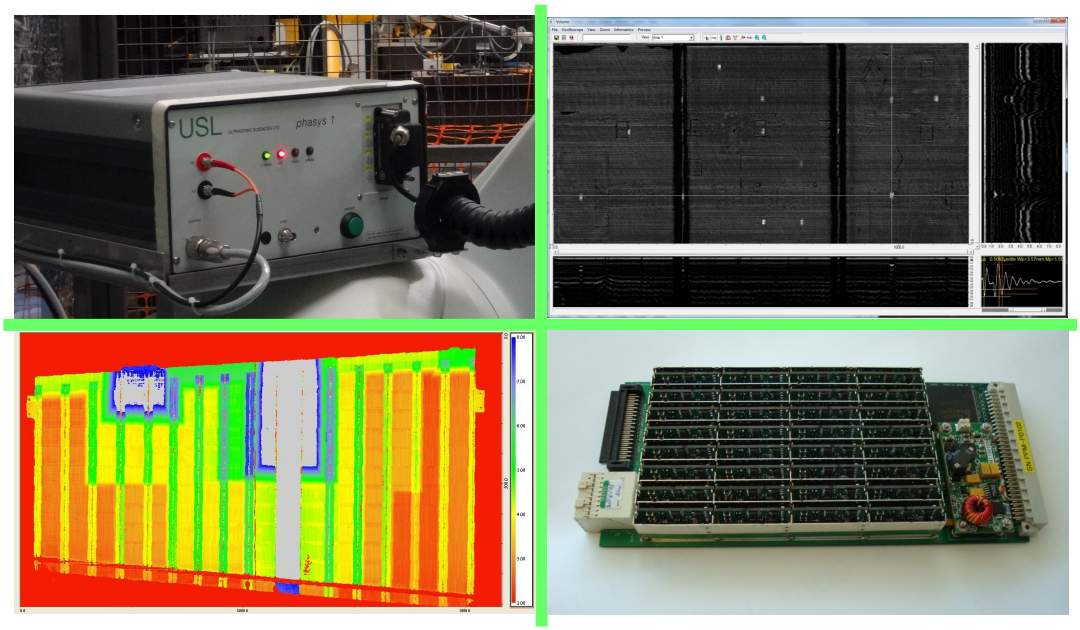
USL Ultrasonic Sciences Ltd

THE QUEEN'S AWARDS FOR ENTERPRISE: 2015

PHASYS phased array system



A new phased array unit for systems use from USL

Drives up to 128 element arrays with active elements in modules of 32

Designed specifically for use in automated high speed scanning systems

USL's conventional ultrasonic systems are in widespread use throughout the world, in applications which demand high sensitivity, exceptional signal to noise ratio and immunity to external noise. They are used in production applications working round the clock, where high reliability is taken for granted.

We have now extended our capability with a phased array electronics system—PHASYS. This means that we can provide the best solution with optimum performance for your application, from a choice of single channel, multiplexed multi channel and now phased array electronics. Furthermore we can incorporate all these choices in a single inspection system if required, so you can benefit from the particular advantages of each method.

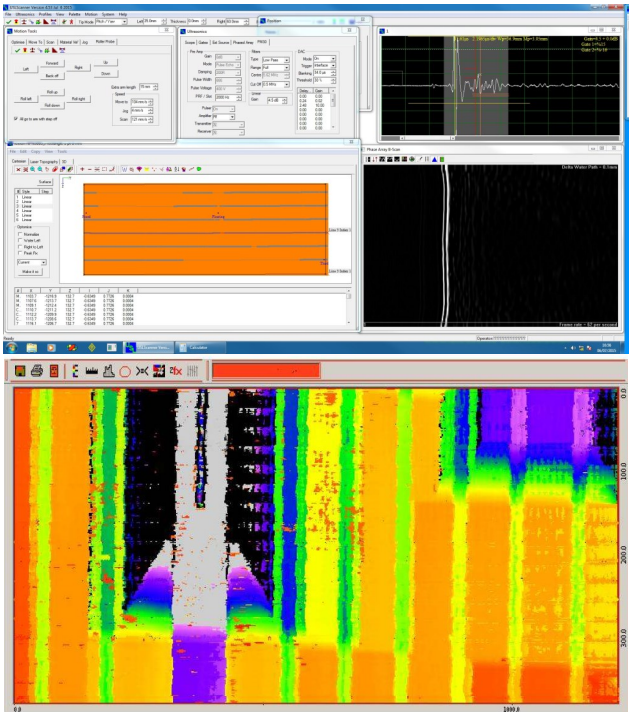
The PHASYS system is optimised for systems applications, such as high speed inspection of composite panels and metal plates. High material throughput is accomplished by the use of a wide array probe for electronic scanning in the "Y" direction, coupled with mechanical scanning in the "X" direction and a large Y index.

In its simplest configuration it is used with array probes of 32 elements, with 1 to 32 active. By adding extra 32 channel modules, arrays with up to 128 elements are used. If necessary all 128 elements can be active.

The inspection speed can be further enhanced by the optional ability to fire more than one group of elements in an array simultaneously, where the physics of the application allows it. Inspection of thin materials using relatively short water paths is one such example.

C scan inspection coverage of at least $1m^2$ minute can be achieved using a 1mm index in both X and Y directions. Whilst this may not be as high as that available from systems using multiplexed paintbrush probes, it gives better spatial resolution and defect sizing, with improved C scan imaging.

Software is integrated into standard USL suites, giving active B and C scan displays as shown below.



Specification

Format	19" rack mount (3U)
Power input	110/240V single phase

Features

Number of full aperture channels	1 to 128
No of active elements	1 to 128
Beam steering	No
Dynamic focussing	Yes
Linear scanning	Yes, with active aperture of 1 to 32 elements

Pulser

Pulse type	Negative square wave
Pulse width	12 nsec to 250nsec
Pulse amplitude	250V variable
Rise/fall time	5 nsecs typical
Output impedance	10 ohms max
PRF	20kHz
Correction	Individual element sensitivity correction

Receiver

Type	Linear and log
Input impedance	50/200 ohms
Gain range	100dB total
DAC range	60dB max (at min gain)
Bandwidth	30MHz
Filters – Band pass	0.2 – 2 MHz 1 – 4 MHz 2 – 8 MHz 4 – 15 MHz 8 – 32MHz in Narrow and Wide band ranges. Centre frequency programmable in 60 steps.
Low pass	15, 10, 5, 3.5 MHz
Input noise	2.7nV/üHz
Crosstalk	-50dB at 17MHz

Digitiser

Sampling rate	250MHz typical
A/D resolution	8 bit or 14 bit (late 2015)

Software

The control software is built into standard USL suites for scanning systems, with the operator setting up functions such as number of transmit and receive elements, focussing depth range and indexing increments. The displays during scanning include A scan, active B scan for the electronic scan and continuous C scan imaging during mechanical scanning of the array, using multiple amplitude and time gates.

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