Tom Allen, W7TAA, from Amateur Electronic Supply (AES) in Las Vegas shows latest equipment at April's UARC Meeting. ***Please note that the UARC Monthly meeting for May will be ***May 13th* instead of the 1st Thursday, due to finals week at the U of U being the first week of May.**

The Periodicals Postage Paid

Microvolt

May 2004

Please Send Dues to:
UARC
c/o Dick Keddington
1732 Woodside Dr #32
Holladay, Ut 84124-1624

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Prologue

The Utah Amateur Radio Club was organized under its present name in 1927, although its beginnings may date back as early as 1909. In 1928, it became affiliated with the American Radio Relay League (club #1602) and is a non-profit organization under the laws of Utah. It holds a club station license with the call W7SP, a memorial call for Leonard (Zim) Zimmerman, an amateur radio pioneer in the Salt Lake City Area.

Meetings: The club meets each month except July and August. The meetings are held on the first Thursday of the month at 7:30 PM in the University of Utah Engineering and Mines Classroom (EMCB) building, Room 101.

Membership: Club membership is open to anyone interested in amateur radio; a current license is not required. Dues are $15 per year, including a *Microvolt* subscription. *The Microvolt* and membership cannot be separated. Those living at the same address as a member who has paid $15 may obtain a membership without a *Microvolt* subscription for $9. Send dues to the Club Secretary: Dick Keddington, KD7TDZ, 1732 Woodside Dr #32., Holladay, UT 84124-1624. ARRL membership renewals should specify ARRL Club #1602.

Contributions: Monetary contributions are gladly accepted. Send directly to the Club Treasurer: Mark Hodgen, 1612 W. 4915 S. Taylorsville, UT 84123-4244. For in kind contributions, please contact any board member to make appropriate arrangements.

Repeaters: UARC maintains the 146.62- and 146.76- repeaters. The repeaters are administered by the UARC Repeater Committee. Comments and questions may be directed to any Committee member. The Lake Mountain repeater (146.76-) has autopatch facilities on both the Orem exchange (covering Santequin to Lehi) and the Salt Lake City exchange (covering Draper to Layton). The 449.10 repeater has autopatch facilities into Salt Lake City only available to UARC members. Due to the volume of traffic, only mobiles should use this autopatch. Autopatch use is open to all visitors to our area and to all club members. Non-members who wish to use the autopatch are encouraged to help with the cost of maintaining the equipment by joining the club.

Ham Hot-Line: The Utah Amateur Radio Club (UARC) has a Ham Hotline, 583-3002. Information regarding Amateur Radio can be obtained, including club, testing, meeting, and membership information. If no one answers leave your name, telephone number and a short message on the answering machine, and your call will be returned.

Publication: The *Microvolt* is the official publication of the Club. Deadline for submissions to the *Microvolt* is the 10th of each month prior to publication. Submissions by email are preferred (gopenshaw@msn.com), but other means including diskettes and typewritten submissions can be mailed directly to: Gary Openshaw, 861 Roosevelt Ave., Salt Lake City, UT 84105. All submissions are welcome but what is printed and how it is edited are the responsibility of the Editor and the UARC board. Reprints are allowed with proper credits to *The Microvolt*, UARC, and authors. Changes in mailing address should be communicated to the Club Secretary: Dick Keddington, 1732 Woodside Dr #32., Holladay, UT 84124-1624.

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Autopatch Engineer: Gordon Smith, K7HFV	582-2438
Provo Autopatch Host &	
ATV Engineer: Dale Jarvis, WB7FID	224-3405
Repeater Monitor:	

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For late breaking news listen to the UARC Information Net Sundays at 21:00 on 146.62 or set your browser to:
www.xmission.com/~uarc/announce.html

We are grateful to the management of XMission, our Internet Service Provider (ISP), for the donation of our Web-Page service.

QST from the Prez

Glen Worthington, WA7X

We have excellent meetings and I need to thank our program Chairpersons, Keith Howard, KA7RLB, and Telvin Mills, KB6BYU, for putting together great programs each month. Last month we had the largest attendance so far this year with many newly licensed amateur operators. It was a great opportunity to see some of the latest manufacturers have to offer.

Speaking of newly licensed operators, be sure and welcome them both on the air and in person. We are an unusual culture with remarkable diversity. For those of us who have been around for years and very comfortable with our culture please allow the newer hams understanding as they learn good amateur practice, rules and radio courtesy. For the new operators please understand that the operators with years of experience do have a lot to offer and take their advice both as training and information on how the rules, culture and local operating practices will really make amateur radio fun and in an emergency, functional.

