



## Membership Form 2012

This form may be used for any of the following purposes (check all that apply):

- Pay Dues ( New  Renew)
- Change of Mailing Address
- Update personal information (new callsign, upgrade, etc.)

### Personal Information

Call Sign \_\_\_\_\_ License Class \_\_\_\_\_ Name \_\_\_\_\_

Address: \_\_\_\_\_ City: \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

Email Address: \_\_\_\_\_ ARRL Member?  Yes  No

Home Phone: \_\_\_\_\_ Cell Phone: \_\_\_\_\_

Ham Hum Delivery:  Mail  Email

### Spouse Information (complete only for spouse applying at same time)

Call Sign \_\_\_\_\_ License Class \_\_\_\_\_ Name \_\_\_\_\_

Email Address: \_\_\_\_\_ ARRL Member?  Yes  No

### Minor Dependent (complete only for minors applying at the same time)

Call Sign	License Class	Name	ARRL Member?
_____	_____	_____	<input type="checkbox"/> Yes <input type="checkbox"/> No
_____	_____	_____	<input type="checkbox"/> Yes <input type="checkbox"/> No
_____	_____	_____	<input type="checkbox"/> Yes <input type="checkbox"/> No

### New Member Application Signature

I agree to conduct my activities in accord with the Articles of Incorporation and Bylaws of the AK-SAR-BEN Amateur Radio Club, Inc.

Signature \_\_\_\_\_

Date \_\_\_\_\_

### Annual Dues

(January thru December)

#### For Club Use Only – DO NOT WRITE IN THIS AREA

- |   |  |                   |
|---|--|-------------------|
| <input type="checkbox"/> Full Member                        | \$20.00 year                                 | Amount: _____     |
| <input type="checkbox"/> Accompanying Spouse                | \$ 4.00 year                                 | Amount: _____     |
| <input type="checkbox"/> Accompanying Minor Dependent       | \$ 4.00 year times number of minors renewing | Amount: _____     |
| <input type="checkbox"/> Student Member (full time student) | \$ 8.00 year                                 | Amount: _____     |
|   |  | Total Paid: _____ |

Make sure your information is correct and return this form to the Club with your dues. Dues are payable at any time and are considered in arrears if not received by Feb 28. Club members renewing within two years of their last year of paid membership must still pay the the full years dues. After two years, members must reapply for membership.

# Ham Hum

Volume LXI, Issue 11

November 2011

## Pirate Radio Stations



No, it wasn't about Talk Like A Pirate Day—which was September 19<sup>th</sup>—it was about people who broadcast radio programs on unlicensed transmitters. Joe Eisenberg, KØNEB, talked about them and similar radio stations for the October AARC meeting.

Joe, who's in his 42<sup>nd</sup> year as an AARC member, got interested in monitoring such stations long ago when he was tuning around and started to pick up "strange-sounding"

broadcasts. As he learned more, he found that these transmissions could be divided into three groups: Pirate, Clandestine, and Spy.

Pirates, as mentioned above, are unlicensed transmitters that can be found on AM, FM, and SSB bands. For the last group, they tend to operate near ham bands, 6.9-6.99 MHz (mostly around 6.925 MHz). He mentioned that one AM broadcaster, Liberty 1640, was an AM pirate station here in Omaha. They operated near 68<sup>th</sup> and Blondo for about a year before being shut down in 2010 by the FCC. Pirate stations broadcast sporadically, but peak on holidays—with Halloween, Christmas Eve, and New Years being the most favorite events. He pointed out that pirate broadcasters tend to use rough language with some inside humor. Also, the content won't always be coherent—sometimes completely random.

Clandestine stations are defined as those who broadcast political propaganda. They're typically AM emissions (around 3 MHz) that are operating near their target region. They tend to broadcast around the clock.

(Pirate Radio Stations continued on page 3)

## Time to Nominate AARC Officers

SEE PAGE 10 FOR DETAILS.

HAM HUM is the official newsletter of the AK-SAR-BEN Amateur Radio Club, Inc. in Omaha, Nebraska. It is printed monthly and is distributed to members of the club, local disaster officials, local electronics outlets, and editors of other ham radio newsletters.

