August 2015 VOL XCX, ISSUE 2

HARMONICS

1916 South Jersey Radio Association 2015

What is Arduino?

Editors Note: I normally do not include articles in the SJRA Harmonics newsletters that can be easily found on the internet. However, I believe that using microcontroller based systems (such as Arduino, which is our presentation this month) in amateur radio is so foreign to many of our members, some commonly found introductory information could be helpful. ed, W2TAG

Arduino is an open-source prototyping platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. All this is defined by a set of instructions programmed through the Arduino Software (IDE).

Over the years Arduino has been the brain of thousands of projects, from everyday objects to complex scientific instruments. A worldwide community of makers - students, hobbyists, artists, programmers, and professionals - has gathered around this open-source platform, their contributions have added up to an incredible amount of accessible knowledge that can be of great help to novices and experts alike.

Arduino was born at the Ivrea Interaction Design Institute as an easy tool for fast prototyping, aimed at students without a background in electronics and programming. As soon as it reached a wider community, the Arduino board started changing to adapt to new needs and challenges, differentiating its offer from simple 8-bit boards to products for IoT applications, wearable, 3D printing, and embedded environments. All Arduino boards are completely open-source, empowering users to build them independently and eventually adapt them to their particular needs. The software, too, is open-source, and it is growing through the contributions of users worldwide.

Why Arduino?

There are many other microcontrollers and microcontroller platforms available for physical computing. Parallax Basic Stamp, Netmedia's BX-24, Phidgets, MIT's Handyboard, and many others offer similar functionality. All of these tools take the messy details of microcontroller programming and wrap it up in an easy-to-use package. Arduino also simplifies the process of working with microcontrollers, but it offers some advantage for teachers, students, and interested amateurs over other systems:

Inexpensive - Arduino boards are relatively inexpensive compared to other microcontroller platforms. The least expensive version of the Arduino module can be assembled by hand, and even the preassembled Arduino modules cost less than $50

(Continued on page 10)

SOUTH JERSEY RADIO ASSOCIATION

HARMONICS is published monthly and is the official news letter of the South Jersey Radio Association. The SJRA was established on June 16, 1916 and has been meeting continuously since it's inception. The club has been affiliated with the American Radio Relay League since 1920.

The SJRA meets each month on the fourth Wednesday, January through September; and usually the third Wednesday, October, November and December; in one of the Meeting Room of the Gibson House at 525 East Main Street, Marlton, NJ 08053. Visitors are always welcome at our general meetings. **"Our Meetings are Smoke Free"**

SJRA operates the K2AA Repeater (145.290 - PL 91.5) located in Medford, NJ and the K2UK Repeaters (146.865 and 442.350 - PL 131.8) located in Pine Hill, NJ. The repeaters are open for use without restriction to all licensed amateur operators.

There are currently over 100 SJRA members active in most all aspects of amateur radio. Membership is by application and is subject to the approval of the Board of Directors. Club dues are currently $30/yr. for memberships, $22.50/yr. for retired-person membership (62 plus 1 yr membership), and $15/yr. for additional family members and student membership. Membership information is available on the K2AA Repeater or from Mary Von Lintig, KV2M, 856-772-6475

EMAIL: sjra *at* sjra *dot* org SJRA's web page: www.sjra.org

SJRA VE Team: ve@sjra.org is the SJRA/ARRL VUCC card checker

Joe Fisher, KC2TN, is the SJRA/ARRL WAS card checker

Harmonics is now available on the WEB in pdf format at:
http://www.sjra.org
South Jersey ARRL Section News is available on the WEB at:
http://www.arrl.org/sections/?sect=SNJ

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Harmonics Staff:

Publisher/Editor: Ted Groke, W2TAG
Alternate Editor: Rick Stoneking, W2RDS
Circulation: Mary VonLintig, KV2M; Jim Vecchiola, KR2T

LOCAL WEEKLY NETS

Monday	K2AA, Medford	145.290 @ 8PM
Alternating Thursday	Various Locations	28.405 @ 8PM

Harmonics Deadline

Articles submitted for the next Harmonics will be accepted until Monday, September 7, 2015. Email:
ted.w2tag *at* gmail *dot* com

SWAP SHOP - For Sale/Wanted ads are free of charge and are accepted for Amateur Radio related items only. While ads are not restricted to SJRA members, there is only limited space available and members have priority for listings. No items will be accepted for inclusion in the Swap Shop from commercial vendors or traders. All ads must be submitted at least three weeks prior to the scheduled SJRA general meeting date.

