THE PROPAGATOR

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MEETINGS ARE HELD ON THE SECOND TUESDAY OF EACH MONTH (EXCEPT JANUARY) AT 7:30 PM AT THE STATE EMERGENCY SERVICES BUILDING, MONTAGUE STREET, NORTH WOLLONGONG. VISITORS ARE WELCOME TO ATTEND MEETINGS.

GENERAL AUCTION
at the November meeting on November 12th.

Next Month's Meeting -: The annual major auction of the Society will be held at the November meeting of the Illawarra Amateur Radio Society. Bring along anything that you wish to be auctioned. (Please bring along only good quality 'junk' and not rubbish.)

After the auction tea or coffee and biscuits will be served.

Remember to set aside the date - November 12 th and "bring yer money with ya".

Annual Christmas Picnic -: Another date to set aside to remember is Sunday December 8th (the Sunday before the December meeting) which will be the day of the annual Christmas picnic to be held at Cataract Dam. Activities of the day will include foxhunts, volleyball and the usual cricket match (for those who are game !!!).

Santa Claus will make an appearance. For those who will be bringing along children, bring along a small gift to throw into Santa's 'goodies' bag to be handed out to the kids.

Christmas Raffle -: The raffle prize at the December meeting will be a Christmas Ham. Remember this for the XYL and come along for the last meeting of the year and bring the XYL along too.

REPEATER REPORT GRAEME VK2CAG

On 8/10/85 Sublime point 7275 appeared to have experienced a failure. It was an unusual fault, as the repeater worked normally on RTTY but would not trigger with plain carrier or voice signals unless the repeater was "opened up" by someone running a carrier into it for several minutes. After that the repeater functioned normally for the rest of the QSO.

I visited the site accompanied by Morry VK2EMV on 8/10/85. The problem was easy to diagnose using the metering and test point facilities that are built into the repeater. The problem turned out to be a faulty 4069 cmos chip which controls the voice and RTTY time-out timers. The RTTY section was OK, as an incoming RTTY signal is decoded by the rtty demod, setting the "RTTY flag" and switching the repeater control from carrier operated with 4 minute timer to tone activated with 10 minute timer. The faulty I.C. was causing the voice mode timer to continually cycle through its timing/timeout/ reset modes.

No reason could be found for the failure of the I.C. and the repeater was back to normal again at 5:30 the same evening.

Last visit to Sublime Point was to repair wind damage to the aerial mast on 3/8/85, and prior to that was on 1/7/84 to replace an open circuit timing resistor.

6850 has had 20 minute time-out restrictions for 2 days on 13/9/85 because of a high level of useage and insufficient wind and/or sunlight to put back the energy used. Again we shortened the time-out for a couple of days before the JOTA weekend, not so much because the repeater battery was low, but to conserve as much energy as possible for the weekend. Past history has shown that the repeater's useage on the JOTA weekend comes pretty close to 100% duty cycle. It paid off because the battery held up OK for the whole weekend, and there has been no need to place any restrictions on the repeater since then. The energy situation at Mt. Murray appears to be satisfactory at present. We need to promote this repeater as the "secondary service", using Sublime Point or simplex if possible, and Mt. Murray only if it is the only satisfactory means of communicating on 2 metres. The energy problem will be with us until such time as our club is in a position to purchase another couple of solar panels.

Talking about repeaters, has anyone noticed that the Sydney RTTY repeater has been moved to a temporary location at Surry Hills while the aerial at its normal location is being repaired after wind damage. This repeater (6675) is about 10db stronger at my place than it was before. I was unable to access it and could hardly hear it when it was in its normal location. From my point of view the temporary location is better! So much for the apology in last weeks RTTY broadcast for the weak signal. Its the first time I have received the RTTY broadcast for months! Maybe there are some who cannot copy it now who could before. I wonder.

E.M.E. REPORT BY LYLE VK2ALU

The weatherproofing covers of the transmitter power amp. box were replaced last week. Fortunately the recent rain had not got into the 'works' but the original covers had suffered badly from the effects of the elements over the past 12 months and would not have remained rainproof for much longer. Tony VK2KAJ performed his 'human fly' act on the dish while assisting in replacement of the PA box on the rear of the parabolic reflector.

A test rig has been partially completed , in which the feed horn and receive preamp. box will be mounted during the modification and readjustment of the feed probes and polarising screws of the feed horn.

Satellite Notes.

Oscar 10 operating schedule starting October 17.

Mode B - MA 55 to 119
Mode L - MA 120 to 136
Mode B - MA 137 to 203
Transponder OFF - MA 204 to 239
Mode B - MA 240 to 19
Transponder OFF - MA 20 to 54

The satellite Attitude is currently Lon 176, Lat N4 (ie. close to Lon180, Lat0)

The significance of satellite Attitude (Longitude and Latitude) is

1. If the Longitude is less than 180 degrees then conditions are better before Apogee (ie. MA 128) and conversely if the Longitude is greater than 180 degrees then operating conditions are better after Apogee.
2. If the Latitude is a negative number then the antennas are pointing above the orbital plane and if it is a positive number then the antennas are pointing below the obital plane.

The satellite attitude is varied from time to time by the Ground Command Stations for various reasons such as - to obtain better illumination of the solar panels by the Sun particularly during periods when the satellite is for more than normal time in the earth's shadow - or to provide better operating conditions for the majority of the amateurs using it (ie for those in the northern hemisphere) over the several hours of its orbit where it is near its Apogee and the sub orbital point at Apogee is well south of the earth's equator.

