Next the other side of the glass tube is turned into a more or less rectangular opening by heating it and opening it with a V-shaped pair of pliers (Fig. 4.2e).

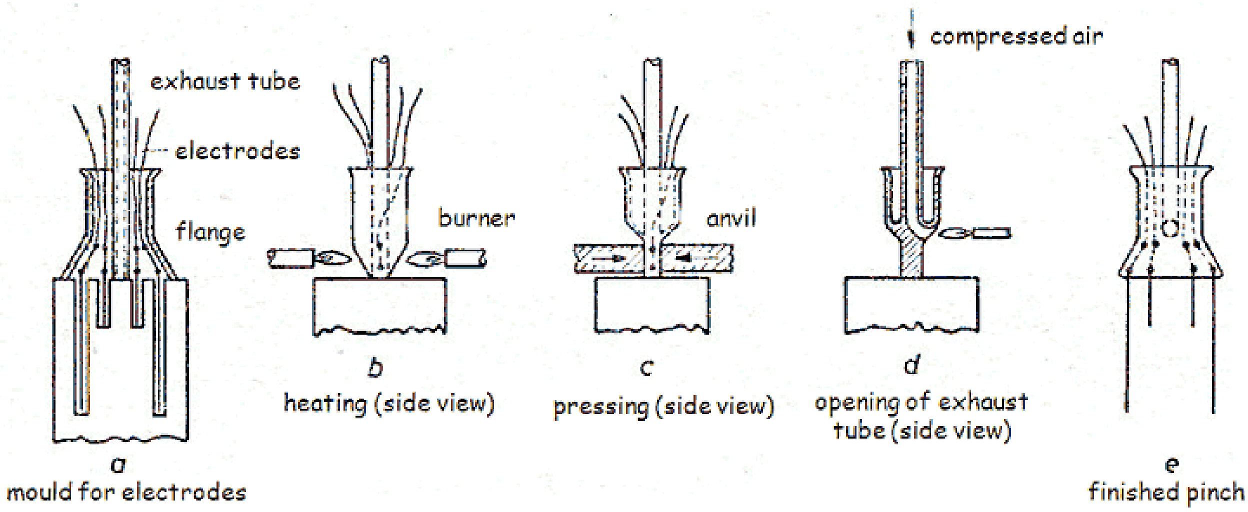
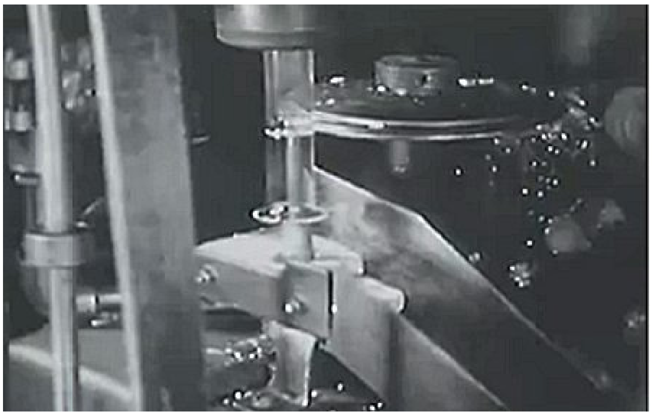


Figure 4.3 Sealing of the electrode wires in the glass pinch and opening of the exhaust tube.

Next the electrode bases and the rods that support the electrode assembly, together with the glass exhaust tube are placed in a fixture/mold which exactly positions these parts with respect to each other (Fig. 4.3a). The lead-in wires are already attached to the electrode bases at this point. The pre-formed glass pinch is placed, top side down, over this assembly. The glass pinch is heated at the narrowest point, and closed by pressing with an anvil (Fig. 4.3c). A small opening to the exhaust tube is formed by heating the glass pinch with an extremely sharp pointed flame, while at the same time some compressed air is applied to the exhaust tube (Fig. 4.3d). This will form a glass bubble which at a certain point will burst open forming the opening (Fig. 4.3e). The whole fabrication sequence is beautifully recorded for posterity by OSRAM.



