

# The Link

April 2010



The Official Journal of the Buffalo Amateur Radio Repeater Association, Inc.

## This Month's Program: Antenna Systems

*Ben Bass, N2YDM*

BARRA is pleased to welcome William J. (Bill) Sitzman as our guest presenter for the April meeting. Bill is the principle consulting radio engineer for Trumansburg, New York based Independent Broadcast Consultants, Inc.

Founded in 1973, the company is engaged in practice before the FCC for AM and FM broadcast facilities. They represent clients across the United States, South Pacific and Latin America. In addition to their work in securing AM and FM allocations, they have designed numerous AM directional antenna phasing and diplexing systems which have been constructed and licensed.

Bill will discuss his company's activities and will also apply these techniques to matching antenna systems for Amateur Radio.

Monday, April 19th is the date; we hope to see you there!

## New Summer Tech Committee Meeting Location in the Works

As of press time plans were not yet completed for a new location for the summer Technical Committee meetings. During the school year the Tech Committee meets at the BOCES Potter Road school, but being a school the building is obviously closed in the summer months. The committee has been meeting at the Cole Road repeater site for the July and August gatherings, but with last summer's less than optimal weather (and some cold and chilly meetings), it has given pause for thought on whether that is such a good idea. Also, some committee members from the northtowns have noted the extreme distance to the Cole Road site from their home QTHs, especially with the forecasts of gas prices for the summer.

Under consideration is meeting at a location in the UB Amherst area for July and August this year. Watch your June *Link* and the email list serves for final details!



**Field Day 2010**  
is coming soon!

Save the weekend of **June 26-27, 2010!**

## New Cole Road Battery Rack



*WA2HKS Photo*

Pictured above is the new battery rack at Cole Road built over various work party visits last fall and this spring by the "battery committee" of W2ZZA, KA2CQQ, KC2UJH, and AB2UK. The batteries were obtained last summer through KB2TOY and replace our old wet cell batteries that gave up the ghost a while ago. The new rack is inside the A-frame shack and W2ZZA has designed a charging system for the batteries. The batteries should be online at the site very soon.

## Build It and the Signals Will Come



Check out Pages 4 and 5 and read about one member's antenna construction project!

## Buffalo Amateur Radio Repeater Association, Inc.

### Club Officers & Directors

President	Nelson Oldfield WA2ZSJ '12	634-6394
Vice President	Doug Alderdice KA2WFT '12	834-2664
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### Voice Repeaters

W2EUP	PL 107.2	29.68-	Boston
K2ISO		145.17-	Wethersfield
K2ILH	PL 107.2	146.73-	N. Tonawanda
W2EUP		146.91-	Boston
N2YDM	PL 107.2	147.00+	Kenmore
W2EUP		224.82-	Boston
WR2AHL	PL 110.9	442.00+	Wethersfield
WA2HKS		444.00+	Buffalo
WB2DSS	PL 151.4	444.75+	Kenmore

### APRS Digi-peater

K2ILH-2	144.39	Amherst
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### BARRA Tech Net

Join the BARRA Technical crew on the 146.91/444.00 system Wednesdays at 8 PM for answers to your technical questions.

### RAWNY Net

Stop by Monday evenings at 7:00 pm and join the RAWNY club's net which meets on our 146.91 and 444.00 repeaters.

### BARRA on the Internet

<http://barra.hamgate.net>

### Club Calls

BARRA holds club calls W2EUP and K2ISO in honor and memory of two of its founders, Gil Boelke, W2EUP, and Hugh Wilson, K2ISO.

CBS-Scanners-Ham-Marine-Business Radios-Radar Detectors

## HIRSCH'S

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*WA2OLW (Leprechaun Graphics, 675-3764) still has BARRA jackets and T-shirts available.*

## Don't Forget to Get Your BARRA Mug!



These great looking, sturdy, quality ceramic mugs sport the BARRA buffalo logo, are dishwasher safe, and let you show your club colors in style!

**Only \$5.00 Each!**

Available at all club meetings

### The BARRA E-Mail List Serves

To join, send look up the group "barrabflo" on

<http://groups.yahoo.com>

The Tech Committee also has an email group, BARRA-Tech, on Yahoo Groups. Or, email the editor to receive an invite to join either or both groups.

