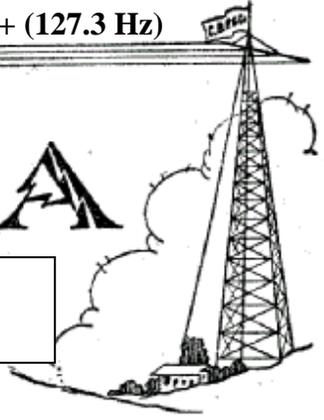


147.165 + (136.5 Hz)



443.500 + (127.3 Hz)



The
ANTENNA

**The Brandon Amateur Radio
Society Newsletter**

**OVER 40 YEARS OF PUBLIC SERVICE TO THE BRANDON AREA
BRANDON, FLORIDA, USA
VOL XLIV, NUMBER 1**

JANUARY 2017

Come to the Club Eating Meeting Thursday January 26th!

Our meeting this month is on the FOURTH Thursday because it is at the Golden Corral in Brandon. It's our Eating Meeting/Officers' Installation Dinner. Come on out for fun, food, and fellowship! Things get underway at 6:30 p.m. Come on out to eat, visit, and mingle with other BARS hams!

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The 70cm Band Under Pressure

Ron Perrett K4FZU

The ISM (Industrial, Scientific and Medical) bands for transmitting data, typically 314.9 MHz, 315 MHz, 433.92 MHz, and 915 MHz, are sanctioned by the FCC. This includes non-licensed legal operations within our UHF ham bands. If you can think monitoring or controlling of almost anything... "There is a device for that!" i.e.) Heart monitor, refrigerator, garage door opener, keyless entry, marine, metrological, etc-etc. To get data from the source, to a receiving device, for processing, of course involves a microwatt transmitter and likely a non-replaceable battery. If you are a product developer, you imagine and design using the authorizing Part 15.231 of the FCC Regulations. FCC and ETSI radiation limits are expressed as field strength (volts/meter), at a distance of 3 meters from the transmitter. Ball-parking, this equates to about 6mV/meter. Bet you can hear that on your sensitive Handi-Talkie for a bunch of feet! The FCC sets the field-strength limit at 3750µV/meter at 260MHz, and allows a linear increase to 12500µV/meter at 470MHz. UHF output can be up to +13 dBm ASK/FSK modulation, but typically only 10uW or -19 dBm and data rates = 8Kbps get most



jobs done. There are of course many creative options. For the more science curious, here is a 9-page .PDF file that you can download and review: <http://pdfserv.maximintegrated.com/en/an/AN3587.pdf>

Now understand that we Amateurs are *secondary service* rated on 70cm, and MUST accept whatever interference these devices may impact on our operations. If you do weak signal work on the low end of the UHF band, you're probably well acquainted with the many neighborhood birdies available to your receiver. HA(!), some even claim a positive contribution by using them as confirmation that they have a properly operating receiver in that spectrum.

So, just several weeks ago, my truck started exhibiting the little "Tire" icon symbol on my dash display - cool weather? Oh, probably that stupid spare, low on air pressure again. Thank you Tire Pressure Monitoring



System (TPMS). I won't bore you with crawling under the truck at Wawa to measure and add some air to the spare... only to still see the silly warning icon. A follow-up trip to the service facility, and my Hamfest mad money cache instantly became I.O.U. depleted. No, not a low pressure warning... rather a dead tire sensor diagnosis on 3 of 5 rims - only \$89 each of course partially resolves this problem. And, naturally it requires completely tearing down the tire to replace this -this thingy. Rebalancing and shop labor completed the educational and financial depletion process. What could be better than the \$2 hand-held tire pressure gage??? Government intervention of course! Time to discover the why and how, now that I won't have to be learning those "new radio" menu keyboard programming structures.

TPMS became a Federal mandate after the Firestone Tire incidents some years back. Today's reality is that TPMS technology is almost everywhere, created a lot of jobs, and an entire supporting industry. Did I mention it is a Federal offense to work on a failed system without repair? The regulations on TPMS from The National Highway Traffic Safety Administration (NHTSA) require all vehicles manufactured after 2007 to have an OEM provided, and owner maintained operating TPMS. Assuming average vehicle life spans, it is estimated that



1/4 of a billion sensors are now in service. Think of the QRM! Time passing brings improvements - new features and the built-in battery that maybe lasts 7 to 10 years. Battery-less TPMS sensors hit the market in 2010. The sensors also transmit data such as their unique sensor ID, temperature and pressure, battery life and other diagnostic information. This data is broadcast freely over the air, but intended for the Engine Control Unit (ECU) or specific receiver on the vehicle. Those vehicles which have graphical displays of the TPMS positions can then show on which wheel there is a problem. These electronic convenience and safety devices are manufactured by International companies such as Schrader,

Siemens, TRW, Pacific, Lear and others. However, there is unfortunately NO common technical standard (go figure that!) for the sensors and the OE's and suppliers have generated a multitude of sensor designs. Each sensor manufactured has a unique registration ID. i.e.) Ford is different from Toyota, from BMW, and sorry, it's illegal to get a used device from the junk yard.

