Verasonics®

The leader in Research Ultrasound™

The Vantage 256™, 128™, 64 *LE*™, 64™ & 32 *LE*™ Systems

A Revolutionary Approach to Ultrasound System Architecture

Verasonics has developed a revolutionary ultrasound system architecture for phased arrays and conventional UT channels that provides researchers and developers a unique, flexible platform for ultrasound innovation across many applications. The Vantage Research Ultrasound Platform uses proprietary hardware and software technologies to provide direct access to raw acoustic data. These design features make the system extremely capable in NDE/NDT product and algorithm development, as well as geophysical and geotechnical, medical ultrasound R&D, and educational disciplines.

Unparalleled Flexibility and Speed

The Vantage System is designed to provide the researcher/developer with broad flexibility in defining each of the system's functional components, using a familiar and powerful software interface based on the MATLAB® programming environment. In fact, a single researcher can conceive, implement, and evaluate a new approach to nondestructive evaluation using the Vantage System. From integration of a custom transducer array to defining a new data acquisition scheme, or implementation of user-defined and real-time data analysis algorithms, the researcher can develop their own NDE system prototype and evaluate it under laboratory or test-floor conditions with unprecedented speed.

Verasonics' Unique Technology Advantages

The Vantage Systems are comprised of 3 fundamental components:

- The Vantage Data Acquisition system, with state-of-the-art hardware and unparalleled performance, available in several different configurations with optional features.
- The Host Controller purchased through Verasonics. This powerful computer is equipped with a PCI express adapter card, the MATLAB application, and other libraries and utilities pre-installed by Verasonics.
- The Verasonics data acquisition and processing software (SW) package, including application-level SW in MATLAB and compiled C, hardware abstraction layer and driver-level SW, installation and self-test utilities to verify full hardware system performance. Also included is an expanding suite of example application programs.

Together these provide:

- An open, software- based research ultrasound platform
- Data acquisition into local memory limited only by acoustic travel time: (max PRF available *over 100,000 frames/second).*
- Extremely rapid RF signal data transfer to host computer over PCI express.
- Highly parallelized software beamforming using proprietary Pixel Oriented Processing, ability to control polarity and the tone burst on each channel
- Fully programmable transmit beams: unlimited Focal Laws with 4 ns delay resolution
- Fully Dynamic Receive Focusing with 1/64th wavelength accuracy and unparalleled SNR
- Very high frame rate imaging using plane waves or other unfocussed transmit beams
- Programmable hardware triggers (both input and output) for synchronizing with external devices
- Familiar MATLAB scripting environment for development of custom user algorithms, graphical interfaces and real-time analysis and display
- Thoroughly documented, flexible and easy-to-use programming API
- Additional software tools to facilitate control script development, analysis, and debugging
- Rapid integration of custom transducers
- A large set of example control scripts (programs) for various transducers and applications, including plane wave imaging, conventional line mode imaging, nonlinear ultrasound using pulse inversion, coded excitation, and many others. These can be modified or replaced by the user to create novel algorithms
- Real-time system simulator for offline development and re-processing of previously acquired data.
- Compatibility with the University of Bristol's BRAIN software
  - Composite materials
  - Defect characterization
  - Irregular surfaces
  - 3D TFM using 2D arrays
- TFM and FMC, plus guided wave, ultrafast imaging and tomography capabilities.

Key System Specifications of the Vantage Plaform for Research in Materials Sciences and NDT/NDE