I know with the large numbers of new operators who are joining our ranks that sometimes we forget this is just a hobby and may get a little too serious at times. Yes we do offer great services and have proven time and time our value to the community and nation as a ready resource including Homeland Security, search and rescue, life and property messages and other public service.

It becomes very important to understand that no operator or group "owns" a frequency, but by common courtesy and help from a diligent Frequency Coordinator (who, if we do have a dispute, has backing from the FCC) we coexist and enjoy our hobby. Please read the ARRL guidelines for shared use of amateur frequencies and look to the Utah VHF Society, as the locally recognized Frequency Coordinators, for our local guidelines and current assignments by visiting their web page at http://www.ussc.com/~uvhfs/ . This page is kept very current and we can all learn something new about the VHF spectrum in our area from this page.

I noticed that amateur radio operators were honored this past month as volunteers for the search for Elizabeth Smart a couple of years ago. The article stated that over 150 amateur operators participated in her search. I know that everyone's efforts are appreciated and collectively contributed to positive reinforcement and fortunate outcome in this horrific situation. I got to meet Elizabeth shortly after she was returned to her family and felt the appreciation she had for everyone who made the effort to find her. Great job to the many ham volunteers who contribute to emergency communication efforts each year.

Remember that Field Day is coming up real fast and our June meeting will feature a review of past events and information on this year's gathering.

Now lets go have some fun and remember, "this is just a great hobby"!

73 Glen WA7X

Tech Net: Wed. 9:00pm

The UARC board decided to try holding a weekly Technical Discussion Net each Wednesday at 9 P.M. Our new President, Glen Worthington, WA7X, has been acting as net control. If you've wondered how a particular antenna works, need advice on how to bias the op-amp in your latest project, or want to share a recent discovery with folks who might appreciate it, this might be the net for you. Check the club's 146.62 MHz repeater. If you are interested in doing Net Control for this for this net please contact a Glen Worthington at 272-8825 or E-Mail at max@wa7x.com. Thanks.

Member of the Month

Linda Reeder, N7HVF

This month we are featuring Dallas Crump, KD7YNB. Dallas is new to the hobby. He has had his Technician license for six months. Dallas is working hard on getting his General license. Dallas hopes to go all the way to the top and get his Extra license. It was Boyd Crump, W7STI, Dallas' grandfather, who lives in St. George, Utah, who got Dallas interested in the hobby. Dallas says his father is thinking about getting his license. Dallas has five brothers.

Dallas is in the 8th grade at South Jordan Junior High School. His favorite subject is science. He is really interested in electronics. Dallas is thinking about talking to the science teacher about starting a ham class to get his classmates into the hobby. Dallas says he would be very happy to be an Elmer for anyone who is interested in getting in the hobby. They can give him a call at 446-9349 or E-mail him at docsboots@aol.com. Dallas enjoys working with people. In fact, his favorite thing about amateur radio is meeting different people.
Dallas says after he graduates from high school he plans to go into law enforcement. Dallas is interested in several other hobbies. Dallas enjoys hiking, camping, hunting, radio control aircraft and all-terrain vehicles. Dallas is a member of UARC. He is net control for the UARC information net on the fifth Sunday of the month.

Dallas is really excited about attending Field Day. This will be his very first Field Day. He really wants to help out in any way that he can. So he will be getting in touch with Lonnie Oaks, K7LO, who is Field Day Chairman for this year.

Dallas, we wish you the best in all of your endeavors.

73, N7HVF, Linda Reeder

May Meeting: Logbook of the World and DX

The first thing to note about the May meeting, is it's not on the regular date. In May only, it will be held on the *second* Thursday of the month -- May 13. (The normal first Thursday date comes in the middle of University final exams, and it is not guaranteed that we can get the room.)

We have been fortunate enough to get Darryl Hazelgren, AC7O, to present our program. Darryl is an avid DXer and a veteran of several high-profile DXpeditions. He will be telling us (among other things) about ARRL's new "Logbook of the World" (LOTW). We hope to have more details soon.

Tickets to UARC's annual steak-fry will go on sale at the May meeting. The steak-fry date is Saturday, July 10. The event will be held at "The Spruces" campground in Big Cottonwood Canyon. The April meeting will be the first of only three chances to buy tickets at a club meeting.