Articles about activities of members are solicited. The subject matter must be of general interest to radio amateurs and be understandable to a significant portion of the membership. No payment will be made to contributors and submissions will be subject to the usual editorial review. Articles containing statements that could be construed as libel or slander will not be accepted. No guarantee can be made that an accepted article will be published by a certain date. Send your contributions to Ham Hum, P.O. Box 24551, Omaha, NE 68124-0551 or email hamhum@aksarbenarc.org. Please contact the editor for permission to reprint anything appearing in the Ham Hum.

### Club Officers & Board Members

President	Mary Joseph	NØTRK	402-492-9156	n0trk@arrl.net
Vice President	Bill McCollum	KEØXQ	402-690-7965	ke0xq@cox.net
2011-2012 Board (Secretary)	Bill True	WA9ASD	402-426-2813	williamtrue@aol.com
2011-2012 Board (Treasurer)	Marvin Taylor	AEØEG	402-556-3668	AEØEG@arrl.net
2011	Jim Harper	KCØSHZ	402-659-0102	kc0shz@yahoo.com
2011	Claudia Peterson	K1AUD	402-593-1950	kc0sqx@arrl.net
Immediate Past President	John Gebuhr	WBØCMC	402-932-3443	wb0cmc@cox.net

### Club Committees

Courtesy Committee	Bill McCollum	KEØXQ	402-690-7965	ke0xq@cox.net
Education	Mary Joseph	NØTRK	402-492-9156	n0trk@arrl.net
Field Day	Claudia Peterson	K1AUD	402-593-1950	kc0sqx@arrl.net
Membership	Mary Joseph	NØTRK	402-492-9156	n0trk@arrl.net
Monday Night .94 Net	Rich Swig	WAØZQG	712-256-7774	wa0zqg@yahoo.com
Prizes	Rollie Miller	ABØNN	402-333-1606	ab0nn@arrl.net
Public Service/Emergency	Jim Harper	KCØSHZ	402-659-0102	kc0shz@yahoo.com
Publications	Bill Wilkinson	KCØSVZ	402-397-8803	kc0svz@yahoo.com
QSL Manager & Technical	Ed Edwards	KØIL		k0il@arrl.net
Special Events Coordinator	Pat Joseph	KØCTU	402-492-9156	ppjoseph@cox.net
Web Services	Mary Joseph	NØTRK	402-492-9156	n0trk@arrl.net

### Repeater Committee

Chairman	John Gebuhr	WBØCMC	402-932-3443	wb0cmc@cox.net
Vice Chairman	Steve Schmitz	NØUP	402-306-2972	n0up@arrl.net
Control Operator	Mary Joseph	NØTRK	402-492-9156	n0trk@arrl.net
Club Callsign Trustee	Corby Krick	KØSKW	402-540-5483	k0skw@k0skw.net

### Other Contacts

ARRL Midwest Director	Clifford Ahrens	KØCA	573-221-8618	k0ca@arrl.org
ARRL Midwest Vice-Director	Rod Blocksom	KØDAS		
EC Douglas County	Steve Schmitz	NØUP	402-306-2972	n0up@arrl.net
EC Sarpy County	Dennis Mitchell	KCØYKN		
Exams/Vol. Council	Brian Zdan	KMØY	402-553-2610	bzdan@novia.net
NE Section Manager	Art Zygielbaum	KØAIZ	402-421-0839	KØAIZ@arrl.org
Official Observer Coordinator	Bill McCollum	KEØXQ		ke0xq@cox.net

### November Meeting

The next meeting of the AARC will be on Friday, November 11<sup>th</sup> at 7:00 PM. The location is the Heartland Chapter House of the American Red Cross at 81<sup>st</sup> and Spring (near 81<sup>st</sup> and Center). Jim Leedham, WBØBIK, will do a presentation on the flooding at the KOTK transmitter site.