GENERAL ADVERTISING - Limited commercial advertising is accepted on a space available basis. Annual advertising rates range from $25/yr (Min 1/8 page) to $200/yr (Full Page). Information is available from Ken Botterbrodt, K2WB.

Meeting Minutes

Minutes of Membership Meeting of 7/22/2015

The meeting, held at the Gibson House was opened by Ken, K2WB at 1933. The meeting was opened with a salute to the American flag, followed by a round of self identification and the question of the night "how did you participate in field day?"

The minutes of the June meeting were approved as printed in Harmonics, motion N2HQL/N2VW. Treasurers report, 112 Paid up members. (Details to members upon request.) Treasurers report accepted as read on motion by KR2T/WB2EOD.

Membership by Mary, KV2M- KD2INW. Health and Welfare- no known sickness, by Roy, WB2EOD.

Programs: August- Arduino by Bob, K2UT; September- The Storm Robotics Team. Noted was a Harmonics thank you to Mary, KV2M, for her many articles over the years.

Nets by John, WY2J- "It's summertime" 2 Meter net usually has 15 check-ins, 10 meter net will need rebuilding come fall.

DX by Jack, N2VW- Monaco, 3A/IK5WWA, 24 July until August 1; Bosnia, E7TESLA, until 10 August, honoring Nikolai Tesla; Antigua, V29SH, 28 July until August 10; Zimbabwe, Z21MG, 21-30 September; Cape Verde Dxpedition, 17-24 October; St Paul Island, (no call yet) 19-29 August; NJ QSO Party, 19-20 September, Saturday, 1600 UTC to 0400 UTC, Sunday, 1400 UTCto 2000 UTC.

Contests by John, W2FDJ– RSGB IOTA, 12:00 UTC Saturday 25th July to 12:00 UTC Sunday 26th July 2015, CW County Hunters, 1400Z TO 2400Z JULY 25 AND 1400Z to 2400Z JULY 26, 2015 (48 Hrs) 3.550, 7.050, 14.050, 21.050, 28.050. Mobiles operate below, fixed stations above, listed frequencies; International Lighthouse contest, all modes, HF. September 12; ARRL September VHF QSO Party, see DX by Jack N2VW above.

Repeaters by Joe, KC2TN- Working ok, holding off on Fusion machine until he checks out some linking issues reported. Club stuff: he hasn't placed a few recent orders due to other duties but will get them placed.

Web team by Burton, NJ2IT, Security patches done, Home page updated.

100th by Ken, K2WB – Eight members currently. Banquet is set for Saturday, July 30, 2016, 11-3 PM at Trump Int'l Golf course.

No old or new business, break at 2020, program- field day follow up began at 2037, with a presentation of certificates and a new DVD.

Minutes of Board Meeting of 8/5/2015

The meeting was held at the residence of KV2R/KV2M, called to order at 1929 by Ken, K2WB.

Minutes of the July meeting were approved as printed in Harmonics, motion N2HQL/WB2EOD.

(Continued on page 7)

HAM TECH

Vol 6 No. 8 by John - WY2J

wy2j *at* arrl *dot* net

Upgrading a Portable HF Vacation Station

Part 2 of 3: Alternative Antennas

Introduction – Last month your author described an up-grade to a QRP portable HF station that he has been using during summer vacations at the Jersey shore. The upgrade included adding 30 and 40 meter bands to the existing 15, 17 and 20 meters, increasing the power from 5 to 50 watts and modifying the bent dipole antenna from a ½ wave at 20 meters to 20 or 30 meters selectable. The antenna changes were tried in August of 2014 and found useful at 30 meters but somewhat lacking on 40. Calculations given in last month's HAM TECH indicate almost a 6 dB loss in antenna performance on 40 meters. This month I will explore two newly promoted portable HF antennas, the SteppIR manufactured CrankIR single elevated radial vertical and the small magnetic loop manufactured by MFJ and others. Space prevents including the manufacturers data but web links are included with much useful information especially on the CrankIR antenna. Calculations for both antennas have been done to determine the real performance of each design and are included.