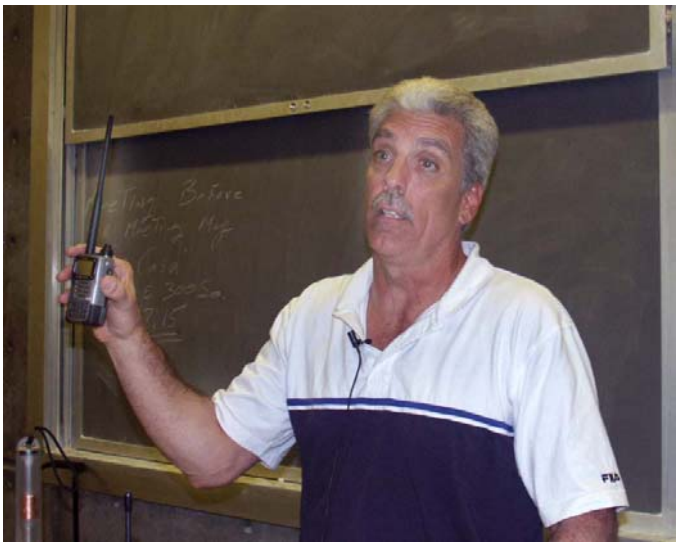
That's the Second Thursday, May 13, at 7:30 P.M. in room 101 of EMCB on the University of Utah campus. It is the Second Thursday because of Finals Week the First Thursday in May.

Help Wanted: UARC NET

UARC needs help with the Information Net on Sunday evenings at 9:00pm. Net Control Operator's are needed, as well as someone to do Other Club Information. Please call Mike Youngs, KK7VZ, 298-7282 or E-Mail him at youngs@qwest.net, and be involved.

UARC Steak-Fry

The annual UARC Steak Fry will be held on July 10th, 2004 at the Spruces -- Area 7. Be sure to plan that day on your calendar and keep it open. Steak Fry tickets may be purchased at the next UARC Meeting. Prices are $3.00 for members, $4.00 for Children, $10.00 for non-members and guests.



Tom Allen, W7TAA, (AES)

If there's one thing practically all hams seem to be interested in, it's the latest equipment, complete with lots of controls, readouts, and multicolored indicators. Tom Allen, W7TAA, from Amateur Electronic Supply (AES) in Las Vegas (Web site is at http://www.aesham.com/) presented the latest equipment at April's UARC Meeting. We would like to thank Tom for coming from Las Vegas and doing his presentation.

Mel Parkes, AC7CP, ARRL Section Manager

We all enjoy Amateur Radio and enjoy the diversified aspects that the hobby provides for our enjoyment. For a number of years ARRL has made an effort to encourage the Amateur Radio Community to help get a bill passed that would protect the Amateur Radio Frequency Spectrum that has been allocated for our use. The Bill is know as "The Amateur Radio Spectrum Protection Act of 2003."

We need the support of as many amateurs as possible in Utah to contact our Senators and Congressional Representatives. If you have done so already I commend you for your dedication and commitment to amateur radio. If you haven't please consider doing so. It is not very difficult and your effort will help us all. Here is what you need to do. First go to the ARRL Web Site (http://www.arrl.org/govrelations/arspa). There you will find an explanation about the act and also information on how to find out the mailing address and email address of our elected officials and sample letters to send. You can email or send a letter. Either will work and carries the same impact.

With a combined effort on the part of all our Utah amateur radio operators we can influence our Congressional delegation in Washington DC to support and sponsor this bill. Another area of concern many have asked about is Broadband over Power Lines (BPL) If you are concerned about this issue you can find more info at: http://www.arrl.org/tis/info/HTML/plc/bpl-deployment.html

I would like to encourage those of you who are not ARRL Members or who have let your membership lapse to consider joining ARRL at your next club meeting. By doing so ARRL will let the club keep $15.00 of your annual dues, thus helping our club, and I can give you a FREE repeater directory. For the club to get the $15.00 you must join through the club and be a new member (expired member of two or more years are considered new members). Also if you are an ARRL member renewing I can also give you a FREE repeater directory. ARRL membership is a very important aspect of being a ham. If you have any questions about ARRL please feel free to contact me at AC7CP@ARRL.net

73, Mel Parkes, AC7CP

Why 50 ohms?