### AARC on the Web

**Club Web Site:** <http://www.aksarbenarc.org/>

**Facebook:** <https://www.facebook.com/aksarbenarc>

**Yahoo! Groups:** <http://groups.yahoo.com/group/AKSARBENtalk/>

### (Meeting Minutes continued from page 5.)

**Public Awareness** - Pat, KØCTU reported that the club participation at the Benson Farmer's Market Kids Day resulted in a few contacts in the Washington State QSO Party and several positive public contacts.

**Old Business** -Mary NØTRK, representing the Trailer Committee reported that a 6 foot by 12 foot 2008 model trailer was purchased almost immediately after the motion to allocate the funds at the last club meeting. Marv, AEØEG towed the trailer to the club meeting and it was outside in the parking lot available for inspection. It is licensed and is searching for a temporary home away from Marv's wife.

Mary, NØTRK reported that the Equipment Committee is still looking for members and would like to make this a standing committee with a Bylaws change. The Heil microphone offered for sale at last month's meeting was sold for \$80. A replacement has not yet been purchased.

**New Business** - none

**Announcements** - November Sweeps are coming up. This is an enjoyable contest that starts on Saturday afternoon.

The Iowa State Convention (Hamboree 2011) is October 22 in Sargent Bluff, Iowa, just south of Sioux City.

The Monthly Saturday Night Coffee is tomorrow, October 15 at 6 PM until???? at Perkins at 108th and L street.

**Door Prize Committee Report** - Rollie, ABØNN reported that prizes this night include a heavy-duty four-wheel moving dolly, a pair of 7 X 50 binoculars, and a visor work light. The Brown Bag Door Prize reappeared and there was another donation from the esoteric collection of international DXer, Anton Reeh, also known as The Mr. Reeh Door Prize. Additional callsigns for Mr. Reeh were noted; those of 8P1E and W1AVV.

Door prizes for the December meeting are, so far, 2 Wuks On (Who's On?) dual-band handhelds and a Radio Shack HTX-100, 10 meter, 25 watt, SSB and CW transceiver.

All tickets purchased throughout the year are included in the drawing at the December meeting. Winners must be present.

At 7:44 PM, a motion was made by John, WBØCMC, seconded by (not-)Norm(al), WAØJYD, to end the meeting. Passed unanimously.

*Bill WA9ASD, Secretary AARC*

### HAM RADIO NUMBERS: 700,000 HAMS IN THE USA

Figures released by the ARRL say that the number of United States hams now stands at a record high of 700,000. According to ARRL V-E-C Manager Maria Somma, AB1FM, the number of Technicians peaked in March at 342,572, while both Generals and Extras peaked in September.

Somma noted that there are up/down fluctuations as new Technicians earn their licenses, current Technician licensees move on to General, and Generals to Extra. Nonetheless, Somma says that there are more than 700,000 hams in the US for the first time.

de Denny KØLGI

# AARC Officer Nominations

We have once again reached the time of year for Club Officer nominations. For 2012, four officers must be nominated and elected: President, Vice-President, and two Directors. Please consider volunteering for one of these positions.

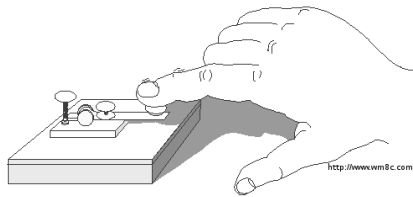
**President:** \_\_\_\_\_

**Vice-President:** \_\_\_\_\_

**Director:** \_\_\_\_\_

**Director:** \_\_\_\_\_

Assess your dedication, position, and ability to accept a floor nomination. Help continue to keep AARC an ongoing strong organization. Realistically, it takes only a couple hours each month. If you are interested or willing to take a position please contact one of the current Club officers to discuss the details. Please consider helping.



## AK-SAR-BEN ARC PROXY

This form is used to have your vote represented by a member attending the annual business meeting in the event you are unable to attend. If you cannot attend, decide on whom or what you wish to vote and instruct the recipient of your proxy to do so.

