

# Spurious Emissions



The Newsletter of the South Bay Amateur Radio Society



Volume 5 Number 1

Winter 2016

## New Members

We would like to welcome the following new members to SOBARS:

Ed Ross, N6GZI

Bob Garvin, KK6YLW

Rick Baskin, KK6ZMI

Miguel Villanueva, Jr., W6GYV

Gary Richard, KK6YKC

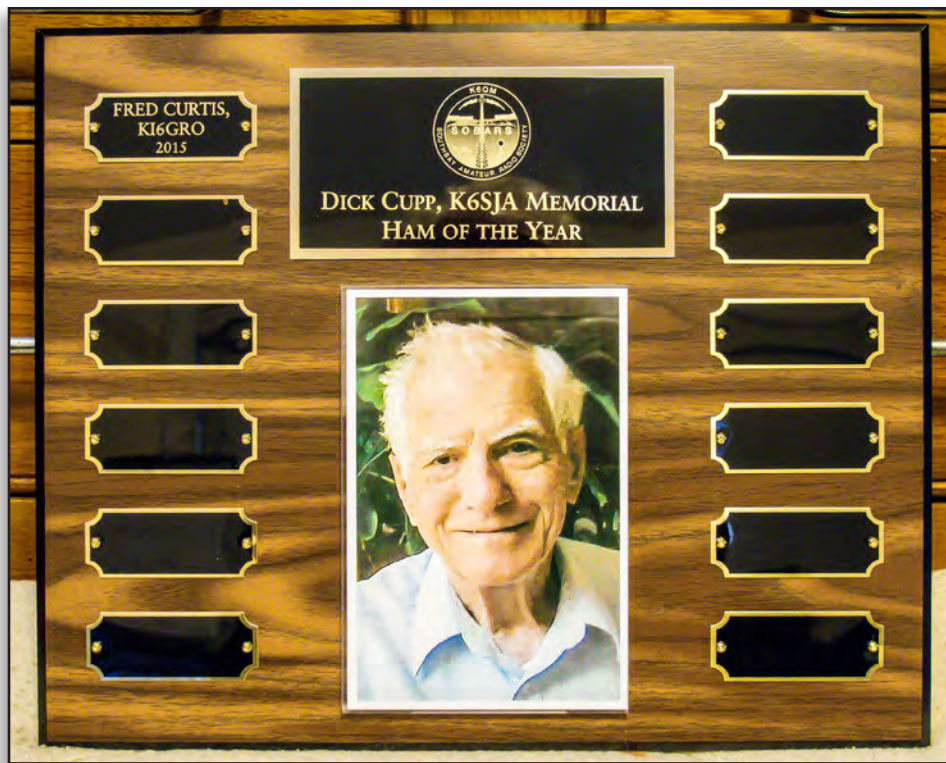
## Editor's Notes

There's a lot to cover in this issue.

A lot of us are aware of the plethora (I love that word!) of inexpensive Chinese-made radios, mostly HTS that have hit the US market in recent years. While these radios are a good way for new hams to get started with a minimal investment, there are some things that people should know about them. To that end, there are two re-printed articles about Chinese radios in this issue.

The Amateur Radio Parity Act, working its way through congress as HR1301 and SB1685, is controversial and facing opposition from the HOA lobby. I have reprinted information from the ARRL website regarding the legislation.

Also in this issue are three columns from contributor Dan Romanchik, KB6NU, including one from a guest columnist.



The first Dick Cupp, K6SJA Memorial Ham of the Year award was presented in December. Congratulations to Fred Curtis, KI6GRO for being the initial recipient.

*John Wright, K6CPO*

## From The President's Shack

By John Wright, K6CPO

Well, 2016 is here and we have a busy year ahead of us. There will be the usual Fry's Operating Days, and Field Day, but we'll be adding a new activity this year.

The ARRL, in partnership with the National Park Service is sponsoring NPOTA, National Parks on the Air; <http://www.arrrl.org/NPOTA>. Throughout 2016, Amateur Radio will be helping the National Park

Service celebrate their 100th anniversary. Hams from across the country will activate NPS units, promote the National Park Service and showcase Amateur Radio to the public.

SOBARS member Pete Villaver, N3PV, is putting together a proposal to activate the Cabrillo National Monument in August as part of this event. Additional information will be forthcoming as it is received.



**SOUTH BAY  
AMATEUR RADIO  
SOCIETY  
(SOBARS)**

**K6QM**

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SOBARS is an ARRL-affiliated ham radio club with members from San Diego, National City, La Mesa, Chula Vista, Bonita, Imperial Beach, and San Ysidro, California.

**OFFICERS**

**President:** John Wright, K6CPO  
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**Vice-President:** Nestor Puñales  
K6JTT  
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**Secretary/Treasurer:**  
Fred Curtis, KI6GRO  
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**Call-Sign Trustee:**

Jim Beckman, N6RSL

**Emergency Coordinators:**

Ramon Dueñas, KJ6QQK

Steve Froetscher, N3NB

**Property Trustee:**

Louie Vignapiano, KI6SRR

SOBARS meetings are held  
at the Chula Vista RV Resort,  
460 Sandpiper Way,  
Chula Vista, CA 91910  
See the website for dates & times.