*The Link* is published eight times a year by BARRA, the Buffalo Amateur Radio Repeater Association, Inc. The opinions expressed herein, however, are not necessarily those of the Board of Directors or membership of BARRA. Letters to the editor are solicited and must be signed. Names and addresses will be withheld if requested. Material for *The Link* should be sent to the Editor:

Buffalo Amateur Radio Repeater Ass'n  
P.O. Box 507  
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or may be submitted electronically to the editor's e-mail address: ka2wft@arrl.net. The editor may be reached by telephone in the evenings at (716) 834-2664.

### DISTRIBUTION

*The Link* is available in both print and electronic formats. If you wish to receive *The Link* in the Adobe cross-platform PDF format by e-mail instead of regular mail, please notify the editor at ka2wft@arrl.net. Regular mail recipients are charged \$4 beyond their dues.

### ARTICLES

Articles for the *Link* on any subject, technical or general interest, are always welcome and encouraged. When submitting material to the *Link*, please type it or submit it electronically, if possible. Remember that the editor reserves the right to make necessary changes including reformatting and condensing for space and that Full Membership may be obtained by writing articles.

### LINK DEADLINES

All material must be submitted to the Editor by the end of the month previous to the issue (e.g. December 31st for the January issue). Of course, if the material is received earlier than that date, you will have a better chance of getting your article in the next issue. All advertising is subject to the same deadline.

### ADVERTISING

Want-Ads are free to BARRA members and are published in the next available issue. Ads from other hams are accepted free on a space-available basis. Ads appearing in other club newsletters with which BARRA has an exchange agreement are reprinted on a space-available basis.

Display advertising is available at the prevailing rates. Business card size is currently \$2.50/mo; full page is \$20.00/mo. Contact the editor for rates for other sizes.

### DUES

Basic membership rate: \$25.00

Family member in the same household as first member: \$3.00

Discounts from basic rate

Senior Citizen (65+): -5.00

Disabled: -5.00

Voting member: -5.00

Full-time student with ID: -5.00

Each new member recommended: -1.00

US Mail newsletter delivery: add \$4.00

**Note:** A voting member is a member who has performed a service for BARRA (e.g. helped out at an activity, written a *Link* article, etc.).



## Hobby Highlights

Richard Sellers, KG2OR

Since November 2001, I have kept track of NASA's "Space Infrared Telescope Facility" which is now called, "The Spitzer Telescope," and the "The Spitzer Science Center," located at The California Institute of Technology in Pasadena which has managed to become a place for research and fellowship for astronomy and physics.



In my 'Hobby Highlights' of May 2003 I focused upon launch delays, and in March 2004 I discussed the launch that took place on August 25, 2003. After a naming competition had completed in February 2004 the "Facility" was called "The Spitzer Telescope," in honor of Lyman Spitzer (1914-1997).

This month's column looks at an exhibit at the Vancouver Winter Olympics by Professor George Legrady called "We are Star Dust." He is based at University of California at Santa Barbara. A note is also given to a doctoral student, Javier Villegas for engineering principals. A history of the spectacle can be seen at <http://www.ia.ucsb.edu/pa/display.aspx?pkey=2174>.

In "Hobby Highlights" of May 2003 I predicted that the "Infrared Space Facility" would "be our friend in outer space." The stellar images generated by the telescope uses cryogenic and infrared technology. This type of camera located at the "Olympic Festival" interfaced people in motion and the heavenly images from the "Spitzer" Telescope between two screens. The math and virtual topography of local points on earth and the camera's reception created a thermal detection relating our time to light years. Fantastic, not only were the Winter Olympics in BC for athletic competition, but as you can see many forms of entertainment, art, and science were used for the world to see.

73 de KG2OR.



Aack! Invasion by moon people? No, it's just Charles, KA2CQQ, suited up for giving Chet's Shack at Cole Road a good "D&C" (dustin' & cleanin') on a recent work party day. Thanks to Ted, WA2HKS, for the pic.



