The Heterodyne

Bulletin of the West Valley Amateur Radio Association
An Affiliated Club of the American Radio Relay League

West Valley Amateur Radio Association, W6PIY— http://www.wvara.org
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May 2008

Next Meeting: Wednesday, 7:30 p.m., May 21, 2008 at the American Red Cross, 2731 North First Street at Plumeria (between Trimble and Montague Expressway) in San José.
Speaker: Dean Straw, N6BV — Subject: “HF Propagation 101”

Dues: All WVARA members who have not yet paid their dues for calendar year 2008 are requested to do so. Basic membership dues are $15.00 per year. Go to the club web site to see the dues rates for other types of membership, enhanced repeater privileges, and so forth. Payment by PayPal is available.

Court finds FCC violated Administrative Procedure Act in BPL decision— The US Court of Appeals for the District of Columbia Circuit today released its decision on the ARRL's Petition for Review of the FCC's Orders adopting rules governing broadband over power line (BPL) systems. The Court agreed with the ARRL on two major points and remanded the rules to the Commission. Writing for the three-judge panel of Circuit Judges Rogers, Tatel and Kavanaugh, Judge Rogers summarized: "The Commission failed to satisfy the notice and comment requirements of the Administrative Procedure Act ('APA') by redacting studies on which it relied in promulgating the Rule and failed to provide a reasoned explanation for its choice of the extrapolation factor for measuring Access BPL emissions."

The Court agreed with the ARRL that the FCC had failed to comply with the APA by not fully disclosing for public comment the staff studies on which it relied. The Court also agreed with the ARRL that the Commission erred in not providing a reasoned justification for its choice of an extrapolation factor of 40 dB per decade for Access BPL systems and in offering "no reasoned explanation for its dismissal of empirical data that was submitted at its invitation." The Court was not persuaded by the ARRL's arguments on two other points, on which it found that the Commission had acted within its discretion.

The conclusion that the FCC violated the APA hinges on case law. "It would appear to be a fairly obvious proposition that studies upon which an agency relies in promulgating a rule must be made available during the rulemaking in order to afford interested persons meaningful notice and an opportunity for comment," the Court said, adding that "there is no APA precedent allowing an agency to cherry-pick a study on which it has chosen to rely in part."

The Court continued, "The League has met its burden to demonstrate prejudice by showing that it 'ha[s] something useful to say' regarding the unredacted studies [citation omitted] that may allow

it to 'mount a credible challenge' if given the opportunity to comment." Information withheld by the Commission included material under the headings "New Information Arguing for Caution on HF BPL" and "BPL Spectrum Tradeoffs." The Court concluded that "no precedent sanctions such a 'hide and seek' application of the APA's notice and comment requirements."

With regard to the extrapolation factor, the Court ordered: "On remand, the Commission shall either provide a reasoned justification for retaining an extrapolation factor of 40 dB per decade for Access BPL systems sufficient to indicate that it has grappled with the 2005 studies, or adopt another factor and provide a reasoned explanation for it." The studies in question were conducted by the Office of Communications, the FCC's counterpart in the United Kingdom, and were submitted by the ARRL, along with the League's own analysis showing that an extrapolation factor closer to 20 dB per decade was more appropriate, as part of the record in its petition for reconsideration of the FCC's BPL Order. The Court said that the FCC "summarily dismissed" this data in a manner that "cannot substitute for a reasoned explanation." The Court also noted that the record in the FCC proceeding included a study by the National Telecommunications and Information Administration that "itself casts doubt on the Commission's decision."

The briefs for the ARRL were prepared by a team of attorneys at Wilmer Hale, a firm with extensive appellate experience, with assistance from ARRL General Counsel Christopher D. Imlay, W3KD. Oral argument for the ARRL was conducted by Jonathan J. Frankel of Wilmer Hale. Oral argument was heard on October 23, 2007; the Court's decision was released more than six months later.