Known by all men by these presents, that the undersigned hereby constitutes and appoints \_\_\_\_\_ as attorney and proxy to appear and cast the votes which the undersigned, as a member of the AK-SAR-BEN Amateur Radio Club, Inc., is entitled to cast at the annual meeting of said corporation, to be held at the Heartland Chapter House of the American Red Cross, 2912 South 80<sup>th</sup> Avenue, Omaha, Nebraska on December 9<sup>th</sup>, 2011, and at any adjournment thereof. The undersigned hereby instructs said attorney to vote:

1. For the election of new directors and officers of the corporation, and
2. Upon any other business which may properly be brought before the meeting of any adjournments thereof.

Member Signature: \_\_\_\_\_

Date: \_\_\_\_\_, 2011

## (Pirate Radio Stations *continued from page 1*)

Spy stations are run by organizations (such as various governments) who transmit coded information to agents with shortwave radios. AM, SSB, and CW are usually the preferred modes. And they use frequencies that provide longer range, typically 6 to 12 MHz. Joe played some samples of spy broadcasts. Mostly code numbers in groups of five and spoken by a synthesized voice. The numbers were in English, but Joe stated that Spanish-speaking stations could sometimes be heard.

In short, pirate/ clandestine/spy stations are alive and well—and even send out QSL cards. (Joe displayed some from *Voice of the Voyager*, *The Voice of Tomorrow*, and *WEED Radio Network*.)

Joe concluded the program by playing some of the Dayton slide shows that he'd created over the years. This included *The Early Years*, and the 2011 Hamvention, *Working for the Weekend*, among others. These can be found on Joe's YouTube site, *joehusker's Channel*, <http://www.youtube.com/user/joehusker>.

Besides monitoring pirate stations and creating ham-related slide shows, Joe edits the *Kit-building* column for *CQ Magazine*. For more information on pirate, clandestine, and spy radio stations, see the following URLs: <http://www.monitoringtimes.com/>, <http://www.popular-communications.com/>, <http://www.fm.net/>, <http://www.anarc.org/>, and <http://www.swlfest.com/>.

**Editor's Note:** *Coincidentally, the subject of spy stations reminded me that it was something I was superficially (\*very\* superficially) involved with when I was in the US Army Security Agency. In the early 70s, ASA had sites along the border between East and West Germany, which would receive reports from field agents east of the border. As I recall, the preferred mode was CW. At the sites, the receivers used were Collins R-390s. Note that I wasn't directly involved with the RF side of the operation. I installed and maintained digital encryption systems used to send the gathered data back to the States.*

Bill KC0SVZ

## November Sweeps

The ARRL's annual November Sweepstakes for Phone begins Saturday, November 19, 2011 at 3:00 PM and continues to 9:00 PM Sunday, November 20<sup>th</sup>.

Established in 1932, this is the ARRL's oldest domestic contest. It's a competition between North American stations – individuals, teams, and clubs. The contest is unique in that each station may only be contacted once and the number of different recognized locations is limited to the 80 ARRL and RAC sections. Working the 80 sections is called a "Clean Sweep" and allows the station to claim one of the coveted Clean Sweep coffee mugs – there are other awards, as well. Bands: 10, 15, 20, 40, and 80 meters. Complete details can be found at <http://www.arrl.org/sweepstakes>.

(For other events this month, see Contest Calendar on page 9.)



## Veep Speaks

I want to thank Joe, KØNEB for the presentation on Pirate and Clandestine Radio.

I am one of three people on the nominating committee, the other two being KØCTU and WBØCMC. Please give some serious thought to running for a board position or a club officer for 2012. It really doesn't involve a whole lot of time, just your desire to help out the club. Over the past few years, it has been the same people running the club. These people are starting to get burned out, so the club really needs a new infusion of people willing to fill leadership positions. If you are dissatisfied with the direction the club is heading, now is your chance to do something about it.

For the November meeting, Jim Leedham, WBØBIK, Chief Engineer at radio station KOTK (formerly KOOO), will give a presentation on the effects of the flood at the transmitter site.

Hope to see you in November.

73, Bill KEØXQ, Vice President AARC

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*You may be a ham radio operator if... the microphones or visual aids at a meeting don't work, you rush up to the front to fix them.*

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## Club Meeting Minutes – October 14, 2011

Bill WA9ASD, Secretary AARC

The meeting was called to order at 7:11 PM by saying the Pledge of Allegiance. There were 22 attendees. Introductions by name and call.