Ron Jones K7RJ

Isn't it interesting how virtually every bit of radio frequency gear has a 50-ohm output or input impedance? I'm not going to discuss why we have to match output impedance with the load impedance in order to get the maximum power to the load and to minimize the SWR, I want to talk about why we seem to always be doing this impedance stuff around 50 ohms. Why not 12 ohms or 2000 ohms or any other number? Why 50? What is magic about 50?

The 50-ohm standard comes from the use of coaxial cable. There is great folklore about how 50 ohms came to be the standard. One of my favorite stories is that a couple of early RF engineers went to the hardware store and ended up with two pieces of pipe that fit inside each other and the resulting impedance happened to be 50 ohms. I suppose that could have happened, but like most things in engineering, there is much better science behind a standard than a happenstance trip to the hardware store.

The impedance of coax has nothing to do with its length, only the ratio of the diameters of the two conductors. If the transmission line is in dry air or a vacuum, we get our only equation for this article in Figure 1. If the coax has some other internal insulation, (called the "dielectric") the concepts for this paper are still the same.

Let's look at the characteristics of this equation. Never mind the 132 and the log stuff, let's just look at the fraction. We see that if the center conductor (a) is really small, the impedance will be large, if the center conductor is large, the impedance will be small. Someplace between small and large is 50 ohms.

OK, now lets get down to work and figure this thing out.

When we are sending a signal down a piece of coax, there are at least three important things to be concerned about. How much voltage can we apply to the coax, how much power can it carry and how little will the coax attenuate the RF signal. Our goal is to figure out how to make coax that will let us apply the highest voltage, transfer the highest power while having the lowest attenuation. Lets look at these three important parameters a little more closely. Figure 2 graphically summarizes the following three discussions.

MAXIMUM VOLTAGE:

If the center conductor is really fat (a low impedance) it will be close to the outer conductor and the voltage will be more likely to arc through to the outer conductor than if the conductor is skinny. Therefore, it would seem that for higher voltage, the skinnier the center conductor the better. But, there is a subtle thing that happens that makes this not the case. If the conductor is really skinny, the electrostatic charge per unit area gets so large that it can discharge into the space between the outer and inner conductor not unlike the corona effect on pointed tips of conductors. In a way, if the voltage is not spread out over a big area, it acts as if it is a much larger voltage. So, a fat center conductor will arc because it is close to the outer conductor and a skinny one will because there is a large electric field per unit area. You can't win!

It turns out that you *can* win. Someplace between too fat and too skinny, there is a center conductor size that will allow for the maximum voltage to be applied to the coax. If we work out the math, and it is not trivial math, we get the plot of "breakdown voltage" on Figure 2. It turns out that the maximum voltage that can be applied to the coax will be when the ratio of outer conductor to center conductor is 2.7 and according to the equation in Figure 1, will be an impedance of about 60-ohms.

MAXIMUM POWER:

The observations about maximum power are much the same as with maximum voltage. Fat center conductors (low impedance), can carry lots of power, whereas skinny ones (high impedance) can't. But, with fat center conductors we have the problem of voltage arcing to the outer conductor and with skinny conductors we have a double whammy of charge density causing corona arcing plus the added problem of high current density acting as a sort of resistance which limits the power transfer. Working out the math, we get the "power carrying capability" plot of Figure 2. Notice how power carrying capability drops off quickly with skinny center conductors due to limitations from both high charge and high current density. It turns out that we get the maximum power handling capability at a conductor ratio of 1.67, which, according to the equation in Figure 1, is an impedance of about 30 ohms.

MINIMUM ATTENUATION:

Lets take the same logical approach and look at signal attenuation. If the center conductor is really skinny, it acts like a resistance to the signal and the attenuation is big. If the center conductor is large, it is close to the outer conductor, thus more of the signal gets attenuated due in part to capacitive coupling the outer conductor. Again, if we work out the math, we get the plot of "attenuation" on Figure 2. It turns out that when the ratio of outer to center conductor size is 3.57 there will be minimum signal attenuation in the coax. This, according to Figure 1, will be an impedance of about 76-ohms.

SUMMARY

Maximum voltage with 60-ohm coax
Maximum power with 32-ohm coax
Minimum attenuation with 76-ohm coax

If the most important parameter for coax is to have minimum attenuation the standard would be 77 ohms. Years ago that was the case, power was hard to come by and amplifiers were expensive so the engineers did all they could to keep the signal attenuation to a minimum. 75 ohms was pretty much a standard in the early days of radio. Even today, minimum attenuation of the VHF signals that have to travel down miles of coaxial cable is of

paramount importance to the cable television industry and they have adopted 75 ohms as their standard.

