Sidebands

The Newsletter of the EAST GREENBUSH AMATEUR RADIO ASSOCIATION

W2EGB

March 2016

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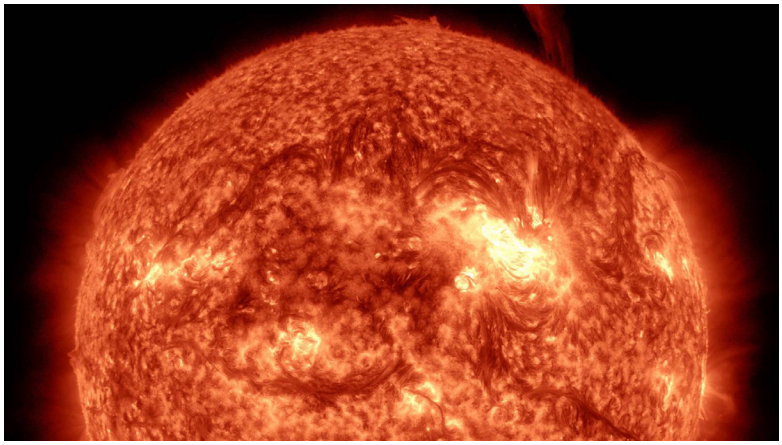
Here Comes the Sun

And the Effects it has on Shortwave Radio Transmission & Reception



Solar activity can aid or hamper HF propagation beyond line-of-sight range. Many sources -- including the ARRL and NOAA -- can help us keep up with solar conditions and predict their effects on long-distance communications. But just exactly how does the Sun affect our ability to transmit and receive?

Interactions between the Sun and our Earth are incredibly complex. Even scientists who have studied the subject for years do not completely understand everything that happens on the Sun. But we do know that the Sun emits electromagnetic radiation of all kinds, ranging in frequency from below HF all the way to the X-ray region. Much of the energy is emitted as heat. Some solar radiation ends up here on Earth, providing the energy needed to sustain all activity here - including HF radio propagation.

Although our Sun is not a particularly large or spectacular star, it still radiates an almost unimaginable amount of energy into space. The total power radiated by the Sun is estimated at $4x10^{23}$ kW-that is, the number four followed by 23 zeroes. At its surface, the Sun creates about 60 megawatts per square meter. Now that is some transmitter!

The Sun also is constantly ejecting material from its surface in all directions into space. This makes up the so-called solar wind. Under relatively quiet solar conditions the solar wind blows around 200 miles per second -- 675,000 miles per hour --taking away about two million tons of solar material each second from the Sun. Don't worry: the Sun is not going to shrivel up anytime soon. It's big enough that it will take many billions of years before that happens.

A 675,000-mph wind sounds like a pretty stiff breeze, doesn't it? Lucky for us, the density of the material in the solar wind is very tiny by the time it has been spread out into interplanetary space. However, even such a low density of solar particles can have immense effects here on Earth.

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In This Issue

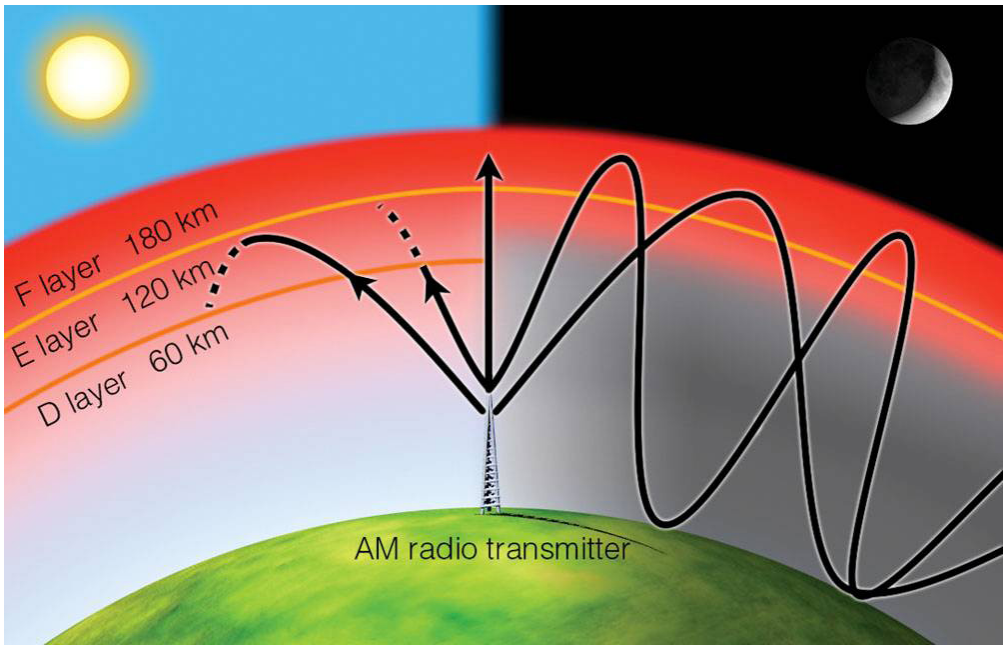
Reminder! EGARA Monthly Meeting
March 9th at 7 pm
Program Topic: Fusion Repeater Systems

