March 11, 2015 Meeting

The March 11, 2015 Waterloo Technical Society (WTS) meeting was called to order by President Gary Dorhout at 7:30 pm.

A total of 21 were in attendance. There were 9 Institute of Electrical and Electronics Engineers (IEEE) Electromagnetic Compatibility (EMC)-S members attending in this joint session. Treasurer Ken Friend reported a previous balance of $1,009.08. There were receipts of $0.00 interest and $20 in membership dues. Expenses were $15 for the February guest speaker's meal. The ending balance was $1,014.08. Ken reported 11 honorary and 43 paid members for a total of 54 members.

Old Business. No old business was discussed..

New Business. No new business was presented.

Phil Berger introduced our guest speaker, Mr. Jim Blaha. Mr. Blaha is currently the Strategic Accounts Manager for National Technical Systems (NTS) in Rockford, Illinois which does Electromagnetic Compatibility testing for manufacturers. NTS is known worldwide as an industry leading provider of Electromagnetic Compatibility engineering and compliance services. He is currently the IEEE Milwaukee Section EMC chapter Chair and has been the IEEE Milwaukee section Chairperson in 2004, 2013 and 2014. He helped develop the EMC lab at NTS (formerly Ingenium Testing) into an accredited lab meeting MIL STD 461. Jim spoke about regulatory standards/markings concerning Electromagnetic Compatibility of products with electronics as part of their makeup. This presentation is an overview of Regulatory markings we see on Information Technology Equipment (ITE) and Industrial, Scientific and Medical (ISM) products as well as on Barbie Dolls and Motor Drives verifying that they meet Electromagnetic Compatibility regulatory requirements.

History. IEEE Milwaukee, WI was founded in 1910 and currently has 1,250 members. It has members from three major universities. IEEE is the oldest engineering organization with 450,000 members world-wide. Region 4 is in the Midwest, there are regions in the U.S. and Canada; 10 globally. Approximately 250,000 members reside in the U.S. with about the same number elsewhere around the globe. Sections are divided nationally in Europe. IEEE creates standards, IEEE 802.11, for instance, is the standard for Wireless Fidelity (WiFi). There are also standards for medical products.

Regulation Requirements: What and Who Cares? National Technical Services began issuing standards for compatibility and safe operation of appliances. Hamilton Sundstrand 787 standard expanded this to the whole electrical grid. A basic rule of thumb for device designers is "Design for regulations, then design for the application."

There are seven phases in the creation of a product from an idea. Consider Design for Regulation in the concept development phase. Manufacturers use the certification process to assure customers of the quality of their product. After a product has passed the certification tests of a particular standards authority, the manufacturer is allowed to label it with a distinguishing mark as proof the product was tested and rated by the standards authority. For instance, when a product has received UL certification, it can carry the Mark, which is a symbol consumer's look for when determining the quality of a product. In the case of operating system certifications, the software companies authorize makers of compatible hardware to label the hardware with special logos that

indicate the hardware is certified to run with their operating systems. Consumers rely heavily on certifications to determine the quality of products, and, therefore, personal computer hardware manufacturers are willing to invest millions of dollars in the process of having their products certified by the world's major product safety authorities and operating system companies All computers have regulation compliance symbols. Typical symbols are shown in Figure 1.



Figure 1. Typical compliance symbols for ITE devices such as computers.

The Chicago fire of 1871 sparked the creation of the non-flammable insulation standard on electrical wires. In 1893 the Chicago World's Exhibition was the first lighting of a major venue with electricity. In 1904 the St. Louis World's Exhibition saw the development of vocabulary, standard paper symbols and ratings of power consumption by electrical devices. In 1906 the International Electrotechnical Commission (IEC) was founded in London and covered products consumed by 80% of the world's population. In 1918 the American National Standards Institute (ANSI) was founded in Washington, D.C. The ISO, iso being a universal term for "equal", standards was founded in Geneva, Switzerland with 158 countries pledging to live by their standards.

The IEC in 1934 formed Comité International Spécial des Perturbations Radioélectriques (International Special Committee on Radio Interference) thus ensuring that 2.4 GHz was the same globally, for instance. In 1973 the EMC sub-committee was formed. This was necessary when vacuum tubes were commonly replaced with solid state circuits and interference from radiated electrical fields would interfere with other solid state appliances. Electromagnetic Interference (EMI) is environmental pollution that affects appliance behavior in an undesired manner. Each country regulates transmission frequencies. All countries use the same bands for radio. For instance, transmitters to open your garage door must turn off after 10 seconds and operate at 319 MHz in the U.S. The requirement is not the same in Great Britain.

