Ottawa Amateur Radio Club

Groundwave

P.O. Box 8873, Ottawa, Ontario, Canada, K1G 3J2

May 2019

The next regular club meeting is at 7:30pm May 8, 2019, 2nd Floor of City Hall, Elgin St, Ottawa. There will be an informal Birds of a Feather Session (BOFS) for DMR over coffee following homebrew presentations. Bring your DMR radios, DMR related questions or both. We will continue this and other BOFS in subsequent meetings if interest warrants.

See you at the meeting.

Ian Jeffrey, VE3IGJ
Editor

Check out our Web Page: ***www.oarc.net***

Next Meeting 7:30 pm, Wednesday, May 8th in the Colonel By Room at Ottawa City Hall

In This Issue....

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May 2019

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Articles may be submitted for use in this publication provided that they portray events or activities that promote Amateur Radio. Letters and comments are also welcome. Submissions may be made by mail addressed to the Editor care of the OARC, or by e-mail to "ve3igj@rac.ca". Deadline for submissions occurs three days after the regular monthly meeting of the OARC.

Please support your local radio organisations. They support you!

Club Information

The Ottawa Amateur Radio Club Inc. is an association of Radio Amateurs devoted to the promotion of interest in Amateur Radio communications in the National Capital Area and to the advancement and achievement of club members.

Regular Meetings of the OARC Inc. are held on the second Wednesday of each month (except July and August) in the Colonel By Room which is on the second floor of Ottawa City Hall, formerly Regional Municipality of Ottawa Carleton Headquarters, on Lisgar Street. Meetings commence at approximately 19:30 local. Further details about each meeting are noted elsewhere in this publication.

Executive Meetings of the OARC Inc. are normally held on the first Wednesday of each month at 19:30 local. Contact the President to confirm the date, time and place of the next meeting.

The CAPITAL CITY FM Net meets every Monday (except some holidays) at 20:00 local on the club repeater VE2CRA (146.940-, 100 Hz) to pass traffic and to make announcements of interest to amateurs in the National Capital Region.

The Rubber Boot Net runs week days at 07:30 local on VE3MPC (147.150+, 100 Hz CTCSS tone) hosted by Mike, VA3TJP. The Rubber Boot net has been running since the early 1980's and is popular for the early risers and the go to work crowd.

The POT-HOLE Net is a SSB/HF net sponsored by the Ottawa Valley Mobile Radio Club and is conducted every Sunday at 10:00 hours on 3.760 MHz**.** All amateurs are welcome to check in.

The POT-LID CW Net is an informal slow-speed **CW** net that meets every Sunday, except during July and August, at 11:00 hours on 3.620 MHz, to promote interest in CW and CW procedures.

The QCWA CHAPTER 70 Net meets every Monday evening at 19:30 local on repeater VE3MPC 147.150+, 100 Hz) You do not have to be a QCWA member to participate.

The Ottawa Valley VHF/UHF SSB Net is sponsored by the West Carleton ARC. Look for it every Tuesday night (except the first Tuesday of the month) around 21:00 local on 144.250, (roll calls after net on 50.150, 432.150, 222.150, and 1296.100.) Horizontal polarization is preferred.

The Phoenix Net meets Tuesday evenings at 20:00 local on VE3MPC (147.150+, 100 Hz CTCSS).

The regular **OVMRC net** meets Thursday evenings at 20:00 local on VE3TWO (147.300+, 100 Hz CTCSS tone) analogue FM.

VE3TEN

Tuning in the beacon so that it makes sense requires you tune to **28.175** on **CW** and read the tone that is there . The spaces between the elements are the higher tone. If that doesn't work, tune to **28.175.28** on **lower sideband** for better results.