The satellite's attitude sets up the parameters for the range of variation of 'Squint Angle' over a complete orbit as experienced by an operator at his particular QTH on the earth's surface.

Squint Angle is the angle at the satellite, at a particular time, between the line drawn from an operators position on the earth's surface to the satellite and the line along which the satellite's antennas are pointed. If the Squint Angle is small then, with the satellite's high gain (narrow beamwidth) antennas in use (the normal arrangement) one will benefit from their maximum gain and will tend to experience a lesser degree of 'spin modulation' fading. If the Squint Angle is zero then the satellite's antennas are pointing directly at the operator's QTH. <u>But</u>, for the most effective communication between two stations located at different places on the earth's surface , a reasonably low value of Squint Angle should exist for <u>each</u> of the stations. Practical experience has shown that, for a <u>good</u> contact, each station should have a Squint Angle of about 30 degrees or less, for Oscar 10.

The Squint Angle varies considerably over a complete orbit,

RADIATION

A paper presented by Mr. Mike Stevens (Telecom). Reprinted with permission.

When considering the biological effects of exposure to radiation it is important not to overstate or understate its dangers. It is difficult to find any definitive information on the long term effects of high levels of exposure to electromagnetic radiation (EMR) because of the possible long period between exposure and possible effect. Generally there is little agreement between medical and occupational health experts regarding such effects.

The difference between EMR of the nature under discussion and ionising radiation produced by x-ray generators and various nuclear devices is that the latter's high energy sub-atomic particles cause cellular damage within tissue which can lead to radiation sickness, various forms of cancer and even death. Radio frequency or EMR in the frequency range 0.3 MHz - 300 GHz causes heating of tissue but does not cause ionisation and hence cellular damage of tissue. Animal tissue acts as a lossy di-electric and thus EMR causes currents to be induced resulting in heating of the tissue. The extent of the heating depends on such factors as frequency of radiation, absorbent properties of tissue, duration of exposure, intensity of RF field and cooling effect of blood supply. In general, a rise in body temperature imposes a load on the body's cooling mechanism and in extreme cases results in fatigue and possible localised heating of individual organs. A critical factor determining the extent of any heating of any particular organ is the blood supply of that organ. The eye which has a poor blood supply is particularly susceptible to damage from certain types of EMR.

In broadly considering the dependence of the tissue heating on the frequency of EMR the effects described are approximate and were observed in animal tissue in extremely high field intensities, far in excess of those which would be encountered in any well maintained radio installation. They do however give a guide to the likely effects of human exposure.

At frequencies less than about 1GHz approximately 30-40% of incident energy is absorbed. Tissue heating occurs well below the surface, i.e. at 300 MHz, penetration is 10-100m.m. (note the large range of 10:1, making it difficult to be specific). Because heating is well below the surface the organs likely to be affected are the liver, brain and nervous system etc. (a frequency of 70MHz is critical for adult humans because of resonance and absorption is high).

At frequencies of approximately 1-3 GHz absorption is high and can approach 100% in some circumstances. Penetration is not so deep and heat is generated near the skin and in the fat and muscles.

The range 2-3 GHz is particularly critical for the eye. The depth of penetration is just right for heating to occur in the suture of the lens and result in possible formation of cataracts. Note: most microwave ovens operate in the region of 2.5GHZ (this is one device with which we should be particularly careful).

Apart from the eyes, high levels of EMR in this range results in heating close to the skin which fortunately is very sensitive, that is to say, we tend to feel it fairly easily. Above about 3 GHz, 40-50% of energy is absorbed and the rest is reflected by the skin. Penetration is low and heating is near the skin where it is readily felt. Note that modulation of about 16 Hz is critical.

That covers very broadly the observable physical effects of EMR exposure.

As with all potentially hazardous situations it is necessary to define a safe dose, or in this case, level of exposure.

In most Western Countries it is accepted that a body temperature rise of $1^{\circ}C$ causes no distress, fatigue or organ damage. The Permissable Exposure Level or P.E.L. is that level of exposure which applied over an 8 hour period will result in heat load

RADIATION - continued

of no more than $1^{o}C$ developing in tissue. A considerable factor of safety is applied in determining this level and people working in a field equal to P.E.L. would only experience a level of radiation 1/10 of that actually required to raise body temperature $1^{o}C$.

For short periods an increase in exposure over P.E.L. is permitted. This is referred to as the Short Term Exposure Level or STEL. For example the STEL for 10 minutes is four times P.E.L. After working in STEL 10 for ten minutes the person concerned should work for 40 minutes in an area where the field is less than 50% PEL.

One more exposure level of importance is maximum Peak Exposure or M.P.E. This is a field intensity of 1000 MW/CM^2 and should not be exceeded under any circumstances.

Contributed by Ken VK2DOI

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GREATEST MATHEMATICAL ERROR -: The Mariner I space probe was launched from Cape Canaveral on 28th July 1962 towards Venus. After 13 minutes' flight a booster engine would give acceleration up to 25 820 mph; after 44 minutes 9800 solar cells would unfold; after 80 days a computer would calculate the final course corrections and after 100 days the craft would circle the unknown planet scanning the mysterious cloud in which it is bathed.

