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# NEWS

## Wave Modulation (WAM)

### A New Modulation Method. Really?

Feb. 3, 2014 by Lou Frenzel in *Communiqué*  
Introducing a new modulation method.

New modulation schemes don't come along very often. In fact, it has been years...decades really.... since any new modulation method has been invented. Remember there are only three basic ways a carrier can be modulated: by varying the amplitude, frequency or phase. Or some combination of those. Most of the useful combinations have already been discovered and either ignored or adopted.

Whether you know it or not, the most popular modulation scheme in use in the wireless world today is QAM or quadrature amplitude modulation. It is a combination of both amplitude and phase modulation. Digital bit sequences are represented as unique amplitude-phase variants of the carrier. For example, 64QAM uses 64 different amplitude-phase combinations to represent any 6-bit combination. QAM is used everywhere because it is very spectrally efficient meaning that it can transmit more bits per Hz of bandwidth than almost any other modulation method. It is used in HSPA and LTE OFDM cellular systems, Wi-Fi, cable TV, DSL modems and a wide range of microwave backhaul, and satellite systems. It is hard to beat QAM despite the fact that it needs a better than average signal to noise ratio and linear power amplifiers for reliable communications.

Anyway, along comes a new company MagnaCom with a new modulation method called Wave Modulation (WAM). You won't find it any textbook and the company won't reveal any details on how it works. MagnaCom's goal is to challenge the dominance of QAM and ultimately replace it with WAM. The company claims that it fully backwards compatible with QAM systems and does not require changing antennas or radio circuitry. WAM is a purely digital modulation method that uses the same analog and RF circuits as QAM.

Even after a long briefing with the company, I still don't know how it works. One explanation said that I should view it as a multidimensional QAM. Here is what MagnaCom's release said about WAM: "WAM technology is a pure digital new modulation scheme, using spectral compression that improves spectral efficiency. The spectral compression enables an increase in the signaling rate thereby affording the use of lower order alphabet, which reduces complexity. It provides inherent diversity of time and frequency domains and uses nonlinear signal shaping. The nonlinearities are handled digitally at the receiver side allowing a lower-cost and lower-power transmitter."

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The discussion continues: "WAM is a multi-dimensional signal construction operating in the Euclidean domain. WAM is breaking the orthogonality of signal construction (zero ISI in a single carrier/zero ICI in OFDM) shown for the first time to increase capacity and provide an optimal handling of nonlinear distortion, ultimately resulting in significant improvements versus today's legacy QAM systems..."

That does not exactly explain it for me. I keep wondering what a WAM signal looks like on a spectrum analyzer. Can a constellation diagram be shown like with QAM? In any case, I am sure that MagnaCom is just protecting its IP. No doubt the whole thing takes place in a DSP or FPGA with some unique algorithms. I would love to include mention in the 4<sup>th</sup> edition of my college textbook *Principles of Electronic Communications Systems* (McGraw Hill) as I am updating it. But frankly I do not know what to say.

Despite the discomfort of not really knowing how WAM works, I am amazed at MagnaCom claims of amazing benefits. These include, up to 10 dB system gain advantage, up to 50% lower power, up to 400% greater distance, up to 50% spectrum savings, better noise tolerance, major increase in speed, lower cost and easier design, and 100% backward compatibility. Wow!

If these claims are real, MagnaCom will have a real success on their hands. The above listed advantages are really needed and wanted especially in the wireless world that never has enough speed or bandwidth. It will be interesting to see who adopts this, who makes chips and so on. I wish MagnaCom great success.

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EL PASO, TX CHAPTER 38 MEETING MINUTE  
DATE 02/11/2014 LOCATION: **CLEARCHANNEL STUDIO.**

**MEETING CALLED TO ORDER:** 18:49 PM, BY ANTONIO CASTRO,  
THERE WERE 8 MEMBERS

**REPORT OF THE SECRETARY:** MINUTES ACCEPTED BY NORBERT  
MILES, 2nd BY DAVID HALPERING.

**REPORT OF THE TREASURER:** CURRENT BALANCE OF \$ 5833.07.  
ACCEPTED BY RICHARD VILARDELL, 2nd BY NORBERT MILES.

**REPORT OF THE CERTIFICATION COMMITTEE:** NO REPORT.

**REPORT OF THE MEMBERSHIP COMMITTEE:** INVOICES FOR CHAPTER MEMBERS PRINTED AND SOME DELIVERED ON HAND. ALSO INVOICES FOR SUSTAINING MEMBERS PRINTED, READY TO GO INTO THE MAIL OFFICE.

**REPORT OF THE FREQUENCY COORDINATOR COMMITTEE:**  
NO REPORT

**REPORT OF THE SCHOLARSHIP COMMITTEE:** BRAD DUBOW, G.M. FOR KALQ PROPOSED THE "RON HANEY SCHOLARSHIP FOUND", DISCUSSED IN THE GROUP. DAVID HALPERING WILL INFORM HIM.

**REPORT OF THE WEBSITE COMMITTEE:** 1533 HITS LAST REPORT, NOW 1567 (14 MORE FROM LAST MONTH). WEB MASTER NORBERT MILES INFORMED OF THE INCLUSION OF A NICE "VIDEO" ABOUT OUR CHAPTER.

**REPORT OF THE EAS CHAIRMAN :** FORWARDED BOTH TEXAS AND NEW MEXICO. WILL KEEP MONITORING.

**REPORT OF THE PROGRAM COMMITTEE:** PROPOSED A VISIT TO EL PASO ELECTRIC. CALLED AND LEFT MESSAGE. NORBERT MILES WILL BRING A PRESENTATION ON STREAMING RADIO.

**UNFINISHED BUSINESS:** NONE

**NEW BUSINESS OR ANY ITEMS FOR THE CHAPTER INTERES:** OFFICIALS WERE RE-ELECTED FOR ANOTHER ONE YEAR TERM.. ENNES WORKSHOP ON OUR NEAR FUTURE, PREPARATION ON IT'S WAY..

**NEXT MEETING DATE AND LOCATION:** TUESDAY MARCH 11, 2014., 6 PM. CLEAR CHANNEL STUDIOS.

**MEETING ADJOURNED:** AT 19:35 PM.

NOTE from the treasurer: invoices were sent for both regular chapter members and Sustaining memberships. Remember that the chapter is sponsoring the 2014 El Paso ENNES Workshop expenditures. Your contribution is gladly expected.



# MARCH PROGRAM

## ANDREW LUNA

WAS THE PRESENTER FOR THE MONTH OF FEBRUARY. VERY INTERESTING CONCEPTS HE DEMONSTRATED  
THANK YOU ANDREW.

## NORBERT MILES (KTEP)

IS GOING TO BRING TO THE TABLE THE "KNOW HOW" OF HIS INTERNET RADIO TOY AND WILL SHOW A VERY NICE PIECE OF VIDEO FOR THE SBE CH-38 WEBSITE.

THE INVITATION IS FOR:

TUESDAY MARCH 11, 2014  
@ 6:00 PM SHARP.

WHERE: **CLEAR CHANNEL STUDIOS**