The Ottawa Amateur Radio Club bulletin "Groundwave" is published and distributed to club members. Publication dates may vary but it is hoped that the bulletin arrives at its destination before the events listed in it have expired. The bulletin is not published for July and August when meetings do not occur. Every effort is made to provide accurate information in the bulletin, however we are all human and mistakes can be made. The OARC accepts no responsibility for any damages that may result from this. The opinions expressed in this bulletin are those of the author.

Voice (VHF) 146.940/146.340 100Hz CTCSS required
(UHF) 443.300/448.300 100Hz CTCSS required

VE3TVA Amateur Fast Scan Television Repeater
Currently off the air and looking for a new home.

IRLP Node 2040 146.940/146.340 (VE2CRA/VE3RC)
(Code 411 for info) (Code 204 for activity)
(Code 88 for time)
For further information please contact the Repeater Chair.

Note: The IRLP link is not connected to ECHOLINK. Please do not try to connect using the alpha keys on your keypad. It just confuses the operator.

Note: The IRLP link is disabled during the Monday night Capital City FM Net from 20:00 to about 21:45 .

Ottawa Amateur Radio Club
Groundwave

May 2019

April Minutes

Ottawa Amateur Radio Club
April Monthly Meeting
Held in the Councilors' Lounge at Ottawa City Hall

April 10, 2019

19:35 Meeting started by Diane VA3DB

Guests
Chris (not yet licensed)

Announcements (David VE3BOW)
+ May 5: CN Cycle for CHEO. To volunteer, see Arthur VA3BIT
+ June 8-9: Rideau Lakes Cycle Tour: To volunteer, see Jeffrey VA3PEW
+ June 15: City-Wide Emergency Exercise. EMRG participating & looking for volunteers
Jeffrey passed around a sign-up sheet for the three above events
+ May 11: Smiths Falls Hamfest
+ June 1-2: Doors Open Ottawa. Scouts Canada VE3SHQ can use help. To volunteer, contact Thane VA3TTM
+ June 22-23: Field Day (Location TBD)
Harrie VE3HYS: Expects permission from Scouts Canada HQ for use of their premises for Field Day within a few weeks
+ September 7: OARC Carp Hamfest.
Ed VE3WGO: The date in the ad in TCA has been corrected. Ed passed around a sign-up sheet.
+ Lap-the-Gats for Parkinson's, normally held the same weekend as Field Day, has been permanently cancelled. Contact VA3PEW for more info.
+ Silent Key: Richard Murtick VE3PD (aka VE3RNM). Celebration of Life on April 13 at the Royal Canadian Legion at 800 Taylor Creek Dr. in Orleans from 13:00 - 16:00

Homebrew Presentations
+ Andrew VA2QCH: Implementation of a spectrum analyzer from scratch
+ Dave VE3TLY: Wireless Controlled Remote Antenna Switch
+ Mike VE3FFK: Tuner accessory, Cable spooler, Dipole coil
+ Wayne VE3CZO: Improved continuity tester, Portable CW paddle-less paddle
+ Jean VE3DNI: HF/VHF mixers and downconverters

Clare Fowler Award (Judges Choice): Andrew VA2QCH
Peoples Choice: Andrew VA2QCH
Runners up: Dave VE3TLY, Jean VE3DNI
On behalf of the Club, the executive would like to thank this year's Homebrew judges:
+ Ed VE3WGO
+ Wayne VE3CZO
+ Dave VE3TLY

Meeting ended at 21:10, followed by coffee and social.

50/50 won by Rick VE3IHI

Pre- and Post-Meeting Announcements
+ May 5: CN Cycle for CHEO. To volunteer, contact Arthur VA3BIT at va3bit@rac.ca

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Dates to Remember

2019

Feb. 9-10	Canada Ski Marathon
Apr. 10	Homebrew Night
May 17-19	Dayton Hamvention
Jun. 12	OARC AGM and Elections
Jun. 22-23	Field Day
Jul. 1	RAC Canada Day Contest
Sep. 7	OARC Hamfest
Sep. 21	Radio in the Park
Sep. 30	Membership Renewals Due
Nov. 1	Joe Norton Award Subm. Due
Nov 21-23	Tall Pines Rally
Dec. 28	RAC Winter Contest

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mk's Word

The 2019 version of the Morse course is winding down, and speeding up.