However, with an efficiency that is truely heartening, Mariner I plunged into the Atlantic Ocean only four minutes after take-off.

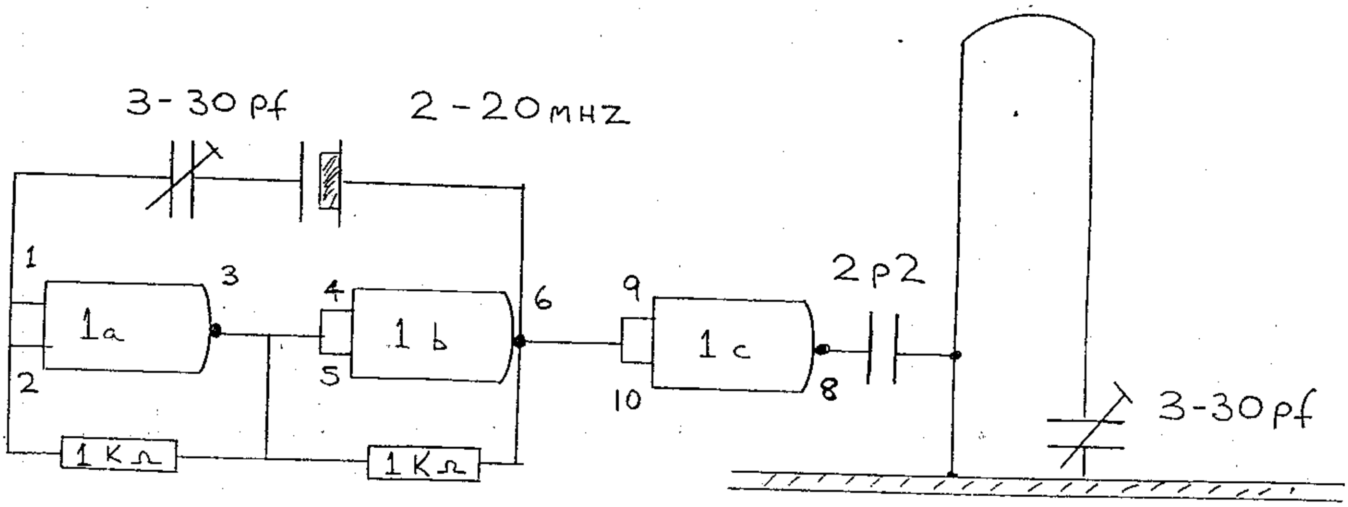
Inquiries later revealed that a minus sign had been omitted from the instructions fed into the computer. 'It was a human error', a launch spokesman said.

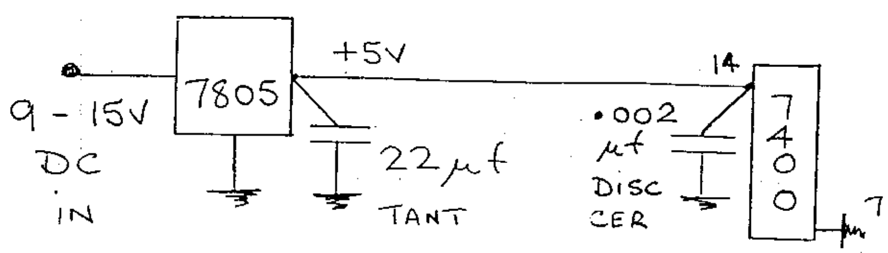
This minus sign cost £4 280 000.

Just another Signal Source ?

John VK2BHO

I constructed this simple source some time ago and have found it very useful for a number of tests including antenna adjustments, receiver adjustments,and in one instance when coupled to an antenna as a cw transmitter over aprox 1 Km, all at 2 meters.
Construction is surface mounted on copper clad glass board,using point to point and self supporting components,the 7400 is placed directly on the board with the pins uppermost ,no socket and soldering directly to IC pins. At 2meters the output loop is 100mm long spaced 15mm and tapped at 25mm ie. aprox 200mm of 18g. Crystal and trimmer must be mounted securly if frequency stability is required at vhf . When using a 18Mhz crystal signal output is considerable and i expect useable signal would be produced at 70cm and possibly 1296Mhz. This is the basic,dream up your own uses





Electromagnetic Wave Propagation By Conduction

The New Theory

One reason we are having problems understanding the mechanics of radio wave propagation is the fact that it is very difficult if not impossible to simulate the real situation in a laboratory set-up. We are dealing with sizeable objects such as the earth, the atmosphere and number of variables that make the situation difficult to model here on earth. The best we could do is conduct some experiments using available means and perhaps complement them with studies done using satelites and electromagnetic wave sources here on earth or in space.

The closest analogy we understand and have available is optics and fiber optics. Radio waves and light have one thing common - they are electromagnetic waves with different wavelengths. Recent advances in fiber optics can help us understand the behavior of light propagation as well as radio waves. It is still difficult to find good analogy for the atmosphere because of its nature, there are great number of variables such as variance of height, density, pressure, dielectric constant, moisture content, temperature, chemical composition, charged particles as well as the effect of the earth's surface. The biggest contributor to ionospheric variations is radiation from space, mainly the sun.

When I started to look for a better, more satisfactory explanation of radio wave propagation it struck me that there must be more "conductivity" going on up there than reflection. During my observations over the past six years I came to the conclusion that radio waves propagate in a medium that resembles a cloud or across between a cloud and fiber optics.

