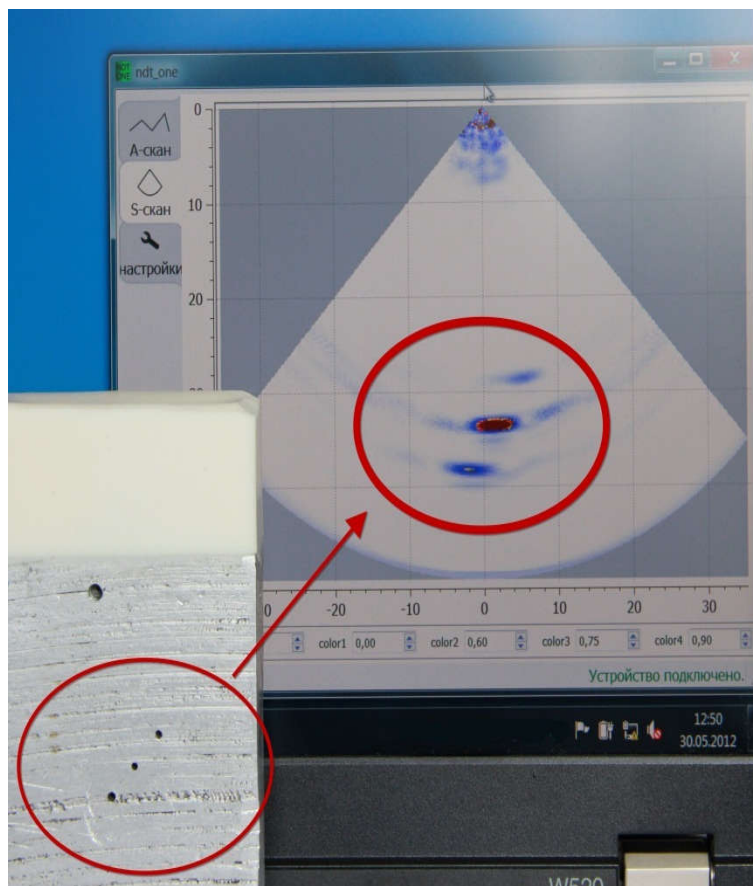




Southern federal University  
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SMART DISTRIBUTED NONDESTRUCTIVE TESTING SYSTEM WITH  
ULTRASONIC ANTENNA ARRAY



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Smart distributed nondestructive testing system with ultrasonic antenna array – SNTS) is a unique tool for ultrasonic nondestructive testing of distributed technically complex objects (CO), which has no analogues in the world. SNTS performs continuous monitoring of the technical condition of the responsible CO nodes.

ULTRASONIC control is implemented both with the help of "traditional" combined converters, and with the help of ULTRASONIC phased antenna arrays of its own design.

The SNTS consists of an Ethernet network of monitoring Points and measuring ADC modules connected to ULTRASONIC transducers attached directly to the responsible nodes of the CO.