Club Repeater: 146.085 (+)  
PL: 100.0

**CLUB NETS**

Club nets are held every Tuesday  
evening on the following bands:  
1830: (PT) 449.980 (-) PL 88.5  
223.840 (-) PL 107.2  
1900: (PT) 146.085 (+) PL 100.0  
1930: (PT) 28.480 USB  
7.240 LSB

Derrick Dudley, K7SVN, has volunteered to be Field Day Chairman for 2016. Everyone should give him all the help they can. I'd like to thank Derrick for volunteering and I like to express the club's gratitude to Mark Wallace, KJ6NMJ for handling Field Day the last couple of years.

The first awarding of the Dick Cupp, K6SJA, Memorial Ham of the Year Award was made in December at the annual potluck dinner. On hand to present the award was Corrin Condron, KJ6YJL, Dick Cupp's Great-granddaughter. Also present were Dick's daughter Norma and many other members of his family. Congratulations to Fred Curtis, KI6GRO for being the first recipient of the award.

2016 is also an election year, both nationally and for SOBARS. While the club will not endorse any particular candidate in the national elections, I urge everyone to carefully research all the issues and cast the best informed vote they can.

All three positions on the SOBARS board expire at the end of December. In accordance with the By-Laws, a nominating committee will be appointed at the September meeting. The committee will be soliciting nominations to be presented at the November meeting with elections to be held at the annual potluck meeting in December. Anyone that is interested in being part of the club leadership should make their wishes know to the nominating committee when contacted

The club has purchased a second Yaesu System Fusion® repeater. The intention is to place this repeater in service on the 440 MHz band. There is space on the tower to install another antenna and room in the building for the repeater. We are in the process of obtaining a coordinated frequency pair and are actively looking for a set of 440 diplexer cans. If anyone is interested in assisting

with the installation of the this repeater and repeater maintenance in general please contact one of the SOBARS board members.

The Chula Vista rv Resort has graciously granted us meeting space for the next year. The resort charges us nothing for the use of the room and has asked for nothing in return. There is a nice little store on the grounds that carries a variety of merchandise including drinks and snacks. I would encourage members to shop in the store for any goodies they might like before our meetings. The store closes at 6 PM in the winter and 7 PM in the summer.

If anyone is looking to upgrade their licenses this year, there are a couple of changes coming. First, SANDARC is raising their VE examination fees to \$10 effective February 1, 2016. Second, the current Amateur Extra question pool expires June 31 and the 2016-2020 question pool goes into effect July 1. As always, anyone upgrading their license class is eligible for a free one-year SOBARS membership. The person must have been a member for at least one year and the free membership benefit can only be used once.

There have been some changes in the SOBARS Tuesday night net schedule. In addition to the usual nets, we are beginning another short 6 meter net to run in conjunction with the 220 net. Jim Beckman, N6RSL, is the NCO. Initially, this net will operate on 51.500 MHZ simplex. Also, the frequency of the 40 meter net has changed to 7.240 MHZ. NCO Sarah Honaker, KK6DKP, chose this frequency as one with less noise. Pete Villaver, N3PV, is conducting a Digital Fusion net on the repeater every Tuesday at 8:00 PM. Jim Beckman has volunteered to become a 2 meter NCO as well. I would like to thank all the net control operators for their efforts in keeping our nets running.

73, everyone! ✈



# Clarity on Amateur Radio Parity

## Prepared by ARRL, the national association for Amateur Radio

Some objections and concerns have recently been raised about the Amateur Radio Parity Act, H.R. 1301 and S. 1685, by representatives of community associations. To address them, and to separate fact from fiction, let's look at the bill itself and what it would and would not do.

### ***Why is it needed?***

Thirty years ago the Federal Communications Commission, recognizing that there was a strong federal interest in effective amateur radio communication from residences, adopted a policy of limited preemption of state and local regulations of amateur radio station antennas. Those regulations:

- 1) Must not preclude amateur radio communications;
- 2) Must reasonably accommodate such communications; and
- 3) Must constitute the minimum practicable regulation to accomplish the state or local authority's legitimate purpose.

Since that time, private land use restrictions have become increasingly common. Restrictions on antennas are now so pervasive that they prevent effective communication from residences in large areas of the country.

### ***What would the Amateur Radio Parity Act do?***

As introduced in both the House and Senate, the bill recognizes the fact that whether a residence is subject only to state and local regulations or also to private land use restrictions, the federal interest in effective amateur radio communications is the same. The bill simply instructs the FCC to extend its time-tested limited preemption policy to private land use restrictions.

### ***What would it not do?***

The Amateur Radio Parity Act does not create new federal policy regarding outdoor antennas. Congress and the FCC already have acted to prohibit restrictions that prevent the installation of direct-to-home satellite dishes, TV antennas, and customer-end wireless broadband antennas.

The bill does not prohibit community association review of proposed amateur radio antenna installations. It simply limits restrictions to what may be necessary to accomplish the association's legitimate purposes, such as safety and aesthetics. Prior approval still can be required, just as in the case of municipal land use regulation.

The bill does not mandate that a particular size of antenna be permitted. As long as a size and placement restriction does not constitute a prohibition, but reasonably accommodates amateur radio communication, and provided that the restriction is necessary to accomplish a legitimate purpose, it will be allowed.