The basic of the new propagation theory can be summarized in the following statments:

A majority of the radio waves are refracted and propagated - conducted -along the borders of media with different dielectric constants and are accompanied by scintillation.

The geometry propagation is dependent on the frequency used and the condition of the atmosphere.

The propagating medium has a cloud-like formation with the density and conductivity varying along its profile and dependent on the physical condition of the atmosphere and the amount of radiation from space.

Intrepretation

It is quite difficult to accurately visualize the mechanics of the radiowave propagation. We are dealing with a three dimension medium with varying density and a cone of radio signals propagating through that medium. The situation is also complicated when considering a broad specturm of frequencies and different angles of refraction and conductivity dependent on the frequency.

In order to clarify the situation and to make it easier to understand we will make some simplifications. The beam of transmitted radio signal will be simplified and shown as a ray. We will use a solid line for relatively strong signal, broken line for medium strength and the dotted line for the weak signal. Density or radio-conductivity will be shown as a heavier shaded area for better conductivity and the lighter shading for worse conductivity.

Looking at figure 4 we have the earth and the atmosphere drawn to scale. The signal is transmitted from the point A. Signal strength decreases rapidly in the line of sight distance and we don't get much signal beyond point B. The main lobe of the antenna puts more signal into the space. Refraction begins at point C. A portion of the signal gets refracted, a portion goes through as shown at D. The refracted signal continues through the points E, G and H, more or less following the curvature of the layer and scintillating along the path. Scintillation is noticed and received as what we call backscatter or sidescatter signals. A portion of the signal is refracted along its path and received at the points W, X, Y, Z. Part of the signal continues through point D to F, where it either gets refracted or escapes into space at S. A portion of the signal from the higher path can be refracted back to earth at point K, at a different angle and combine with the signal propagated by the lower path causing considerable QSB. This is a simplified view of what is happening "up there." In a real life situation it gets a little bit more complicated due to the wider beam width of the transmitted signal, irregularities in the medium, and the range of frequencies and angles of the transmitted signal.

There is an indication that the speed of travel or propagation of the radio waves can vary in different layers and this combined with the scintillation or scattering of the signal, can be observed as Doppler shift of signal's frequency.

Scintillation in this case can be compared to the situation where we have a strong source of light with its beam going through the patch of fog or smoke. Particles of fog will be "glowing" or scintillating and become visible - detectable by our receivers -our eyes. Portion of the beam will continue to propagate after passing through the fog patch.

Supporting Evidence

When observing the rising or setting of the sun and moon we observe refraction of light in the layers of the atmosphere. It is well known fact that sun or moon can be "seen" after they actually set below the horizon, the lag being about 12 minutes in time. Also the image or the size of the sun quite often appears to be larger than normal. This is definitely not reflection. We do not see the "mirror image" but the actual "picture." The same thing is happening when we travel along the highway during a hot summer day. Hot air above the road's surface causes the refraction of light rays and we can see the images of the objects that are actually slightly higher. (sky, fence, etc.) They are moved and blank out the background. The same is happening with 'Fata Morgana' in the desert.

Why should not radio waves behave in the similar manner? Light is electromagnetic wave with very short wavelength. The longer wavelengths are easier to refract or bend and harder to reflect.

During our "muscle flexing" with VE3HGN, who is about 70 miles East of my QTH, we have noticed an interesting phenomenon. While comparing antennas and during tests with overseas stations we found a shift in frequency on our signals when compared to the frequency of the DX station. First we thought that it was a flaw in my equipment, but repeated checks with DX stations confirmed that we were both dead-on the same frequency. But when listening to each other we were about 500 Hz lower in frequency. That could only mean that there is Doppler shift occurring somewhere. That, to my knowledge could be caused by a moving media or source, or perhaps different speeds of propagation being observed from the side. If there is a difference in the speed, of propagation, it would mean that the signals are propagating in the layers by conduction rather than reflection.

Another form of this effect can be observed when passing under the high tension power lines and listening to the car radio on the a.m. band. Depending on the location of the transmitting station and the direction of power lines, when passing under the

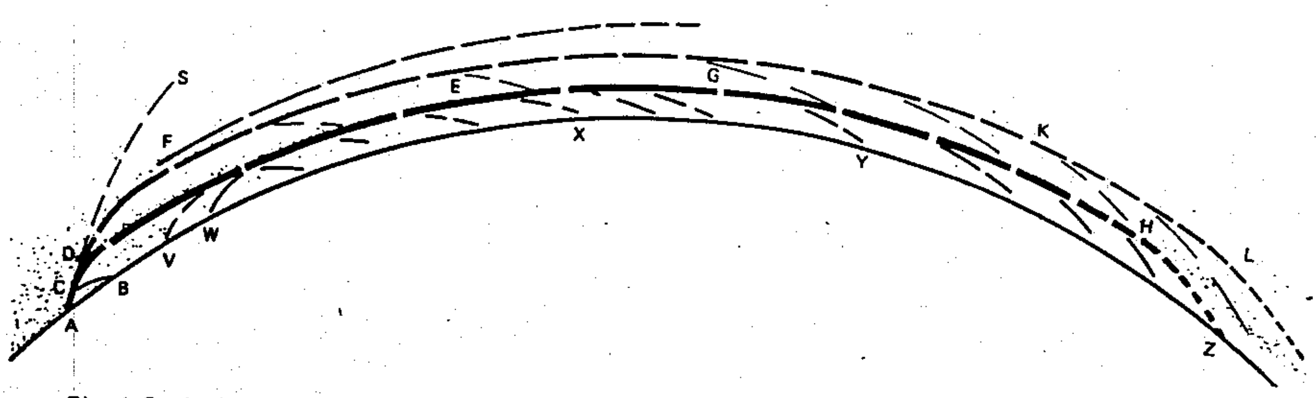


Fig. 4- Scale drawing of a portion of the earth and a conductive ionosphere showing wave propagation.