CrankIR Single Radial Folded Vertical – This 2 to 40 meter band antenna was designed as a true portable which breaks down and fits in a small duffel type carrying case. Go to www.steppir.com and click on the CrankIR link. Check out the brochure, white paper and the movie showing one man assembly of the antenna in 8-1/2 minutes. The operator manual is also available with more details. The order form link is there but don't click it yet, let me give you the good news before the sticker shock.

The antenna simulation focused on 40 meters since this is the most difficult band. The radiator configuration and radial is shown in Figure 1.

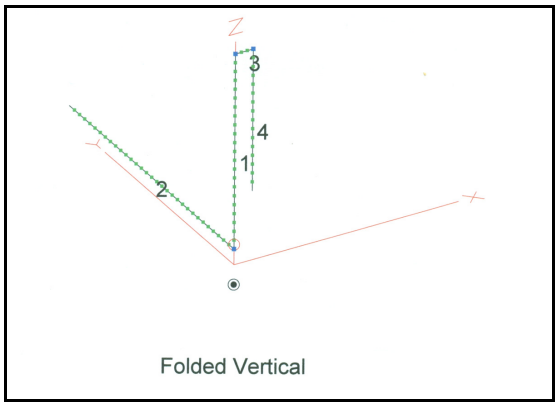

Figure 1, Single Radial Folded Vertical on 40 M.

The antenna base and radial are 4 feet above average ground (Σ = 0.005, ε = 13), the main radiator (1) is 22 feet, the radial (2) is 32.1 feet, the fold spacing (3) is 2 feet and the folded radiator (4) is 16 feet long, all No. 14 copper wire. The feed impedance is 37.7 ohms at band center giving an SWR of 1.32. Note that the antenna can be tuned to any frequency so no tuner is ever required. The 2:1 SWR bandwidth for center band tuning is 250 KHz on 40 meters and greater on higher frequency bands.

The elevation pattern on 40 meters is shown in Figure 2. Note the gain at 25 degrees elevation angle is –1.31 dBi, which is 0.78 dB poorer than a 33 foot full ¼ wavelength ground plane with multiple elevated radials.

(Continued on page 5)

***(Ham Tech** from page 4)*

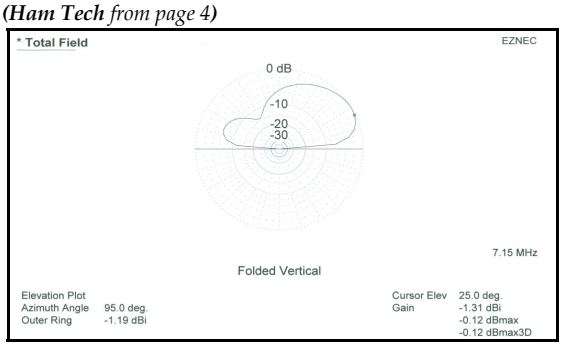

Figure 2, Elevation Pattern at 40 M

This antenna also has better high angle coverage than the full size ground plane, an advantage for short distance QSO's.

The azimuth pattern is not completely circular but has a maximum in the direction of the radial with a front to back loss of 6 dB at 180 degrees.

Conclusions – This is a very well designed HF all band portable antenna that does not compromise on electrical performance. It is not a base station antenna and will not survive high winds. SteppIR will sell you what pieces of the antenna you want but a full compliment with a tripod base is about 15 pounds and fits in a 4 foot duffel bag for easy transport. The bad news is that this great little antenna is going to set you back close to $700. I'll stick with my $20 dipole.