Radio Propagation 101

When you pick up a hand held transceiver and communicate on VHF or UHF across town or through a repeater you are generally transmitting line-of-sight. Not so however with HF transmission. When you are using 160m to 10m the signal reaches the earth's ionosphere and bounces back to be received at a greater distance than line-of-sight.

The Ionosphere

The ionosphere is a layer in the Earth's atmosphere that lies in a range of 80 to 300 miles above the Earth's surface that reflects radio waves. As the sun shines on the ionosphere it changes composition and height which affects its propagation characteristics.



In general signals below 30 MHz bounce off this layer and return to Earth while signals above 30 MHz go through the layer into outer space. So watch what you say on 2 meters, someone on Alpha Centauri might be listening.

Signals below 30 MHz can also travel by ground wave and be received a short distance from the transmitter.

Daily Patterns

Radio signals that are bounced or refracted off the ionosphere are also affected by the time of day and season of the year. During the 24 hours cycle the ionosphere changes in height above the Earth and bounces some signals while absorbing others. During the day the higher frequencies (above 10Mhz) tend to propagate while lower frequencies are absorbed. At night the reverse happens. There are many exceptions to this but it is a good general guideline.

Seasonal Patterns

Seasons also affect propagation. Summertime in the northern hemisphere means that higher frequencies have better propagation while in the winter the lower frequencies improve. An interesting time of the year for propagation is when the seasons change from fall to winter and from winter to spring. This is often when the best DX can be found. Because the seasonal change is occurring in both hemispheres -- but in the opposite direction -- DX from North American to Australia or southern Africa can be at its best.

The Sunspot Cycle

Another phenomenon that affects radio propagation is the 11 year sunspot cycle. A peak occurred during the year 2014. A sunspot low occurs at the midpoint of this cycle. When the sunspots are at their maximum propagation is at its best. At this time the higher shortwave frequencies exhibit the best propagation extending to 6 meters which becomes quite popular during this time of the cycle. 10 meters can easily work stations worldwide with low power (even qrp) and a modest antenna.

Here Comes the Sun

(continued from page 1)

For years scientists have used different filters on their optical telescopes to observe various aspects of solar activity. Starting in the 1930s, observations began at radio frequencies and now we have satellites that specialize in watching what happens at the Sun and in space. Caution! Never look directly at the sun without special eye protection!

One of the best known gauges of overall solar activity is the number of sunspots seen on the Sun's surface. Sunspots are relatively cool areas that appear as dark spots. Surprisingly, sunspots are not really dark, but appear so only because the surrounding surface is even hotter and brighter. A large sunspot can be up to 80,000 miles in diameter.

Systematic study of solar activity began around 1750. Long-term sunspot activity varies in cycles. On average, the number of sunspots reaches a maximum every 11 years, but the period has varied from 7 to 17 years. The first cycle to be completely and scientifically observed began in 1755 and it's known as Cycle 1. We are now on the backside of Cycle 24. Solar activity also follows a 27-day cycle, which is the sun's rotational period.

Sunspot activity changes continuously. A sunspot can vary in size and appearance, or even vanish, within a single day. Large areas of sunspot activity usually last through several rotations of the Sun, some as long as two years. To offset the confusing effects of short-term changes, we average (or smooth) solar data. HF propagation predictions commonly use Smoothed Sunspot Numbers (SSN), which are monthly sunspot counts averaged over a 12-month period.