wires a sudden frequency shift if observed, very similar to what we call selective fading. This can be explained by the different speed of propagation of the signal along the wires as opposed to the speed of propagation in the air. This "selective fading" is noticeable on h.f. and the frequency shift can be also observed on the s.s.b. signals coming from Europe. During contacts with OK2RZ on 15 m. I have observed QSB of his signal and at the same time slightly frequency shifting of his signal.

Familiar "Artic Flutter" and raspy signals propagated from the Aurora are another example of the frequency shift caused by propagation of the signals through the medium. Arctic flutter can be simulated by tuning two receivers to the same signal and slightly detuning one receiver's v.f.o. The signal will sound as if it just passed over the pole, with familiar flutter. With the signals propagated through the auroral region, there is multiple frequency shift apparent, making s.s.b. signal reception almost impossible. Another noticeable feature of this frequency shift is the absence of the higher notes in the audio response of the shifted signals.

Known "Negative Doppler Effect" observed on the satellite signals can also be attributed to frequency shift caused by propagation.

Frequency shift has been observed to be present when experiments were carried out in both directions, east and west. It appears to be present at times on signals going across the Atlantic, but it is harder to detect due to the dominating "direct" signal. It is also more difficult to detect the shift on DX signals, because the shift will be more or less the same in both directions, therefore both stations will be "on the same frequency."

One important thing is apparent from this: when one is trying to calibrate his receiver to WWV, and his QTH is such that he is receiving a "backscatter" signal, then there is good chance that he might be off by about 500Hz.

Let's assume for now that signals are propagated by conductivity rather than reflections and we will have a look at the various modes of propagation and see how well they fit the theory. More detailed descriptions, will be presented in subsequent articles.

Short Path

Lets assume the simplified situation for the purpose of understanding the geometry of various modes of propagation. We will assume again that we have single ray of radio signal and simplified model of the atmosphere.

Figure 5 shows the average situation where signal is transmitted from point A and gradually bends, refracts through the atmosphere with a gradually changing dielectric constant reaching point D, placed on a more distinct border of two layers with different dielectric constants. The main portion of the signal follows the border along line D, E, G. A portion of the signal refracts back to the earth and allows us to receive the signals with relatively even strength along line W, X, Y, Z. Depending on the refractive angles we can receive signals under low or higher angles as shown along D-W and D-X. Point V gets almost no signal, because the angles of refraction will not supply any signal. Very weak signals can be onserved at point V "seeing scintillation at points E and G under low angles with low angle antennas. It appears that we are propagating the signals at considerably lower heights than previously thought. The dotted line shows the path A-M-W as explained by the reflective theory.

A portion of the signal transmitted from the point A is transmitted at a different angle and is refracted or partially refracted and reaches another layer or escapes into space as shown at A-C and A-C'.

Having antennas with low angle of radiation extends the useful range of propagation under adverse conditions with lower angles of refraction.

Day - Night Variations

Let's have a look at the typical path of a signal radiated at a 45° beam heading from VE3 over Europe to Asia, fig. 6. The Sun is over Europe, it's morning in North America, and evening in Asia. The atmosphere is warmed by radiation from the sun raising the height of the layers and changing the dielectric constant of the media affecting the refractive angles. The hump over Europe causes the signal to change its direction - refraction -and this is experienced as a "black out" following noon local time in that area. Some weak signals are being heard, with the typical hollow sound. This is mainly the result of scintillation. It is very difficult to make the contacts from OK to other areas. VE and UAØ have no problems communicating, with conditions actually peaking at UAØ This is a changing situation with time of day, radiation from the sun, frequency, and angles of refraction. Shown example is typical for higher frequencies in the range of 14 - 30 MHz. There is a delay of about 2 hours between the local noon and the "hump."

It is known that with increased sunspot activity the thickness of the atmosphere increases. (This caused Skylab to come down prematurely). This also increases the height of the propagating layers and therefore increases the height and length of the "arches", it allows us to span longer distances and extends propagation later into the night.

We have been told that during peaks of solar activity the lower frequency bands are very poor, mainly because of attenuation of the D layer of the ionosphere. On the contrary, the propagation on the low bands has been better than what we experienced during the sunspot minima. The 40m.

band has longer openings to remote areas of the world. Eighty meters is the same; we are hearing Europeans around 6 p.m. local time. During the 160m. CQ Contest I was hearing G stations for about 8 hours during the night. It appears again that the refracting layers are higher, allowing us to work longer distances with stronger signal levels.

It appears then that with higher sunspot activity, the average height of the media increases, refraction of higher frequencies improves, allowing us to work further and increase the number of useful frequencies for communication.