But, the electronics industry in general had to decide on a sort of compromise standard, since it had to appeal to the industries that want to transmit high power or high voltage as well as those who are concerned about absolute minimum signal loss. Some industries, such as two way radio or amateur radio, have the compounded problem of having a single piece of coax that has the double burden of having to transmit high power to the antenna and deliver a low loss weak signal to the receiver. So, a compromise was slowly adopted. Someplace between 77-ohm minimum attenuation and 32-ohm maximum power carrying is 50 ohms. This is a nice easy to work with number that strikes a good compromise. It is also pretty close to the point of maximum voltage handling, a big concern when we start considering the effects of standing waves.

So, there you have it. Why 50 ohms? Because it is a really good compromise between impedances that maximize the power, minimize the signal loss and maintain a high voltage rating.

73, Ron Jones, K7RJ

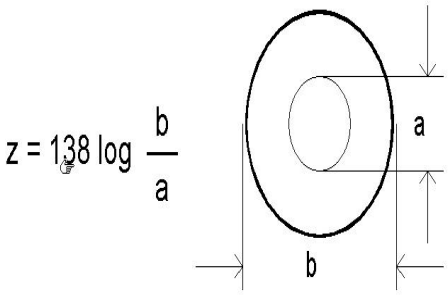


FIGURE 1
Equation for impedance of a coaxial line with a vacuum or dry air dielectric

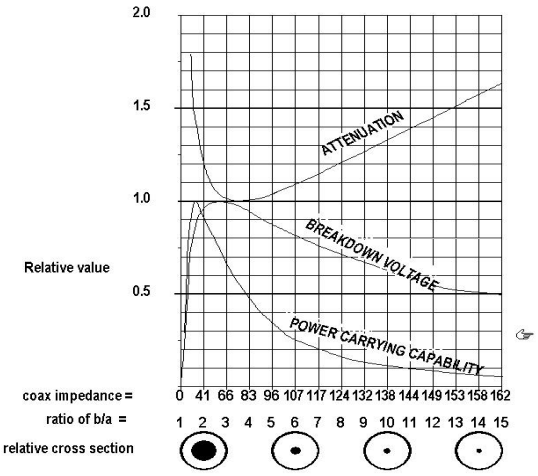


FIGURE 2
Relative value of various parameters of coaxial cable as a function of impedance

Field Day: June 26th & 27th

Lonnie Oaks, K7LO, has agreed to be Chairman of this year's Field Day Committee. Lonnie could use lots of help with everything from antennas to Forest Service permits. Departments could include antennas, rigs, computers, filters, safety, and entertainment. If you would like to be a part of the planning, contact Lonnie at 255-1225.

Field Day is an annual contest sponsored by the American Radio Relay League (ARRL). It is a contest in which portable and mobile stations compete trying to make the most possible contacts in a 24-hour period. The object is to give hams experience in setting up stations in the field and exchanging information accurately under bad operating conditions. The dates of the contest always fall on the fourth Saturday of June and the following Sunday. That puts the 2004 event on June 26 and 27th.

UARC has entered as a club portable station for many years, often combining the operating event with a family campout. This year's entry will likely

be held in the traditional place, in Payson Canyon south of Payson Lakes. Be sure to reserve the dates.

If you have suggestions or would like to offer assistance, do get in touch with Lonnie.

Exam Schedule

05/19/04	(Wed.)	Provo	Steve Whitehead, NV7V	465-3983
05/19/04	(Wed.)	St. George	Ronald C. Sappington, WI7Z	(435) 673-4552
05/25/04*	(Tues.)	Salt Lake C	Eugene McWherter, N7OVT	484-6355
05/27/04	(Thu.)	Roosevelt	R Chandler Fisher, W7BYU	(435) 722-5440
06/02/04	(Wed.)	Ogden	Mary Hazard, W7UE	430-0306
06/05/04	(Sat.)	Salt Lake C	Gordon Smith, K7HFV	582-2438 534-8116
06/12/04	(Sat.)	Logan	Heidi Black, AC7ZC	(435) 753-7487
06/16/04	(Wed.)	Provo	Steve Whitehead, NV7V	465-3983
06/16/04	(Wed.)	St. George	Ronald C. Sappington, WI7Z	(435) 673-4552
06/29/04*	(Tues.)	Salt Lake C	Eugene McWherter, N7OVT	484-6355

*Only Technician elements (1 and 2) given at this session