Solar-flux readings are another measure of solar activity. The average intensity of solar emissions also varies slowly over the 11-year solar cycle. A solar flux reading is a measure of power received, per unit area, per unit frequency. The Dominion Radio Astrophysical Observatory in Penticton, British Columbia, measures 2800-MHz (10.7-cm) solar-flux data daily at local noon. Solar flux correlates well with the intensity of ionizing UV and X-ray radiation. Smoothed Sunspot Numbers range from 0 to over 200 and solar-flux numbers range from 60 to 300.

QRPers should check the higher bands for openings for several hours following a solar flare event. A flare may enhance E/F layer ionization, possibly temporarily raising the Maximum Usable Frequency.

All of this is really interesting stuff, but you're probably wondering how the Smoothed Sunspot Number can be used to tell whether 10 meters will be open today for DX?

Long-time users have found that the upper HF bands are reliably open for propagation only when the average number of sunspots is above certain minimum levels. For example, from mid-1988 to mid-1992 during Cycle 22, the SSN stayed higher than 100. The 10-meter band was open then almost all day, every day, to some part of the world.

But when few, if any, sunspots show up, the 10-meter band is rarely open. Even 15 meters, normally a workhorse DX band when solar activity is high, is closed most of the time during this low point in the solar cycle. Sunspots are associated with increased solar ultraviolet (UV) radiation. UV acting on the ionosphere is what makes radio propagation exciting on the upper HF bands. Luckily, since we are still enjoying the effects of sunspot cycle number 24, it's expected to keep the 10 meter band open until at least 2017 or 2018. But you're probably wondering how?

As we've discussed, the sun's activity pulsates every 11 years or so. And, as we've learned, this activity is characterized by "spots" appearing on the outer limits of the sun's atmosphere. These spots are actually huge nuclear explosions sending shock waves of radiation in the solar system. During cycle 24, the sun produced an increasing number of nuclear explosions until about the middle of 2014. The sun's activity has now passed its peak and is slowly subsiding. Even so, there is still enough activity to produce fair to good propagation conditions now and then.

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The Sun's Effects on Shortwave Radio Transmission & Reception

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But sometimes when sunspot numbers have been really high conditions have still been less than optimum. It's important to keep something in perspective -- the Sun is a very large, very hot, thermonuclear ball of flaming gases. The Sun and its effects on earthly propagation can be described in "statistical" terms as the 11-year solar cycle does. However, you may experience vastly different conditions on any particular day compared to what a long-term, 11-year average would suggest.

Have you ever gazed into a blazing campfire and been surprised when a flaming ember or a large spark was ejected in your direction? The Sun can also do unexpected and sometimes very dramatic things. Disturbances of propagation conditions here on Earth are caused by disturbed conditions on the Sun.

There are three general types of major disturbances on the Sun that can affect radio propagation, and almost invariably they do so in a negative manner. You may hear people complaining about Solar Flares, Coronal Holes or Sudden Disappearing Filaments, especially when propagation conditions are "rotten." Just like the weather, there's not a lot we can do about solar disturbances, except perhaps to know they're coming and then to endure the effects. Each disturbance causes both electromagnetic radiation and ejection of material from the Sun.

Solar Flares

Solar flares are cataclysmic eruptions that suddenly release huge amounts of energy, including sustained, high-energy bursts of radiation ranging from Very Low Frequencies to X-rays, as well as vast amounts of solar material. Most solar flares occur around the peak of the 11-year solar cycle. The first earthly indication of a huge flare is often a visible brightness near a sunspot group, along with increases in UV and X-ray radiation and VHF radio noise. If the geometry between the Sun and Earth is right, intense X-ray radiation takes eight minutes to travel the 93 million miles to Earth at the speed of light.

The sudden increase in X-ray energy from a large flare can immediately increase RF absorption in the Earth's lowest ionospheric layers, sometimes causing a phenomenon known as a ***Sudden Ionospheric Disturbance*** (SID). An SID affects all HF communication on the sunlit side of the Earth and signals in the 2 to 30-MHz range may disappear entirely. Even background noise may cease in extreme cases. When you experience a big SID, your first inclination may be to look outside to see if your antenna fell down! SIDs may last up to an hour before ionospheric conditions temporarily return to normal.