## Home Made 220 MHz 6 Element Beam Building Project

David S. Faul, VE3TIJ/N2ZVK

Photos: P. G. Crowley

I recently built a 6 element end fed 220 MHz beam for use on my limited space apartment building balcony antenna farm. I plan to use this home brew antenna for the 220 FM repeater frequencies in the Rochester area [224.260 - KE2MK; 224.580 - N2HJD (110.9)]. I already use a Directive Systems 10-element beam, a DSF0222-10RS, for Newfane and Lockport repeaters respectively [224.940 - K2AER (88.5) and 224.360 - K2MJ (107.2)]. This eastern facing balcony presents many solid brick walls that prohibits south west and western communication opportunities.

The 10 element beam (8 foot boom) faces south for Lockport and Newfane... but would have to extend into very conspicuous and tenant dubious free space [not allowed] for Rochester orientation. The 6 element beam (5 foot boom) is easily accommodated by the width of the balcony. The 6th floor balcony height is great but is a small almost confined space. The close proximity of numerous brick walls and metal building materials acts as a shield and causes signal reflections, cross band interference, opportunistic SWR issues and desense. Changing one antenna configuration may cause problems on adjacent ham band antennas. I note these special issues here to justify some considerations in this article that may make not sense in a free space antenna installation.

I can receive the Lockport and Newfane repeaters year round ... but at greater signal strength during the excellent summer propagation conditions over Lake Ontario. Rochester signals are normally present only during the summer. However, on some days I can copy a weak KE2MK with this new home made beam. My Ajax QTH is 1.5 miles north of the Lake Ontario north shore in Canada. ..just east of Toronto. I am 48 air miles from Lockport and 82 air miles from Rochester.

The 220 MHz band is very quiet in Western New York and the Toronto area. In Toronto I spend most of my time on 224.860 - VE3BEG repeater within the Toronto FM Communications Society repeater group. A chance QSO drew my attention to the plans for a 220 MHz FM beam. I was directed to: <<http://www.fredspinner.com/WOFMS/CheapYagi/vjbcy.html>>. The antenna is a Kent Britian WA5VJB design [edited by F. Spinner, WOFMS] presented at the 1995 Central State VHF Society Conference Proceedings. I can use the back end of either beam antenna to reach VE3BEG to my north east. I have no access to other Toronto repeaters [west of me] due to the extensive building brick walls noted above.

A fellow ham here in my area, Don, VA3DDN, has drawn my attention to another edited version of this antenna at <<http://www.iw5edi.com/ham-radio/?cheap-yagi-antennas-for-vhf-uhf,93>>. This amplified version of the Britian plan [edited by John Maca, AB5SS] offers some additional detail and may be helpful for some of the dimension issues noted below.



The author with his creation.

I went to Home Depot here in Ajax to buy all of my antenna supplies. I used a 1/2 inch X 3/4 inch X 60 inch piece of wood for the boom. The driven element is one strand from a thick bare, multi-strand copper wire ground cable. The remaining 5 antenna elements were from 3/16 inch aluminium rod. The individually cut length rods are placed in drilled, element mounting holes in the wooden boom. The elements are to held in place by speed nuts. I was not able to get speed nuts at my location. Instead of the speed nuts, I drilled undersized holes and forced the cut elements through the boom. I

used tie wraps on both sides of the element penetration in the boom for additional stability. I also placed weather proof silicone sealant on each penetration for added stability. It is also a good idea to coat the wooden boom with a outdoor weather resistant varnish to prevent wood rot. I also learned that if the wood became saturated with rain water or water from melted ice, the SWR value may change - not for the better !! [see *The ARRL Antenna Book*, Chapter 18, p. 18-21. 1994] My sheltered balcony prohibits wetting where I have the antenna placed.

The most difficult part was the interpretation of the WA5VJB diagram of the driven element. Britian provides a drawing template for only a 902/903 MHz driven element. He clearly states that the driven element for the 220 MHz 6 element beam is 24.5 inches. But a careful review of the driven element drawing indicates that the complete driven element is in the shape of a "J" - not just a straight rod. The "J" axis itself alone is 24.5 inches long. The axis continues and curves an additional 1 inch to continue as the "J" tail. The 1 inch turn was my interpretation: the plan inch stated 1 inch in "height" for the driven element. Then, after the curve, one adds the tail of the "J" for an additional 12.25 inches. The diagram illustrates that the "J" tail penetrates the boom and exits the other side of the boom with a slight extension away from the boom. I defined this protruding tail extension as 1 inch in length, bent it over and fixed it into place with silicone sealant as an anchor. The final length of the driven assembly was 37.75 inches. Britian does not specify this extrusion length.

