

Papers and Patents Relating to Ultra Narrow Band Modulation:

- 1) H.R. Walker, " Facts About High Speed SCA Data Transmission", Proceedings of the 1988 Broadcast Engineering Conference, Society of Broadcast Engineers, Denver Col.1988.
- 2) H.R. Walker, "Digital Audio for Links and Subcarriers" 43 rd Annual Broadcast Engineering Proceedings, National Association of Broadcasters, April 28, 1989, Las Vegas, Nev.
3. H.R. Walker, " Field Experience With VPSK Digital STL " Proceedings of the Broadcast Engineering Conference 1992 " Society of Broadcast Engineers , pp 66-73.
- 4) H.R. Walker, " Digital Modulation using Single Sideband FM with VPSK Encoding Reduces Bandwidth 10/1" Proceedings R.F. Expo East, Baltimore, Md. Aug. 21, 1995
- 5) B. Stryzak and H.R. Walker " Improve Data Transmission Using Single Sideband FM with Suppressed Carrier", R.F. & Microwaves Magazine, Nov. 1994 (Wireless Systems Designs Supplement)
- 6) B.Stryzak and H.R. Walker, " Digital Cordless Telephone Provides WLAN/ Telephone/ Video phone Service", Fourth Wireless Symposium, Santa Clara Cal., Feb. 1996. ( Describes a Cordless Phone for 46/47 MHz that can handle Videophone traffic at 320 Kb/s -15 bits/sec/Hz compression).
- 7) H.R. Walker, " The Advantages of VPSK Modulation", Transactions -IEEE Wescon, Communications Technology, Part 1., San Francisco, Cal., Nov. 1995.
- 8) B.Stryzak and H.R. Walker, " U-PCS Band Wireless PBX / LAN is Multimedia Ready" Fourth Wireless Symposium, Santa Clara Cal., Feb. 1996. ( Using VPSK for Wireless LANs ).
- 9) H.R. Walker, " A Summary of Digital Modulation Techniques". Wireless Technology Conference and Exposition, Providence R.I. Oct. 7, 1996.
- 10) B. Stryzak, "Digital Data Transmission at 15 Bits/Sec/Hz" Wireless Technology Conference and Exposition, Providence R.I. Oct. 7, 1996.
- 11) H.R. Walker, "VPSK Modulation Transmits Digital Audio at 15 Bits/Sec/Hz". Microwaves and RF Magazine, Wireless Design Supplement. Dec. 1996.
- 12) B. Stryzak and H.R. Walker, " VPSK Modulation on FM Subcarriers", Wireless Symposium, Santa Clara Cal. Feb. 1997.

- 13) H. R. Walker, " High Data Rate Power Line Modem" Wireless Symposium, Santa Clara Cal. Feb. 1997. New Modem using VMSK modulation.
- 14) H.R. Walker, " VPSK and VMSK Modulation Transmit Digital Audio and Video at 15 Bits/Sec./Hz." IEEE Transactions on Broadcast Engineering, March 1997.
- 15) H.R. Walker, " VPSK Modulation, A Tutorial", Conference Proceedings, RF Expo West, San Diego, Cal. Jan 29, 1995
- 16) H.R. Walker, " Digital Cordless Telephone Provides WLAN/ Telephone/ Video phone Service", Applied Microwaves and RF Magazine, Jan./Feb. 1997. ( Describes a Cordless Phone for 46/47 MHz that can handle Videophone traffic at 320 Kb/s -15 bits/sec/Hz compression- using VPSK modulation). Can now do 1.544 Mb/s using VMSK/2.
- 17) H.R. Walker, "Comparison of FM vs VPSK Modulation in RPU Service", IEEE 44 th Annual Broadcast Symposium. IEEE Broadcast Technology Society. Wash. D.C., 1994
- 18) H.R. Walker, "Encyclopedia of Electrical and Electronics Engineering" John Wiley, NYC.  
Section Author on "Intermediate Frequency Amplifiers". Vol. 11. Edited by Prof. John Webster, U. of Wisconsin.
- 19) H.R. Walker. , "Encyclopedia of Electrical and Electronics Engineering" John Wiley, NYC.  
Section Author on "Modulation Analysis". Vol. 13.
- 20) H.R. Walker, "VMSK, A New Modulation Concept", Wireless Technology Conference, Chantilly, Va. Oct. 7, 1997.
- 21) H.R. Walker, "VMSK, A New Modulation Method", Wireless Symposium, East, Burlington, Mass. Sept 15, 1997.
- 22) H.R. Walker, " Universal Equation Analyzes All Modulation Methods, Applied Microwaves and RF. July/Aug. 1997. This paper also appears as -- "Modulation Analysis", H.R. Walker, "Encyclopedia of Electrical and Electronics Engineering", John Wiley, NYC, Vol. 13.
- 23) J. Pliatsikas, C. Koukourlis, J. Sahalos and H.R. Walker, " VMSK Modulation BOOSTS Wireless Communications Efficiencies", Wireless Systems Design Magazine, Jan 1998.**
- 24) H.R. Walker, B.Stryzak, and Mildred Walker, "VMSK Modulation, A Tutorial. Wireless Symposium, Santa Clara Ca. Feb. 12, 1998
- 25) H.R. Walker, " Attain High Bandwidth Efficiency Using VMSK Modulation",

Microwaves and RF Magazine, Dec. 1997.