Claims that the bill will do any of these things are simply wrong, and are either misunderstandings of the plain language of the bill or deliberate misrepresentations.

## ***What is the current status of the bill?***

As of August 28, 2015, H.R.1301 had 94 co-sponsors in addition to its sponsor, Rep. Adam Kinzinger of Illinois. It has been referred to the Subcommittee on Communications and Technology of the House Committee on Energy and Commerce. S.1685 was introduced on June 25, 2015 by its sponsor, Senator Roger Wicker of Mississippi, and original co-sponsor, Senator Richard Blumenthal of Connecticut. It has been referred to the Senate Committee on Commerce, Science, and Transportation.

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225 Main Street  
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860-594-0200  
[www.arrl.org/amateur-radio-parity-act](http://www.arrl.org/amateur-radio-parity-act)

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## **What is legal, and what is NOT legal for our Chinese radios.**

John L Wilkerson, Jr, KD8DVR Ohio Repeaterbook Admin

### ***Ask ten people, get ten answers.***

**O**K... A radio needs Part 95 acceptance for FRS, GMRS, MURS. No Baofeng has this. I'm aware of only one Wouxun model that is approved for Part 95(a) GMRS use. Anyone has two models that are pending GMRS and MURS certification. Currently, legal issues have suspended the previous certification.

For commercial use, radios need Part 90 approval. Most Baofengs have this. Many Wouxun radios have this. A few Puxing radios have this. Most Anyone radios have this. GMRS radios need Part 95A certification. MURS radios require Part 95D certification. FRS radios require Part 95B certification.

Check on the back of the radio for the "FCC ID" sticker. This FCC identification can be looked up to see what rule parts the radio is certified for. An FCC ID label is required to be placed on the back of the radio.

Some commercial radios have more than one rule part. You'd see Part 90 and Part 95(a). These would be legal on GMRS, but not FRS, Part 95(b) or MURS Part 95(d). Because FRS radios have a maximum of 500 mw and non-removable antennas. MURS has a 2 watt maximum, and these radios exceed that on high power. Of course, you then have the field programmability, which oddly enough even violates the Part 90 approval... Figure that one out!

For Amateur radio use, no Part 97 approval is required. I don't even think there is an equipment certification for Part 97. Part 97 primarily covers operating rules, although there are some equipment rules. Since amateur operators can use \*almost\* all equipment, other rule parts dealing with equipment come into play. Part 97 does cover proper engineering practices that are required to make sure equipment is within tolerance.

For amateur equipment, Part 15 largely applies on VHF and UHF radios. This is primarily for radios with a scanning function, to certify the radios cannot monitor cellular, as well as receiver products interfering and receiving interference from consumer products.

If you take your Icom, Kenwood, etc., radios and enter the FCC ID into the FCC database, you will see it likely listed as "Part 15 scanning receiver." That's why you see some new equipment being listed "This radio has not received FCC approval." It's not waiting for Part 97 approval; but waiting for that Part 15 receiver compliance.

The applicable rule here is 15.101 Paragraphs (a) and (B)

Most Part 90 radios, which are commercial radios, can be used on the amateur bands legally. That's why all these Baofengs, Wouxuns, Puxings, etc., have taken off. Wouxun started it off by being the first Chinese radio to get approval. All these other radios floating around at the time had no approval. Of course, when this hit

the net with a firestorm and sales took off, other manufacturers finally got into the fray, and we now have the mess we are in today.

You see all the hams with Motorola, Midland, and other radios on the ham bands. They are Part 90 radios, which makes them legal for amateur operators. They have been certified for use in the USA, based on technical standards for commercial use. Amateurs may use any equipment certified under any other rule part. The reverse is not true. Amateurs are expected to utilize proper engineering practices and are granted wide latitude for operation.

What about all those Quangshengs, and oddball brands? Forget it. If they have no FCC ID, they are not legal for use on any radio service in the USA, including amateur. This may, at first thought, contradict my previous statements regarding proper amateur engineering practices. The answer to that is simple: The radios have not passed any type of scrutiny in regards to spectral purity, or any other factors governing equipment for use in the USA.

This will not, by any means, stop the debate. If I get one person to consider the rules, then that is a victory. I will hear 100 different reasons why I am wrong. This

is an interpretation. I've tried to be as literal as possible, with as little personal bias as possible. I could spoon feed each and every applicable regulation, and draw pictures. I'd still be doubted. At any rate, at least I'd cause a pause to consider. For the record, I own several brands of radios, such as Baofeng and Puxing.

The point, really, is to make people stop and consider the fact that all radio services have rules, regulations and technical standards. Not all radios will work with other radios. Very few can be used by the general public.

### **Update 11-27-2015 for Part 15 clarifications and Part 90 corrections**

Note: the FCC approval process only applies to commercially manufactured equipment. Homebrew stuff is exempt.

On my web page below, I have some detail in the exact provisions of the rules: <http://kd8dvr.dodropin.org/part15>

Of course, feel free to consult the FCC regulations if you don't want to take my word on this: <https://www.fcc.gov/encyclopedia/rules-regulations-title-47>. ✈

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## **A New Heathkit! So, Why Am I Not Excited?**

By Dan Romanchik, KB6NU

A couple of weeks ago I got an e-mail from Heathkit. Yes, the NEW Heathkit. You might remember that a couple of years ago, there was all this hype about a "new" Heathkit and how they were going to start designing new kits as well as revive popular old designs.