After reading the decision, General Counsel Imlay observed, "The decision of the Court of Appeals, though long in coming, was well worth the wait. It is obvious that the FCC was overzealous in its advocacy of BPL, and that resulted in a rather blatant cover-up of the technical facts surrounding its interference potential. Both BPL and Amateur Radio would be better off had the FCC dealt with the interference potential in an honest and forthright manner at the outset. Now there is an opportunity to finally establish some rules that will allow BPL to proceed, if it can in configurations that don't expose licensed radio services to preclusive interference in the HF bands."

ARRL Chief Executive Officer David Sumner, K1ZZ, added: "We are gratified that the Court decided to hold the FCC's feet to the fire on such a technical issue as the 40 dB per decade extrapolation factor. It is also gratifying to read the Court's strong support for the Principles underlying the Administrative Procedure Act. Now that the Commission Has been ordered to do what it should have done in the first place, we look forward to participating in the proceedings on remand, and to helping to craft rules that will provide licensed radio services with the interference protection they are entitled to under law."

ARRL President Joel Harrison, W5ZN, concluded: "I am very pleased that the Court saw through the FCC's smoke screen and its withholding of valid engineering data that may contradict their position that the interference potential of BPL to Amateur Radio and public safety communications is minimal. The remand back to the FCC regarding their use of an inappropriate extrapolation factor validates the technical competence of Amateur Radio operators and especially of the ARRL Lab under the direction of Ed Hare, W1RFI. We are grateful for the work of our legal team and especially for the unflagging support of the ARRL membership as we fought the odds in pursuing this appeal."

Club Net: Tuesday, 8:30 p.m. on our club repeaters:

WVARA Repeaters (W6PIY)			
Band	**Frequency**	**PL**	**Status**
6 meters	52.580-	151.4 Hz	Operating
2 meters	147.39+	151.4 Hz	Operating
1.25 meters	223.96-	156.7 Hz	Operating
.70 meters	441.35+	88.5 Hz	Operating
.23 meters	1286.2-	100 Hz	Operating

WVARA Tuesday Night Net Check-ins:

Call Sign	Name	Apr. 15, 2008	Apr. 22, 2008	Apr. 29, 2008	May 6, 2008
AB6XS	Kevin	X	X	X	X
AD6YU	Loren	X		X	X
K6EBN	Eben		X		X
K6QFO	Mike		X		
KF6UTE	Casey				X
KG6MYR	Harry	X			X
KG6SEA	Tom	X		X	
KK6VF	Kevin	X #	X #	X #	X #
N6BIH	Senad			X	
NU6P	John	X			X
W6HOC	Howard	X		X	
W6TQG	Phil	X			X
W6ZZZ	Marc	X	X		X
WB6KHP	Dave	X	X	X	X
Notes: X — Checked into net # — Net control operator					

Field Day exhibit kits now available: Please visit the Field Day information page http://www.arr.org/fieldday for all the details on Field Day rules, frequencies, forms, pins, logos and t-shirts. The complete Field Day packet can be downloaded from the site as well. If you want To order exhibit kits containing printed flyers about Amateur Radio, you may order these materials at http://www.arrl.org/brochures/ on the ARRL web site. Your order must be received before June 13.

Japanese amateurs receive more privileges on 75/80 meters: Japan's Ministry of Internal Affairs and Communications (MIC) announced that Japan's Table of Frequency Allocations and the Japanese Amateur band plan have been amended, giving amateurs in that country more privileges on certain frequency blocks in the 75/80 meter band. Japanese amateurs are now allowed to operate the following additional frequencies on the 75/80 meters: 3.599-3.612 MHz, 3.680 to 3.687 MHz, 3.702-3.716 MHz, 3.745-3.747 MHz and 3.754-3.770 MHz. As of April 28, 2008, Japanese amateurs will have privileges on the following frequencies in the 75/80 meter band: 3.500-3.520 MHz (CW only), 3.520-3.525 MHz (digital mode and CW), 3.525-3.575 MHz (CW and phone), 3.599-3.612 MHz (CW and phone), 3.680-3.687 MHz (CW and phone), 3.702-3.716 MHz (CW and phone), 3.745-3.770 MHz (CW and phone) and 3.791-3.805 MHz (CW and phone)."This makes it a bit easier for US amateurs to make contacts with Japanese amateurs, especially in contests, since Japan does not have phone privileges on the 160 meter band," said