The alphabet, numbers and punctuation have all been sent and (more or less) cemented into the heads of the students who have persisted this far. Now the interval between letters decreases as we ramp our way up to 20 WPM.

It has been a lot of work, both for the students and for me. So I am trying to come up with a way to capture the course for use next year or next month, or tomorrow if someone wants to start to learn. It is not good enough to just hand someone a zip file and tell them to open up a "chapter" a week. That is like giving someone who wants to lose weight a list of foods to eat and to avoid. It lasts a week, maybe two at best. People respond to what the whiz kids call "nudges" (putting on my old man hat). Back in my day, it was called nagging. They also respond to competition. I can learn 5 letters this week, can you? Very short term (daily) goals and records help too, as do little rewards. I know ABOUT this stuff, but have no clue how to do it. Does anyone out there have any ideas? Can you lend a hand? Let me know.

GPS Week Number Rollover

The 50th Space Wing Public Affairs office of Schriever Air Force Base has established and posted guidelines, known as Interface Specification GPS-200 (IS-GPS-200), for receiver manufacturers to ensure continued capability during the April 6 GPS Week Number Rollover on Coordinated Universal Time derived from GPS devices.

According to the 50th Space Wing, users should be aware of the upcoming GPS Week Number Rollover as it may impact receivers that are not manufactured in compliance with IS-GPS-200 specifications.

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Efficient 2 meter Disguised Antenna Made From a TV Satellite Dish

This horizontal "slot" antenna, cut into the reflector of a TV dish, is both the master of disguise and high in performance.

By John Portune W6NBC

The referenced figures are not included. Please see the web site at: http://w6nbc.com/articles/20xx-dishslot.pdf

47 C.F.R. Section 1.4000, October 1996, "prohibits restrictions that impair... antennas used to receive video... including... satellite dishes less than one meter (39 in.) in diameter". (FCC Web Site)

I've long wondered, is it practical to hide an efficient 2 meter base-station antenna in a TV satellite dish? My CC&R committee couldn't make me take it down. But what about all the metal in the TV dish? Wouldn't that compromise a 2 meter antenna? Finally it struck me, don't fight the metal; take advantage of it. Cut a "slot" antenna into the TV dish's reflector.

A slot antenna is a narrow rectangular opening in a large conductive surface, such as a TV satellite dish. Slot antennas are familiar in the commercial radio world, but not to hams. They're common in TV broadcasting, the skin of aircraft and in radar, microwave and cell phone applications. This disguised TV dish slot is equal to a J-pole (Figures 1 and 2) and is also a great way to learn about slot antennas.

The Slot Antenna

My learning curve first showed me, as the literature says, that a slot behaves much like a dipole. Both have roughly 2 dBi gain, perpendicular to the antenna and they are omnidirectional on axis.
Also I quickly found that a slot is docile and easy to work with. I was delighted to find that

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SIGSALY

In the years before World War II, German intelligence could decode band-scrambled U.S. radiotelephone conferences. After Pearl Harbor, an unbreakable speech scrambler was developed with top priority, and by 1943, it was deployed. Known as SIGSALY, the device pioneered many advances critical to modern digital media technologies, including spread-spectrum communications and the first use of pulse-code modulation (PCM) to transmit speech.

SIGSALY was top secret, so even today information about the details of its construction are hard to come by. I've spent 20 years researching the history of digital technology and digital media, especially SIGSALY. I searched IEEE and U.S. National Security Agency (NSA) journals, and Bell Telephone Laboratories patents. Finally, I found Lieut. Donald Mehl, a WWII SIGSALY technician, who gave me invaluable assistance. In 2015, I realized that it might be possible to re-create a key element of SIGSALY—the quantizer—using vintage parts.