Then, nothing. They went completely quiet—until a couple of weeks ago. In an e-mail sent to their "insiders," they say:

*"Dear Heathkit Insider,*

*'What I really hope Heathkit will produce,' a Silicon Valley colleague recently told me, 'is a new radio kit with a beautiful finish, maybe in rosewood.' Something great to enjoy building and learn from, and also visually stunning, so he could put it in his living room and keep it forever.*

*"Today, my friend gets his wish.*

They then go on to explain all of the work they've been doing in relocating Heathkit to Santa Cruz, CA, acquiring a second company, and securing all the intellectual property rights to the old Heathkit manuals and logos

(meaning no more bootleg copies on the Internet). The e-mail continues:

*"That's a lot, but there's more. We've designed and developed a wide range of entirely new kit products. We authored the manuals for these kits, complete with the beautiful line art you rely on, preserving and respecting our iconic historic Heathkit style. We developed many new inventions and filed patents on them..... We built the back office infrastructure, vendor and supply chain relationships, systems, procedures, operations methods, and well-thought-out corporate structure that a manufacturing company needs to support its customers, to allow us to scale instantly the day we resume major kit sales. All this effort enables us to introduce a fleet of new kits and helps ensure Heathkit can grow, prosper, and continue to bring you great new products for a very long time."*

So, what's the exciting news? A new QRP transceiver? Maybe a shortwave radio? A new 100-in-1 experimenter kit for Makers?

Uh-uh. Sorry. The "exciting" news is a tuned radio frequency (TRF) AM band (yes, I said AM band) radio



kit that costs \$150 (<https://shop.heathkit.com/shop/product/explorer-jr-trf-am-radio-receiver-kit-black-case-gr-150-bk-16>). Not only is that crazy expensive for an AM radio, it doesn't even come with a speaker. On top of that, there's no soldering. You screw all of the components to the board. I'm speechless (well, figuratively, not literally).

I'm not sure what the target market is for this product. It's certainly not amateur radio operators, who expect

a lot more (in terms of both functionality and "fun") for their money. Nor is it the "Maker" folks, who want something more challenging than an AM radio. I think that if I took this to show off at the local Ann Arbor Maker group, they'd laugh me out of the place.

I really hope that they have something better up their sleeves. A strong Heathkit would be good for the Maker movement and for ham radio. ✈

## Ham of The Year Presentation



Corrin Condron, KJ6YJL, presents the first annual Dick Cupp Memorial Ham of the Year award to Fred Curtis, KI6GRO.

*Nestor Puñales*



Fred Curtis, KI6GRO poses with his award,

*Joe Acevedo, N6SIX*



Corrin Condron, KJ6YJL, addresses the SOBARS membership as Norma Cupp looks on.

*Nestor Puñales, K6JTT*



## Technical Correspondence

Larry D. Wolfgang, WR1B, tc@arrrl.org

# ARRL Laboratory Handheld Transceiver Testing

Those who have attended Hamvention in Dayton, Ohio or several other conventions over the last 3 years may recall seeing a team of ARRL Laboratory Engineers and volunteers performing spectral output tests of VHF/UHF handheld transceivers. This testing was performed as a service for attendees who wished to know the spectral quality of the output from their handheld transceiver.<sup>1</sup>

Most readers are familiar with ARRL Product Reviews, and the laboratory testing that we conduct for those reviews. How was the convention testing different? In the case of Product Review testing, we have new radios, in previously unopened boxes. We conduct extensive testing, and compare a radio's receive and transmit test results with the manufacturer's claimed specifications as well as the FCC spectral requirements, specifically FCC Rule, Part 97.307(e).

*\*FCC Part 97.307(e) The mean power of any spurious emission from a station trans-*

*mitter or external RF power amplifier transmitting on a frequency between 30 – 225 MHz must be at least 60 dB below the mean power of the fundamental. For a transmitter having a mean power of 25 W or less, the mean power of any spurious emission supplied to the antenna transmission line must not exceed 25 µW and must be at least 40 dB below the mean power of the fundamental emission, but need not be reduced below the power of 10 µW. A transmitter built before April 15, 1977, or first marketed before January 1, 1978, is exempt from this requirement.*

For example, a typical 5 W handheld transceiver transmitting at 146 MHz would need a minimum of 53 dB of harmonic and spurious suppression. For a 4 W transmitter, a minimum of 52 dB is required; 3 W = 50.8 dB, 2 W = 49 dB, 1 W = 46 dB, and 100 mW = 40 dB.

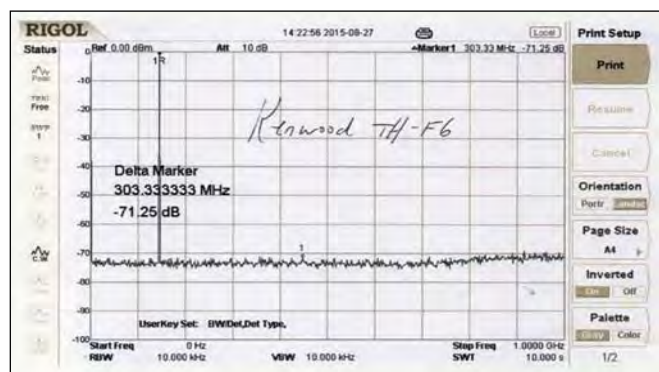
A spurious emission is RF energy that is unintentionally generated by a transmitter at any frequency other than the desired (fundamental) transmit frequency. Harmonics are spurious emissions that are unintentionally generated by a transmitter and are easy to

spot on a spectrum analyzer or panoramic receiver, being two times, three times, four times, and so on, the fundamental frequency. Other spurious emissions ("spurs") can sometimes be unintentionally generated above or below the fundamental frequency.

