

# **The Jersey Broadcaster**

NEWSLETTER OF THE NEW JERSEY ANTIQUE RADIO CLUB



March 2019

Volume 25 Issue 03





Reported by Marv Beeferman

# The ON-LINE Broadcaster

The Jersey Broadcaster is now on-line. Over 160 of your fellow NJARC members have already subscribed, saving the club a significant amount of money and your editor extra work. Interested? Send your e-mail address to mbeeferman@verizon.net. Be sure to include your full name.

# FINAL CALL FOR DUES

March 31st is the cutoff date for 2019 dues. Your Board, with the support of a great job by treasurer Harry Klancer, has held the cost at \$25 (\$30 for a family membership). This still remains quite a bargain in light of the club's benefits:

• Twelve issues of the *Jersey Broadcast*er.

• An entertaining and informative web site.

• The NJARC Communicator - a new and efficient forum for the exchange of club and member information.

• Two convenient and historic meeting locations.

• Unique technical presentations by a highly respected membership.

• Repair clinics and challenging contests.

• Capacitors, tubes resistors and parts at bargain prices.

• Resources for schematics and technical information.

• An award-winning radio museum, a constantly expanding technical library and a vintage radio repair facility for member use.

• Auctions, "PAL" swapmeets and InfoAge tailgates.

• A subsidized Holiday Party, and... much, much more.

At the present time, while our member-



The next NJARC meeting will take place on Friday, March 8th, at 7:30 PM at Princeton's Bowen Hall. Directions may be found at the club's website (<u>http:www.njarc.org</u>). This month, we're scheduled to hear a talk from member Dr. Mike Littman titled "Alexander Graham Bell's Early Experiments: The Harmonic Telegraph and Sound from an Empty Coil." In addition, Al Klase will be presenting awards to the winners of our BCB DX Contest. We'll also continue to collect dues for 2019. Keep an eye on our website for any late additions to the agenda.

ship secretary Marsha Simkin recovers from vision issues, her duties will be taken over by Ray Chase. There will be a mailing of 34 membership cards to those who have paid in advance and to honorary and lifetime members.

For members receiving the *Broad*caster by mail, check the code next to your name on the mailing label. Honorary (H) and Lifetime (L) members are exempt from paying dues. If you're receiving your *Broadcaster* by email and you're not sure about your membership status, it will be provided when you pay your dues or contact Ray at 908-757-9741 or at raydio862@verizon.net.

Dues will be collected at monthly meetings and other club activities or you can mail a check made out to the "NJARC" to:

#### Ray Chase 1350 Marlborough Ave. Plainfield, NJ 07060

Payment via PayPal is also available at the club's website but it will cost the club a fee. While you're at it, you might want to consider a lifetime membership. In any case, please renew early and avoid the membership cutoff date of March 31st.

Thanks go out to member Dr. Alex Magoun for his presentation at the February meeting documenting decades of FBI surveillance of celebrated RCA scientist Vladmir Zworykin. Alex's talk may be found at the following link courtesy of Dave Sica:

# https://you.be/WjRJLKureyA

According to Dave: "It was a meticu-

lously researched, eye-opening look at government surveillance of a foreign-born citizen who, however famous and patriotic, fell under suspicion and ended up with an FBI "tail," regularly spying on him from before World War II until the late nineteen-sixties! And along with all the intrigue, the part I found most interesting was a brief side-note that RCA had developed a self-driving car all the way back in 1953!



According to Albert Abramson's book "Zworykin, Pioneer of Television," on September 17, 1946, the FBI admitted that: "The file on subject was reviewed and it was found that all leads had been covered. This case is being closed upon the instructions of the special agent in charge." But while actual FBI surveillance abated, the information in their files was always there to be used against Zworykin when the occasion arose. But no charges were ever filed against him or brought out in public and he retained his top secret clearance - and his status with RCA and Sarnoff remained untainted.

Mike Slepian, an adjunct professor at Rowan College in Burlington County posted that he teaches a course in the history, development and operation of Radio,

# March 2019

#### **THE JERSEY BROADCASTER** is the newsletter of the New Jersey Antique Radio Club (NJARC) which is dedicated to preserving the history and enhancing the knowledge of radio and related disciplines. Dues are \$25 per year and meetings are held the second Friday of each month at InfoAge or Princeton University. The Editor or NJARC is not liable for any other use of the contents of this publication other than information.

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# Volume 25 Issue 03

TV and the Internet. He noted that he added Alex's presentation to his class materials and offered students extra credit if they did a brief report on Zworykin.