ARRL Membership Services Manager Dave Patton, NN1N. "These new privileges will also make it easier for DXpeditions to work Japan." — Information provided by JARL

Field Day 2008 Planning and Preparation:

Jim Peterson, K6EI will present further refinements and modifications of WVARA Field Day plans at our June monthly meeting. Stay tuned.

General Information	
Date	June 28-29, 2008
Set-up	Starts Friday 1100 PDT
Operation	Saturday 1100 PDT to Sunday 1100 PDT
Call sign	K6EI to request 1x1 special event call sign
GOTA call sign	AD6RE
Location	Mora Hill, Rancho San Antonio Open Space Preserve (access is Mora Drive)
Latitude / Longitude	37.3358 / 122.0993

Field Day Committee	
Name	**Call Sign**
Jim Peterson (Chairman)	K6EI
Jim DeLoach	WUØI
Tom Dunbar	W6ESL
Scott Emery	AD6RY
Dave Hartzell	NØTGD
Phil Verinsky	W6TQG
Grant Willner	AD6RE
Marc Ziegler	W6ZZZ

Planning and Preparation Tasks	
Month and Year	**Task**
April 2008	C3S Yagi antenna assembly/test on a push-up mast in a park
	Tower trailer right-rear jack needs to be repaired.
May 2008	C4S Yagi antenna/assembly/tutorial on the tower trailer
	WriteLog and networking final testing

Site Operations	
Note	**Explanation**
1	No open flames at Mora Hill (no camp stoves, Coleman-type lanterns, etc.)
2	No generators running after sunset or before 0700 PDT
3	Need 15 fire extinguishers
4	Garbage must be brought home in bags.

Field Day 2008 Planning and Preparation:

Band Captains			
Band(s)	**Mode(s)**	**Captain(s) and Call Sign(s)**	**Category**
HF			
80M-10M	CW	K6EI	1A
40M-15M	Digital	W6TQG, W6ZZZ	2A
80M-10M	SSB	AD6RY	3A
80M-10M	Flex	WUØI	4A
80M-10M	GOTA SSB	AD6RE	free
VHF/UHF			
6M	SSB/FM	W6ESL	5A
2M	SSB/FM	W6ESL	free
220 MHz	SSB/FM	W6ESL	6A
440 MHz	SSB/FM	W6ESL	7A
1.2 GHz	SSB/FM	W6ESL	8A
Satellite	SSB/FM	NØTGD	free

Vice President's Visions: Flea Markets— from Marc Ziegler, W6ZZZ
If you have some extra money to spend, here are some ways to spend it a few times a month. They are free to attend:
Electronics Flea Market at De Anza College and LARK Swap Meet in Livermore, http://www.fars.k6ya.org/events/efm ; ASVARO Electronics Flea Market, De Anza College, Cupertino, http://www.electronicsfleamarket.com/ ; flyer, http://www.electronicsfleamarket.com/efm-flyer.pdf ; Livermore Swap Meet, http://www.livermoreark.org/swap/swap.html ; flyer, http://www.livermoreark.org/swap/swapbrochure.pdf .

Hams residing in the Santa Cruz Mountains Marc Ziegler, W6ZZ, advises prospective hams or new hams who live in the Santa Cruz Mountains area to consult the Loma Prieta Amateur Radio Club web site, http://www.lparc.org , for helpful links to license examination preparation material, repeater listings, and the like.