It is important to note that the data gathered at the convention measurement tables represents the emissions from *used* equipment, unlike the data that is gathered during testing of new equipment for *QST* Product Reviews. Handheld transceivers that have been dropped, damaged by moisture, or modified by their owners in any way may become noncompliant.

A total of 919 handheld radios were tested, to date. After five major conventions, some interesting trends began to appear. Certain radios tend to comply, or not, with FCC emission requirements regarding spurious emissions. Table 1 summarizes the data collected over the years. Table 2 breaks down the data by manufacturer, although no attempt was made to list the specific models of radios being tested. In Table 2, the manufacturers are listed in order, according to the number of radios tested.

<sup>1</sup>Handheld testing was performed at 2012 Pacificon, 2013 – 2015 Dayton Hamvention® and in the ARRL Laboratory during the 2014 ARRL Centennial Convention.



**Figure 1** — This Kenwood TH-F6 handheld transceiver has a very clean spectral output, with only a single signal at the intended fundamental frequency, and all of the remaining spectrum being more than 70 dB below the intended output, out to 1.0 GHz. This spectral output is typical of most of the compliant radios.



**Figure 2** — Many of the handheld radios that are not compliant on the 2 meter band show good engineering practice when operating on the 70 centimeter band. Here you can see a Baofeng UV5R operating on 70 centimeters, and the second and third harmonics are 60 dB or more below the fundamental output.

**Table 1**  
**ARRL Laboratory Testing of Handheld Transceivers at Conventions**

Year	Units Tested	Compliant	Borderline	Noncompliant
2012	129	91%	3%	6%
2013	244	87%	4%	9%
2014	282	76%	8%	16%
2015	264	80%	7%	14%

**Table 2**  
**ARRL Laboratory Testing of Handheld Transceivers by Manufacturer**

<b>2012</b>				
Manufacturer	Units Tested	Compliant	Borderline	Noncompliant
Yaesu	54	100%	0%	0%
Wouxun	16	100%	0%	0%
Kenwood	15	100%	0%	0%
Icom	14	100%	0%	0%
Baofeng	13	31%	15%	54%
TYT	6	50%	17%	33%
Other	11			

<b>2013</b>				
Manufacturer	Units Tested	Compliant	Borderline	Noncompliant
Yaesu	67	99%	0%	1%
Icom	47	100%	0%	0%
Baofeng	41	49%	15%	36%
Kenwood	40	100%	0%	0%
Wouxun	26	77%	4%	19%
Motorola	6	100%	0%	0%
RadioShack	5	100%	0%	0%
Other	12			

<b>2014</b>				
Manufacturer	Units Tested	Compliant	Borderline	Noncompliant
Yaesu	90	100%	0%	0%
Baofeng	67	10%	33%	57%
Kenwood	47	98%	0%	2%
Icom	37	100%	0%	0%
Wouxun	15	67%	0%	33%
RadioShack	6	100%	0%	0%
Motorola	5	100%	0%	0%
Connect Systems	5	100%	0%	0%
Other	10			

<b>2015</b>				
Manufacturer	Units Tested	Compliant	Borderline	Noncompliant
Yaesu	69	100%	0%	0%
Baofeng	65	25%	21%	54%
Icom	53	100%	0%	0%
Kenwood	27	100%	0%	0%
Wouxun	22	86%	0%	14%
Connect Systems	8	100%	0%	0%
Other	20			

Specific makes and models in which the majority of the units tested were noncompliant:  
*Baofeng*, UV5R, UV5R+, UV5RA, UV5RE, UV5RT, UVB5, UV82X, UV-B6, BF-F8HP, GT3; F-11, E-5 MKII, UV-3R (older units, pre 2013)  
*Wouxun*, KG-UV3D (2 m / 220 MHz), KGUV3D (2 m / 220 MHz)  
*TYT*, TH-UV3R (2 m / 220 MHz), TH-UVF9 (2 m / 220 MHz)  
 Handhelds of "Other" Manufacturers numbered less than 5 units of each model and therefore, a reasonable sample of each model was not available.

One reason for carrying out this testing was to help Amateur Radio operators understand the spectral output of their handheld radios. Many radios produce very clean transmitted signals, while some produce strong harmonic content or other spurious emissions, which may or may not comply with the FCC requirements.

Our convention tests measured the levels of spurious emissions using a test fixture consisting of a Bird Model 43 RF Power Meter, a Bird Model 8322 30 dB power attenuator, a Hewlett-Packard HP-355C 0 to 12 dB step attenuator, and a Rigol DSA-815TG spectrum analyzer. All test equipment was calibrated by Essco Calibration Laboratory of Chelmsford, Massachusetts prior to each convention.