Member Jim Whartenby commented that when he first started work at RCA Labs, he was told that Zworykin, even after his retirement in 1954, still had an office in the building. "I was told that if I ever saw a white Cadillac on the grounds while walking after lunch, I was to get off the road!"

We sadly learned that our friend Ron Hutchinson passed away on February 2nd at the age of 67. Ron was part of a group that created the Vitaphone Project in 1991. They set out to preserve the onereel shorts that Warner Bros. made under the name Vitaphone Varieties from 1926 to 1931 as Hollywood was shifting from silent movies to talking pictures. Vitaphone used a Bell Labs technology which synchronized the speeds of the film projector and a turntable that played 16-inch sound discs. In 2016, Ron gave a talk at one of our monthly meetings and the New York Times obituary quoted his comments to the club on the 1926 release of "Don Juan," a feature with only music and sound effects but no dialogue: "It went over great, but the people loved the shorts with people speaking." So before showings of a subsequent Vitaphone feature in 1926, he said, "they had Al Jolson, Georgie Jessel and other popular performers, each in five-to-ten minute shorts, and this just set off everything."



Ron Hutchinson at our February 2016 meeting.

Member Harry Klancer would like to welcome members to the RTM Café. In his own words:

Most radio and electronics collectors share at least one issue. When you own an interesting artifact and it's at your home – or worse, in storage - almost nobody gets to see it. Well, I have a shiny Seeburg Wall-O-Matic wallbox, one of those that was a fixture in every restaurant and diner from the 1950's until...when did they disappear?

Fortunately, over the past year, the RTM has been installing a new section of the museum devoted to recorded music. After all, music has been a mainstay of radio broadcasting even before the inception of broadcasting as we know it. Think of "Victrola Recordings" transmitted from the AT&T Deal Test Site around 1920. The audio section of the RTM displays all manner of playback devices, from Edison players and Victrolas, 45s, 33s, wire recorders, 8-track players, etc. It also houses Al Klase's exhibit demonstrating the history of loudspeakers from the 1920's to And It includes Kevin the present. McDermott's AMI Jukebox and Phil Vourtsis' "Poor Man's Jukebox."

I decided that a Wallbox would be extraneous unless it was housed in its natural environment. So I built a diner booth (half a booth actually - we have limited space) in which the Wallbox is just a normal item, along with a napkin holder, drinking straws (advertising 5¢ Coca Cola) and other items. Club members Robert Forte and Steve Rosenfeld helped by outfitting the booth with these necessary items.

Hidden inside the walls of the booth are the minuscule electronics necessary to operate as if it were 1960. So come to the museum and sit down in the booth. But don't put in your nickel. Instead, press the large black button and you'll get two free plays. Flip the cards on the Wallbox to select your music, press the selector buttons, sit back and be transported back in time. But sorry, we don't serve food.



# **Upcoming Events**

March 16 - NJARC Spring Swapmeet/ Hamfest at Parsippany PAL April 12 - Monthly meeting at InfoAge; Hints & Kinks/Show & Tell May 10-11 - Kutztown Spring swapmeet May 17 - Monthly meeting at InfoAge; Presentation by Al Klase (topic TBA) May 18 - Spring Repair Clinic at InfoAge June 14 - Monthly meeting at Princeton; presentation by Alan Wolke (topic TBA) July 12 - Monthly meeting at Princeton; topic TBA

July 20 - Summer Tailgate Swapmeet/ Hamfest at InfoAge

# VATICAN RADIO

# By Robert Forte

The radio station "Vatican Radio" broadcasts on short wave, medium wave, FM, satellite feed and the internet. It was established in 1931 by Guglielmo Marconi under the direction of Pope Pius XI. Programs are transmitted in 47 languages and the station employs over 200 journalists in 61 countries. Broadcasts include international news, religious celebrations, music and other programs.

Vatican Radio first began broadcasting at Vatican City on February 12th, 1931 with two 10KW transmitters on two shortwave frequencies with a pontifical message from the Pope. Since summer temperatures in Rome are extremely hot, in 1933, a microwave link was made between the summer residence of the Pope (Castel Gandolfo) and the Vatican. In 1936, the ITU (International Communications Union) authorized broadcasting without any geographical limits as a "special case." Accordingly, in 1937, a 25 KW transmitter and two directional antennas were added for broadcasting over ten frequencies.