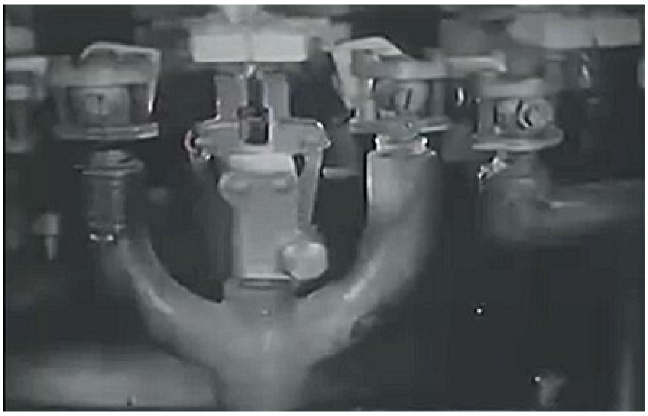


Figure 4.4 Cutting of glass tubes for the pinch (left) and sealing of the electrode wires in the pinch with the anvil (right).

The pictures are stills from the OSRAM movie Manufacture of Modern Radio valves, 1930.

The pinch technology, borrowed from incandescent light bulb manufacturing, made it possible that radio could be taken quickly into high volume production. However, within a few years also the limitations of the pinch technology became apparent: With the increasing complexity of radio valves (pentode, heptode, octode) also the number of electrodes increased. The width of the pinch however was more or less fixed, so that the distance between the connections in the pinch had to decrease, sometimes to less than 0.5 mm. This resulted in increased inter-electrode capacitances, especially because of the high dielectric constant of the glass. Especially a low anode-to-control grid feedback capacitance, which is essentially a Miller capacitance, is extremely important for a good high frequency performance. To keep this capacitance as low as possible, the control grid was in most cases already connected by a separate electrode cemented to the top of the valve (Fig. 4.1). This solution was however not very popular among set-makers.

Apart from the fact that the inter-electrode capacitances had to be as low as possible, they also had to remain constant over time and especially temperature. For pinched based valves the capacitances tended to vary depending on the valve's operating temperature because of the high temperature dependence of the dielectric constant of the glass. This caused a considerable detuning of resonant circuits.

The high field as a result of the small electrode distances in the pinch could lead to electrolysis in the glass at operating temperatures.

The distance from the pinch to the tube base amounted often to more than half of the total length of the distance between the base and the electrodes. This resulted in relatively high parasitic series inductances in the electrodes, and to high mutual inductances. Especially parasitic inductances in the cathode lead reduces the gain at high frequencies.

The construction of the pinch with all electrodes placed in one row is mechanically not very stable. Movement or shocks in the direction perpendicular to the pinch could result in deformation of the electrode system.

The pinch based valves were quite large, which made it difficult for set-makers to meet the demand for small and portable radio-sets. The pinch based radio valves were not very suitable for down-scaling. First of all because the distance between the electrode leads in the pinch was already critically small. Additionally, the glass envelope had to be welded to the pinch at a high temperature. Reducing the size of the tube inevitably resulted in an unintentional, but nevertheless harmful heating of the cathode, resulting in a reduced emission.