Municipal Wi-Fi to extend global service area to 30,000+ square miles by 2012

In 2004, there were only 520 square miles of networked municipal Wi-Fi. However, ABI Research forecasts a nearly sixty-fold increase over the next several years, to more than 30,000 square miles *Municipal Wireless*, a recent report from ABI Research, examines the current state of municipal Wi-Fi networks — assessing technology evolution, current market challenges, and possible solutions.

At present, the United States leads in municipal Wi-Fi deployments – but Canada, Japan, South Korea, and Western Europe are undergoing expansion of municipal Wi-Fi infrastructure and applications. Varying levels of maturity and acceptance exist within this market, spread across global regions and individual countries.

The following is a snapshot of some major variations, according to recent analysis from ABI Research:

— North America: Leads in deployments; but in many cases, the region employs the wrong business plan of free consumer access and free infrastructure; consolidating incumbent service providers view municipal Wi-Fi as a competitive threat.
— Europe: Mobile-oriented rather than PC-oriented; incumbents initially resisted municipal Wi-Fi but now recognize in-building limitations and are incorporating it within service bundles for nomadic broadband Internet access, or as a way to compete out of region.
— Asia-Pacific: Status varies widely, but rapid uptake in advanced countries such as South Korea is resulting in innovative applications and the development of new end-user devices to leverage municipal Wi-Fi.
— Emerging Regions: Equipment costs remain prohibitive; there is interest in the technology, but compared with more basic services such as electricity, funding is a challenge; these regions are likely to be late adopters.

ABI Research vice president and research director Stan Schatt believes that there are key financial benefits that should be included within the municipal Wi-Fi business case.

“Wireless surveillance systems, for example, will provide financial returns by helping prevent possible terrorist attacks, decreasing overall crime, improving traffic flow, and even boosting tourism by creating stable communities,” he explains.

Once technology, business, and cost issues are resolved, nations will benefit from this simple and low-cost broadband Internet access technology, consequently broadening the range of the networked service. [From: http://rfdesign.com, March 11, 2008]

Switching off incandescents a no-brainer?
By Tyler Hamilton, thamilt@thestar.ca, *Toronto Star* [Canada], March 17, 2008

Compact fluorescent light bulbs are much more energy efficient than incandescent lighting. No arguments there. But is it wise to outright ban the old Edison light bulb in Ontario? Across Canada? A year ago this writer would have had one answer: Definitely. But the answer, it turns out, shouldn't be so clear cut. At least that's the conclusion of a recent paper by Michael Ivanco, a senior scientist at Atomic Energy of Canada Ltd., and professor Bryan Karney (along with graduate student Kevin Waher) from the department of civil engineering at the University of Toronto. The three have authored a study called "To Switch or Not to Switch: A Critical Analysis of Canada's Ban on Incandescent Light Bulbs," and you may be surprised by the findings.

"Only certain Canadian locations would benefit most from this light bulb paradigm shift," they argue, adding that switching to CFLs "may not always result in an environmentally friendly outcome, especially in cold climates."

We know that between 5 per cent and 10 per cent of the electricity that flows into old-style incandescent bulbs is used to support its primary purpose, which is to produce light. CFLs, on the other hand, are between four and fives times more efficient. When former energy minister Dwight Duncan announced a year ago that Ontario plans to ban the sale of inefficient incandescent bulbs in the province by 2012, he pointed out that the 87 million incandescent bulbs being used in Ontario homes and businesses were wasting enough electricity to power 600,000 homes. Electricity that isn't used to produce light is released into the ambient air as heat. In the summer, and in year-round hot spots such as California, this

heat energy is truly wasted. In fact, it makes our air conditioners work harder – a double-whammy that makes the switch to CFLs a no-brainer.

The question is whether that wasted energy is truly "lost" when you've got sub-zero temperatures outside.

"In Canada, the excess heat produced by interior (incandescent bulbs) is not entirely wasted, at least not during the cooler months between fall and spring," the paper argues.