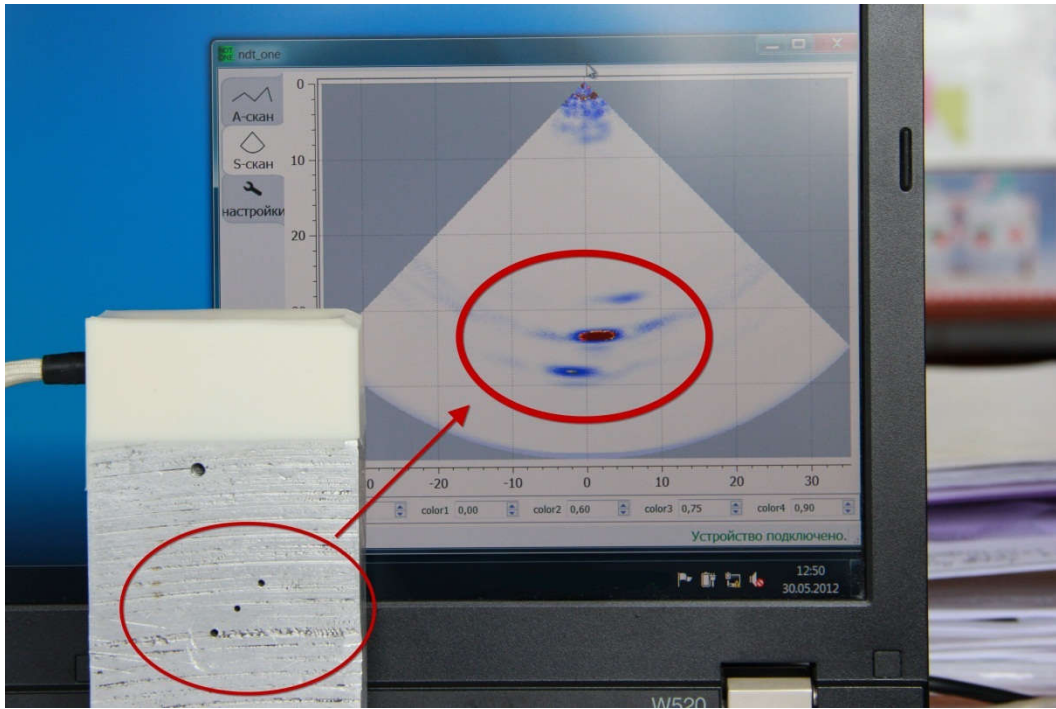
One SNTS module can serve up to 128 ULTRASONIC transducers, which makes it possible to connect a combined type of transducer to a 128 ULTRASONIC module, or 8 sixteen-element ULTRASONIC antenna arrays.

The software-controlled input angle of the ULTRASONIC beam and the focus point allows you to control one type of transducer (antenna array), replacing numerous inclined transducers.

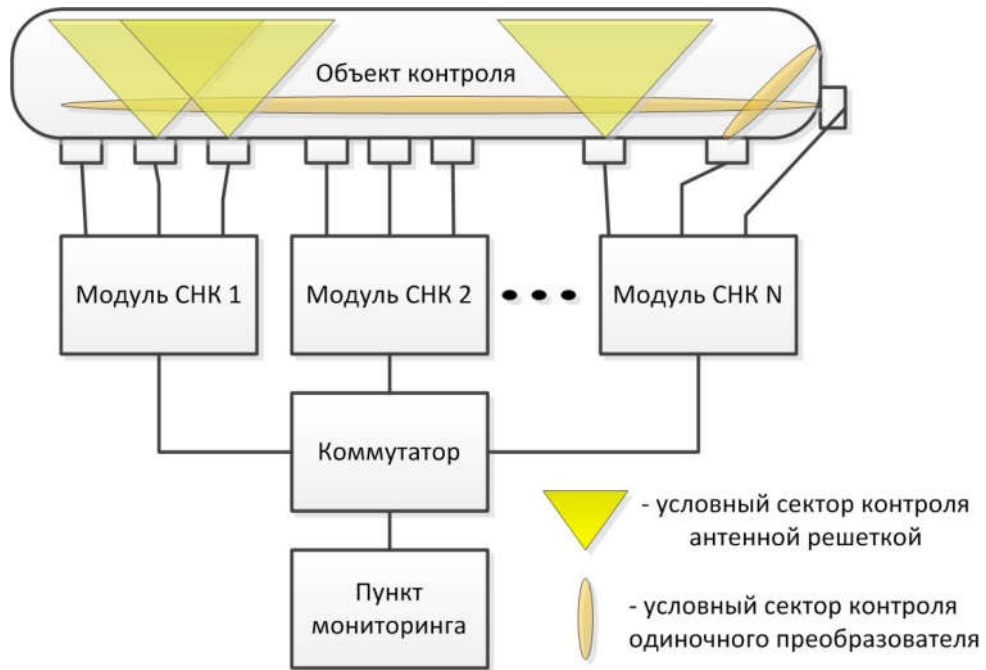
The sector scan function significantly improves the ability to detect defects and increases the productivity of monitoring. A single scan from a single point of contact covers a large area of CO.