The test procedure was fairly simple. First, the power output of the handheld under test was measured using the Bird Model 43 meter. For a given power output, the minimum level of the required harmonic suppression, in dB, was known. For example, the minimum required suppression level for a 5 W transceiver is 53 dB;  $\geq 53$  dB is compliant; 50 to 53 dB is considered borderline; 50 to 0 dB is noncompliant.

Next, with the radio push-to-talk (PTT) button pressed and held, the Rigol DSA-815TG spectrum analyzer was used to perform a sweep from 0 to 1000 MHz. After about 10 seconds, a completed spectral plot appeared on the spectrum analyzer screen, showing the transmitted fundamental signal, plus any harmonics and spurs. Viewing the completed sweep, the test engineer noted the difference, in dB, between the level of the fundamental and the level of each harmonic and any other spurious emission. The spurious emission with the least difference from the fundamental, in dB, was the level of suppression.

Spurious emission suppression levels were documented in our test notes. Noncompliant handheld spectral plots were printed directly from the Rigol spectrum analyzer for later analysis. The brand name and model number were hand-written on the printed spectral plots. Each owner of a tested handheld was given a paper copy of the test results, if he or she wanted it.

There are three basic categories of test results; compliant, borderline, and noncompliant.

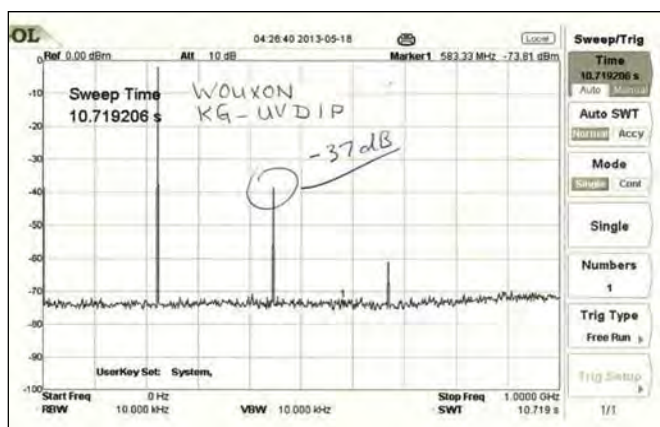




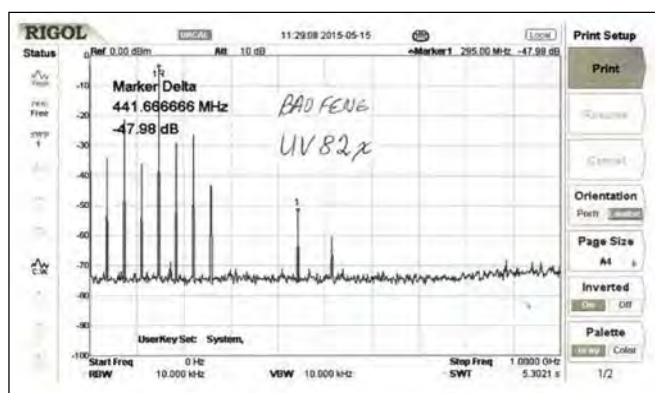
**Figure 3** — Here is the spectral output for another Baofeng UV5R, which is borderline compliant with the FCC spectral requirements. Note that there are several signals that are approximately 50 dB below the strength of the fundamental output.



**Figure 4** — This Baofeng UV82X does not comply with the FCC spectral requirements of Part 97.307e. The second harmonic of the fundamental signal is only 15.8 dB below the strength of the desired output signal.



**Figure 5** — This Wouxun KG-UVDP1P does not comply with the requirements of FCC Part 97.303e, with a second harmonic signal that is only down 37 dB.



**Figure 6** — This Baofeng UV82X does not comply with the FCC requirements. Notice that there are three strong signals at frequencies less than the fundamental and three more signals higher in frequency than the fundamental, all of which are less than 40 dB below the strength of the fundamental. All of these signals are strong enough to cause interference to communications on other radio services.

Compliant transceivers had spurious emission suppression that exceeded FCC requirements. Figure 1 shows one of the compliant spectral plots. Figure 2 shows a Baofeng UV5R transceiver that was operating on the 70 centimeter band. While many of these radios were not compliant on the 2 meter band, they show good engineering practice on the 70 centimeter band. Here you can see some noticeable second and third harmonic radiation. Please note that FCC Rule 97.307(e) does not apply to radios operating above 225 MHz.

Borderline transceivers had spurious suppression that was 3 dB less than or equal to FCC requirements. Figure 3 is an example of a borderline handheld radio. There are three spurious signals that are only a little more

than 50 dB below the strength of the fundamental signal. The borderline category was necessary to accommodate measurement tolerances and uncertainty.

Noncompliant transceivers had spurious emission suppression that was more than 3 dB less than FCC requirements. Figure 4 is the spectral plot of a radio that had a second harmonic signal that was only 15.8 dB below the strength of the fundamental! Figure 5 is the plot for a radio that has a second harmonic signal that is only down 37 dB.

Figure 6 shows the plot of another noncompliant radio. In this case you can see that there are multiple spurious signals that are less than 50 dB below the fundamental, including one that is less than 20 dB down. As

you can see, this radio is transmitting many fairly strong spurious signals, starting much lower in frequency than the fundamental signal.