Long Path

We have no problem explaining long path propagation. It is just an extension of the short path propagation with the signals following the higher layers where the losses can be lower and signals attenuated less. We still get the refraction towards the earth and the signals are heard along most of the path. See fig. 7. The path does not have to be in a straight line. Quite often we experience skewed path. The skewed path can be the result of side refraction which will produce quite strong signals, or caused by scintillation, characterized by low angle and weak signals.

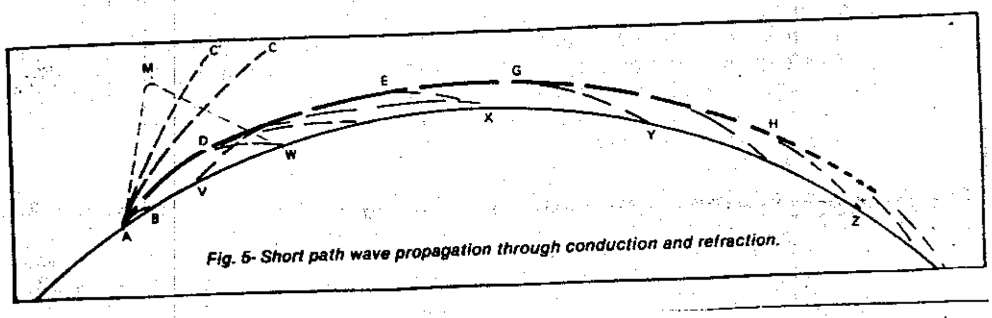


Fig. 5- Short path wave propagation through conduction and refraction.

Fig. 6- Illustration of day-night variations in propagation. "Hump" over Czechoslovakia in this drawing results in a "black out" shortly past noon, OK time.

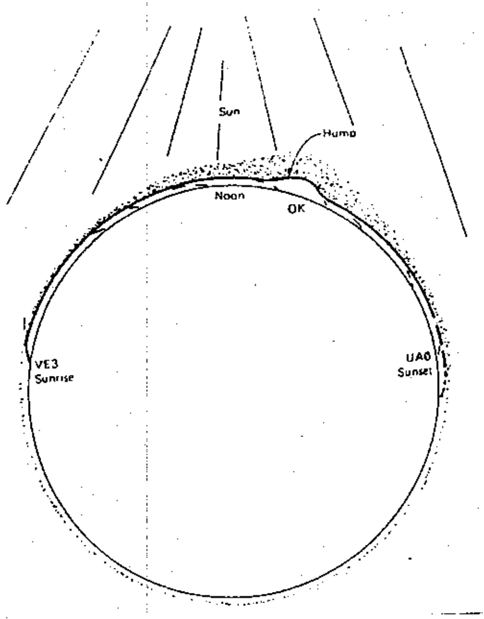
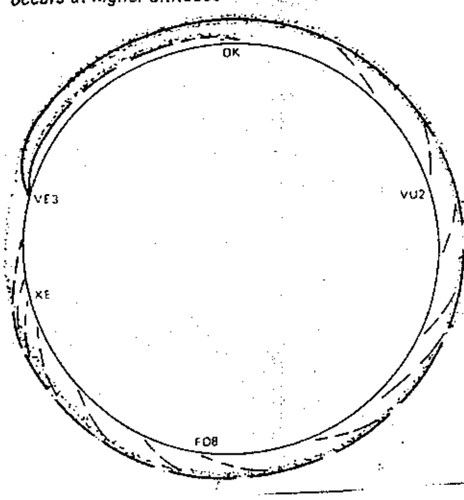


Fig. 7- Long path propagation is similar to short path, but occurs at higher altitudes where losses may be lower.



The best case of long path would be the situation when signals get "trapped" in layers with low attenuation, and travel a number of times around the earth causing long delayed echoes. There is also the possibility that signals might enter Van Allen belts and propagate within the belts.

The best answers could be provided by satellites. Observation of the various satellite signals will help to clarify a number of unanswered questions. Any room left in the space shuttle?

Grey Line Propagation

In the case of gray line propagation we have a situation where the medium is more or less at the same height, the refractive layers are more uniform, without major humps and therefore allow us to propagate signals along that path over quite wide range of frequencies with relatively small attenuation or refraction in the unwanted directions. Again the low angle antennas should perform best. When the signals are aimed in the direction of the grey line, just about any point on earth on the grey line can be communicated with especially at the lower frequencies.

One Way Propagation

Quite often we experience a sort of one way propagation, *i.e.*, on the 40m. band East Coast to Europe in the late afternoon. Strong signals from Europe are heard, but it is nearly impossible to work the Europeans. When switching between high and low angle antennas there is almost no difference. Later on, signals become stronger on the low angle antenna and contacts become possible.

This can be explained by scintillation, such as we can see on the end of a fiber optic fiber. When light exits the fiber and there are some impurities, it disperses the light at various angles. It is very difficult to enter the fiber under those conditions. A similar situation can exist with our radio signals and the conducting layers. Another form of one way propagation can be caused by different refractive indexes at both ends of the path. Going in the one direction signals can be refracted gradually and due to local conditions at the other end they can exit or be refracted towards the earth. For the transmitted signal the angle of refraction can be different and it will not refract the transmitted signal into the same layer that the received signal is coming over.

Transequatorial VHF Propagation.

This type of propagation was discovered when stations located close to the same meridian were able to work each other, typically across the equator. Contacts were made between KP4 and LU. The world record on 2m. is between 5B4 and ZS. The propagation usually peaks just after sunset.