TPMS serial numbers and all? Every time you replace a tire, you have to fill in a form with the government? That unique ID, burned in to every sensor, and its' data, are only activated at and above 20 mph. They transmit about once every minute. A sensor is almost never a receiver. The only exception is during reprogramming. Some sensors use a tool to excite a coil inside the sensor to enter into a learn mode. Other sensors enter into learn mode by placing a magnet over the valve stem. What tells the sensors to transmit when they are on the road? Accelerometers and specific programming tell the sensors to transmit at specific intervals and speeds. When a sensor is not turning, it's typically not transmitting information. When it's moving, it's transmitting information in 15, 30 or 60 second intervals depending on the application. Not transmitting a signal all of the time saves battery life, allowing some batteries to last up to 10 years. Stationary (always-on broadcast at 1-30 minute intervals) vs. Autolearn (while driving) vs. OBD (on-Board Diagnostics w/activation and scan tool interrogation) types. These TPMS devices are registered and tracked. It does not matter how long you own the vehicle, transportation authorities keep up-to-date information about vehicle ownership. If you're interested, the paperwork includes the 5497-2 TPMS Identifier Registration Form.

The tire service facility handles programming and relearning procedures, and your vehicle requires an activation or combination activation/scan tool to accomplish this. Tx Range typically limited to ~100ft, Rx is very much more near-field. Protocols use Manchester bit coding. Think 45 KHz deviation and a bit rate of ~25Kbits with variations including frequencies, modulations, data structure, communications protocols, mechanical fitment and many other factors - like everyone else nearby on the road at the same time. The majority of today's sensors can be activated by sending a 125 kHz LF signal (either continuous wave or modulated) - think of a mildly squelched radio and only good signals of sufficient strength break through the threshold. This signal forces the sensor to typically transmit an unencrypted encoded message at either 315 MHz or 433.92 MHz. With that unique ID is burned in to every sensor, the tech needs a proper tool to decode that message and provide the CORRECT FEEDBACK to the log. This "proper tool" will have in it all the necessary protocols to be effective on all of these types of sensors. Some sensors have reed switch technology requiring the positioning of a strong magnet near the valve stem to force a trigger. Tire Technicians require certification training, and test equipment manufacturers are all too happy to provide paid-for training and subscription technical support structures. If you would like to be better informed, there is a 2:52 minute Bartec Tech500 tool promo video available here: <http://www.bartecusa.com/tech500.html>

And a 6:52 minute Training video - Tech400 Pro video here: <http://www.bartecusa.com/tech400pro-basic-use.html>

If you're digging into the tolerances and buzz words of TPMS here is a short list:

- readings within +/- 5% -40C to 100C
- Delta of +/- 2 lbs as trigger
- 25% or more below the vehicle manufacturer's recommended cold inflation pressure
- Initiator (125 KHz tx), Trigger, Wake, Learn localization, Reset, Re-Learn (min 10 ft rule for interference)
- Program

Big Brother knows where you are... These devices are actively being utilized for more than just providing a warning indicator on your dash. Read some 2008 entertaining comments here... if you dare.

https://www.schneier.com/blog/archives/2008/04/tracking_vehicle.html

It's a radio system folks, so for a moment consider the system Antivirus needs and those who have already demonstrated defcon hacks - can they shut you down? Check this link out - Hacker receiving and decoding information...

<https://www.youtube.com/watch?v=bKqiq2Y43Wg> 30 minutes of seminar - using a SDR
<https://www.youtube.com/watch?v=TDYoo7TGNcw> 11 minutes - packet sniffing

I hope you feel safer and better informed... Oh, and you better be setting aside some TPMS maintenance fund money for new microwatt transceivers as well. I know... Maybe we could organize a special QSL for road trips - "Confirmed All Interstates" or "Confirmed 100 Different Vehicles" awards. Automated GPS equipped receivers could systematically upload TPMS SWL reports to "LogBook of the Road" (LTOR).

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That wraps it up for this month. Have FUN with radio!
After all, if it is not FUN, why do it?

Keep in Mind Our Weekly Nets and Bulletins

Monday 8 p.m. The Two Meter Net 147.765 - 147.165 MHz Hosted by Doris Haskell WB9VDT

Tuesday 7 p.m. 6-meter Roundtable 50.200 MHz USB followed at 8 p.m. with the 10 Meter Roundtable 28.365 MHz USB

Send us your articles AND PICTURES! We do much more in the digital format! I would like to have pictures of BARS members and their ham shacks!

**Remember to check out the BARS website:
brandonhamradio.org**