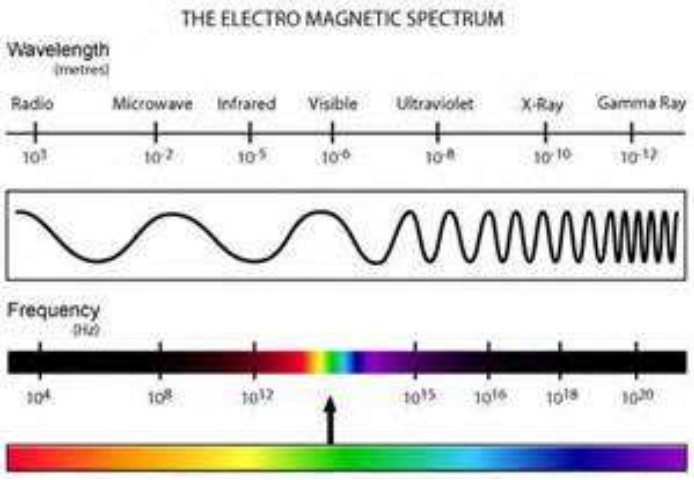


Figure 2. Electromagnetic spectrum. 1 GHz = 10^9 Hz.

All U.S. produced cell phones operate at 1.9 GHz, Bluetooth devices use 2.400-2.483 GHz in the U.S. Microwave ovens are the most well-known EMI devices due to their interference with heart pacemakers. View this YouTube video to see a demonstration of EMI with medical devices https://www.youtube.com/watch?v=kRBvOsKO5vw. As the frequency increases from infrared, to visible, ultraviolet, X-ray and gamma rays the propagation becomes more and more directional. All signal frequencies from 9 KHz to 40 GHz radiate. Microwaves at 2.4 GHz are very directional.

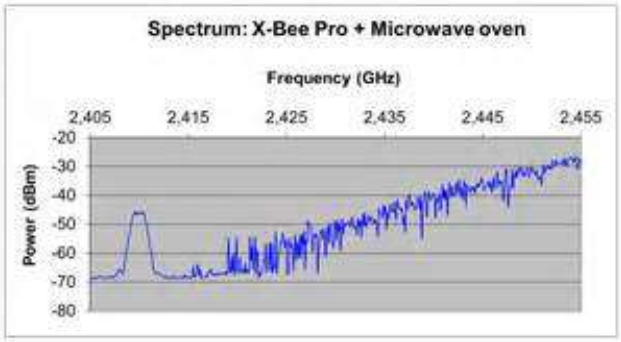


Figure 3. Microwave oven power at frequencies from 2.400 to 2.455 GHz.

The sun is a major generator of EMI. In 1967 a Zuni rocket fired due to EMI and sank the USS Forrestal. In 1968 Mil-Std-461F was issued to prevent this in the future. Recently, the Toyota Motor Company was involved in run-away vehicles disasters. Dr. Todd Hubing researched the possibility of EMI causing this. See his YouTube video at https://www.youtube.com/watch?v=ljR106eghAc%20.

In the U.S. there are laws regulating organizations and personal conduct. The U.S. Code system also contain Telecommunication laws:

- U.S. Code Section 3 Presidential Laws
- U.S. Code Section 26 Internal Revenue Laws
- U.S. Code Section 47 Telecommunications Laws
  - Part 15 Radio Frequency Devices

- Part 18 Medical and Scientific Devices
- Part 22 Mobile and Portable Radios, FC symbol on device
  - Mobile is greater than 20 cm from body to device
  - Portable is less than 20 cm from body to device
- Part 90 License by Latitude and Longitude to operate at a selected frequency
- Part 95 Personal radio service

Symbols commonly displayed on electronic devices around the world are described here:

- Industry Canada, IC symbol on device.
- European directives are to "harmonize" within the European Union, CE symbol on device. The Declaration of Confidence (DOC) accompanying these standards list test conditions for People, Animals and Environment that must be passed in order to display the symbol on the appliance. The CE symbol can be for physical, chemical and electrical properties.
- **REACH** (**R**egistration, **E**valuation, **A**uthorization and **R**estrictions of **Ch**emicals) is a large volume of tests, 890+ pages, detailing the requirements and tests required to display the compliance symbol.
- Australia uses the European symbol, CE.
- China requires all tests must be conducted in China and then authorizes the CCC symbol. Certification is compulsory in China.
- United States uses Underwriters Laboratories, UL, and FC symbols to show device is compliant and safe.

Proper certifications must be complied with or product may be banned from sale in the certifying country. Mr. Blaha believes that 20% of devices are not compliant although they bear the compliance symbol.

In some cases, rather than label products, web sites are referenced to indicate compliance. DP-160 for all military aircraft is such a standard. SAE-J1113 for all cars is another with company specific standards appended. In 1905 the first compliance standards were written for automobiles in the U.S.A.

Next Meeting. The April 8, 2015 will host Dr. James Kenyon who will talk about his experience as one of four veterinarians looking after the health of sled dogs during the trans-Alaska Iditarod race.

Meeting Adjourned. President Dorhout accepted a motion for adjournment at 9:15 pm.

Respectfully submitted,

James R. Stevenson