This appears to be another form of grey line propagation, where we have uniform medium with gradually changing height around the equator, refracting signals over great distances. I would predict that given good conditions it might be possible to establish the contacts on the 2m. band between the VE and LU.

VHF Propagation

Various modes of v.h.f. propagation can be explained and understood better by applying the new theory. If refraction and scintillation are considered, then we can explain most of weird modes of v.h.f. propagation. Refraction then replaces reflection and scintillation replaces scatter. It also appears as mentioned earlier, that signals are propagated (refracted) at lower heights then previously considered assuming reflection by the ionosphere. Horizontal polarization seems to be better for the long haul v.h.f. propagation probably due to the fact that the orientation of borders of the media with different dielectric constants are oriented horizontally, enhancing the refraction of horizontally polarized signals.

mysteries are the whistlers. They are bursts of signals in the range of 0 - 30 kHz, usually caused by the lightning strokes. They are "whistles" changing the frequency downwards and lasting from the fractions of the second to 10 seconds or so.

This can be also explained by our theory if we apply doppler shift and multiple path refractions. Consider that lightning could start the whistler and propagation by refraction and variable speed will cause the frequency to change and change the time required to travel a given distance.

Receive vs. Transmit

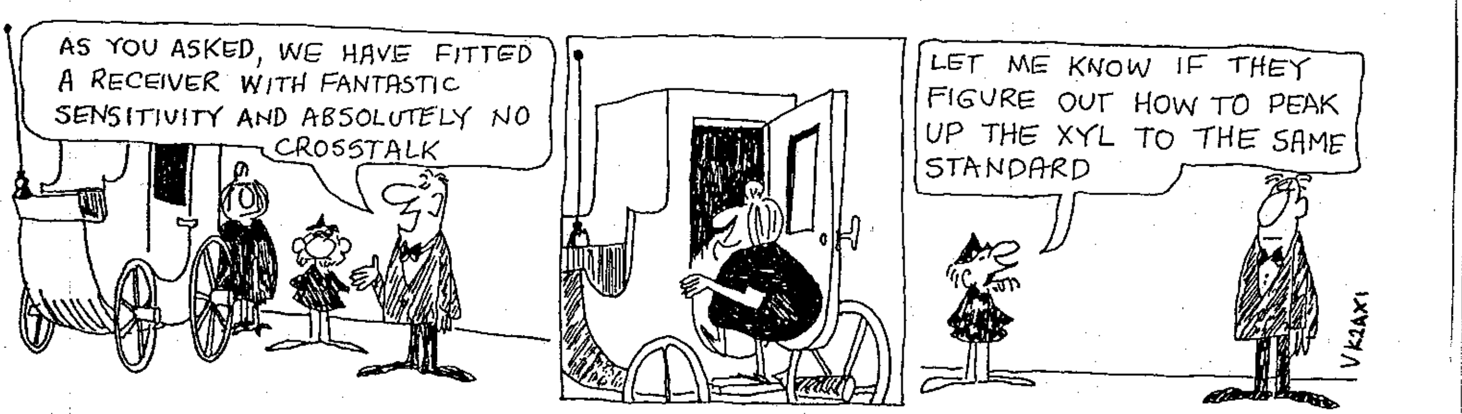
Having different antennas available during contests and switching between low angle and higher angle antennas I have found during numerous tests that there is quite a difference between the angles of received and transmitted signals. This has been observed on bands from 10m. down to 80m. Also the optimum angles change from day to day, hour to hour. This is very important to know, especially for contesters, who cannot afford to wait in the pile-ups. Ideally the most successful station would have antenna systems capable of directing signal in the desired direction and at the most favorable angle too. The differences at times amount to around 20 dB. The stacked beams are worth gold!

Discrimination against noise is very important too. Quite often we can select the angle where signals would be about the same strength but the background noise from the band is considerably lower. S/N ratio improves tremendously.

Another thing that was found while switching between high and low angle antennas was the fact that most of the so called "short skip" signals are strongest at the low angle. Stacked beams were the best for working W1,2,3,4's on 15m. It made the difference of about 800 US contacts in the contest as compared to another station operating the same band and having a single antenna with higher angle of radiation. This also supports the refractive theory.

Significance.

In cooperation with Amateur Radio operators around the world we can further explore and experiment with the propagation of radio signals. We can probably do it better and cheaper than a government or commercial effort. Hopefully we can reinforce the new theory and can open new possibilities and modes of propagation across the whole range of frequencies. Verification of the new theory will have great implications on anten-



Whistlers

One of the very low frequency na design, improved reliability of communications, and overall performance of radio stations. It will help to establish better methods of predicting radio wave propagation and develop more reliable means of forecasting propagation based on the factors known to affect it. Hopefully it will set the record straight and make more sense and fewer exceptions.

Hopefully this article will inspire hams as well as scientific institutions to more in-depth study and eventually produce operating formulas and diagrams, which, given the right set of values, will enable us to predict propagation with much better accuracy.

Amateur satellites with transponders on the lower frequency bands such as 160 to 80m., or 80 to 40m., or perhaps one utilizing the new 10MHz band and having the eliptical orbit would be an ideal tools to explore the validity of the new theory.

Let's not be afraid to challenge a long-accepted theory.