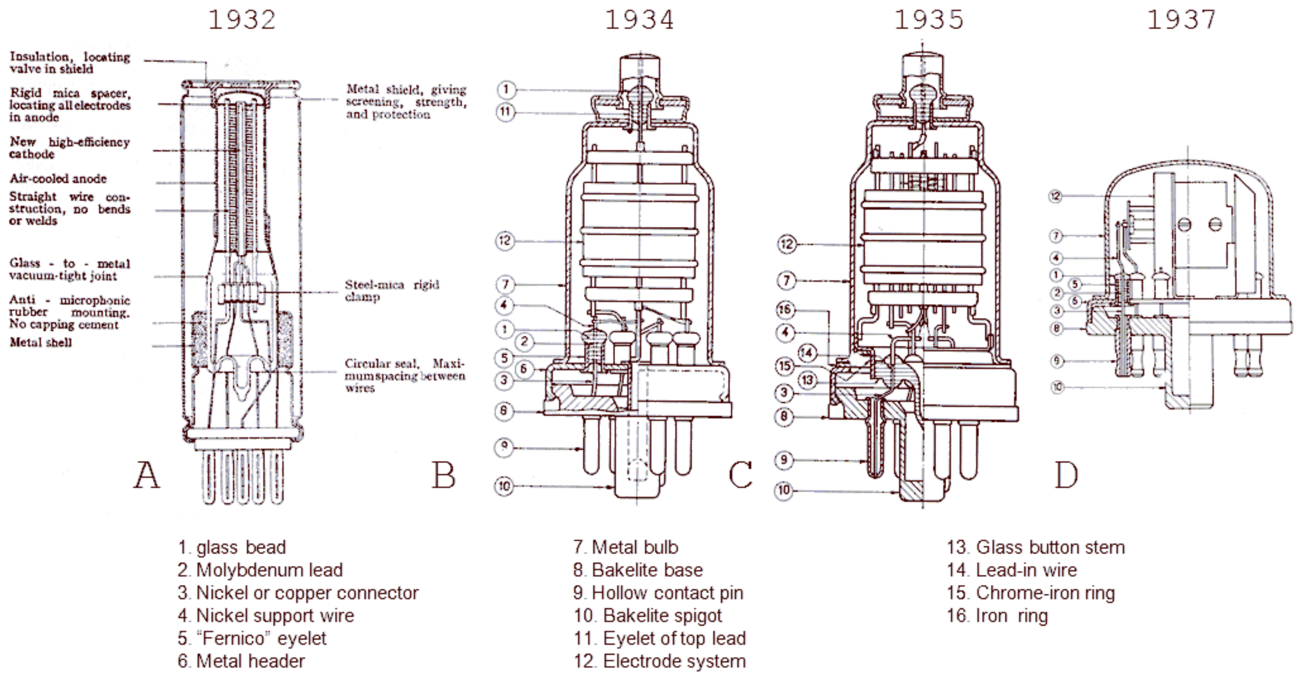


Figure 4.5 Metal valve envelopes developed in the thirties as an alternative for pinch based valves.

To find a way to make radio valves better suitable for high frequency operation, valve manufacturers in the thirties came up with the concept of the metal valve. The first one in this series was the CATKIN (diminutive of Cooled Anode Transmitter). It was developed by G.E.C. in Britain and was derived from metal transmitter tubes, in which the metal envelope was used as the anode connection (Fig. 4.5A). The CATKIN was expensive to manufacture and it was not a success. The CATKIN was only manufactured for a few years.

In 1934 G.E.C. in the US introduced another metal tube concept (Fig. 4.5B). It consisted of a metal base plate (the heather) into which "Fernico" (iron-nickel-cobalt) eyelets, each one containing a hard-glass bead with a lead-in wire, were welded. The lead-in wires were welded to pins which were pressed in a Bakelite bottom plate in octal-base configuration. After the electrode system was mounted, the iron envelope was welded to the header by means of a very heavy projection welder. Klaas Rodenhuis vividly remembers the enormous "bang" produced by these welding machines when they welded the envelope to the header. The tube was exhausted through a metal tube welded to the header. Philips second-sourced these valves in high volumes for the foreign market straight through the war. The valve did have lower parasitic capacitances and inductances, but was also expensive to manufacture.

In 1935 R.C.A. developed a variant of this model of which it was hoped that it would be less expensive as the construction described in the previous section. In this tube the metal header was replaced by a glass plate with sealed-in lead wires (Fig. 4.5C). Both this tube, as well as the previous tube used a top control-grid connection. Everybody was so used to the top grid connection that another construction was simply not considered. Telefunken surprises everybody, when in 1937 they introduce a single ended all-metal valve, the so called "Stahlröhre" (Fig. 4.5D). In this valve all connections were located on the bottom side of the tube, which obviously meant a big advantage for set-makers. The electrode system in this tube was horizontally, which implied a better mechanical stability, and less microphony. It did however imply a rather large tube diameter which reduced the inter-electrode capacitances, but didn't help in reducing the size of receivers. In inter-electrode capacitances were further reduced by the way the pins were grouped (in groups of 3 and 5 opposite of each other) and by the placement of metal screens between the electrodes in the tube. Technically the tube was superior, but the implementation was again expensive because of the use of "Fernico" eyelets.