Officers and Board Members present included: Mary, NØTRK; Bill, KEØXQ; Bill, WA9ASD; John, WBØCMC and Marv, AEØEG.

Secretary's Report - A motion was made by Bill, KEØXQ, seconded by John, WBØCMC to accept the September club meeting minutes with correction to the spelling of the convention the club was invited to exhibit at but unable to attend due to schedule conflicts from NEWCON to Nuke-Con. Motion passed.

Treasurer's Report - Marv, AEØEG reported that there were revenues of \$126 and expenditures of \$2,591 for the trailer and license in the past month. Marv also presented a summary comparison of the original budget for the year with the revenue and expenses so far.

Vice President's Report - Bill, KEØXQ reported that the program for tonight's meeting will be Pirate and Clandestine Radio by Joe, KØNEB.

(Meeting Minutes continued on page 5.)

## Contest Calendar

### November 2011

CWops Mini-CWT Test	1300Z-1400Z, 1900Z-2000Z, Nov 9 and 0300Z-0400Z, Nov 10 2000Z-2130Z, Nov 9 0000Z, Nov 12 to 2359Z, Nov 13 0001Z, Nov 12 to 2359Z, Nov 13 0700Z, Nov 12 to 1300Z, Nov 13 1200Z, Nov 12 to 1200Z, Nov 13 1300Z-1400Z, 1900Z-2000Z, Nov 12 and 0300Z-0400Z, Nov 13 1400Z, Nov 12 to 0200Z, Nov 13 1900Z, Nov 12 to 0500Z, Nov 14 0000Z-2400Z, Nov 13 1800Z-2000Z, Nov 14 0130Z-0330Z, Nov 17 1600Z-2200Z, Nov 18 0000Z, Nov 19 to 2359Z, Nov 20 1000Z, Nov 19 to 1000Z, Nov 20 1200Z, Nov 19 to 1200Z, Nov 20 1600Z, Nov 19 to 0700Z, Nov 20 1600Z-1800Z, Nov 19 2100Z, Nov 19 to 0100Z, Nov 20 2100Z, Nov 19 to 0300Z, Nov 21 2100Z, Nov 19 to 0300Z, Nov 21 0000Z-2400Z, Nov 20 0200Z-0400Z, Nov 21 0000Z-0200Z, Nov 23 1300Z-1400Z, 1900Z-2000Z, Nov 23 and 0300Z-0400Z, Nov 24 2000Z-2130Z, Nov 24 0000Z, Nov 26 to 2400Z, Nov 27 1300Z-1600Z, Nov 27
RSGB 80m Club Sprint, SSB WAE DX Contest, RTTY 10-10 Int. Fall Contest, Digital JIDX Phone Contest OK/OM DX Contest, CW CWops Mini-CWT Test	
Kentucky QSO Party CQ-WE Contest SKCC Weekend Sprint NAQCC-EU Monthly Sprint NAQCC Straight Key/Bug Sprint YO International PSK31 Contest ARRL EME Contest SARL Field Day Contest LZ DX Contest All Austrian 160-Meter Contest Feld Hell Sprint RSGB 2nd 1.8 MHz Contest, CW NA Collegiate ARC Championship, SSB ARRL Sweepstakes Contest, SSB EPC PSK63 QSO Party Run for the Bacon QRP Contest SKCC Sprint CWops Mini-CWT Test	
RSGB 80m Club Sprint, CW CQ Worldwide DX Contest, CW SARL Digital Contest	

### December 2011

QRP ARCI Topband Sprint ARRL 160-Meter Contest TARA RTTY Melee Wake-Up! QRP Sprint	0000Z-0600Z, Dec 1 2200Z, Dec 2 to 1600Z, Dec 4 0000Z-2400Z, Dec 3 0600Z-0629Z, 0630Z-0659Z, 0700Z-0729Z, 0730Z-0800Z, Dec 3 1600Z, Dec 3 to 1559Z, Dec 4 2300Z, Dec 3 to 2300Z, Dec 4 and 2300Z, Dec 10 to 2300Z, Dec 11 0200Z-0400Z, Dec 6 0230Z-0300Z, Dec 9
TOPS Activity Contest AWA Bruce Kelley Memorial CW Contest	
ARS Spartan Sprint NCCC Sprint Ladder	

For details, check: <http://www.hornucopia.com/contestcal/index.html>

### Address Change?

If you've changed your mailing address, or would prefer to receive the Ham Hum via email, please contact Mary NØTRK (Membership) or Bill KCØSVZ (Publications) with your new information.

