

About Signum Concepts

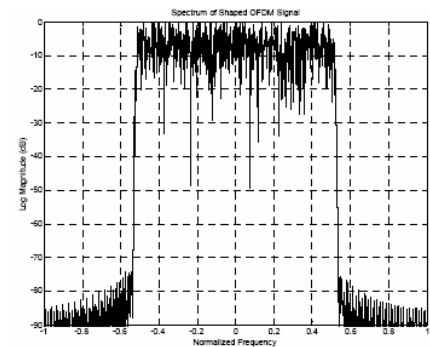
Signum Concepts, Inc. is an SBA-registered high-technology small business product and services firm, headquartered in San Diego, CA, that focuses on advanced, realtime DSP-based products and services for both commercial and government applications. Signum Concepts has extensive experience and expertise in developing Software-Defined Radio based prototypes and products and in conducting system design and analysis related to DSP Algorithms, Radar systems and terrestrial fixed and mobile, marine and satellite-based communication systems for voice, data and video.



Software-Defined Radio Development Platform Developed by Signum Concepts

Signum Concepts offers a range of services to customers and clients including Systems Design and Analysis, Waveform Design and Analysis, DSP Algorithm Development, Implementation Studies, Design-to-Cost Considerations, Board Design, FPGA Design, PCB and PCBA Design, Implementation, Bring-Up and Production, Embedded DSP Software Design, Digital Sub-System Integration, and RF Systems Integration on a firm-fixed-price and cost-plus basis.

Signum Concepts has a strong history in U.S. and worldwide DSP and SDR-related patents and the Signum Concepts staff can be instrumental in helping customers develop its own IP base for competitive advantages and/or market protection. Patents developed by Signum Concepts personnel include the following:



Spectrum of Shaped OFDM Waveform Developed by Signum Concepts

- U.S. Patent No. 5325318, Variable Rate Digital Filter, 1993
- U.S. Patent No. 5504785, Digital Receiver for Variable Symbol Rate Communications, 1996
- U.S. Patent No. 4995006, Apparatus and Method for Low-Pass Equivalent Processing, 1988
- U.S. Patent No. 5736950, Sigma Delta Modulator with Tunable Signal Band Pass, 1998
- U.S. Patent No. 5757867, Digital Mixing to Baseband Decimating Filter, 1998
- U.S. Patent No. 5760722, Distributed Quantization Noise Transmission Zeros in Cascade Sigma-Delta Modulators, 1998
- U.S. Patent Pending, Time Recovery with Linear Phase Recursive Filters, 2001
- U.S. Patent Pending, Resampling Digital Filter Structure for Demodulator 3G Wireless Signals, 2001
- U.S. Patent Pending, Resampling Digital IIR Filter Structure for Demodulating 3G Wireless Signals, 2001
- U.S. Patent, System and Method for Non-Disruptively Embedding an OFDM Modulated Data Signal into a Composite Video Signal
- U.S. Patent Pending, High-Speed FFT ASIC Architecture, 1999
- U.S. Patent Pending, Band Edge Filter for Timing and Carrier Synchronization, 1999

The Signum Concepts team has widely recognized expertise with critical tools used in DSP and SDR-based system design, development and analysis. Signum Concepts develops Xilinx and Altera FPGA cores and is a Texas Instruments 3rd Party supplier. The Company also has a solid track record of success in analyzing and troubleshooting existing DSP and communications systems.