President's Corner by ZS6TF

Plastic and real AM

It was with great pleasure that I tuned around the upper end of the 20 metre band on 18th June and heard a Swedish station SM5CQT calling CQ. I listened for a minute or so and after I realized that the whopping carrier on his signal was not QRM but a normal AM signal, I switched the FT 897D to AM and went back to his call. OM Alf, located 100 Km south of Stockholm was testing and was amazed to get a response. We had a 20minute QSO and the reports were 5x7 bothways, despite my 30watts and primitive portable inverted vee antenna in southwest France. He was using an old Collins valve aeronautical radio, which generated a smooth, lively audio helped by Alf's excellent command of the English language. The remark he made before I could tell him about my station, that sticks in my mind is " I think you are using a modern solid state rig". Before I could ask him how he knew, propagation got suddenly longer and fading took him out of the QSO. It then struck me that this was my first AM QSO on 20 metres in my lifetime and I had just magically experienced what all hams up until the mid 1950's had to do to work DX.

So what is the difference between what we call plastic and real AM? It is too simplistic to say valves versus the rest but I think they have a lot to do with it. A couple of years ago I stayed with Mark, ZS4D near Bloemfontein. We did some swapping of old iron for even older tubes and the highlight of the visit was to listen to his Klipsch horn speakers driven by single ended 300B amplifiers giving 2 independent stereo audio channels. With less than 8 watts available each side, the sound can only be described as magnificent and all embracing. I recall as a rock-band guitar player in my teens, with my home brew push-pull 6V6 amplifier, how awfully tiring it was to listen to the harsh sound of the main act group who could afford the latest solid state amplifiers.

So where does this lead us? It is a fact, obscured by much folklore that distortion introduced by valve amplifiers yield 2nd order harmonics in the distortion products whereas solid state amplifiers yield predominantly 3rd order components. Any guitar player will tell you that the shorter the string, the higher the note and that the closer to the bridge you pluck the string , the more harmonics are generated. These harmonics progressively alter the timbre from mellow to pleasant to downright tinny as you move up the fretboard. But a valve amplifier will produce the even harmonic component over the odd and its slower attack due to the time constant of the inter-stage coupling capacitors, coupled with the linearity of the audio chain to avoid saturation in the output/modulation transformer, generate the sound which characterizes real AM over the plastic substitute. A word of caution, there is a basic conflict between fidelity and bandwidth. The audio chain by and large determines the bandwidth occupied by an AM signal. What is needed is an overall audio characteristic resembling the flat part of Table mountain falling off at the sides at 400 Hz and 2.7kHz for pure punchy comms, and 80Hz and 6kHz if you want to play music although still not hi-fi, bearing in mind this takes double the bandwidth. Some more mature operators voices are problematic, and their earhole's are likely to be very non linear as well so it is advisable to get a variety of reports to build up an assessment of your signal. The microphone at the transmitting end and the speaker and its matching at the other end are also critical elements in the audio chain.

The answer is stick to what works for most people, If it doesn't have valves and heavy Iron, it probably won't earn you a upper crust AM report.

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Antique Wireless Association of Southern Africa

Mission Statement

Our aim is to facilitate, generate and maintain an interest in the location, acquisition, repair and use of yesterdays radio's and associated equipment. To encourage all like minded amateurs to do the same thus ensuring the maintenance and preservation of our amateur heritage.

Membership of this group is free and by association.

Notices:

NET TIMES AND FREQUENCIES:
The following are times and frequencies for the AWA nets:

AM Net—Wednesday evenings from around 18:30: Saturday mornings from around 06:00 or when band conditions allow. Frequency—3615.

SSB Net—Saturday mornings from 08:30. Frequencies—7070 with a relay on 14125.

CW Net—Saturday afternoon from 14:00. Frequency—7020.
(Times given are CAT or SAST)