The 1 inch extension was at best an estimate. In free space, I would try cutting this extension as a fine tune for best SWR. If the entire length would turn out to be too short I would have to replace this entire combined length of wire strand from the start ..The idea would be to make the overall length too long ... then reduce in increments to achieve the best SWR. In my case, I had decided to use an MFJ tuner [MFJ-921] as the weather for the entire construction week was to be 0 F. Also, the balcony equipment and snow offered a serious tripping hazard. My XYL, Diane, my normal measurement assistant, was away all week. Past experience has proven antenna adjustments in some cases are futile and dangerous on the balcony. The antenna set up at a 1.9: 1 SWR ; the tuner brought it

down to 1:1.

The antenna is mounted on a mast and tripod. The feedline lead connections consist of a short run of RG 8X that ends in a PL-259 plug. The PL-259 plug interfaces with a PL-259 barrel connector to another PL-259. I use LMR 400 with PL-259's for the remainder of the feedline. All connections are sealed with electrical tape to protect against the weather as a general precaution despite the balcony shelter. The soldered feedline leads are sealed with silicone. I spent \$ 35.00 in US funds for all the supplies .

Other arrangements at lowering the SWR would be to vary the feedpoint placement a few inches away from the WA5VJB - Britian plan instructions. His published feedpoint instructions requires one to solder one feedline lead to the long straight axis portion of the "J" right adjacent to the boom surface. The other lead was soldered just below on the "J" section itself before it re-enters the boom. The plan also contains a comment from editor F. Spinner that a small RG -58 coaxial wound balun may help. Britian prefers no balun. If I was to move the feedline connection points, I would experiment with temporary wandering leads.

A new ARRL antenna book [see: *Basic Antennas* by J.Hellas, Chapters 18,19,21 , pp. 18-2 -21-8. 2008-2009] offers some insight into Yagi design matching devices and SWR. He advises that one consult a computer antenna design program where one can experiment with multi inter-related wave-length boom length variables, driven element length, director element lengths, element proximity to other elements ... all at the same time ... to alter SWR by design. However, one should still be prepared to test, interpret results and adjust the home brew antenna for lowest SWR.

There is no published gain figure for this antenna nor a half power beam width [3 dB signal loss] angular degree measurement. The following information may provide a rough estimate: Cushcraft's 4 el 224WB beam rates at 8.0 dBd with a E plane 3 dB loss beam width of 60 degrees. My 10-element beam [Directive Systems] has a gain of 11.2 dBd with a E plane 3 dB beam loss width of 39 degrees. The Directive Systems 8 element beam rates at a 9.8 dBd gain with a E plane 3 dB loss beam width of 44 degrees. I can find no commercially rated 6 element beam. I have no way to perform any type of comparison of power loss and beam width tests between the home made beam and the commercial beam on this crowded balcony. Also there are too many design variables given each unique antenna construction. Recall that this home made beam will point south east directly toward Rochester. As noted, I have already had a promising weak copy on KE2MK in Rochester. Experiments would have to be conducted in free space with multi directional signal reports to estimate a beam width. An antenna testing range, such as offered at VHF conferences, would be more useful for gain estimates.

This home made antenna works well so far for local repeater work. If I reposition it for the Lockport and Newfane signals I can copy both repeaters ... but not as well as the 10 element beam. But the home made beam will be for Rochester summer use. I have also



Looking down the boom of VE3TIJ's 220 MHz beam

tested it twice for local simplex on 223.500 MHz. I receive solid signal reports with no hint of unwanted noise on my Jetstream JT220M. I use the 6 el beam back end daily for VE3BEG only at the moment.