The Small Magnetic Loop – Small low loss transmitting loop antennas can be built providing the loop has extremely low resistive loss, much below a 0.1 ohm. This requires a large diameter pure copper one turn coil and a very high Q non-contacting tuning capacitor. Typically 1 inch copper tubing is used and the capacitor is a variable vacuum or split stator butterfly design. Table 1 gives the antenna gain and other parameters with 1500 watts input power for an 8.5 foot and a

Design Data for Loops

Loop Circumference = 8.5' (Width = 32.4"), Vertically Polarized				
Frequency, MHz	10.1	14.2	21.2	29.0
Max Gain, dBi	–4.47	–1.42	+1.34	+2.97
Max Elevation Angle	40°	30°	22°	90°
Gain, dBi @10°	–8.40	–4.61	–0.87	+0.40
Total Capacitance, pF	145	70	29	13
Peak Capacitor kV	23	27	30	30

Loop Circumference = 20' (Width = 6'), Vertically Polarized				
Frequency, MHz	3.5	4.0	7.2	10.1
Max Gain, dBi	–7.40	–6.07	–1.69	–0.34
Max Elevation Angle	68°	60°	38°	30°
Gain, dBi @10°	–11.46	–10.12	–5.27	–3.33
Capacitance, pF	379	286	85	38
Peak Capacitor kV	22	24	26	30

Table 1, Design data for 2.7 and 6 foot diameter loops as a function of frequency.

20 foot circumference loop. Note the extreme voltages across the capacitor. This will drop by the square root of the actual power divided by 1500 but will still be about 1.5 KV for even QRP levels. The antenna must be elevated by at least 8 ft for safety reasons.

Comparing the data in the tables will quickly show that to cover 40 to 10 meters two loops are required. About an octave is the limit on the coverage to maintain good performance. If you can accept about 3 dB added loss on 30 meters the smaller design will cover 10 to 30 meters. This design it typical of the MFJ 1786, which is motor tuned with a remote control. It sells for $450 plus S/H. Other small loop designs on the market use the shield of RG-8 size coax as the loop to improve transportability but it will have higher loss due to its smaller diameter.

A major deficiency of small transmitting loops is the extremely narrow bandwidth due to the extremely high Q. Design equations for this class of antenna are in chapter 5 of the 20th edition of the ARRL

(Continued on page 10)

President's Message

Ken – K2WB

The summer is going to be over well before we know it. Field Day 2015 is over and good memory. Some of us are already we are looking forward to Field Day 2016.

As the summer draws to a close, you should look carefully at your antenna farm and it may be time to start planning on any improvements or repairs that could be done while the weather is still pretty good.

While working on your projects always think of safety and get assistance for big jobs. Use the right tool for the right job and never climb a tower without the spotters, climbing gear and ground help.

Bring a friend to a meeting, SJRA meetings are a great night out, we even offer great programs to keep you entertained. Let Mario, N2AK, (mdradio1@zoho.com) know if you can join us for dinner at Tarantella's restaurant the following the group to the meeting at the Gibson house in Marlton. Also, we are still having a membership drive and you can earn a free one year membership, contact our membership committee membership@sjra.org for details. We have about 120 members and growing… Let's see if we can get to 200!

If you have any ideas or projects that you would like to see the club get involved with, contact any board member or club officer.

Enjoy the rest of the summer and I hope to see you on the air soon.

100TH Anniversary Happenings

Ken – K2WB/100

So far the 100th anniversary committee has had 10 meetings (many more to come). Just to keep everyone up to date here is where we are.

Over 60 coffee cups have been sold. There are plenty more to go. Mugs may be acquired to SJRA members by a minimum donation of $10.00. There will be coffee mugs available at the General Membership Meeting on August 26th.

We now have 9 centennial members, there are centennial members in 6 states. Our goal would be to have at least 2 members in each of the States. At least 1 member in each of the ARRL sections and at least 1 member in 100 countries. This will make some of radio sport events planned very exciting. Pass the word around.

Our 100th Anniversary banquet will be held at the Trump Country Club in Pine Hill, NJ on Saturday July 30th, 2016. So mark your calendar.

There are no barriers to sign our call signs with /100 during the 2016. So you can sign for example <yourcall>/100 to identify yourself as an SJRA member celebrating 100 continuous years in Amateur Radio.