The first radio broadcast from Vatican Radio - Marconi in left rear, Pope Pius XI at center and the future Pope Pius XII at left.

During WW2, Vatican Radio, like all foreign broadcasts, were banned in Germany and subject to very severe penalties. But Vatican Radio continued to broadcast news of oppression of the Church in Poland and elsewhere. While some critics have said that Pope Pius XII was too quiet regarding the Holocaust, examination of wartime broadcasts exposed Nazi persecution of the Church and opposed collaboration with Nazism. It appealed to Catholics to remain true to their faith's injunction: to defend the sanctity of life and the unity of humankind. In doing so, the Pope at least pursued a policy of spiritual resistance to Nazi ideology and racism.

In 1952, a thousand acre broadcast site eleven miles north of Rome was acquired at Santa Maria di Galeria. The site was operated with two 10KW, three 100KW, one 120KW, one 250KW and a 500KW transmitter (for the East and Latin America). Antennas consisted of one omni-directional and twenty-one directional. By 2009, commercial advertisements started to meet rising costs. In 2016, Vatican Radio had a staff of 355, but was losing between 20-30 million Euros a year. In March 2017, service to Asia was discontinued (but continued online).



The Vatican City radio complex (headquarters of operation).

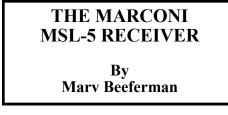
Vatican Radio still has its technical control center in the Vatican Gardens, which I visited in January, not realizing the significance of the center. Two parabolic antennas uplink to satellites which is then fed to other relay sites and general feeds. Our guide, as an aside, stated that the reason why Vatican Radio transmitters were relocated North to Santa Maria di Galeria was fear of radiation. However, I speculate that the reason was related to reaching a wider world audience and provide room for expansion. Oddly, the neighbors of the Galeria site still think that a radiation health hazard still exists, with RF causing an increase in leukemia and lymphoma, but this has not been examined or accepted by the authorities.

Reception of Vatican Radio in the U.S. is sketchy, depending on skip, since there are no relay stations aimed at us. The station may be found on the Internet and its distinctive chimes are quite unique. In Greenville, South Carolina, there is a relay station re-broadcasting to South America.

While I was researching this story, I came across a wonderful video of the Vatican Radio Technical and Historical Museum which I did not know existed. It is located in the Palazzina Marconi, the first historical seat of Vatican Radio, inside the Vatican gardens. It contains hundreds of artifacts, many working, including spark transmitters, microphones, recorders, receivers, record players, etc. and a large collection of photographs and films.



I plan to arrange a private tour the next time I visit Rome...so stay tuned! Meanwhile, you can take a virtual tour on the Internet; just google "Vatican Radio Technical Museum" and you'll find the YouTube link.



At the January NJARC monthly meeting, a Marconi MSL-5 receiver came up for bid during our members-only auction. I didn't stay to see what it was hammered down for but member Ray Chase found its cats whisker detector interesting enough to obtain for our Radio Technology Museum. When we got it to the shop, it was found to be in pretty good shape although the previous owner had jury-rigged an internal power supply which could only be described as a total mess. Fortunately, the added components did not do too much damage and it appeared that the receiver could be easily restored to its original condition.



The Marconi MSL-5 was mainly designed for the ship and coast station reception of shore-based broadcast messages. It was first introduced by the Canadian Marconi Company in 1940 but the Royal Canadian Navy was still reconditioning the receiver as late as 1962. It was a four tube, low/medium frequency regenerative receiver operating in the 15 to 1550 or 15 to 1775 KHz band depending on the variant. The receiver consisted of a 6K7 tuned R.F. stage, a 6K7 untuned R.F. stage, a 6F7 combination detector and "regenerator" and a 38 output pentode. Power was provided by a 6-volt storage battery and two 45-volt heavy duty dry batteries (for 90 volts). For A.C. operation, a type PPR-1 power unit using an 84 tube was available. The battery supply was connected to chassis-mounted binding posts. Since there was no audio output stage, high resistance earphones were required for normal operation but a magnetic type, high resistance loudspeaker could also be used when connected to the "PHONES" output jack.