A prototype of an intelligent distributed nondestructive testing system SNTS with an ultrasonic antenna array installed on the control object, and a computer that performs the function of a monitoring post that displays the results of the control



Simulator of the control object with built in ULTRASONIC antenna array and scan results



Structure of an intelligent distributed nondestructive testing system

## Phased array for ULTRASONIC nondestructive testing

Converter type

16 element phased array,  
straight combined

Rated frequency

5 MHz

Aperture

10 x 10 mm

Matching elements on the electrical side

No

Static electric capacity of a single element (without cable)

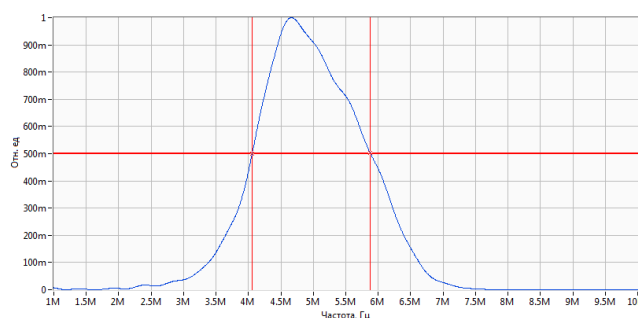
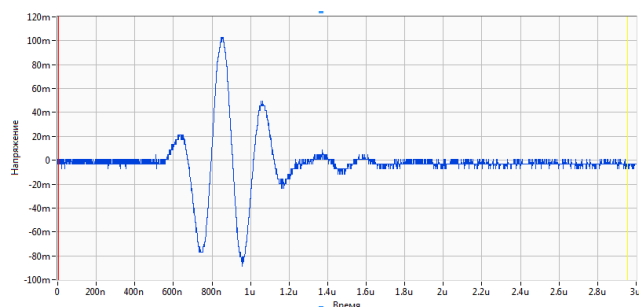
200 pF

Scanning sector

$\pm 40$  deg

Overall dimensions

20 x 25 x 25 mm



Typical time and frequency characteristics of the bottom echo signal for a single element

## Piezoelectric transducer for ultrasonic nondestructive testing **Основные технические характеристики**

Converter type

Contact direct combined

Rated frequency

5 MHz

Piezoelement dimensions

10 x 10 mm

Matching elements on the electrical side

No

Static electric capacity of piezoelement

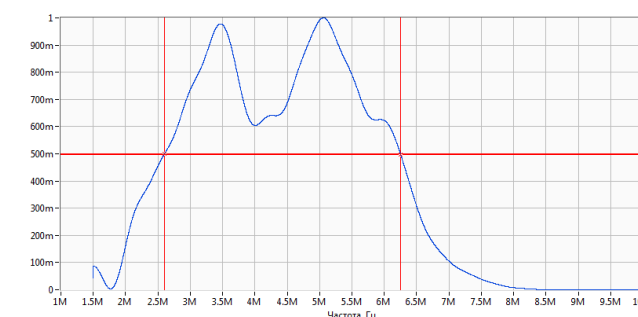
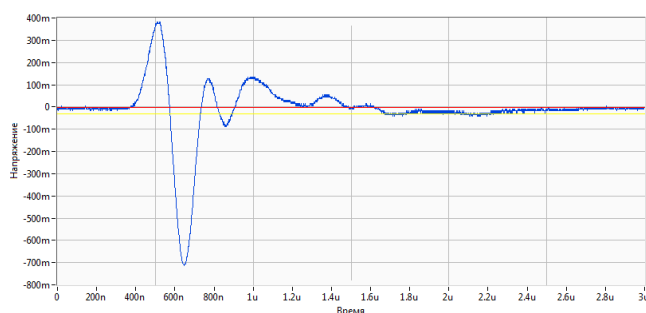
3200 pF

Operating temperature range

- 20 ... + 70 °C

Overall dimensions

d25 x 35 mm



Bottom echo pulse and spectral density modulus when excited with a pulse duration of 0.2 microseconds

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