*What did I learn? What would I do different?*

I do not have a workshop. A drill press and vice or at least a vice would have allowed for more perpendicular element drill holes. Some of the elements are slightly askew in their mounts. I drilled the element, mast mounting assembly holes and cut the element lengths by hand over the kitchen sink. My shack is in the kitchen for easy access to the balcony antenna farm. The absence of speed nuts made the elements just slightly shaky despite the efforts noted to stabilize their placement. Diane, my XYL and construction assistant, commented that the antenna seemed to be "flimsy" and wondered if it "would hold together." She may

be on to something here! But since my antenna will be on a partially sheltered balcony, I have easy access for upgrades. I also run a constant inline SWR meter/tuner on this antenna to detect problems. However, given my slightly askew elements and the generous applications of silicone sealant, the antenna does look home made. It also lacks the typical sleek appeal of a Cushcraft product and could rouse the ire of picky neighbours in some fussy neighbourhoods if used in free space.

The Britian antenna plans may appear confusing to some. I have been spoiled by Cushcraft for sure. The Maca plan edition shows that the lower "J" tail driven element re-enters the boom ... but does not extend outside the boom as shown in the Spinner version. I allowed my "J" tail to extend 1 inch from the boom lower penetration based on the Spinner version. I bent this extrusion over and secured it for stability -- possibly for SWR trimming. I would consider a second antenna version to test the SWR with the 1 Inch extrusion removed.

I have built some small vertical antennas [1/4 wave ground plane on a standard chassis antenna mount socket], several out-of-the-box beams from Cushcraft and the Directive Systems beam discussed here. This antenna was a real challenge. I re-drew the antenna design in my own interpretation and discussed various issues with my 220 friends, Don, VA3DDN and Joe, VE3LNU, over coffee. But overall it was an excellent learning experience. I am not too proficient with measurements and made several element hole measurement errors. In my case, the adage "measure twice.. cut/drill once" would be "measure four times ... cut /drill still once." Consider that the measurements be checked by the XYL construction assistant first would be added. Really! I might not consider computer modelling. But my computer ability is akin to my rudimentary measurement and spatial skills. I will stick with the Spinner and Maca versions of the Britian design then test and adjust.

Overall the process of energizing the antenna for the first QSO was a positive experience that is hard to explain. But it was fun. I have gained a small understanding in the difficulty of designing and assembling a beam antenna. I can only wonder what it was like to build antenna prototypes years ago with no plans or help. The same goes for designing the first transceivers.

# Buffalo Amateur Radio Repeater Ass'n

Post Office Box 507

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## FIRST CLASS MAIL

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## Calendar of Events

### GENERAL MEETINGS

General meetings are held at St. Bartholomew's Anglican Church, 2368 Eggert Road, Tonawanda, near Sheridan Drive. Doors open at 7:00 pm for rag chew, business meeting at 7:30, with program following.

**Monday, April 19, 2010** -- Presentation by Bill Sitzman, a broadcast consulting engineer, discussing AM broadcast systems.

**Monday, June 21, 2010** -- Meeting Program TBA.

**Saturday-Sunday, June 26-27, 2010** -- Annual BARRA Entry in ARRL Field Day. See December's *Link* for info.



**NO GENERAL MEETINGS IN JANUARY,  
MARCH, MAY, AUGUST OR NOVEMBER**

The *Link* is not published in March, May, August and  
November.

### BOARD MEETINGS

Board Meetings are held the first Tuesday of every month at the **Athens Family Restaurant**, 2801 Harlem Rd, Cheektowaga, between Genesee Street and George Urban Blvd. The meetings begin at 7:30 PM and **members are always welcome** to sit in on a meeting or bring concerns to the board.

### TECHNICAL COMMITTEE

The Technical Committee has formal meetings the first Friday of every month at 7:00 PM in Room 117 of the BOCES Potter Road Career and Technical Center, 705 Potter Road, West Seneca (Corner of Slade, Potter and Orchard Park Rds). Come on out to BARRA's own CCITT (Coffee & Crumpets Interrupted by Technical Talk), where progress of current projects is evaluated and new projects are planned. The meetings usually conclude with munchies at a nearby restaurant.

See you at Bill Sitzman's Antenna System  
Presentation

**Monday, April 19th!**