Conclusion

What I have tried to present in this article is the expression of what I feel, what I have observed and what I think makes sense. I find it quite difficult to describe or express exactly what I am experiencing. This is partially due to the lack of good clean analogy, partially due to the difficulties of verification and expressing accurately what is happening up there. I hope that I succeed in getting the main message across: "Maybe there are no mirrors up there but more likely something like layers or clouds which can conduct or refract radio waves."

Much more work has be to done. This is just a brief outline of what I was able to gather in my limited available time.

Thanks to contests, I think I "see the light" a little brighter. Contests are moving force and inspiration for many advances in the field Amateur Radio communications, so please put up with the contest racket when you hear it and if you can, give us a point or multiplier. This is the only reward for all the work we put into those super antennas and stations.

I would like to express my sincere thanks to my XYL Sonya for letting me "play with the radio", to Don, VE3HGN for his help with the experiments, to all those participating in the contests and experiments for their cooperation and valuable reports, and last but not least to *CQ* Magazine for providing the opportunity to publish the theory for the first time and for supporting the finest in Amateur Radio Contesting.

I hope to see you all in the next contest! ▣

Continued from last month.
from CQ June, 1980.

1.8 and 3.5 Mhz Interference Possibilities

Recently released Cordless Telephones use a range of frequencies 1.725 - 1.785 Mhz , mode is FM, Transmission from the base to the portable handset is via 240 v AC mains , the return path is 40 Mhz radiated from the portable handset.

1.8 Mhz Amateur band transmissions may cause interference due to proximity of frequency,and interference to the 3.5 Mhz band may be caused as the second harmonic of the transmitted frequencies fall in the lower portion of amateur band at 3.510, 3.540, 3.570 Mhz .

John VK2BHO

MOST INACCURATE VALUE OF -: Pi (π) is a mathematical constant which is the ratio of the circumference of a circle to its diameter. It is a neverending number and, for most calculations is taken to its third decimal place (3.142).

However, in 1897 the General Assembly of Indiana passed a Bill ruling that the value of Pi was four. This ensured that all mathematical and engineering calculations in the state would be wrong. For example, it would mean that a pendulum clock would gain about fifteen minutes every hour.

THE ILLAWARRA AMATEUR RADIO SOCIETY.
P.O.BOX. 1838 . WOLLONGONG . N.S.W.

MEETINGSSecond Tuesday of every month except January at 7.30.pm. in the S.E.S. Headquarters, Montague Street, North Wollongong

REPEATERS: VK2RAW - 146.850 VHF Mt Murray
VK2RUW - 438.225 UHF Hill 60 Port Kembla
VK2RIL - 147.275 VHF Sublime Point
VK2RIL - 438.725 UHF Sublime Point

BROADCASTS: On Sunday evening prior to the club meeting - 7.00.pm. R.T.T.Y. 7.15.pm. voice. Transmitted on 147.275 VHF and by relay to 3.562 Mhz. Callbacks will be taken after the voice broadcast.

W.I.A. Relay: On 146.850. at 11.00 am. and 7.30.pm. each Sunday.

CLUB NETS:3.562 Mhz SSB on Sunday at 8.00.pm. and a slow morse net on 28.440.Mhz on Tuesday at 8.00.pm.

NEWSLETTER:"The Propagator", published monthly to reach financial members in the week preceeding the club meeting. All articles, adds, etc to the editor by the 3rh Tuesday each month.

MEMBERSHIP: The Secretary, I.A.R.S. , P.O.Box. 1838, Wollongong, code 2500. Full memberschip is $10 per annum; students and pensioners concessional members $5 per annum.

AWARDS: The award of the Illawarra Amateur Radio Society is the **LAWRENCE HARGRAVE AWARD:** VK stations require 10 contacts with I.A.R.S. members. Overseas stations require 5 contacts with I.A.R.S. members. Contact with the club station VK2AMW is sufficient for the award. Band details, date, frequency, station worked and $2 or 4 I.R.C.'s to The Award Manager, I.A.R.S., P.O.Box. 1838, WOLLONGONG , code 2500. No QSL cards required.

STORE :The club store operates at eaach club meeting.

COMMITTEE: President - KEITH CURLE - VK2OB, 24 Beach Drive, Woonona.
Vice President - BILL CHADBURN - VK2DYU, 45 Beltana Ave, Dapto.
Secretary - JIM HAYES - VK2EJJH, Kathleen Cres, Woonona.
Treasurer - ANDREW McEWAN - VK2XGC, 7 Nioka Ave, Keiraville.
Auditor -GEOFF CUTHBERT - VK2ZHU, 1 Nioka Ave, Keiraville.

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E.M.E. CO-ORDINATOR: LYLE PATISON. VK2ALU.

STORE: RAY BALL. VK2PHD/XCC

PUBLICITY OFFICER: DAVE MYERS. VK2DFL.

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SUNDAY-EVENING-CLUB-NET-ROSTER:

First SUNDAY OF THE MONTH : VK2DFK-MIKE KEECH.
2 ND SUNDAY OF THE MONTH : VK2PHD-RAY BALL.
3 RD SUNDAY OF THE MONTH : VK2EMV-M.v.d.VORSTENBOSCH.
4 TH SUNDAY OF THE MONTH : VK2NGS-DAVE ROUTLEDGE
5 TH SUNDAY OF THE MONTH : VK2EBI-KEVIN MURPHY