A word of caution to those who wish to modify their handheld so it can operate on additional amateur bands (or other frequencies). One gentleman who had his handheld transceiver tested was pleased as punch to tell the ARRL Laboratory booth that he had successfully modified his 2 meter / 70 centimeter handheld radio so it could also transmit on the 1¼ meter amateur band. When measured with a spectrum analyzer, the second harmonic was 14 dB *greater* than the intended fundamental! — 73, Bob Allison, WB1GCM, ARRL Senior Test Engineer; ballison@arrl.org

## Kids are Not the Future of Ham Radio

By Bob Witte, KONR

You've heard it a million times: our kids are the future. That statement gets applied to almost everything, including amateur radio. How can you argue with an obvious fact like that?

But I am starting to think it is incorrect .

We've had really good success on creating new hams of all ages in our Technician License Class (at the Tri-Lakes Monument Radio Association). We've been doing this for a while now and I think I am seeing a pattern emerge. We've been able to attract middle schoolers to the class and help them get their ham radio license. I've talked to many of them on the air. They've helped out with public service events. They seem to have fun playing with radios.

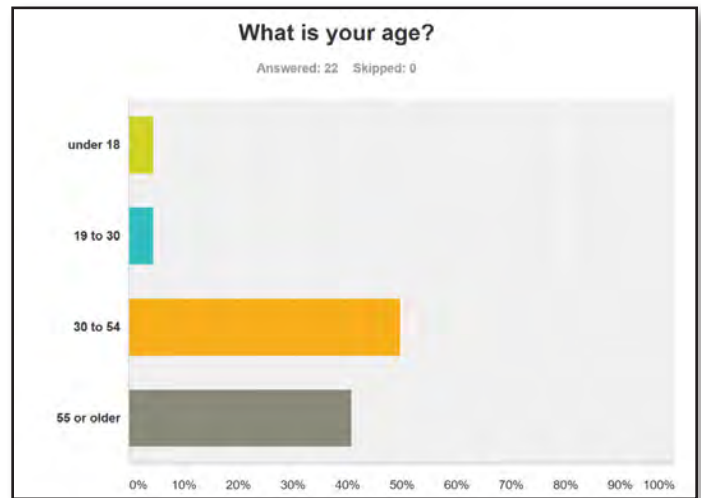
Then this thing called high school happens. The high school phase in the US is filled with tons of stuff to do: studying, homework, AP classes, science competitions, sports, dating, movies, driving and after school jobs. Way too much stuff. Ham radio starts to take a backseat to these normal high school activities. Then we don't see the kids at the radio club meetings or chatting on the local repeater because they are busy doing other things. Have we lost them forever? Not sure.

High school is often followed by college which has its own set of challenges: a totally new environment, away from home, a new set of people, new studies, etc. There might be a ham radio club on campus but maybe not. If a kid is not off to college they are (hopefully) out doing something to establish themselves in this world. Eventually they emerge on the other side, get a job, get themselves established, sometimes with a spouse and maybe a kid or two. By this time they are 25 to 30 years old, depending on the individual.

I recently posted about the demographics of our students in the Tech License Class (<http://www.konr.com/wordpress/2015/10/where-are-the-new-technicians-coming-from/>). The chart below shows the age distribution of our students from our most recent class. Hmm, clearly most of our students are 30 or older. (Sorry, we have not collected age data with finer resolution.) This particular class is light on the under 18 crowd...sometimes we have a clump of kids in the mix.

For whatever reason, it seems that most people find themselves in a situation as an adult that causes them to say "I want to get my ham radio license." When asked

why they want to get their ham license, the top response is always emergency/disaster communications, followed



by backcountry communications, pursuing electronics as a hobby and learning about radio communications. I suspect that starting to be established in a community and having some disposable income also play a role.

My hypothesis is that the most effective way of growing a vibrant ham radio community is to target adults ages 25 to 40.

This age range is more equipped and ready to be ham radio operators and are still young enough that they will be around for a while. Of course, we still want to work with all age groups, including kids and retirees. We've all seen very young hams get the bug for ham radio early and carry it throughout their life. And we also see plenty of older folks get interested in the hobby as they approach or enter retirement. We don't want to miss out on either of those groups.

So that's my read on the situation. I've got some data to support my theory but I can't really prove it. What do you think? What are you seeing in your ham radio community? ⚡

Bob Witte, KONR, blogs about amateur radio at [KoNR.Com](http://www.konr.com). You can find this post at <http://www.konr.com/wordpress/2015/11/kids-not-the-future/>. You can e-mail him at [bob@konr.com](mailto:bob@konr.com). He is also on Twitter: @KONR.

## What Would Wayne (Green) do?

By Dan Romanchik, KB6NU

Wayne Green was a crackpot...but he was a great one. For those of you who aren't as old as I am, Wayne Green, W2NSD, was not only the publisher of 73 Magazine, but also the founder of Byte and other PC magazines in the early days of personal computing. In 73, he would write these long, rambling editorials. Often, he would take the ARRL to task, criticizing what he thought to be some lunk-headed policy or another.

Just as often, he'd be encouraging hams to take up some new technology. He was, for example, one of the guys driving hams to set up repeater systems.