Tools Frequently Used

- Xilinx ISE Logic Design
 - Xilinx System Generator
 - Xilinx Embedded Design
 - ModelSim HDL Simulation
 - Synplify FPGA Synthesis
 - MathWorks MATLAB
- MathWorks SIMULINK
 - Nallatech FPGA Development Platforms
 - GVA FPGA Development Platforms
 - ORCAD Schematic/Layout
 - PCAD Schematic Capture
- Altera Quartus II
 - Altera DSP Builder
 - TI C5000/C6000 Development Platforms
 - TI C5416/C6711 DSK Development Platforms



Recent Projects

Customer & Date	Projects	Key Tasks	Key Tasks
Company Private 2006/2007	Development of OFDM-based product for wireless applications	<ul style="list-style-type: none"> • System/Modem Design • Implementation Trade Studies • Modeling and Simulation • Prototype Design 	<ul style="list-style-type: none"> • Firmware Development • Integration and Test • Support Demonstrations • Commercialization
Company Private 2006/2007	Development of a DSP-based Spectral Analyzer for Surveillance Applications	<ul style="list-style-type: none"> • Reverse Engineering of Legacy Design • Spectrum Analyzer Design • Board Design and Layout 	<ul style="list-style-type: none"> • Modeling and Simulation • Firmware Development • Integration and Test • Support Demonstration
Internal 2006/2007	Design of a FPGA-based Software-Defined Radio development platform based on 3 Giga-Sample per Second A/D technology	<ul style="list-style-type: none"> • System Design • Board Design • Board Layout 	<ul style="list-style-type: none"> • Modeling and Simulation • Board Integration and Test • Firmware Development
Company Private 2006	Development of a high-performance, high bandwidth DSP-based Transceiver for Surveillance Applications	<ul style="list-style-type: none"> • Modem Design • Modeling and Simulation 	<ul style="list-style-type: none"> • RF Integration • Demonstration Support
Company Private 2006	Development of a DSP-based Channelized Transmitter for multi-channel broadcast audio service	<ul style="list-style-type: none"> • System/Transmitter Design • Reverse Engineering of Legacy Equipment • Modeling and Simulation • Prototype Board Design • Firmware Development 	<ul style="list-style-type: none"> • RF Integration and Test • Demonstration Support • Production Software Development for Low-Cost, High-Volume Product
Company Private 5005/2006	Development of a DSP-based Modem based on a novel bandwidth efficient modulation scheme	<ul style="list-style-type: none"> • System/Modem Design • Modeling and Simulation • Implementation Trade Studies • Prototype Board Design 	<ul style="list-style-type: none"> • System/RF Integration • Performance Characterization • Demonstration Support
Company Private 2005	Development of DSP-Based Channelized Receiver for Surface-Wave Radar Applications	<ul style="list-style-type: none"> • System/Modem Design • Modeling and Simulation • Implementation Trade Studies • Prototype Board Design 	<ul style="list-style-type: none"> • System/RF Integration • Performance Characterization • Production Design
Company Private 2005	Development of DSP-Based Communication System using Bandwidth Efficient Modulation Techniques	<ul style="list-style-type: none"> • System/Modem Design • Modeling and Simulation • Prototype Board Design • FPGA Development 	<ul style="list-style-type: none"> • System/RF Integration • Performance Characterization