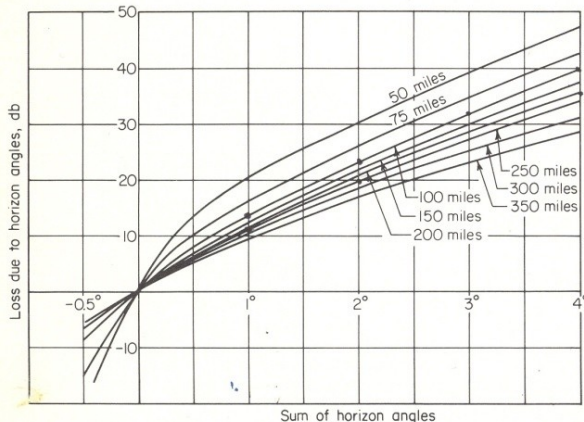
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*You may be a ham radio operator if: You have given out RST reports while you were on the telephone.*

**(HAM TECH continued from page 6.)**

This loss in Fig. 1 (page 6) includes the line of sight loss plus excess scattering loss. It assumes operation at 1.0 GHz with the antenna beams on the horizon. Simple, but it is a big loss and there is more to come. One more chart to compensate for elevated antenna beams (right).

The loss in Figure 1 must be corrected for use at other frequencies. The frequency correction allows its use in the range of 100 to 4000 MHz. The correction in dB which is added to the loss from the chart is equation #1.



**Fig. 2: Loss for elevated horizon angles. (1)**

$$Eq. \# 1 \quad L_c = 30 \log \left( \frac{f_{MHz}}{1000} \right) \text{ dB}$$

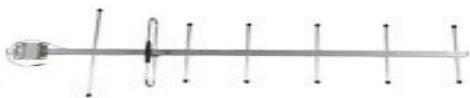
As an example, the loss at 200 miles and 432 MHz is 216 dB + (-10.9) dB = 205.1 dB.

This implies that operation at lower frequencies will yield lower loss and be easier to achieve. But remember this is loss for antenna beams on the horizon; not possible to achieve. Let's use the 50 ft. towers from last month's LOS example, a practical value for modest stations. At 2 meters with horizontal polarization the elevation beam will be 2 degrees above the horizon. At 70 cm it will be at 0.67 degrees and 0.22 degrees at 23 cm. For two stations both with 50 ft. towers the horizon angle loss will be 36 dB, 15 dB and 4 dB respectively for these bands. The total propagation loss from all three components put together is as follows:

- |            |                     |            |
|------------|---------------------|------------|
| 1. (2 m)   | LT = 216+(-25.2)+36 | = 226.8 dB |
| 2. (70 cm) | Lt = 216+(-10.9)+15 | = 220.1 dB |
| 3. (23 cm) | Lt = 216+(+3.4)+4   | = 223.4 dB |

Our lowest loss is at 70 CM, due to the non linearity of the components with frequency. Next month we will configure a station at 432 MHz, calculate the S/N ratio for various ham modes and see if 200 mile coverage is possible, or something greater. Keep this issue of HAM TECH as you will need the charts and equation.

Reference (1): *Communication System Design* Chapter 13, Figures 13-19 & 13-21. By: Philip F. Panter c. 1972.



**(Meeting Minutes continued from page 4.)**

President's Report - Mary announced that the club officer Nominating Committee was formed. Members include John, WBØCMC, chairman, as specified in the Bylaws, Bill, KEØXQ and Pat, KØCTU. Bill volunteered to insure that he will not be nominated for an office and Pat volunteered to insure that Mary, NØTRK will not be nominated for an office. Members were urged to approach the Committee to become a nominee for the offices of President, Vice President and 2 Board members. The responsibilities for these positions are not difficult to perform and plenty of assistance is available for those elected. Please step up to the task when contacted.