He would often exhort hams to get started in their own technology-related business. I remember one column where he urged hams to get involved in the home-security business. And, of course, when personal computers became popular, he wrote that hams should think about getting into that business. His reasoning was that our knowledge of electronics would stand us in good stead in those businesses.

Today, I think that he would be telling us to get more involved in with technologies like the Internet of Things, WiFi, or whatever other wireless technology is coming down the pike. "Wireless" is the key word here. These networking technologies are based on good, old radio, and who better to push these technologies forward than guys like us who understand radio.

This point was brought home to me last week as I was interviewing an executive of a wireless company for an article that I'm writing. He said to me that many of the

companies he works with are taking a software-centric view to their wireless products. They simply use the reference designs provided by the wireless chip makers and expect those designs to work flawlessly in their products.

While they often do, he gave me an example where simply using the reference design was a colossal failure. In one case, he said, the company mounted the board inside a metal enclosure. Since the antenna was part of the printed-circuit board, the enclosure acted like a shield, and of course, the device had little or no range.

He went on to say that he thought that there was a real shortage of experienced RF guys in the wireless industry. Does that sound like an opportunity to you? It does to me. So, I'm going to make like Wayne Green here and exhort all you guys to get out there and take advantage of it.

This is not only a business opportunity, but a way for amateur radio operators to fulfill a couple of the "purposes" of amateur radio, as set forth in Part 97.1 of the amateur radio regulations. Part 97.1(b) says that one of the purposes of the Amateur Radio Service is "*Continuation and extension of the amateur's proven ability to contribute to the advancement of the radio art.*" According to Part 97.1(d), another purpose of the Amateur Radio Service is "*Expansion of the existing reservoir within the amateur radio service of trained operators, technicians, and electronics experts.*"

Let's do it! ✈

## Field Day

Thanks to Mark Wallace, KJ6NMJ, here is the list of all the items that insure Field Day is successful. If you can help with one or more of these, contact this year's Chairman, Derrick Dudley, K7SVN.

1. Contact the port to initiate the permit request. I highly recommend calling first as the site mentions alternatives not available last year. Ask for permit department and let them know your intention is to duplicate last year's event as we have for many years past. Let them direct as you can get ahead of yourself online. <https://www.portofsandiego.org/recreation/apply-for-a-park-permit.html>
2. Recruit: Operators, helpers, publicity (see no. 6 )

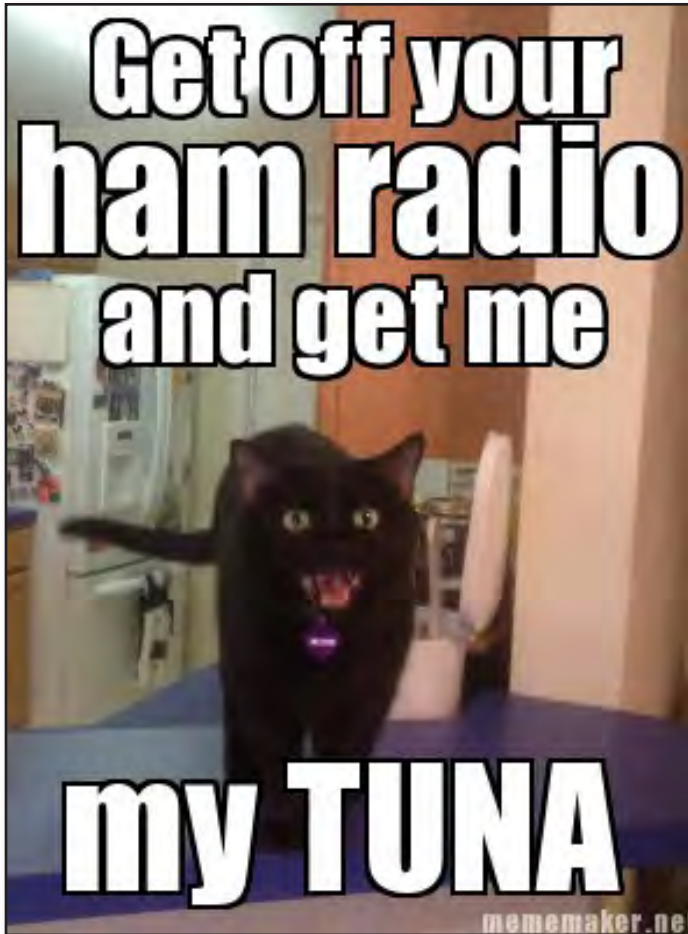
3. Friday evening antenna party: Highly encourage membership to setup and come down to help.
4. Logging contacts - This needs to be discussed
  - App Service Laptop
  - Laptop/PC
  - Network - Software testing
  - Mesh - Club has 4 donated Nodes
  - Network shake out.
  - If you do not use a sure data collection scheme you will have to create a paper record for submission. Think that through
  - Power for these devices.
5. Contact file for Submission



6. Earning additional points as described in the Field Day document published on line. I will provide a break down of these if needed..
7. Diagram site lot use.
8. Food consideration

9. Info booth
10. GOTA or not to GOTA
11. License Testing, VE's... Solicit for Chairs/Canopies.
12. Submit clubs event documents to ARRL by date.  
Done online earns extra points. ⚡

## QRM



Editor: This is my cat...