Typically, several hours after a flare erupts at the Sun, particles begin to arrive at the Earth in the form of a plasma, a highly ionized gas made up of electrons, protons and neutral particles, traveling at speeds up to 300 miles per second. This may interact violently with the Earth's magnetic field. Really high-energy protons may even disable satellites orbiting high above the atmosphere.

Another possible effect of a high-energy particle bombardment during a flare may be high absorption of HF signals propagating through the polar regions. This is called a ***Polar Cap Absorption*** (PCA) event and it may last for several days.

Coronal Hole

A second major solar disturbance is a so-called "coronal hole" in the Sun's outer layer (the corona). Temperatures in the corona can be more than four million °C over an active sunspot region but more typically are about two million °C. A coronal hole is an area of somewhat lower temperature. Solar-terrestrial scientists have a number of competing theories about how coronal holes are formed. Matter ejected through this "hole" becomes part of the solar wind and can affect the Earth's magnetic field, but only if the Sun-Earth geometry is right.

Statistically, coronal holes tend to occur most often during the declining phase of the 11-year solar cycle and they can last for a number of solar rotations. This means that a coronal hole can be a "recurring coronal hole," disrupting communications for several days about the same time each month, for as long as a year or even more.

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Sunspots! Can You Here Me Now?

Sudden Disappearing Filament

The ***Sudden Disappearing Filament*** (SDF) is the third major category of solar disturbance that can affect propagation. SDFs take their names from the manner in which they suddenly arch upward from the Sun's surface, spewing huge amounts of matter as plasma out into space in the solar wind. They tend to occur mostly during the rising phase of the 11-year solar cycle.

When the conditions are right, a flare, coronal hole or an SDF can launch a plasma cloud into the solar wind, resulting in an ***Ionospheric Storm*** here on Earth. Unlike a hurricane or a Nor'easter in New England, an ionospheric storm is not something we can see with our eyes or feel on our skins. We can't easily measure things occurring in the wispy ionosphere some 200 miles overhead. However, we can see the indirect effects of an ionospheric storm on magnetic instruments located on the Earth's surface, because disturbances in the ionosphere are intimately related to disturbances in the Earth's magnetic field.

During a geomagnetic storm ("geo" means Earth, in Greek), we may experience extraordinary radio noise and interference, especially at HF. You may hear solar radio emissions as increases of noise at VHF. A geomagnetic storm generally adds noise and weakens or disrupts ionospheric propagation for several days. Transpolar signals at 14 MHz or higher may be particularly weak, with a peculiar hollow sound or flutter-even more than that which is normal for transpolar signals.

So now that you hopefully have a better understanding about solar disturbances, you may want to know more about the A-Index and K-Index numbers that can be found on some amateur radio websites and broadcast by WWV.

Scientists measure geomagnetic activity with a device called a magnetometer. It detects minute changes in the Earth's magnetic field, and may be as simple as a magnetic compass rigged to record the appropriate movement. Since geomagnetic activity can vary with location, a world-wide network of magnetometers monitors it. Two scales, the A and K Indices, quantify geomagnetic variations

A Index

The A Index is a daily average of data from observatories around the world that reflects the state of the Earth's magnetic field for the preceding 24 hours. The index can be revealing because geomagnetic disturbances due to phenomena such as recurring coronal holes tend to recur at 27-day intervals as the Sun rotates.

K Index

The K Index broadcast by WWV reflects the instability of the geomagnetic field over the last three hours at Boulder, Colorado. Such frequent updates can indicate K Index trends. A decreasing K Index is good, especially for propagation paths at greater than 30° latitude. Some VHF operators like to see an increasing K Index, because aurora is possible at K Index values of 3 and greater. Such values also warn that conditions associated with degraded HF propagation were present in Boulder, Colorado (the K Index is a measurement made at Boulder and it may not correlate well to conditions in other areas). The A Index range is from 0 to 400, while the K Index ranges from 0 to 9. Lower indices indicate better HF propagation conditions.

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On the Beam
News & Notes

Fusion Repeaters Focus of Next EGARA Meeting

David Galletly, KM2O, will join us at our March 9th meeting to explain Yaesu System Fusion repeaters, which feature one radio for analog as well as digital communications. This exciting technology allows you to key up a repeater with your FM rig or a digital rig and it will automatically figure out what input it is receiving.