SIGSALY was unbreakable because, unlike earlier analog systems, it scrambled voices by using a one-time random digital encryption key. Before a digital key can be applied, a speaker's voice must first be converted from analog to digital, thus the quantizer.

Modern analog-to-digital conversion makes it easy to capture the entire audio spectrum. With the technology available at the time, the creators of SIGSALY used 12 speech parameters that best encoded speech. SIGSALY used vocoders to analyze incoming speech and classify them into 10 frequency sub-bands; a pitch parameter; and a bit that indicated whether the speech sound was voiced or unvoiced.

SIGSALY had 72 identical quantizers to digitize the 12 vocoder parameters and the encryption key (stored as a vinyl recording of noise). The digitized voice and key were enciphered by modulo six addition. Each quantizer employed five VT-109/2051 thyratrons. Thyratrons are a type of electronic tube, but they differ from conventional ones in that they don't respond in a linear way: They are off until the grid voltage exceeds a trigger; then an arc forms and they "latch up" and conduct until the anode current falls to zero, resetting them. The five thyratrons formed a flash converter, in which an incoming signal is compared to a reference voltage at a number of tap points in the circuit. In SIGSALY, the analog input voltage is fed into a five-tap logarithmic resistor divider ladder, whose taps drive the thyratron grids. As the input voltage increases, the five thyratrons thus trigger in sequence (producing not binary but a logarithmic "thermometer code"). These five outputs were sampled every 20 milliseconds to form a six-level quantized output signal (it's a six-level output, not five, because zero is one level).

In reconstructing the SIGSALY quantizer I wanted to make something that could be used in practical demonstrations and also double as a wonderful museum piece. The design includes a 120/240-volt power supply, a microphone preamp, a ramp generator, a panel meter displaying the analog-to-digital conversion, and five neon lamps that light up in logarithmic sequence. One input is a dynamic microphone: It's plugged into a preamp that uses a 6SL7GT dual triode to amplify its audio signal by 60 decibels. A slowly increasing ramp signal is an alternate input.

My design uses the same five-tap logarithmic ladder and the same type of thyratron that SIGSALY used. Instead of SIGSALY's 20-ms pulsed sampling, I sample the input at the zero-voltage crossings of the AC power.

The full details of the quantizer's construction would take more room to explain than is available here, but a complete description is available as a supplement to this article online. One critical difference between thyratrons and their modern descendants—silicon controlled rectifiers and TRIACs—is that the thyratron filaments must be preheated before applying any anode voltage to prevent dam-

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age. A thermal time-delay relay gives the filaments 15 seconds to heat up.

For some parts, I turned to my own laboratory, which has vintage electronic parts I've collected since the 1950s. I searched eBay for original VT-109/2051 thyratrons, and porcelain octal tube sockets. I used other 1940s-era parts (such as Allen-Bradley carbon composition resistors) for the quantizer, while I used some modern components (like dual primary power transformers) for supporting electronics not present in the original quantizer. To display the components, I built the quantizer into a 49- by 17- by 8-centimeter clear plastic chassis. The overall cost was US $1,250.

