July 2016 VOL CI, ISSUE 1

HARMONICS

1916 *South Jersey Radio Association* 2016

Field Day 2016

SJRA had a whopping turnout of 69 people for Field Day this year, and this translated into a greatly improved score compared to recent years. The performance was highlighted by great results from the 20m and 40m CW stations captained by Bob KE2D and Ray N3RG. In addition, GOTA captain Bobby KD2AWE brought out a great score and many bonus points from the 13 participants.

Of interest as well was the wonderful food and refreshment provided by Dom, KD2EPM. He was on station from Friday lunch to late Sunday afternoon to keep the crews well fed.

Another promising aspect of this year's Field Day was the number of new member participants who had a really significant hand in setup, operating, and take-down. There were always ample people to keep progress moving on at least a couple stations most of physical part of the process. And a number of new or infrequent operators set personal highs for contacts made in a single Field Day.

(Continued on page 9)

Taking a break in the hospitality area after raising several towers. (from left, Ted, W2TAG; Tony, N2ABT; Ken, K2WB; Ken, N2UNI; Holden, KD2JPV; and Mike, W2OSD)

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 for SJRA members 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

Officers

President: Ken Botterbrodt, K2WB
Vice Pres.: Jon Mac Millan, W2MC
Treasurer: Ray Golley, N3RG
Rec. Sec: Lou Priestley, N2HQL
Cor. .Sec: Dennis Cioffi, AC2FO

Directors:

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Rich VonLintig, KV2R
Rick Lawn, W2JAZ
Ira Weinstein, W2IRA
Tony Canuso, N2ATB
Ted Dean, KD2ARD
Al Witner, N3AVT

Committees:

Historian: Mark Walter, KD2JPW
Membership: Alan Handley, K3WWT
Field Day: Ken Botterbrodt, K2WB
Contests: John Doran, W2FDJ
Repeater: Joe Fisher, KC2TN
Programs: Rick Lawn, W2JAZ
H&W: Roy Herman, WB2EOD; and Dara Herman, KC2THQ
Awards: Rick Lawn, W2JAZ
Hospitality: Jean Priestley, KA2YKN
Nets: John Fogleboch, WY2J
Publicity: Vacant (Please Volunteer)
Picnic: Vacant (Please Volunteer)
Ways & Means: Ray Golley, N3RG
Property: Jon Mac Millan, W2MC
Web Site: Ira Weinstein, W2IRA

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, August 8, 2016. 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

General Meeting of June 22, 2016

The meeting was opened at 1937 by Ken, K2WB/100, at the Gibson House in Marlton, NJ. There were introductions around, the question of the night was "Did you participate in the SJRA QSO party?"

There was no treasurers report due to the absence of the treasurer.

The minutes were approved as read, motion N2HQL/K2JHG. Jim, KR2T, had a question regarding the board minutes, as to the pros and cons of keeping the P.O. Box.

No new members were proposed and Ken, K2WB, announced that the digital portion of the Fusion repeater would be off for the field day period.

Programs for June and July will concern Field Day, Prep and Wrap-up.

Contests- Aug 6/7 North American QSO party - CW; August 20/21 North American QSO Party - SSB; Sept 9/10 ARRL Sept VHF Contest.; Sept 17/18 NJ QSO Party.

Health & Welfare– Roy, WB2EOD, three Get Well Cards sent out. Birthday Greetings have ceased.

100th : Menu Selected, info to be sent out.

Break @ 2007

Program- Field Day Prep, including a review of the 2005 Field day as saved on DVD.

BOD Meeting of July 6, 2016

The meeting opened at 1931 by Ken, K2WB/100.

Minutes of the June Board meeting were approved as printed in Harmonics. Motion N2HQL/KD2ARD

New Members: Al Ziegler, KD2LVT; Bruce Canio, KD2LBU; Rizal Malong, KH7JO. All were accepted.

Harmonics- Ted, W2TAG, needs articles.

Treasurer- By Phone, 113 Total Members.

100th – Ads/Boosters needed- The deadline approaches. K2AA logs to be submitted to John Hill and Ken. The menu will be sent out on the club reflector. The easels are half done.

Repeaters- Working well.

Mark Walter, KD2JPW accepted the position of Historian.

A Membership Chairman or Face of SJRA at the Meetings" is still needed.

Trustee- Ken, K2WB, No OO cards received so far.

Health & Welfare- By Roy WB2EOD- nothing new.

Programs- July- FD Wrap; Aug- Matt N2IDW to present use of SDR Play Receiver; Sept- Member Auction.

VE- June had eight tested of which seven passed at least one element.