The SJRA website has been updated allowing easier access to 100th anniversary information.

We still need a lot of money to achieve our goals and objectives. Our anniversary is only 307 days away.

With that said, Joe KC2TN is already selling 100th Anniversary clothing and hats, in addition he has patches. Contact Joe should you want to have the "New" SJRA Look.

There is still a lot to do and we need your help. Please contact me if you are interested in helping with the 100th.

(Meeting Minutes** from page 3)

New members- John Hall, W2HUV– extra from Sewell, NJ. Accepted on motion by W2MC/WB2EOD.

Mary reported a problem regarding new members wanting to pay senior rate. She has had some problems getting hold of the test takers .

Programs: August, Bob, K2UT, Arduino; September, Storm Robotics; October, Gridless Power; November, Tony, N2ATB, digital modes.

A discussion regarding the Section news, needing permission to repeat articles from Harmonics. He will be sent press releases in the future.

VE- 142 tests administered so far.

Web team by Burton, NJ2IT– Need input (writers). A possible presentation on how to enter content may bring volunteers. From Ken, K2WB, thanks to web team for getting 100th anniversary page up.

Historian– Some sorting to occur after meeting.

Centennial- Ken, K2WB, proposed Bob, W2SJ, as member- elected on motion by W2MC/AC2FO. 60 coffee mugs sold to date.

No old business.

New business: Dennis, AC2FO, suggested a "time capsule" to be sealed at centennial. Motion by AC2FO/N2ARD passed- the work will be finding a suitable location.

Adjourn at 2050.

Lou, N2HQL
Recording Sec.

Monthly Puzzle

Don—WA2DUE, wa2due *at* arrl *dot* net

Last months puzzles were as follows:

An amateur radio club decided to buy land to erect repeater tower. A number of club members pledged to donate $500 each towards this purchase. However, five members backed out and the remaining pledgees upped their pledge by $200 to make up the difference. How many members originally were going to fulfill their pledge?

Solution: Due to an error on my part, this problem was written improperly. The remaining pledgees upped their pledge by $300 to make up the difference. Therefore the shortage was $1500 and it took 5 members to make it up. Originally there were 8 members making the pledge. I am sorry for this mistake.

A train after leaving station A has complete one-quarter of its trip to the station B. After going 6 more miles it would have completed one-third of the distance to station B. What is the distance between the two stations?

Solution: To solve this problem we write the equation 1/4D + 6 = 1/3D and D is easily seen to be 72 miles.

Art, N2CPR submitted his solutions. Thank you Art.

For August we present the following:

The sum of the number of resistors and capacitors on a particular circuit board is 93. One eight of the number of resistors is equal to three sevenths of the number of capacitors. How many of each component are on this board?

(Continued on page 11)

How Much Performance Do You Really Need?

By Dan Romanchik, KB6NU

A reader recently e-mailed me:

"Just a quick question – Are you still in the thinking stage about getting an Elecraft K3? Great rigs, aren't they?

"What I would like you to think about, though, is how many contacts you log in one year's time. If you log 100 per year (check your log) then your cost will be $50 per contact for that year. If you log 500, then your cost will be $10 per contact. If you keep that rig for three years, and log 500 contacts over that time, then you will have spent $10 per contact.

"Now, consider what that rig will be worth in three years. Will there be something come along that just blows the K3 away in terms of performance?"

I replied:

"K3s are great radios. I've just purchased a used KX3, though, so I am not planning on getting a K3 in the near future. I have purchased a 50W HobbyPCB amp to use with the KX3, so I'm not going full QRP.

"I make a lot of QSOs/year. My average over the last 13 years is more than three per day, and that doesn't include contacts made with other callsigns, such as the club station, or on Field Day. I'm sure that my cost/QSO will be low enough to justify my investment. :)

"In addition, rigs seem to keep their value pretty well. I'd guess that you can sell a three-year-old K3 for at least 80 percent of what you paid for it. I think that one of the reasons that an Elecraft K3 is worth the investment is that Elecraft provides such good customer support, and that they are continually improving their radios. For example, they just came out with a new synthesizer board, with better RF specs, for the K3.