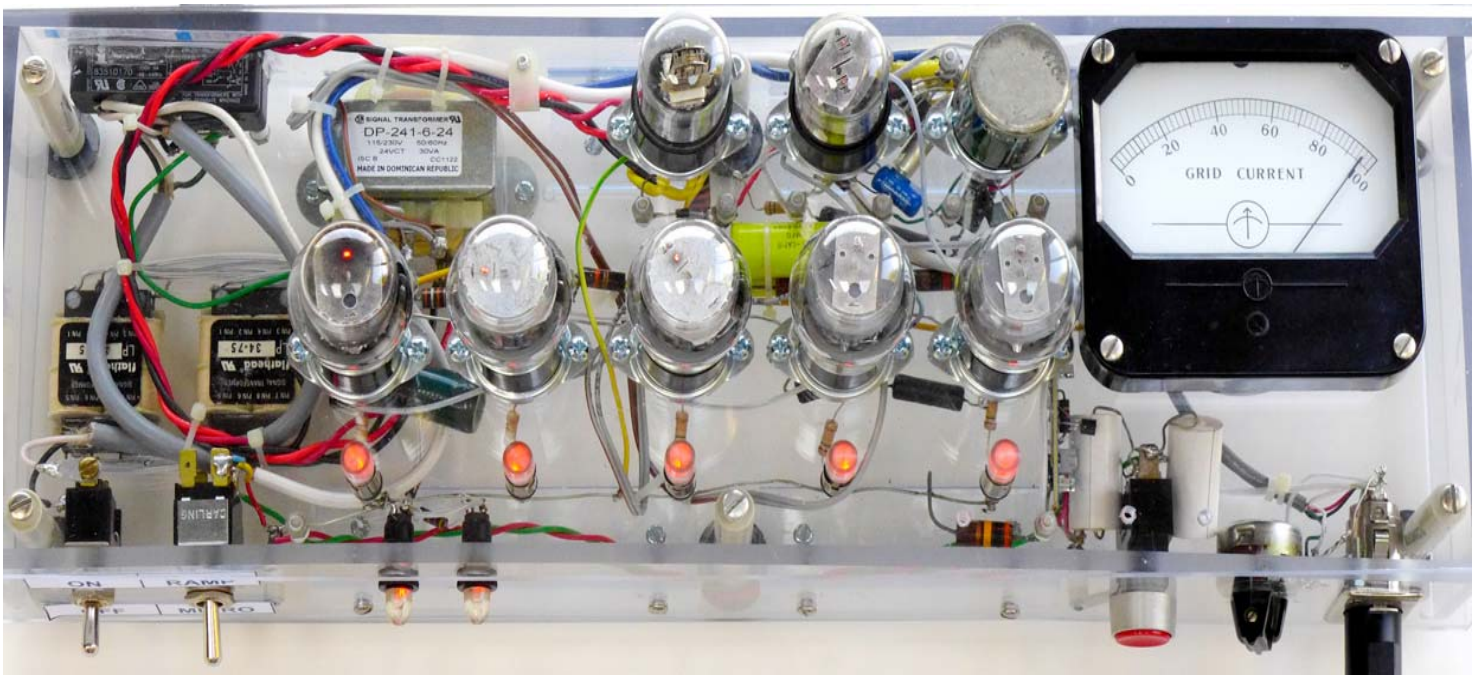
Design and construction extended over three years, and the debugging was very challenging, especially with 350 V present! Construction finished and I started debugging just an hour before departing from California to Paris, where the quantizer was to be demonstrated at several crypto and InfoSec conferences. After I added power resistors to solve some problems with filament voltages and fixed a few wiring errors, the quantizer began to work a bit, but only two of the five thyratrons triggered, the microphone preamp had full-scale oscillations once a second ("motorboating"), and the anode power was heavily overloaded as each thyratron fired.

I had to stop debugging and depart. I packed the quantizer with a few tools and spare parts, and Air France kindly obliged me with special treatment for the delicate machine. In Paris, I had to finish debugging without a laboratory or instruments, save for a voltmeter. I scrounged parts and tools at the Marché aux Puces (Paris flea markets), and finally finished debugging at an old friend's ham-radio shack! Many of the problems arose because the thyratrons varied considerably in grid trigger voltages. (The same problems of thyratron inconsistency were tackled by the original SIGSALY engineers and technicians.)

Now, the finished unit works reliably. According to the NSA and the National Cryptologic Museum curators, this is the first attempt ever to re-create any piece of SIGSALY. But best of all, old and young, technical and nontechnical audiences alike are impressed and immediately comprehend the underlying principles and the close connections to today's digital age.