Stations were tuned in by operating two separate tuning controls ("AERIAL" and "DETECTOR") and two non-ganged range switches ("WAVE RANGE"). Regeneration was provided by "REACTION" control, "reaction" being the term normally used by the British and Canadians in lieu of "regeneration." Both the detector and reaction "tubes" are enclosed in the same 6F7 glass envelope but act as separate entities. Signals applied to the detector grid are also applied to the grid of the reaction tube. Signals are amplified in the plate circuit of the reaction tube and coupled back into the detector tuning inductance in the correct phase so that regeneration can take place. The "REACTION" knob controls the potential applied to the screen grid of the reaction tube, thus controlling the amplitude of the

signals that are fed back to the detector grid. When reaction is turned to zero, the detector then functions as a straight grid leak detector with no regeneration.

An interesting feature of the MSL-5 was a self-contained galena crystal detector. Until the early 1950's, it was a requirement of the British Merchant Shipping (Wireless Telegraphy) Rules that the radio installation aboard a British registered vessel should be capable of "maintaining reception by means of a rectifier of the crystal type." Subsequent modification of these rules required the installation of a separate emergency or reserve receiver. If the MSL-5 or its power source failed, the operator could move the antenna connection from the binding post marked "VAL" (valve) to the receiver's binding post marked "CRYS." (crystal). Crystal headphones could then be plugged into a separate front panel jack marked "CRYS. PHONES." An easily accessible, internally mounted cat whisker galena crystal would then be manipulated until its most sensitive spot was found, exactly the way it was done with early crystal radio sets.

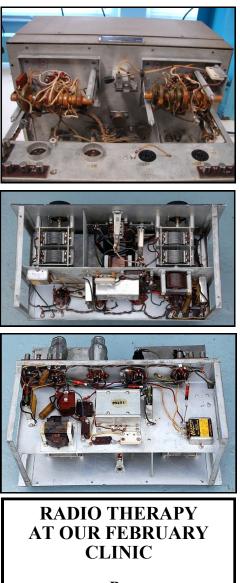


In later MSL-5 models, the cat whisker crystal was replaced with a diode such as a 1N34. In the crystal radio mode, stations were tuned by operating the "AERIAL TUNING" control in conjunction with the band switch mounted directly above it. The frequency range was limited to 274-786 KHz.

For CW operation, a "NOTE FIL-TER" resonating around 1100 Hz was used and connected between the detector output and the audio input circuits. A "FILAMENTS" on-off switch served to open or close both the heater and high voltage ("high tension") circuits. A "H.T." switch enabled the receiver to be inoperative when transmitting. The "FILAMENTS" switch was not suitable for this purpose due to the time required for the tubes to heat up after being switched on.

Once made operational, the MSL-5 will be a great addition to the museum

and I'm looking forward to it as an entrant in our 2020 BCB DX contest.



By Marv Beeferman

Another great radio repair clinic has come and gone and as member Bob Bennett notes "there were working radios and smiles as folks exited to go home." A "snippet" of the day's activities have been posted by Bob at his latest "RadioWild" segments on YouTube. Here's a summary for the less computer literate:

• **Ray Chase** worked on a homebrew broadcast receiver with an estimated vintage between 1950 and 1960. The radio would oscillate and motorboat at certain spots near the top of the band. In previous clinics, Ray had replaced the electrolytics. He determined that the layout of the circuits and wiring was causing feedback and oscillations. At the end of the day, the radio worked over much of its band but "took off" at several frequencies. Further analysis indicated that wiring in the detector and AVC circuits needed to be revised, grounds improved and some shielding was required.

Just before the end of the day, a Grundig-Majestic 2440U AM/FM/SW radio (1964-5) showed up that was completely dead. It seems that Ray grabbed the golden ring for the day - all it needed was a new fuse. I'm not sure about the cause but some threads on the Internet pointed to the failure of aged slow-blow fuses in these radios.

• Tom Cawley and Chuck Paci joined forces to work on Tom's RCA 5-C-591 clock radio from 1955. This radio features a dual tuner for automatic change of frequency from nighttime to morning stations. It also has an appliance outlet and phono and tape jacks. Initially, the radio had no reception but its amplifier looked good. Troubleshooting found a problem with the ON/OFF/AUTO switch. As noted, the radio has a separate tuning condenser for the main radio and one for the alarm (to set the wake-up station). The switch that selected either mode was not working and only the alarm mode was enabled.

The switches were cleaned, circuits aligned and the radio came to life. However, the radio was re-wired to work only in the alarm mode for now pending further troubleshooting by Tom in order to return it to full functionality.

• Phil Vourtsis tackled a 1957 RCA SHF-9 record player featuring three loud-speakers. It was owned by Bob Becker. "As Found" condition was an out-of-adjustment landing and slow speeds. The motor was rebuilt, a new idler rubber was installed and the landing adjusted to return this unit to working well on all speeds.