	LF Low Frequency	SF Standard Frequency	HF High Frequency
Transmitters			
Waveform	Tristate (per channel programmable)		
Time Resolution	4 ns (Pulse Width and Delay resolution)		
Pulse Width (min-max)	12 ns – 10 µs	12 ns – 700 ns	12 ns – 700 ns
Focal Delays (per ch)	0 - 45.5 µs (4 ns resolution)		
Frequency Band (MHz)	0.05 – 1.5	0.5 – 20	2 – 42
Voltage	2 to 190 V p-p		
Current (max per ch)	2 A (peak) / 0.4 A (rms)		
Transmit Options			
Arbitrary Waveform	Arbitrary Waveform (independent on each channel)		
Extended Transmit	Extended Transmit bursts (long, high energy pulses)		
Receivers			
Frequency Band (MHz)	0.050 – 1.5	0.5 – 27	1 – 50
Gain (fixed)	24 to 54 dB (6 dB steps)		
Gain (time varying)	0 to -40 dB		
Input Impedance (Ω)	50 – 3000	110 – 3000	110 – 3000
HP Filter (MHz)	0.010 – 0.200	0.050 – 0.250	1 – 20
LP Filter (MHz) (3rd order)	5, 10, 15, 20, 30	5, 10, 15, 20, 30	5, 10, 15, 20, 30, 35, 50
Noise Figure (dB)	1.5 - 3.0 (depending on gain and input impedance)		
Digitizers			
ADC Resolution	14 bits		
Sampling Rate (MHz)	10 – 62.5		
Interleaved Rate (MHz)	125		
Filters	23-Tap and 41-tap FIR filters		
Accumulator	Over 1000 acquisitions per channel, with offset subtraction		
Numerical Gain	-4.00 to +4.00 (for channel calibration)		
Memory (per channel)	64 MB (32 MSamples)		
Data Transfer Rate	6.6 GB/s (over 8 lanes PCIe 3.0)		
External Connectivity and Synchronization			
UTA Modules	**UTA 128 LEMO**: 128 single-channel LEMO (00) connectors		
	UTA 64 LEMO: 64 single-channel LEMO (00) connectors		
	UTA 160-DH/32 LEMO: 2 Hypertronics† 160-pin phased array connectors, plus 32 single-channel LEMO (00) connectors		
	UTA 160-SH/8 LEMO: single Hypertronics phased array connector and 8 single-element LEMO connectors		
	UTA 160-SI/8 LEMO: single I-PEX phased array connector and 8 single-element LEMO connectors. Avail. Q-4 2018		
	260-MUX: single 260-pin Cannon connector with multiplexer for phased array transducers with up to 128 elements		
Input Triggers	2 channels (BNC; LVCMOS; TTL compatible)		
Output Trigger	1 channel (BNC; LVCMOS; TTL compatible)		
Master Clock	250 MHz (HDMI connector)		
External Sync Module	Synchronize up to 2048 channels (± 2 ns accuracy)		
Computer			
Host Controller	Multi-core computer configured and provided with system purchase		
OS	Windows® operating system		
MATLAB® Programming	MATLAB® with Signal Processing Toolbox installed and configured (MATLAB® user license not included)		

The Vantage System is available in five models with several optional configurations:

	Vantage 32 *LE*™	Vantage 64™	Vantage 64 *LE*™	Vantage 128™	Vantage 256™
Channels					
	64 Tx / 32 Rx	64 Tx / 64 Rx	128 Tx / 64 Rx	128 Tx / 128 Rx	256 Tx / 256 Rx
Configurations					
Standard Frequency (0.5 MHz – 27 MHz)*	✔	✔	✔	✔	✔
High Frequency (1 MHz – 50 MHz)	N/A	N/A	✔	✔	✔
Low Frequency (50 kHz – 1.5 MHz)	✔	✔	✔	✔	✔
HIFU (External Power Supply)	N/A	N/A	✔	✔	✔
Licensable Options					
Extended Transmit	N/A	N/A	✔	✔	✔
Arbitrary Waveform	✔	✔	✔	✔	✔
Synchronization Triggers	✔	✔	✔	Included	Included
Image Reconstruction	✔	✔	Included	Included	Included

✔ = purchasable configuration or option. All Vantage systems can be reconfigured or upgraded to additional options.

* = higher receive frequencies possible with filter adjustment

Safety Certifications

- IEC 61010-1 3rd Edition (2010) and EN 61010-1:2010 3rd Edition
- UL 61010-1: 2012 and CAN/CSA-22.2 No. 61010-1-12

Power Requirements and Physical Dimension

- 100V-240V (50-60 Hz)
- Size (Data Acquisition System) L-49cm (+10cm clearance) W-28cm x H-48cm
- Size (Host Controller) L-42cm x W-18cm x H-47cm
- Total weight of all components: approx. 35-44 Kg depending on configuration

Notes:

*Transmit and Receive specifications represent the nominal range for fully specified operation. Operation outside those limits is possible with some reduction in performance.

†Labeled "Hypertac"; Hypertronics is now part of Smiths Connectors.

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