By Jon D. Pol

IEEE *Spectrum*, Feb. 2019



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this one displays close agreement to theory. It's a classic 38 in.

The width of a slot, I further learned, determines its bandwidth. Its analogous to the conductor diameter of a dipole. My first slot was arbitrarily ½ in. All small widths I subsequently tried worked well too. This one is a single jig-saw-blade cut. I reasoned that the thinner the slot, the less the neighbors would notice it. Figure 3 graphs its very adequate bandwidth – less than a 1.5 to 1 SWR over the entire 2 meter band.

A slot, however, isn't exactly a dipole, there are differences. Here, one difference is very convenient. A horizontal slot is surprisingly, vertically polarized. The RF currents flowing in the entire surface around the slot, cause a 90 degree rotation of the E and H fields. Hence, a horizontal dish slot is correct for vertically polarized 2 meter repeaters.

Dish Size and Slot Size

At first, I considered an 18 in. round or 18 x 20 in. elliptical dish. However, the common 22 x 32 SlimLine DIRECTV dish, or equivalent, is better. It has a larger surface area. Kraus (Antennas, Ch 9, p. 305, 3rd Edition) suggests that classical slot behavior is achieved for a surface larger than ½ . by ¾ .. This did make me wonder if even a SlimLine dish would be too small. Subsequent tests suggested otherwise. This slot behaves classically. I welcome reader comments, though.

However, in a SlimLine DIRECTV dish, the slot can't be straight; the ends must "droop." But again like a dipole, this only slightly "softens" the gain and directivity. Figure 4 shows the comparison, using dipoles for the simulations. EZNEC is "iffy" for slots.

Feeding and Matching

Attach the feed coax braid to one side of the slot and the center conductor to the other directly across, though not in the middle. Coax feed for a slot is best done off-center. The reason is this. A

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+ May 11: Smiths Falls Hamfest
+ June 1-2 Doors Open Ottawa: Scouts Canada VE3SHQ needs help. To volunteer, contact Thane VA3TTM
+ June 8-9: Rideau Lakes Cycle Tour: To volunteer, contact Jeffrey VA3PEW at va3pew@rac.ca
+ June 15: City-Wide Emergency Exercise. EMRG participating. To volunteer, contact Jeffrey VA3PEW at va3pew@rac.ca
+ June 22-23: Field Day (Location to be confirmed)
+ September 7: OARC Carp Hamfest. Sign-up List.
+ Lap-the-Gats no longer exists. VA3PEW for info.
+ SK: VE3PD / VE3RNM Celebration of Life on April 13 at Legion in Orleans from 13:00-16:00

Minutes taken by VA3BIT.

Lanark Highlands Forest Rally

This rally has been very lucky in attracting dedicated volunteers, without whom the Lanark Highlands Forest Rally could never have been a success year after year.
We couldn't do it without you!
If you know anyone who has never volunteered at a rally and is curious to know more, please feel free to pass along this information to them. To help newcomers, Motorsports Club of Ottawa produced two short videos about rally marshalling which can be viewed at these links:
http://vimeo.com/22478150
http://vimeo.com/22479119
There will be more information about this rally posted on the Lanark Highlands Forest Rally website at https://www.rallysport.on.ca/fastrally/oprc/lhfr/ . For more information, questions or comments, please feel free to email anytime at lhfrvolunteers@gmail.com
Hope to see you there!

Jason Crandall
2019 LHFR Chief Control Marshal

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dipole's free-space impedance is low in the middle (72O), increasing toward the ends. A slot's free-space impedance is conversely high in the middle (493O), and decreases toward the ends. Kraus, (Antennas, Ch 9, 3rd Edition) estimates 50O points roughly 1/20 . from either end. With my MFJ-259B antenna analyzer, I easily found the match near his estimate.

Then, because all antennas are affected by location, during my learning curve, I used an easy-to-move feed-line-attachment fixture. With it I found that feed point location is not touchy. See Figure 5. You needn't duplicate my movable fixture. It will be fine to directly make a permanent attachment. See Figure 6.