Field Day- Very successful, lots of participation, no injuries. 352 Days to FD 2017.

New Business: Ted, W2TAG, we have

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HAM TECH

Vol 7 No. 7 by John - WY2J

wy2j *at* **arrl** *dot* **net**

AM to SSB – A Technology History

Part 3 of 3: Latter Day Technology

Introduction – Hams did have SSB rigs on the air 60 years ago in the mid 1950's but they were few and far between. Most were single frequency crystal controlled, like the gang up on 3999 KHz, to solve the stability problems with the transmitters. The receivers with L/C local oscillators were a huge frequency stability problem even though Hams modified them to regulate the DC voltages with gas tube regulators and left them run 24/7 to avoid the long warm up frequency drift. The rig architecture was still separate transmitters and receivers and most receivers tuned every kilohertz from 540 KHz to 30 MHz, a myth from the 1930's that no ham would buy a radio that his XYL couldn't listen to her soaps on the AM broadcast band. The AGC system didn't work on SSB or CW mode either, they gave you a switch to turn it off and run MGC. Signal matched filtering didn't exist for SSB and was a poor after thought for CW. But the frequency stability problem had to be solved.

The First Frequency Synthesized Transmitter – In 1962 Barker & Williamson in Upper Darby, PA introduced the first HF SSB ham band transmitter with a crude but workable non-coherent frequency synthesizer, their model 6100, with 180 watts input on SSB. Price then was $875, about $13,000 today. It flopped in sales due to price and they took it off the market. The technology and architecture were similar to a HF SSB transmitter that RCA in Camden, NJ was designing for the US Air Force's B-52 bomber program in 1958, when I had a short stint there at the beginning of my RCA career. Seems the US Air Force has a bigger budget than the average ham.

The Non-Coherent Synthesizer – A typical non-coherent synthesizer with 1,000 frequency steps of 1 KHz each or 1 MHz coverage block diagram is shown in Figure 1.

The synthesizer used three crystal oscil-

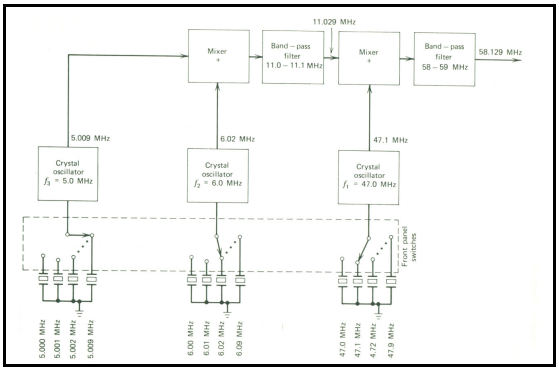

Figure 1, An Early Non-coherent Synthesizer

lators each with ten switchable crystals, two frequency additive mixers and two band pass filters. The frequency spacing of the crystals in the left most bank is 1 KHz setting the resolution, 10 KHz in the middle bank and 100 KHz in the right bank giving a 1 MHz total coverage. A fourth crystal bank and oscillator would be required to put the signal in the HF ham bands. Seven crystals would be required to cover the 160, 75/80, 40, 20, 15, & 10 meter bands in 1962. All crystals have to be ground to an accuracy of 100 Hz or better to prevent channel over lap. This is 37 precision ground crystals which may have cost between $10 and $20 each in 1962, a significant chunk of that $875 price tag. B&W made a change to the synthesizer architecture to eliminate 10 crystals and re-

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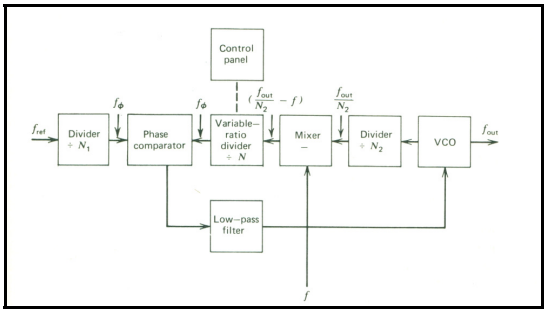
(Ham Tech** from page 4)

duce tolerances. They eliminated the 1 KHz step size oscillator, hung a reactance tube modulator on the 10 KHz step size bank and pulled the frequency of each crystal over 10 KHz, VCXO style. This got them down to 27 crystals but it just didn't sell.

Collins used a low frequency L/C VFO that they called permeability tuning to build a receiver that tuned 1575 to 1775 KHz then put an HF crystal controlled converter a head of it much like the VHF boys did. This scheme got the number of crystals down to 12 and was introduced on their 75A1 receiver in 1946. The tuning resolution was 1 KHz. The price was $375 then, about $6,000 today.