• Your editor worked on a 1933 Philco 60 owned by Peter Boser. He told me that the radio picked up stations but had significant interference. When the radio was powered up at InfoAge, stations were clear and relatively loud. Upon discussion, Peter's proximity to power lines may have been the culprit. The tuning capacitor was extremely loose because of degraded mounting grommets so it was shimmed and stabilized. A few capacitors had already been replaced but I had Peter replace a wax one and a .05 mfd "brown devil" that looked suspicious. When it was closely examined, a crack and a hole were discovered and it appeared that the capacitor had been "punched-through." Following replacement, the radio seemed to have gained even more volume.

• **Bob Bennet** worked on Andy Vilagi's Fada 1000 ("Bullet"). He found a bad 35Z5 rectifier and poor wiring carried over from previous service. The tube was replaced, the radio rewired and an alignment performed. A good playing (and expensive) radio was the result.

Bob had an interesting experience with Owen Gerboth's Zenith H500 Trans -Oceanic. The radio had no AC hum when powered by Owen's homebrew battery pack but on AC, the hum was present. It was obvious that a filter recap was in order but interestingly enough, it did not solve the problem. When Bob got the radio home and closely examined the schematic, he learned the difference between chassis ground and floating ground. You can learn about Bob's discovery on YouTube at his "RadioWild" posting. He'll also talk about the use of a 1LC6 as a 1L6 substitute.

• Joseph Divito noted that our clinic "was indeed a great time! I came away with a happily singing Zenith R511 thanks to Neville." Sometimes called the "Broadway" because of its shape, the 1954 AC/DC, 5-tube R511 was quick work for **Neville Greenough**. Low audio was traced to an open 470 Kohm resistor in the 12AT7 plate circuit. Neville also tackled a Heathkit scope calibration but stopped at a broken AC/DC trigger switch, a Bendix radio with a still unknown hum problem and a TV sound I.F. issue.

At our December Holiday Party, Neville "stole" a Hallicrafters S-41W Skyrider Junior radio from member Kevin McDermott. At our repair clinic, Ne-



ville surprised Kevin with a "re-gifted," re-capped, fully functional radio. Thanks Neville for a little Christmas in February! Kevin himself replaced a number of capacitors and tubes in a Crosley radio owned by Bob Masterson to get it back to life.

• Tom Provost worked on a 37-650 Philco console owned by Jim Doran. The radio was totally inoperative and Tom found that the radio was poorly repaired by the previous owner showing poor workmanship, incorrect part values, bad wiring, failed components and improperly installed electrolytics. Tom replaced components and wiring as required, working both at InfoAge and his home shop. The result was another working radio.

Jim considered work on his 1938 Silvertone 6125 table radio a "bonus repair." The radio features the standard BC band and one SW (5.9-18.2 MHz) band, a tuning eye and five channel pushbutton station selection. A slipping dial cord and one weak tube was found. The dial cord was replaced and adapted to work around a crumbling rubber dial drive wheel. The radio was working well despite its weak tube.

• **Tommie Snider** tackled a 1955 RCA EY-1DJ 45 player with worn parts and a bad motor capacitor and cartridge. The motor was disassembled and the mechanism cleaned and oiled. All capacitors and the cartridge was replaced. The player is still awaiting further testing.

• A shout out to John Ruccolo for his persistence and perseverance in repairing a client's GE console. It's a great reflection on both John and the club (with help and suggestions from Al Klase, Phil Vourtsis, etc.) that this radio could be returned to its owner in working condition. One of the problems that John encountered was that its "Beam-O-Scope" antenna must be connected to troubleshoot the radio since it is part of the input circuit. This confined John to our repair shop for quite a few days. Other problems were found in the I.F. transformers. John was able to find one replacement from a 1941 Philco parts chassis which "peaked nicely at 455 KHz." John took some goodnatured kidding over this project with one member threatening "no pizza for you until the GE can pull in Radio Cuba!"



John diligently at work.

# March 2019

Volume 25 Issue 03

Page 6



























A true reflection of the talents of our clinic participants was member Sal Brisindi's recently restored Oldsmobile Cutlass. As you can see, Sal had a little fender-bender on his way to the clinic. Well, the boys dropped their soldering irons, got out their Bondo and sandpaper and made quick work of a potential disaster.