As you can see, the match is good anywhere 3 to 6 inches from an end. 4 ½ in. works well for most final dish locations (Figure 6). Be sure, though, to use a 1:1 current balun. The one shown is six turns of RG-58 coax, secured with UV-stabilized ty-wraps. I used clear silicon adhesive to attach the balun to the back of the dish.

Using the Dish

After seeing my dish, my ham friends asked if one dish could be used for both 2 meter activity and TV reception. Possibly, but recalling that the slot has azimuth gain, you might want to point your slotted dish at the repeater(s). However, it's omni-directional in elevation, so you can tilt it upward as if it were receiving TV satellite signals. For a good wave angle to the repeaters, mount it at least at roof height as you would any 2 meter antenna.

Another reason dual operation may not be practical is that 2 meter transmissions might interfere with TV reception. I have not tested this, so I welcome reader comments. I prefer separated dishes, on opposite sides of my house. That way my neighbors don't notice the aiming difference.

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The GPS Week Number count began around midnight on Jan. 5, 1980. Since then, the count has been incremented by one each week and years later broadcast as part of the GPS message. One of the GPS week number fields in the legacy navigation message counts from zero to 1,023 weeks. At the completion of every 1,024 GPS weeks, the field rolls from 1,023 to zero and starts counting again.

The first occurrence took place the evening of Aug. 21, 1999, and the message field rolled to zero at midnight GPS time. The next similar GPS Week Number Rollover is set to take place April 6. "We appreciate the four billion people around the world who use GPS signals on a daily basis, which is why we are transparent in providing detailed guidance on use for compatibility," said Lt. Col. Stephen Toth, 2nd Space Operations Squadron commander.

Civil GPS users are encouraged to submit reports of GPS problems to the Coast Guard Navigation Center and civil aviation users are encouraged to report GPS anomalies to the Federal Aviation Administration .

Phase & Frequency Modulation Difference

It is impossible to change the phase of a sinewave without changing its frequency. It is impossible to change the frequency of a sinewave without changing its phase. That being true, are phase and frequency modulation equivalent? The answer can be either 'yes' or 'no' depending on the modulating signal. The answer is 'yes,' the processes are exactly equivalent, if a sinewave is modulated by a single frequency. However, the answer is 'no' if a modulating signal has multiple frequency components, because phase modulation results in greater frequency-deviation at high, compared to low, modulating frequencies in comparison to frequency modulation. Therefore, the difference is merely a difference in modulation frequency response, making it possible to effectively convert one form of modulation to the other by simply modifying the amplitude vs. frequency characteristic of a signal prior to modulation.

2018-2019 **OARC Membership Application/Renewal**

Ottawa Amateur Radio Club Inc., Box 8873, Ottawa, ON, K1G 3J2, Canada

◯ Single $25 ($20 after February 1)
◯ Family $30
◯ Junior $15 (under 18 years of age)
◯ New Ham $0 (licensed in current membership year)

◯ Emailed Newsletter $0 ◯ Mailed Newsletter $10

Name _____ Phone _____

Callsign(s) _____ Year Licensed _____

☐ Basic ☐ Honours ☐ Advanced ☐ Morse ☐ RAC Member

Email Address _____

Name _____ Phone _____

Callsign(s) _____ Year Licensed _____

☐ Basic ☐ Honours ☐ Advanced ☐ Morse ☐ RAC Member

Email Address _____

Postal Address _____

Membership year is September 1 through August 31. Paying members who are in good standing by the December General Meeting will be eligible for a free one-time name badge. Members who wish to purchase additional replacement badges may do so through the club for $10 each. Ordered badges will be available in January. All prices are listed in Canadian Dollars (CAD).

First Name on badge _____ Callsign on badge _____

First Name on badge _____ Callsign on badge _____

Notes _____