Customer & Date	Projects	Key Tasks	Key Tasks
Company Private 2005	Development of DSP-Based, Multi-Channel Communication System using MIMO techniques	<ul style="list-style-type: none"> System/Modem Design Prototype Board Design FPGA Firmware Development 	<ul style="list-style-type: none"> Modeling and Simulation System/RF Integration Performance Characterization
Company Private 2005	Development of DSP-Based, Reconfigurable Surveillance Receiver	<ul style="list-style-type: none"> System/Modem Design FPGA Firmware Development RF/System Integration 	<ul style="list-style-type: none"> FPGA Development RF/System Integration Production Board Design
Confidential 2005	Development of a Software-Defined Radio prototype for multi-channel, high-speed data links for mobile applications	<ul style="list-style-type: none"> System/Modem Design Prototype Development Board Design 	<ul style="list-style-type: none"> DSP Software Development System Integration
Company Private 2004/2005	Development of UHF/VHF Mobile Communication System for Public Safety Applications	<ul style="list-style-type: none"> System/Modem Design System Design Specification DSP Software Development 	<ul style="list-style-type: none"> RF/Systems Integration Production Acceptance Testing
Company Private 2004/2005	Development of a Software-Defined Radio prototype video Unmanned Air Vehicle (UAV) video and control data links Video Data Rate: 11 Mbps Control Data Rate: 20 kbps	<ul style="list-style-type: none"> System Design Prototype Development Modeling and Simulation 	<ul style="list-style-type: none"> FPGA Development System Integration
Company Private 2004/2005	Development of a Software-Defined Radio prototype for a reconfigurable transceiver implemented for mobile land-mobile voice and data applications Data Rate: Variable,32-128 kbps Channel: Variable,25-50 KHz	<ul style="list-style-type: none"> System Design Prototype Development 	<ul style="list-style-type: none"> FPGA Development System Integration
Company Private 2004	Development of Wideband, Multi-Channel Detection System for Low CNR Waveforms	<ul style="list-style-type: none"> System Design Prototype Development 	<ul style="list-style-type: none"> FPGA Development System Integration
Company Private 2004	Development of "Channelized" Power Amplifier Pre-Distortion subsystem	<ul style="list-style-type: none"> Prototype Development FPGA Development 	<ul style="list-style-type: none"> System Integration
Company Private 2004	Development of a Software-Defined Radio prototype for a spectral detection system for next-generation cellular system	<ul style="list-style-type: none"> System Design Prototype Development 	<ul style="list-style-type: none"> FPGA Development System Integration
Company Private 2004	Development of a Software-Defined Radio prototype of a channelized receiver for next-generation cellular system Bandwidth: 20 MHz	<ul style="list-style-type: none"> System Design Prototype Development 	<ul style="list-style-type: none"> FPGA Development System Integration
Company Private 2004	Shaped Orthogonal Frequency Division Multiplexing (S-OFDM) burst modem prototype for a land-mobile application Data Rate -100 KBPS Channel Bandwidth – 25 KHz	<ul style="list-style-type: none"> System Design Waveform Design Carrier, Timing, and Synchronization 	<ul style="list-style-type: none"> Prototype Development FPGA Development RF System Integration
Company Private 2003	Development of a "Featureless" DSP-based MODEM	<ul style="list-style-type: none"> System Design Waveform Design 	<ul style="list-style-type: none"> Simulations
Cian 2003	Development of a DSP-based CI-OFDM-64 MODEM and 802.11a MODEM (OFDM-64) Data Rate - 72 MBPS Satellite and Terrestrial Channel PAPR Reduction Technique	<ul style="list-style-type: none"> System Design Simulations Carrier, Timing, and Synchronization 	<ul style="list-style-type: none"> Prototype Development FPGA Development System Integration
Telisar 2002	QAM-16 MODEM OFDM-16 MODEM Data Rate – 3-5 MBPS Embedded Video Application	<ul style="list-style-type: none"> System Design Waveform Design Carrier, Timing, and Synchronization 	<ul style="list-style-type: none"> Prototype Development FPGA Development RF System Integration Two Patents Submitted
Intel 2001	Wireless MODEM DS3/STS01	<ul style="list-style-type: none"> System Design Waveform Design 	<ul style="list-style-type: none"> Simulations Two Patents Submitted
Lucent Tech. 2001	Multi-Standard 3G MODEM	<ul style="list-style-type: none"> Algorithm Development 	<ul style="list-style-type: none"> Performance Simulations
Netro 2000	Wireless Adaptive Equalizer	<ul style="list-style-type: none"> Algorithm Development 	<ul style="list-style-type: none"> Performance Simulations
Anritsu 2000	High Resolution Spectrum Analyzer	<ul style="list-style-type: none"> System Design Modeling & Simulation 	<ul style="list-style-type: none"> Software Development FPGA Development
US Navy 2000	Proportional Bandwidth Spectrum Analyzer	<ul style="list-style-type: none"> System Design Algorithm Development 	<ul style="list-style-type: none"> Simulations
PowerWave Technologies 1999	Power Amplifier Pre-Distortion Subsystem	<ul style="list-style-type: none"> System Design Simulations 	<ul style="list-style-type: none"> Prototype Development
PoweWave Technologies 1999	Power Amplifier Pre-Distortion Subsystem	<ul style="list-style-type: none"> FPGA Development 	<ul style="list-style-type: none"> RF System Integration
TrueTime 1999	Multi-Standard IRIG Receiver	<ul style="list-style-type: none"> System Design Simulations 	<ul style="list-style-type: none"> FPGA Development