"I don't see anyone coming out with a radio that blows the K3 away in terms of performance in the near future, although I might be wrong. FlexRadio has perhaps the best chance of doing that, but you'll have to buy into the Flex user interface philosophy to take advantage of that. I think that Elecraft and Flex, plus the three Japanese manufacturers, will make incremental performance improvements over the coming years, leapfrogging one another as they bring out new models.

"One thing to think about is how much performance is overkill? Just like you can now buy a computer that has way more computer power than the average user will ever need, I think that most of these high-end radios offer way more performance than the average ham will ever need. It's cool to look at the Sherwood Engineering receiver tests and see that your rig is in the top ten, but will the average ham actually notice the difference? My guess is probably not.

"Thanks for sparking my thought process on these issues."

My guess is that most amateur radio operators don't think about what the rig will be worth in three years when buying an HF transceiver. Instead, they're looking at what the radios that are currently available cost, and when there's a big price difference between two models that appeal to them, they're trying to figure out if the higher price is warranted. In many cases, the lower-priced model wins out. It's not because the more expensive radio isn't better, but it's not that much better.

(Continued on page 9)

(How Much Performance? from page 8)

It all goes back to how much performance you actually need. Yes, you can probably do more with a $10,000 radio than you can with a $1,500 radio but is it really worth the added expense? In other words, are you going to have more fun with a $10,000 radio than you are with a $1,500 radio?

Let me know what you think. E-mail me at cwgeek *at* kb6nu *dot* com.

When he's not agonizing over what radio to buy, Dan operates CW on 30m and blogs about amateur radio at www.kb6nu.com. He's the author of the "No Nonsense" amateur radio license study guides and the CW Geek's Guide to Having Fun with Morse Code.

Gloucester County ARC (NJ) Hamfest is on September 13, 2015 One of the biggest in South Jersey!

Go to the below link and take a look for the details and directions.

http://gloucestercountyarc.weebly.com/hamfest-2015.html

Don't miss it!

73 de GCARC Members

DXCC COUNTRY/ENTITY REPORT

According to the AR-Cluster Network for theweek of Friday, 7th/August, through Friday, 14th/August there were 206countries active. Countries available: 3A, 3B8, 3B9, 3D2, 3DA, 3V, 3W, 4J, 4L, 4O, 4S, 4U1I, 4X, 5B, 5H, 5R, 5V, 5W, 5X, 6Y, 7Q, 7X, 8P, 8Q, 8R, 9A, 9H, 9J, 9K, 9M2, 9M6, 9N, 9V, 9Y, A3, A4, A5, A6, A7, A9, AP, BV, BY, C3, C5, C9, CE, CE9, CM, CN, CP, CT, CT3, CU, CX, CY0, D2, DL, DU, E4, E5/s, E7, EA, EA6, EA8, EA9, EI, EK, EL, EP, ER, ES, ET, EU, EX, EY, EZ, F, FG, FK, FM, FO, FP, FR, FS, FW, FY, G, GD, GI, GJ, GM, GU, GW, HA, HB, HB0, HC, HC8, HI, HK, HL, HP, HR, HS, HZ, I, IS, J6, J7, JA, JD/o, JT, JW, JY, K, KH0, KH2, KH6, KL, KP2, KP4, LA, LU, LX, LY, LZ, OA, OD, OE, OH, OH0, OK, OM, ON, OX, OY, OZ, P2, P4, PA, PJ2, PJ4, PY, PZ, S2, S5, S7, SM, SP, ST, SU, SV, SV5, SV9, T7, T8, TA, TF, TG, TI, TK, TR, TT, TU, TY, UA, UA2, UA9, UK, UN, UR, V3, V4, V5, V6, V7, V8, VE, VK, VP2E, VP8, VP9, VR, VU, XE, XU, YA, YB, YJ, YL, YN, YO, YU, YV, Z2, Z3, Z8, ZA, ZB, ZD7, ZD8, ZF, ZL, ZP, ZS.