System Fusion

Several area repeaters either have or are in process of installing Yaesu System Fusion repeaters.

System Fusion provides a pathway to amateur digital radio that does not make present VHF/UHF equipment obsolete while opening doors to new ways of operating.

Dave will present a video and discussion of this system. Dave has been licensed since 1998 and serves as Section Emergency Coordinator for the Eastern New York section of the ARRL. He is also a Field Instructor and Field Examiner for emergency communications as well as a VE.

Pizza and soft drinks and coffee will be provided. The meeting begins at 7 pm.

Hams
Do It
With
Frequency!

Hamfest Season Begins!

It's that time of year again! EGARA will hold its Annual Hamfest May 14th at the East Greenbush Firehouse. It will run from 8 am to 1 pm. Admission is $6.00. More information can be found on the EGARA website at: **http://www.w2egb.org**

In addition, the Orange County Amateur Radio Club Annual Hamfest has been set for May 24th from 8 am to 1 pm at the Walkill Community Center on Wes Warren Road in Middletown, NY. Information is available on the club's web site at: **www.OCARC-NY.org.** The entry fee is $8.00. FCC exams will also be given.

If you've been yearning for learning Morse Code, EGARA will begin holding code classes following its monthly membership meetings. The first code class will be held after the March 9th meeting. If you'd like to participate, please RSVP Tom Scorsone at:
kc2fcp@nycap.rr.com

You, the Sun & Making Contact

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So now that you have some idea what the numbers mean, where do you get them? Fortunately, there are several sources.

National Institute of Standards and Technology (NIST) stations WWV and WWVH broadcast propagation information on 2.5, 5, 10, 15 and 20 MHz (WWV only) at 18 and 45 minutes past each hour, respectively.

Space Weather Prediction Center - National Oceanic and Atmospheric Administration
Website: ***http://www.swpc.noaa.gov/products/station-k-and-indices***

ARRL
W1AW broadcasts a weekly propagation forecast as part of the normal, daily bulletins. The W1AW schedule appears monthly in QST.

Quick Guide to Reading Propagation Numbers

The A index [LOW is GOOD]

- 1 to 6 is BEST
- 7 to 9 is OK
- 11 or more is BAD

Represents the overall geomagnetic condition of the ionosphere ("Ap" if averaged from the Kp-Index) (an average of the eight 3-hour K-Indices) ('A' referring to amplitude) over a given 24 hour period, ranging (linearly) typically from 1-100 but theoretically up to 400. A lower A-Index generally suggests better propagation on the 10, 12, 15, 17, & 20 Meter Bands; a low & steady Ap-Index generally suggest good propagation on the 30, 40, 60, 80, & 160 Meter Bands.

Solar FIux Index - SFI [HIGH is GOOD]

- 70 NOT GOOD
- 80 GOOD
- 90 BETTER
- 100+ BEST

The measure of total radio emissions from the sun at 10.7cm (2800 MHz), on a scale of 60 (no sunspots) to 300, generally corresponding to the sunspot level, but being too low in energy to cause ionization, not related to the ionization level of the Ionosphere. Higher Solar Flux generally suggests better propagation on the 10, 12, 15, 17, & 20 Meter Bands; Solar Flux rarely affects the 30, 40, 60, 80, & 160 Meter Bands.

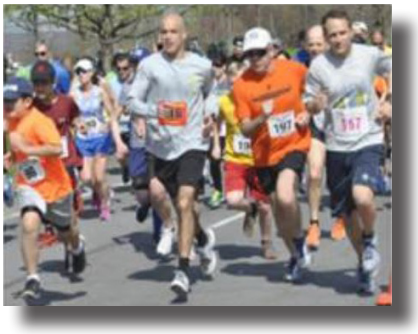
K index [LOW is GOOD]

- 0 or 1 is BEST
- 2 is OK
- 3 or more is BAD
- 5 is VERY VERY BAD

The overall geomagnetic condition of the ionosphere ("Kp" if averaged over the planet) over the past 3 hours, measured by 13 magnetometers between 46 & 63 degrees of latitude, and ranging quasi-logarithmically from 0-9. Designed to detect solar particle radiation by its magnetic effect. A higher K-index generally means worse HF conditions. A lower K-Index generally suggests better propagation on the 10, 12, 15, 17, & 20 Meter Bands; a low & steady Kp-Index generally suggest good propagation on the 30, 40, 60, 80, & 160 Meter Bands.