Company History

Founded in 1995 by Robert “Wade” Lowdermilk and DSP pioneer Dr. Fredric J. Harris, Signum Concepts was established to pursue the analysis and development of advanced capabilities in DSP-based communication systems. The company today has close ties with commercial and government communication industries, as well as the academic community. Headquartered in San Diego, CA, the company also maintains a technical staff of 12 engineers including 4 in the US and 8 in the EU. The Signum Concepts team is well known and often published in the DSP and SDR community. Important papers and topics presented by the Signum Concepts team include the following:

- Robust FPGA Implementation: Ultra-Wideband 1.6 GHz Channelizer, 2005, fred harris, Chris Dick, Benjamin Egg.
- Digital Receivers and Transmitters using Polyphase Filter Banks for Wireless Communications, 2003, Fredric harris, Chris Dick, Michael Rice
- Smart Radio using Multirate Filters to Process, Identify, and Reconfigure Itself to Receive and Demodulate Multi-Standard IRIG Signals, 2002, fred harris, Wade Lowdermilk, Dragan Vuletic
- On the Structure and Implementation of Algorithms for Carrier and Symbol Synchronization in Software-Defined Radios, 2000, fred harris, Chris Dick
- Band Edge Filtering for Carrier and Timing Recovery, 1999, fred harris
- Digital Signal Processing in Radio Receivers and Transmitters, 1998, fred harris
- I-Q Balancing Techniques for Broadband Receivers, 2005, fred harris, Sinjeet Parekh, Itzhak Gurantz
- The ABCs of Linear Block Codes, 2004, fred harris, Bernard Sklar
- Resolving and Correcting Gain and Phase Mismatch in Transmitters and Receivers for Wideband OFDM Systems, 2002, fred harris, Ron Porat
- A Fresh View of Digital Signal Processing for Software-Defined Radios: Part 1 and Part 2, 2002, fred harris
- FPGA QAM Demodulator Design, 2002, fred harris, Chris Dick
- Multirate Digital Filters for Symbol Timing Synchronization in Software-Defined Radios, 2001, fred harris, Michael Rice
- Synchronization in Software Radios: Carrier and Timing Recovery using FPGAs, 2000, fred harris, Chris Dick, Michael Rice
- Interference Mitigation in Orthogonal Frequency Division Multiplexing, 1996, fred harris, Wade Lowdermilk
- An Improved Square-Root Nyquist Shaping Filter for Software-Defined Radios, 2005, fred harris, Chris Dick
- Synthetic Instruments Extract Masked Signals, 2005, fred harris Wade Lowdermilk
- Flexibility, Performance and Implementation Advantages of Recursive, Linear and Non-Linear Phase, Polyphase Filters in Transmitters and Receivers, 2005, fred harris, Chris Dick
- Polyphase Filter Banks for Symbol Timing Synchronization in Sampled Data Receivers, 2002, fred harris, Michael Rice
- Maximum Likelihood Carrier Phase Synchronization in FPGA-Based Software-Defined Radios, 2001, fred harris, Chris Dick, Michael Rice
- FPGA Signal Processing Using Sigma-Delta Modulation, 2000, fred harris, Chris Dick
- Carrier Synchronization Techniques for DSP-Based Modems, 2000, fred harris
- OFDM Transmission with Receiver Windowing for Improved Interference Rejection, 2003, fred harris, Mikko Valkama

For More Information

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