**26) Dr. C.S. Koukourlis, J.C. Pliatsikas, Dr. J.N. Sahalos and H.R. Walker, " Spectrally Efficient Biphase modulation." Applied Microwave and Wireless Magazine. May 1998.**

**27) J.C. Pliatsikas, C.S. Koukourlis, J.N. Sahalos, H.R. Walker, "Digital Implementation of Alternate Aperture Phase Shift Keying Modulation (AAPSK)", Proceeding ICT 98, Chalkidiki Greece, June 1998. ( Different name for VMSK ).**

**28) H.R. Walker, Dr. J. Pliatsikas, Dr. C Koukourlis and Dr. J. Sahalos, "Wireless Communications Using Spectrally Efficient VMSK/2 Modulation" In " Third Generation Mobile Telecommunication Systems" Springer Verlag, Berlin, Edited by Dr. P. Stavroulakis.**

29) H.R. Walker, "Encyclopedia of Microwave and Electronic Engineering John Wiley, NYC. Section Author on Intermediate Frequency [Amplifiers](#). Edited by Prof. Kai Chang, Texas A&M.

30) H.R. Walker, " Understanding Ultra Narrow Band Modulation", Microwaves and RF Magazine, Dec. 2003.

31) H.R. Walker, "MSB Modulation Doubles Cable TV and FM-SCA Capacity" IEEE CCNC2004, Las Vegas NV. Jan 2004.

32) H.R. Walker, "Ultra Narrow band Modulation", Wireless Systems Design Conference, San Diego CA, March 8, 2004.

33) H.R. Walker, " Ultra Narrow Band Modulation" , IEEE Sarnoff Symposium, Princeton NJ, April 26, 2004.

34) H.R. Walker, "Ultra Narrow Band Modulation". International Conference on Computing, Communications and Control Technologies, CCCT2004.

35) Bohdan Stryzak, "Comparing Ultra Wideband and Ultra Narrow Band Modulation", Wireless Systems Design Conference, San Diego CA, March 8, 2004.

36) H.R. Walker and Bohdan Stryzak, "Comparing Ultra Wideband and Ultra Narrow Band Modulation" ". International Conference on Computing, Communications and Control Technologies, CCCT2004. Austin Tx.

37) Wang Jianqing, Yu Xiaoyan, Si Hongwei, Wu Lenan, " Performance Evaluation of LDPC Coded VWDK Modulations" International Conference on Computing, Communications and Control Technologies, CCCT2004.

38) Wang Jianqing, Si Hongwei, Wu Lenan, Li Xiaoping, " Optimization of VWDK PSD and its Performance". International Conference on Computing, Communications and Control Technologies, CCCT2004. Austin Tx.

39) Li Xiaoping, Si Hongwei, Wu Lenan, “ On Spectrum Structure and Optimization of VWDK Modulated Waveforms”. International Conference on Computing, Communications and Control Technologies, CCCT2004. Austin Tx.

40) Wm. C.Y. Lee, “Lee’s Essentials of Wireless Communications”, McGraw Hill 2001.

41) K. H. Saywood and Lenan Wu, "Raise Bandwidth Efficiency With Sine-Wave-Modulation VMSK". Microwaves and RF Magazine, April 2001.

42) Li Xiaoping and Wu Lenan, “Power Spectra Analysis for a standard sine-like VMSK modulation”, Chinese Journal of Radio Science, Dec. 2003.

43) Ki Xiaoping and Lenan Wu, “ On Orthogonality of Sine-Like VMSK Modulations”, Journal of Circuits and Systems, ( Chinese ).

44) J.S. Lin, K. Feher, “Ultra High Spectral efficiency Feher Keying (FK): Computer Aided Design and Hardware Development”, European Test and Telemetry Conference 2001, Marseilles France June 2001.

45) J.S. Lin, K. Feher, “Test and Evaluation of Ultra High Spectral efficiency Feher Keying (FK),” Proceedings of International Telemetry Conference”, Las Vegas NV, Oct 2001.

46) P. Vanchev, C.H. Chen, “ System Performance of xGCM<sup>tm</sup>, available as download from [www.XGTECHNOLOGY.com](http://www.XGTECHNOLOGY.com)

47) Wu, Lenan and Li, Xiaoping, “ Extension of Channel Capacity Formula” International Conference on Computing, Communications and Control Technologies, CCCT2004. Austin Tx.

#### Applicable Patents:

[A] US 4,742,532, H.R. Walker, “ High Speed Data Communications System” ( 1 st VPSK Pat.

[B] US 5,185,765, H.R. Walker, “ High Speed Data Communications System” ( 2 nd VPSK Pat.)

[C] US 5,930,303, H.R. Walker, “Digital Modulation Employing Single Sideband With Suppressed Carrier”, covers VMSK and VMSK/2.

[D] US 6,445,737, H.R. Walker, “Pulse Position Phase Reversal Keying ( 3PRK )”, also called Missing Cycle Modulation ( MCM/3PRK ).

[E] US 6,748,022, H.R. Walker, “Single Sideband Suppressed Carrier Digital Communication Method and System.”

[F] US 6,775,324, Mohan, Riedl and Zhang, “Digital Signal Modulation System”, assigned to Thompson Licensing. ( Describes a method similar to ‘303 patent )

[G] US 6,198,777, K. Feher, "Ultra High Spectral Efficiency Feher Keying" ( FK ).

[H] Application: US 2002/0058484 A1, May 16 2002, J.A. Bobier and N. Khan. “Suppressed Cycle Based Carrier Modulation Using Amplitude Modulation”

03152978.X ( Chinese Pat. ) Wu Lenan et al, 'A Modulation Method for High Efficient Utilization of Frequency Bandwidth'. 2003.

#### Known Abandoned Methods:

4,742,532 “ High Speed Data Communications System” ( 1 st VPSK Pat.)

5,185,765 “ High Speed Data Communications System” ( 2 nd VPSK Pat.)

"Time-Shift Keying" (TSK), ISD Communications.