Public Service/ARES/SATERN/Community Events - ARES - The planned drill has been delayed. When scheduled, it will be an S. E. T.

SATERN - Corby, KØSKW reported there is some discussion on reactivating this station.

Community Events - Pat, KØCTU reported on the success of the Market-to-Market race support and thanked all the participants as well as praised the coverage of the WBØEMU repeater on 145.325. He also reported that the Crop Walk was another successful event.

Membership Committee - Mary, NØTRK reported that Russell, NØMNW joined the club in September - Welcome!

Work on the membership certificate is continuing.

Education Committee - Mary, NØTRK reported that a license class in November is problematic. The next class is more likely for January. Volunteers are sought. Instructors need not present for the entire class - it can be short sections and the material is easily covered. Sign up now to help!

Publications/Web Services. Bill, KCØSVZ reported that Ham Hum has been delivered. It was well received by most of the membership. Any members with ideas or articles for Ham Hum should submit them to Bill, KCØSVZ.

A correction to the calendar was noted. The Southwest Iowa ARC meetings on October 27 and November 24 will start at 7:30 PM.

Web Services - Mary, NØTRK requested active assistance with the club website. Internet access is required but HTML experience is not.

Repeater Committee - working

Field Day Committee - it's still over

QSL Committee - no report

Technical Committee - no report

Courtesy Committee - Bill, KEØXQ reported that a get well card was sent to KØAWB. He took it to heart and is doing well.

**(Meeting Minutes continued on page 11.)**



# HAM TECH v1n3: Tropospheric Scattering Propagation Over the Horizon

By John Fogleboch Sr. WY2J  
Email: wy2j@arrl.net

*(Reprinted from the South Jersey Radio Association <<http://www.sjra.org/>> newsletter, Harmonics, Ted Groke, W2TAG, Editor.)*

This month we stretch VHF/UHF and Microwave radio signals around a curved earth to 200 to 400 miles, by means of Tropospheric Scattering. This method of propagation was first discovered in the late 1940's after high power television stations first lit up the airways in the US. The world quickly learned that signals above 50 MHz are not limited to line of sight distances. In the HAM radio world we often refer to this as weak signal work but that also includes other propagation like ducting and sporadic E which will not be discussed here.

This month I will focus on how tropospheric scattering works and overview the primary loss mechanisms of this type of propagation. Next month in the concluding article, equations useful in sizing a station will be introduced.

The troposphere is the region of the earth's atmosphere located up to about 16 km above the surface. The air is not ionized like in the ionosphere but does have a varying index of refraction which causes bending of radio waves. The mechanism is extremely complex depending on density and temperature profiles as well as water vapor content and to a great extent is statistical in nature. While a great deal of theoretical work was done in the 1950's and 60's to describe the loss mechanisms, much of it depends heavily on empirical methods and field measurements. There is nothing wrong with this method because the data is very repeatable and the communication links built exhibit very reliable communication.

The wide use of communication satellites since the 1980's has made tropo links largely obsolete for commercial and military use.

We can define the total propagation loss between two isotropic antennas in a tropo link using three graphs and one equation. One graph is not needed if the antenna beam width exceeds 5 degrees, the usual case in HAM applications. Let's look at the two graphs that are most useful.

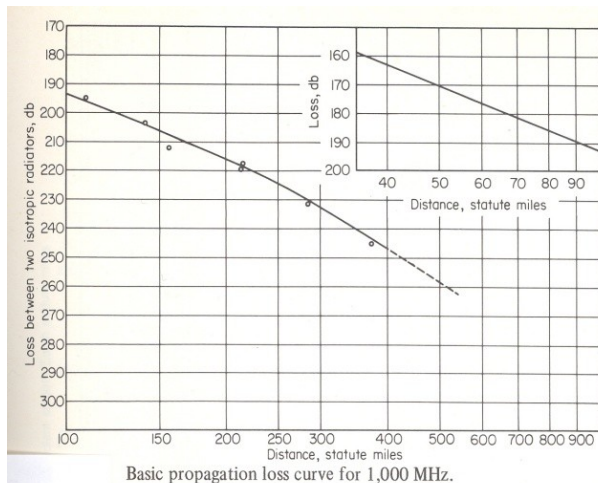


Fig. 1: Tropospheric Propagation Loss between isotropic antennas at 1,000 MHz. (1)

(HAM TECH continued on page 8.)