EGARA to Provide Communications Support for Community Events

Again this year, several upcoming community events will receive communications support from EGARA.



On May 1st, club members will assist at the ***Literacy 5K Walk/ Run*** which will be held at the RPI Technology Park in East Greenbush. Money raised by the run helps support free literacy programs for adults. The Walk/ Run runs from 8 am to noon and EGARA will help event organizers keep in touch as they coordinate the various events of the day.

On Sunday, June 12th, ***The Run for Help*** in memory of Liza Ellen Warner and Nikki L. Hart will be held at the Goff Middle School in East Greenbush.

This 5K run/walk event brings awareness to the serious issue of domestic violence and raises funds for The Nikki Hart Children's Memorial Fund and Unity House Domestic Violence Services Program.

EGARA members who would like to assist with communications for these events may call Tom Scorsone, KC2FCP, at (518) 272-1494.

ARRL CEO Retires

ARRL Chief Operating Officer Harold Kramer, WJ1B, wrapped up 11 years at ARRL headquarters in late February. His last official day on the job was March 1st.

At a retirement party, staff members presented Kramer with an antique clock from a Waterbury, Connecticut, clock maker -- a particularly fitting gift, as he was born in Waterbury.

"I was glad to have him as a colleague and a friend," said ARRL CEO David Sumner, K1ZZ -- who will depart ARRL headquarters himself on April 18, after more than 40 years with the organization. Sumner cited several of Kramer's contributions during his tenure. These included arranging for some ARRL publications to be issued digitally, recruiting new authors, and his participation in the development of the League's new strategic plan.

Kramer said he is proud of what he and the ARRL Headquarters staff accomplished together during his tenure, including the response to Hurricane Katrina. He also cited the upgraded ARRL website and the League's enhanced presence in digital publishing -- including a digital edition of QST.

List of US House Amateur Radio Parity Act Cosponsors Continues to Grow

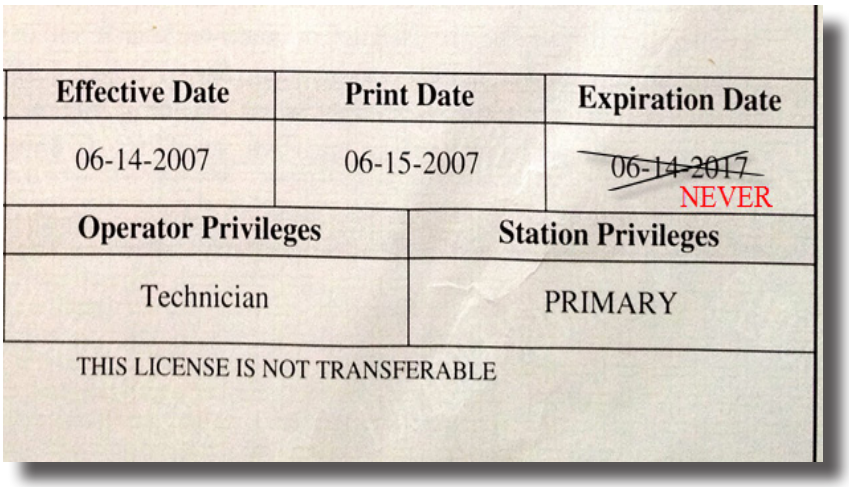
Three more members of the US House of Representatives have stepped forward to cosponsor The Amateur Radio Parity Act, H.R. 1301. That brings the total to 123. The latest to sign on are Reps Evan Jenkins (R-WV), Stephen Knight (R-CA), and Charles Boustany Jr (R-LA).