The First Digital Synthesizer – In the early 1970"s Motorola introduced their Emitter Coupled Logic of which the 3rd generation known as MECL – 3 could be used to build counters that would work at 200 to 300 MHz. They also built lower frequency programmable counters and digital phase detector chips. If you took these chips and added a VFO, analog loop filter and a single crystal oscillator you had a variable frequency Digital Synthesizer on a 4 X 5 inch PC board built with a couple of dozen components, the first digital synthesizer. A block diagram of this unit is shown in Figure 2.



Figure, 2, PLO Digital Frequency Synthesizer

The theory of operation of this synthesizer is covered in detail in HAM TECH in the March 2013 issue of Harmonics. This type of synthesizer is still used today in many transceivers including the Yaesu FT-817ND QRP rig that covers 160 meters to 70 cm. It contains two synthesizers.

A Modern Direct Digital Synthesizer (DDS) - By the late 1990's the semiconductor technology had reached the point where it was possible to describe a local oscillator mathematically, implement the digital hardware to solve the equations at speeds up to 400 MHz and then convert the digital format signal to an analog carrier with a precision 14 bit current output D/A converter chip and a simple low pass filter. And it fit on a couple of square inches of a PC board using 1 crystal, 3 chips and a half dozen resistors and capacitors. The spurious signal levels were 70 to 80 dB down from the carrier. You can even phase lock the crystal oscillator to the timing output signal of a GPS receiver to get the accuracy and stability of the best atomic frequency sources in the world. This is quite an improvement over the 1962 synthesizer in B&W's 6100 SSB transmitter that no one could afford. For more details on the modern DDS see the HAM TECH column in the April 2013 Harmonics.

The Roofing and Matched Filters – Fifty years ago hams and receiver manufacturers didn't know what a roofing filter was or why he needed it in a receiver because he didn't understand the IMD problem. He did understand that his IF filter should be about 3 KHz wide for SSB but the only one available was the Collins mechanical filter and it could not be built above about 0.5 MHz center frequency. Half and Full Lattice crystal filters could act as good roofing filters but

(Continued on page 6)

(Ham Tech** from page 5)

they were difficult to design and even more difficult to build due to extreme matching of crystals. It was a lab tinker's dream.

Milton Dishael recognized that the ladder configuration of the classic L/C filter could be implemented with quartz crystals for very high Q narrow band applications and the design data that was available by the late 1960's could be used for analysis. His ladder design is shown in Figure 3.

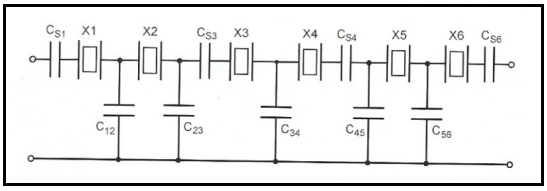


Figure 3, A 6 pole Dischael Crystal Filter

Mean while Stedler DJ6EV in Germany and Hardcastle G3JIR in Great Brittan developed free software that almost automates the design of this filter. A key feature is that while the series resonant frequency of all of the crystals must be the same, they must only be matched so the frequencies are close. You then measure the frequencies, insert them into the design software and it calculates the values of the series capacitors to retune each crystal to the correct value. This is a very easy filter to design and fabricate in the highly desirable 4 to 9 MHz IF frequency space. For more details on this filter and the design software see my HAM TECH column in the January 2013 issue of Harmonics.

Other Technology - We now throw out the vacuum tube amplifiers and mixers

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Monthly Puzzle

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

Reviewing last months puzzles:

What letter is next in this series O,T,S, N,T,F,E,.....?

Answer: T. Each item represents the first letter of a number. In this case, the numbers 1, 3, 6 and so forth. The last letter is the string was E for 18 and therefore the next number is 21.

The daily cost for producing a certain electronic device can be represented by the equation C = 800 – 10x + 0.25x2 where C is in Dollars and x is in units produced. How many devices must be produced daily to obtain the daily minimum costs?

Answer: 20 Units. The classical solution is obtained by differentiation of C in respect to x. Then we set the resulting function to zero and solve algebraically. A simpler way is to just insert numbers into the equation for x and plot the function. If a computer with a spreadsheet program is available, this problem is very easy to solve.

For July let us consider the following:

Two AC circuits are connected in series, one with an impedance of 3 + 5j ohms and the other with an impedance of 2 – 4j ohns. Find the total impedance and the current if the total voltage across them is 110 Volts.

A bowlers average score for three games is 162. In the second game his score was 10 less than the first game. In the third game his score was 13 less than in the second game. What was his score in the first game?