You might not know it, but that incandescent bulb shining bright actually contributes to the heating needs of your home during the winter. When you switch to CFL bulbs, which are more efficient at using the electricity that goes into them, your home heating system needs to work harder to make up for the heat that your new light bulbs are no longer providing. There's a reason why cottage owners will often leave an incandescent light bulb turned on during the winter in certain spaces and areas. A single bulb is like a tiny space heater, providing enough warmth to keep pipes and other equipment from freezing. Given this, and coming at it from the perspective of greenhouse-gas emissions, we have to ask whether it's better to use old inefficient light bulbs to supplement the heat in our homes during cold months or more fuel to run our existing home heating systems.

If you live in Alberta, which relies heavily on fossil fuels for both its power generation and home heating, then switching to CFLs always makes sense. It's simply more efficient to heat your home using, say, a natural gas furnace, rather than using dirty electricity from the grid to power a resistance heater.

In provinces such as Manitoba and Quebec, which rely primarily on emission-free electricity, you can come to the opposite conclusion. Using clean hydropower to light up an incandescent bulb and fill your home with residual heat during the winter will release fewer greenhouse gases than using a natural gas furnace to provide that same amount of heat.

"If all homes in Quebec were required to switch from (incandescent) bulbs to CFLs, there would be an increase of almost 220,000 tons in CO2 emissions in the province, equivalent to the annual emissions from more than 40,000 automobiles," the paper suggests.

"In fact, this amount will increase in future as homes move away from electric space heating to cheaper and more efficient fossil fuel sources."

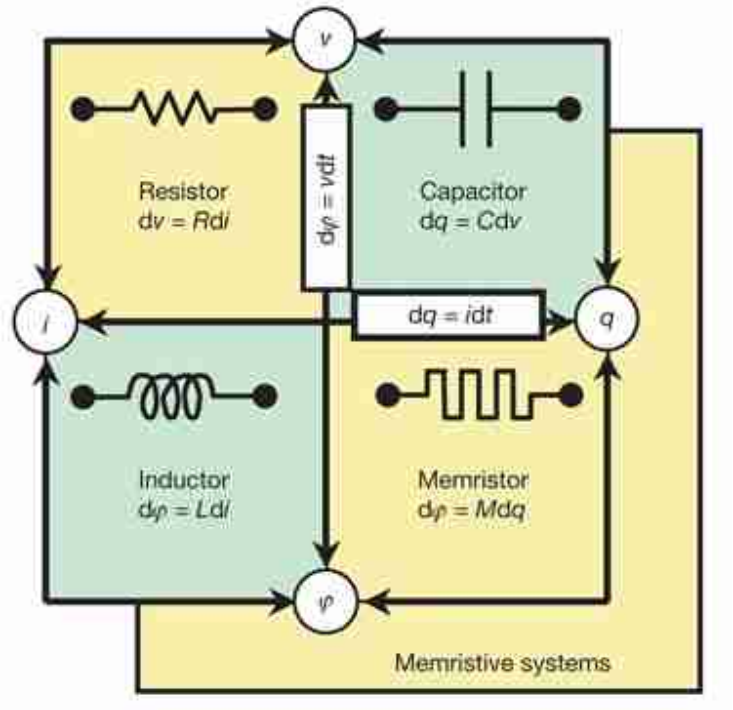
So where does this leave Ontario? The answer is more complex. This province generates its electricity from a diverse mix of low-emission sources, such as nuclear, wind and hydroelectric, and high-emission sources such as coal, natural gas and occasionally oil.

It's reasonable (if not entirely safe) to assume that at night, when we turn on the lights, we're using more low-emission baseload power from our nuclear and hydroelectric plants, and during the day we're relying more on coal and natural gas, which are both significant sources of CO{-2} emissions. So switching to CFLs would, for millions of households, mean using less clean electricity and more natural gas to make up for the lost heat. Based on this crude analysis, it would suggest Ontario households should continue to use incandescent bulbs during the coldest winter months if the province is truly interested in lowering its greenhouse gas emissions. As the grid gets cleaner over time – for example, all coal plants are expected to close by 2014 – this case gets even stronger.