In a voice vote last month, the US House Subcommittee on Communications and Technology, chaired by Rep Greg Walden, W7EQI, sent H.R. 1301 to the full House Energy and Commerce Committee with a favorable report for further consideration. More information on The Amateur Radio Parity Act is available on the ARRL website at this link:

http://www.arrl.org/amateur-radio-parity-act

FCC Considering Lifetime Ham Radio Licenses

The FCC is seeking comments on a Petition for Rule Making (RM 11760) that asks the FCC to grant lifetime Amateur Radio licenses. Amateurs are being urged to contact the FCC to support the proposal and can read about it on the Commission's website at: ***http://apps.fcc.gov/ecfs/document/view?id=60001333714.***



Effective Date	Print Date	Expiration Date
06-14-2007	06-15-2007	~~06-14-2017~~ NEVER
Operator Privileges	**Station Privileges**	
Technician	PRIMARY	
THIS LICENSE IS NOT TRANSFERABLE		

Mark F. Krotz, N7MK, of Mesa, Arizona, filed his request with the FCC last November. He wants the FCC to revise §97.25 of its rules to indicate that Amateur Radio licenses are granted for the holder's lifetime, instead of for the current 10 year term.

In his request, Krotz noted that the General Radiotelephone Operator License (GROL) already is issued on a lifetime basis, and he maintained that not having to renew licenses would lighten the FCC's workload.

"It would be mutually beneficial for the FCC and Amateur Radio operators to update Part 97 to grant operator licenses for lifetime, Krotz said in his filing. "The FCC would benefit by reducing administrative costs."

In 2014 the FCC granted lifetime credit for examination elements 3 and 4, but applicants seeking relicensing under that provision still must pass examination element 2.

Individuals may submit comments via the FCC's Electronic Comment Filing System (ECFS) at:

http://apps.fcc.gov/ecfs/proceeding/view?name=RM-11760

Still Need to Send In Your Annual EGARA Dues?

Print and clip the handy form below and send your 2016 membership dues to:
Steve VanSickle, EGARA Treasurer - 3010 Tibbits Avenue - Troy, NY 12180-7019 --
Please make checks payable to *EGARA. Thanks for your support!*

2016 EGARA Membership
(please print clearly)

Name:_____ **Call Sign:**_____
Address:_____ **Zip Code:**_____
City:_____ **State:**_____
Phone:_____ **Email:**_____
Membership type: Individual ($15) _____ Family($25) _____ Amount Enclosed:_____
Membership Renewal _____ New Membership_____

CALENDAR

March 9, 2016 - EGARA Monthly Meeting @ 7:00 pm

May 1, 2016 - Literacy 5K Wal/Run @ 8 am - RPI Tech Park, East Greenbush - Communicatiions support

May 14, 2016 @ 8 am to 1 pm- 13th Annual Hamfest, East Greenbush Fire House, 68 Phillips Road.

May 24, 2016 - Run for Help, Goff Middle School, East Greenbush - Communications support

May 24, 2016 - Orange County Amateur Radio Club Annual Hamfest. Walkill Community Center on Wes Warren Road in Middletown, NY.

June 25-26, 2016 - 2016 Field Day - East Greenbush Masonic Temple.

Ham It Up

For Sale

DStar Gear for Sale - 1st system includes: ***ICOM 5100 - Bluetooth card - Bracket MBA2 - DVAP 2 Meter - RT prog sft.*** 2nd system includes: ***ICOM 51 Plus HT - BP271 battery - BC202 02 drop in chg - HM 75LS spk mic - Data cbl 2350LU - RT prog sft.***

Originally paid $1,030 for 1st system and $730 for 2nd. Both available for $1,300! Or make a reasonable offer. Will also sell systems separately. Contact: Stan, WA2UET at **WA2UET@taconic.net** for info any of gear listed above. Includes manuals and software.

♦♦♦♦♦♦♦♦♦

Wanted to Buy

Any old broadcast radios for possible restoration, any brand, style, preferably tubes models. Contact: Steve WB2HPR **326-0902**.

Looking for a 6 meter radio for around $60.
Please contact Peter by email at: **KD2JKV@arrl.net**

♦♦♦♦♦♦♦♦♦

Looking to Buy, Sell or Swap?
Send your info W2RBJ@outlook.com

The East Greenbush Amateur Radio Association

Organized in 1998, by Bert Bruins, N2FPJ, SK and Chris Linck, N2NEH, the East Greenbush Amateur Radio Association, an ARRL affiliate, is committed to providing emergency services, educational programs, and operating resources to the amateur radio operators and residents of the Capital Region of New York State. The club station is W2EGB. The club also has several VHF and UHF repeaters open to club members or the public.