# March 2019









# 2019 BCB DX CONTEST RESULTS

We had a very nice response to our 2019 Broadcast Band DX Contest. As you can see from the results, there were seven first time contestants. Thanks to Tom Provost for compiling the results; awards will be presented at our March meeting.

# Volume 25 Issue 03

# **Category A - Crystal Radios**

<u>Winner:</u> Nevell Greenough 2,564 pts. 1922 Audiola Crystal Set using galena crystal or 1N34A diode, w/Klase PGXS passive pre-selector, sound powered phones using 70'dipole antenna connected as flat top, MDS 1530 kHz WCKY Cincinnati, OH 550 mi.

# <u>Category B - Primitive Tube Receiv-</u> ers, 1 or 2 Tube

No entries

# Category C - 1920's Battery Sets

<u>Winner</u>: Jerry Dowgin 2,083 pts. RCA Radiola III with Radiola Balanced Amplifier and Magnavox speaker, using random wire antenna, MDS 840 kHz WHAS Louisville, KY 630 mi.

# <u>Category D - Other Tube Radios Sold</u> <u>for Home Entertainment</u>

<u>Winner:</u> Tim Walker 11,679 pts. 1938 Philco 38-7 console using DYI Skywaves air core loop, MDS 850 kHz KOA Denver, CO, 1,615 mi.

Irwin Sobelman 7,121 pts. Westinghouse H-126 (refrigerator radio) using longwire ant, MDS 1040 kHz WHO Des Moines, IA 1014 mi. (first time DXer)

Al Klase 6,483 pts. Zenith 12S232 using vampire antenna (on transistor set), MDS 1540 kHz KXEL Waterloo, IA 950 mi.

John Ruccolo 5,828 pts. Silvertone 1002 (AA5) using built in ferrite ant., MDS 1040 kHz WHO Des Moines, IA, 1014 mi.

Rich Skoba 5,297 pts. 1934 Simplex U91T using Grundig 200 tunable loop, MDS 1120 kHz KMOX St. Louis, MO. 860 mi. (first time DXer)

William Coffman 4,993 pts. General Electric H639 table top radio phono using internal ant., MDS 1040 kHz WHO Des Moines, IA 1014 mi. (first time DXer)

# <u>Category E - Amateur, Commercial</u> and Military Tube Type Radios

<u>Winner</u>: John Ruccolo 8,930 pts. National HRO 60R using indoor random wire, MDS 950 kHz Radio Reloj, Havana, CU 1,279 mi.

Al Klase 8,226 pts. Collins 51J4 using

Skywaves Shielded Loop, MDS 950 kHz Radio Reloj Havana, CU 1,279 mi.

Mike Shaw 5,328 pts. ICOM-765 transceiver using 125 ft. long wire, MDS 1040 kHz WHO Des Moines, IA 1,014 mi. (first time DXer)

# <u>Category F - Any Radio of Your Choos-</u> ing

Winner: Aaron Hunter 8,674 pts. Philco T-9 multi-band portable using internal loop, MDS 600 kHz CMKA San German, CU. 1,347 mi. (first time DXer)

Bill Sloma 7,123 pts. C Crane 2E solid state portable using tuned loop ant. MDS 740 kHz KTRH Houston, TX 1,391 mi. (first time DXer)

Phil Vourtsis 7,111 pts. Zenith Model MJ1035 using internal loop, radio rotated on lazy-susan, MDS 530 kHz La Habana, Havana, CU 763 mi. (distances calculated from DXer's location in Myrtle Beach, SC)

Joe Gilberti 4,321 pts. General Electric Super Radio III using internal loop, MDS 750 kHz WSB Atlanta, GA 717 mi. (first time DXer)

Mike Shaw 3,985 pts. 2016 Subaru radio in car using factory window ant., MDS 870 kHz WWL New Orleans, LA 1,128 mi. (first time DXer)

# <u>Category G-Light Weight- Any Radio</u> <u>Weighing Less than 1 Pound.</u>

<u>Winner:</u> Tim Walker 10,272 pts. Sony ICF-SW100 using internal loop, MDS 670 kHz Radio Rebelde Havana, CU 1,279 mi.

Joseph Serafin 9,459 pts. Kaito KA345 pocket radio (\$20) using Terk loop, MDS 600 CMKA San German, CU 1,347 mi.

Compiled by Tom Provost MDS = Most Distant Station

Congratulations to our 2019 NJARC DX Contest first time contestants:

William Coffman Joe Gilberti Aaron Hunter Mike Shaw Rich Skoba Bill Sloma Irwin Sobelman