## Club Calendar

Nov 8	7:30 PM Lincoln Amateur Radio Club Meeting. 4647 Superior St, Lincoln, NE.
Nov 11	7:00 PM AARC Meeting. Red Cross Building, 81 <sup>st</sup> and Spring St, Omaha, NE.
Nov 12	11:00 AM Midwest Home Brewers & QRP Group. Bredeaux Pizza, Ashland, NE.
Nov 17	7:30 PM Bellevue ARC Meeting. 1908 Franklin St, Bellevue, NE.
Nov 19	6:00 PM AARC Coffee. Perkins Restaurant, 108 <sup>th</sup> & L Streets, Omaha, NE.
Nov 24	7:30 PM Southwest Iowa ARC Meeting. 705 N 16 <sup>th</sup> , Council Bluffs, IA.
Nov 25	7:30 AM PARC Meeting. 1900 E. Military Ave, Fremont, NE.
Nov 29	6:30 PM AARC Board Meeting. Village Inn, 7837 Dodge, Omaha, NE.
Nov 29	6:30 PM VE Testing. Red Cross Building, 81 <sup>st</sup> and Spring St, Omaha, NE.
Dec 9	7:00 PM AARC Meeting. Red Cross Building, 81 <sup>st</sup> and Spring St, Omaha, NE.
Dec 10	11:00 AM Midwest Home Brewers & QRP Group. Bredeaux Pizza, Ashland, NE.
Dec 13	7:30 PM Lincoln Amateur Radio Club Meeting. 4647 Superior St, Lincoln, NE.
Dec 15	7:30 PM Bellevue ARC Meeting. 1908 Franklin St, Bellevue, NE.
Dec 16	7:00 PM SACMARC. Wendy's, 610 Galvin Road, Bellevue, NE.
Dec 22	7:30 PM Southwest Iowa ARC Meeting. 705 N 16 <sup>th</sup> , Council Bluffs, IA.
Dec 23	7:30 AM PARC Meeting. 1900 E. Military Ave, Fremont, NE.
Dec 27	6:30 PM AARC Board Meeting. Village Inn, 7837 Dodge, Omaha, NE.

For the latest updates and new events, see the *Upcoming Events* section of the AARC web site (<http://www.aksarbenarc.org/main/>).

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*You may be a ham radio operator if... You have told the XYL, when she noticed a new rig in the shack, "Why, that's been there for years."*

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## October Door Prizes

Prize Committee Chair Rollie ABØNN announced that the door prizes for the October meeting were a pair of 7x50 binoculars, a visor worklight/magnifier, a heavy-duty four-wheel moving dolly, the Brown Bag prize, and the Mr. Reeh Door Prize.

The Binoculars went to Marvin AEØEG, while Don WBØVGB won the visor/magnifier, and Kevin KDØOI got the dolly. Bill KEØXQ won the Brown Bag, which turned out to be a heavy-duty cable cutter.

The Anton Reeh Prize went to Dave NØJSB. It consisted of 30 tubes (6BG6 and 6BQ6 sweep tubes) which could be used to build a full-gallon amplifier: With all of them in parallel, the output impedance would be about 200 ohms; easily matched to 50 ohms with a 4:1 balun. Apparently these tubes were part of an ambitious—but uncompleted—project of Mr. Reeh's; as preventing self-oscillation alone would be an interesting engineering challenge.

Note that the proceeds for each month's tickets go for buying next month's prizes. Each month's tickets are kept and included in the Grand Prize(s) drawing in December. The more tickets you buy each month, the better your chances of winning at the end of the year. More details on these prizes—plus some more information about the mysterious Mr. Reeh—can be found by a careful reading of the Club Meeting Minutes, beginning on page 4 of this issue.