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

Great Starter Rig For Sale!

John, W2HUV, has a mint Alinco DX-SR8T 160m-10m transceiver, including a DM-330MVT 5-15 VDC 30A continuous power supply, a USB cable for CAT control and a 20M dipole with a W2AU balun center insulator, coax, and a W2FMI UNUN transformer for 75 ohm to 50 ohm impedance matching, sitting unused in his shack. He no longer needs the rig, now that he uses www.remotehamradio.com exclusively. Please see the photograph. The transceiver and power supply will be delivered in their original boxes. If you compare this offer with e-bay ads for the DX-SR8T, you will find that none of them include the DC power supply required. John is only asking $400 for the lot. Call him at (856) 374-3696 or email him at **w2huv** *at* **arrl** *dot* **org**.

***(Meeting Minutes** from page 3)*

radios donated from the estate of Sid Abbot, KM2C-SK, What do we do with them? The question of "loaners" came up and was voted down. The decision was made to sell them, TS440- $250 with Power supply. TM 241 with 6M board- $200.

No further business, the meeting was adjourned at 2115.

For Sale

FLEX 1500, SDR Radio, 5W Output, 1.8 to 50MHz. $500.00

ICOM IC-7000 1.8MHz to 50MHz, 144MHZ , 432MHZ. $800.00 (Radio has never been mobile, used only in shack). Has composite video output for monitor.

M² 2M5WL Antennas (2 meter 17 element yagi) currently on the air. $150.00 (I had four of these antennas and planned to put them up in a 15' square array for EME. However, due to high winds at my location I decided against the larger array and have been using two of these antennas. Also, I sold one of the antennas so I wouldn't have second thoughts! Recently I acquired four smaller M2 EME antennas (2MXP20) and plan to put them up when I take down the pair of antennas I'm using now. So, If you're interested in 2 meter EME or Tropo, I'll sell the package, which includes the following Items:

2 x 2M5WL 17 element 2 meter yagis
1 x 2 port power divider
2 x 2 meter phasing cables
1 x 15' boom (used for horizontal stacking)
1 x Yaesu G-550 elevation rotor

EME Package Deal. $600.00 (If no interests in package then I'll sell the items individually.)

Call or email if you're interested.

Ray, N3RG
Cell Phone: 609-828-1330
Email: **n3rg** *at* **comcast** *dot* **net**

List Your "For Sale" Ham Stuff in the SJRA Harmonics
Email Ted, W2TAG, with your listing, ted.w2tag *at* gmail *dot* com

100TH Anniversary Happenings

Ken – K2WB/100

So far the 100th anniversary committee has had 22 meetings (more to come). Just to keep everyone up to date here is where we are.

There are about 6 more mugs left. may be acquired to SJRA members by a minimum donation of $10.00. There will be coffee mugs available at the General Membership Meeting in June

Our 100th Anniversary banquet will be held at the Trump Country Club in Pine Hill, NJ on Saturday July 30th, 2016. 11:00 AM to 3:00 PM. Mark your calendar and save the date.

Cost will be $45 per person which includes:

Tickets will be $45 person, this includes: Brunch; Cake; and Chance to win the door prizes (a Yeasu FT-100 Radio, DJ and more…) There will be cash bar available.

Menu has been emailed to the membership.

So far I have only 66 committed to coming to the party and over 40 have paid. Please let me know as soon as you can if you are coming.

Logs and QSL cards are coming in slowly for the SJRA QSO party. It was a lot of fun, getting on the air.

We are starting to achieve our goals, but we still need help. Our anniversary party is only 12 days from the writing of this column.

With that said, Joe, KC2TN, is selling 100th Anniversary clothing and hats, in addition he has patches. Contact Joe so you can have the ***New*** SJRA Look.

The Web Team needs help with content for our history time line. Please contact Rich KV2r if you would like to help.

Jon, W2MC; Mark, KD2JPW; and Rich, KV2R are working feverously in putting together our 100th Anniversary book.

This is a good way to show you support for the SJRA and be part of the history of the club.

We need your help. Please contact me if you are interested in helping with the 100th. If you like to help out in the last minute now is a good time to help!

Please email me your picture showing your SJRA!! Email them directly to me **ken** *at* **k2wb** *dot* **com**. Go to our web site to see where the SJRA logo has been.

Also, we are looking for old SJRA photographs. If you can scan them at the highest possible resolution. If you need help we could scan them for you so that they can be included on our website for all to share.