Clearly, this issue needs to be studied more thoroughly. Does the province and the federal government really want to ban incandescent lights, only to look back and realize we've actually increased the country's carbon dioxide emissions? Perhaps we should start considering light fixtures the same way we consider car tires – one set for the summer and one for the winter. That's the approach Ivanco is taking.

"I practice what I preach," he recently wrote in an email message. "All of my exterior lights are compact fluorescent and I switch our interior lights to compact fluorescent ones only in the summer."

It seems a sensible approach.



Memristors — A Hewlett-Packard senior fellow claims to have realized the long-sought-after "missing link" of electronic-circuit theory: the memristor. Memristors were postulated as a fourth passive-component type (after resistors, capacitors, and inductors) in a seminal 1971 paper for *IEEE Transactions on Circuit Theory*, by Leon Chua of the University of California, Berkeley. Now HP Labs scientist R. Stanley Williams says he has hit upon the first such circuit. According to both Williams and Chua, electronics textbooks will have to be revised to include the memristor and the new paradigm it represents for circuit theory.

Chua had used mathematics to deduce the existence of a fourth circuit element type, which he called a memristor because it "remembered" changes in the current passing through it by changing its resistance. At HP Labs (Palo Alto, Calif.), Williams built the circuit element using a bi-level titanium dioxide thin film that changes its resistance when current passes through it.

HP has already tested the material in ultrahigh-density crossbar switches, which use nanowires to pack a record 100 Gbits onto a single die (compared with 16 Gbits for the highest-density extant flash memory chips).

Chua attributed the 37-year delay between the memristor's postulation and realization to the misconception among circuit theorists that the fundamental relationship in passive circuitry is between voltage and charge. The researchers contend the fundamental relationship is actually between voltage changes, or flux, and charge.

HP invited Chua to speak about his theory a few years ago but did no divulge to the professor that an HP team was actively pursuing the memristor. Only two weeks ago did Williams tell Chua that he had used the proper variables—flux and charge—to give Chua's concept concrete form.

A memristor works by virtue of hysteresis, whereby its rate of change accelerates as it moves from the "on" state to the "off" state or vice versa. According to Williams and Chua, prevailing circuit theory regards hysteresis as an anomaly, but it is in fact a fundamental property of passive-circuitry.

Electrical engineers have known that titanium dioxide changes its resistance in the presence of oxygen—indeed, that is the principle behind titanium dioxide-based oxygen sensors—but they could not explain why.

Chua believes electrical engineers will discover a wealth of materials that manifest the hysteresis relationship between flux and change. He is confident this new era of electronics will solve the scaling-related problems of excess power and heat that bedevil circuit design.

The memristor behaves like a non-linear resistor with memory. As such, it is a small, compact and highly energy-efficient means of creating a memory device. But Chua and Williams claim it will also enable the creation of device types not yet imagined.
The circuit element realized at HP is based on a two-layer sandwich of titanium dioxide film. As a memory element, it works by changing the atomic structure of the film, doing so by coupling the motion of atoms in the material with the movement of electrons through it. The bottom layer of HP's material uses a symmetrical lattice of titanium atoms and oxygen atoms, making it a good insulator. But the top layer has had oxygen vacancies introduced as a dopant, making it a good conductor. The more numerous the vacancies, the more conductive the device.

By placing the crossbar of nanowires above and below the sandwiched layers, charge can be passed through the material. HP created the oxygen vacancies using sputter deposition, beginning with an excess of oxygen and then cutting back on the flow. Williams explained that he hit upon the material after "studying how titanium dioxide oygen sensors work."

Williams is already thinking about deploying the crossbar architecture to create devices beyond simple memories. "If we push current through it hard and fast, it acts like a digital device, but if we run current through it gently and slowly, it acts as an analog device," he said.
[Excerpted from *Electronic Engineering Times*, May 5, 2008: "First proof of circuit theory's 'missing link'," by R. Colin Johnson.]

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