**PLEASE NOTE: The report "could" contain "Pirate/SLIM" operations or more likely a "BUSTED CALLSIGN". As always, you never know - "Work First Worry Later".*

*(**Arduino** from page 1)*

Cross-platform - The Arduino software runs on Windows, Macintosh OSX, and Linux operating systems. Most microcontroller systems are limited to Windows.

Simple, clear programming environment - The Arduino programming environment is easy-to-use for beginners, yet flexible enough for advanced users to take advantage of as well. For teachers, it's conveniently based on the Processing programming environment, so students learning to program in that environment will be familiar with the look and feel of Arduino

Open source and extensible software - The Arduino software is published as open source tools, available for extension by experienced programmers. The language can be expanded through C++ libraries, and people wanting to understand the technical details can make the leap from Arduino to the AVR C programming language on which it's based. Similarly, you can add AVR-C code directly into your Arduino programs.

Items for Sale

50 Foot Free Standing Tower (not heavy duty). Tower is on the ground in two pieces that bolt together at the 30 foot level. $100.

All proceeds from the sale of this item will be donated to SJRA.

Contact Ted, W2TAG
Tabernacle, NJ
ted.w2tag *at* gmail *dot* com
(609)268-8460

*(**Ham Tech** from page 5)*

Antenna Book. The author ran some of these calculations for the 6 foot. diameter loop at 40 meters using the data in Table 1. The Q of the antenna is 1733. The bandwidth is 4.2 KHz at 7.2 MHz making continuous retuning on both receive and transmit necessary in normal amateur use. The loop current is 18.3 amps at 50 watts input and the voltage across the tuning capacitor is 4.75 KV at the same power.

Conclusion - Given all the negative factors this antenna does not seem to be practical for portable use.

Next Month – We conclude the Upgrade of a Portable Vacation Station with a look at modern battery technology and some of the problems to look out for.

Test Session Report for: August 12, 2015

The SJRA would like to congratulate the following on their recent achievements:

Paul Campana III, N2OAW
P.O. Box 603
Cherry Hill, NJ 08003
Earned his Extra

Michael Gilman
1106 Buttonwood Dr.
Cherry Hill, NJ 08003
Earned his Tech

	Tech	General	Extra	Total
To Date	87	38	19	144

(Monthly Puzzle from page 7)

An eighty year old heiress had four times the money her grandson had but after she gave him a 33 million dollar trust fund he then was worth 3 times as much as she. How much money had she before establishing the trust for her grandson?

Please submit solutions and/or comments to wa2due *at* arrl *dot* net.

SJRA Jackets, Shirts, Hats

Order NOW – Next order going in soon!

Spring Jacket is $44 (S,M,L,XL), Fall Jacket is $55 (S,M,L,XL),
Shirts are $27 (S,M,L,XL), Hats are $20 (*New Lower Price*, one size fits all)
Name and Call Sign embroidery included….Larger sizes slightly more!
Email Joe, KC2TN, with orders or additional info: kc2tn *at* comcast *dot* net

Amateur Radio FCC License Testing

The SJRA sponsors *FREE* Amateur Radio FCC License testing on the second Wednesday of each month. The location is: 443 Commerce Lane, Suite 5, West Berlin, NJ 08091. Registration is at 7:00 PM and testing begins at 7:30PM. Walk-ins are accepted.

VE team members can be reached at VE ***at*** SJRA ***dot*** org. A calendar and more information can be found on the SJRA web site.

August Meeting:

Fourth Wednesday, August 26, 2015

The meeting commences promptly at **7:30PM** in the first floor Meeting Room of the Gibson House on Main Street, Marlton, NJ 08053. Guests are always welcome.

Program For August:

Arduino by Bob, K2UT

SJRA Member September Birthdays

Donald Cavallaro, KD2EHE; Alan Cohen, WA3ZKI; Matthew Grohgans, N2IDW; Alan Handley, K3WWT; Craig Martin, N2ASU; John Mulvey, N2ADE; Dominic Sacca Jr., KD2EPM; James Stanmore, N2UAS; Michael Tolotta, W2OSD.

Health and Welfare Co-chairpersons: Roy, WB2EOD, and Dara, KC2THQ

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