Test Session Report for: July 13 ,2016

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

Gregory P Schuckle
259 White Horse Pike 1A
Atco, NJ 08004
passed his General

Angelo T Scott
1142 Jackson Street
Philadelphia, PA 19148
passed his Technician

	Tech	General	Extra	Total
To Date	103	47	25	175

(Field Day 2016 from page 1)

Best of all, especially with the added emphasis on safety by ARRL, we had no persons injured in any way or any equipment damaged.

SJRA scored a total of 15,006 points in the Field Day contest this year compared to only about 13,300 in recent years. So there was indeed a big improvement. The total of 2370 bonus points is probably a record, and 40 CW perhaps set a recent record with 1047 QSOs. The complete breakdown is shown below.

Band	CW QSO	CW Points	SSB QSOs	SSB Points
80m	380	760	58	58
40m	1047	2094	559	559
20m	832	1664	483	483
15m	104	208	79	79
10m	5	10		
6m			40	40
Satellite			1	1
GOTA			362	362
Totals	2368	4736	1582	1582

Field Day QSO/Points Breakdown. The sum of 6318 QSO points is multiplied by 2 because of generator power for a total of 12,636 points.

Richard VonLintig, KV2R
Field Day Points Chairman

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President's Message

Ken – K2WB

Who knew a 100 years ago that a small bunch of guys in Collingswood, NJ who shared common interest would form such an organization that would last a century?

When I look at today's SJRA membership I see the same great group of people with a common interest. Some call it "Ham Radio" and others call it "Amateur Radio". We come from many diverse backgrounds both professionally and ethically and yet we still hold true to our hobby and friends. This is the principal ingredient of the continued success of the SJRA. This is something to think about as we celebrate our first 100 years as a radio club. Now we look forward to the next 100 years.

Field Day 2016 is now a fond memory, much kudos to the band captains and members for their tireless efforts in keeping the club call sign of K2AA on the air for 24 hours. Field Day would not be field day without help. It takes a lot to setup, operate and breakdown the equipment for Field Day. This year we had a lot more help than last year and it really made a difference. We can always use more help. Congratulations to all that participated. I already look forward to Field Day 2017, it is already less than a year away, are you making plans?

With some of the activities of Field Day, it reminds us to be safe while working on our antennas or equipment. Accidents come with no warning. Towers, antennas and equipment can be replaced easily, but injuries are not so easily remedied.

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***(Ham Tech** from page 6)*

and replace them with modern solid state amplifiers and that 90 year old BTL ring quad modulator upgraded with modern diodes is our new mixer. Last we redesign that old AM AGC system for SSB and CW and we have all the technology for today's transceiver. It took a lot of technology invention over many decades to get there but today's low end SSB transceiver is a vast improvement over what the early adopters of SSB had in their shacks. The high end products are unbelievable in performance. The modern day digital modes from PSK-31 to Joe Taylor's JT-9 and JT-65A for EME moon bounce communication wouldn't be possible without today's SSB transceiver.

Next Month – Next month is the 72 and last issue of HAM TECH. Join me and I will tell you why and what I would like to see next.

***(Presidents Message** from page 9)*

There are following committee vacancies,

Co-Editor of Harmonics
Membership Committee staff

Let me know if you would like to help. It takes people to operate and run the club. Your help would be greatly appreciated.

As the heat of the summer continues, everyone should be mindful of the staying hydrated. The other bad side of the heat is severe weather. Some of our members are experiencing this and hopefully by the time Harmonics is published things will returned to normal.

Thank you for being a member of the South Jersey Radio Association, encourage others to do the same.

***(Field Day 2016** from page 9)*

Raising the GOTA tower. Emphasis on safety is seen in this photo where all the workers near the tower are wearing hard hats and caution tape is in use. Included are John, W2FDJ; Burton, NJ2IT; Bob, KE2D; and Bobby, KD2AWE (plus others who could not be identified).

Star GOTA operators Bobby, KD2AWE and Mark, KD2JPW are shown as they work together to make contacts. Each scored about 100 contacts and 100 bonus points for GOTA.

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.

July Meeting:

Is the Fourth Wednesday, July 27, 2016

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 July:

Field Day Wrap-Up

SJRA Member August Birthdays

Alfred Chai, KD2ELG; Jim Higgins, KC2SZ; Robert Price, KD2GEO; Lou Priestley, N2HQL; Debbie Pullaro, W9QWN; and Rick Stoneking, W2RDS.

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

Ride Needed

We have two members who need rides to our meetings. If you come from or go through Mount Holly/Lumberton or Medford (near the Library) please contact me ASAP!!!

Ken, K2WB
Ken *at* k2wb *dot* com

First Class Mail

South Jersey Radio Association
PO Box 1026
Haddonfield, NJ 08033