



ULTRASONIC PHASED ARRAY TESTING

ENSURE YOUR MATERIALS ARE FIT FOR MARKET
AND READY FOR SERVICE

By:

[element.com](https://www.element.com)

*Making tomorrow
safer than today*



With almost 200 years of experience and a global network of world-class laboratories, we make certain that the materials and products we test, inspect and certify for our customers are safe, quality, compliant and fit for purpose.

CONTENTS

Conventional Ultrasonic Testing	4
What is Phased Array?	5
Phased Array vs. FMC/TFM	6
The Element Advantage	7

CONVENTIONAL ULTRASONIC TESTING

Conventional ultrasonic testing relies entirely on single-element transducers that use one piezoelectric crystal to generate and receive sound waves.

The ultrasonic field propagates along an acoustic axis with a single refracted angle fixed by the wedge (contact tests) and has a fixed focal point based on the diameter and the frequency of the transducer. Because both the focal point and the incidence angle are fixed parameters, it can be difficult to optimize conventional UT to detect expected flaws.

Operators often have to switch between different transducers and wedges to make sure that they can inspect their component



WHAT IS PHASED ARRAY?

Phased-array ultrasonic technology took its origins in the medical field to create highly detailed cross-sectional pictures of internal organs. By the beginning of the 1990s, phased-array technology was incorporated as a new method.

- While conventional UT consists of a single active element that generates and receives sound waves, phased-array probes, on the other hand, typically of an assembly of small individual elements that can each be pulsed separately.
- Phased-array ultrasonic testing is based on principles of wave physics, which also have applications in the fields of optics and electromagnetic antennae.
- When all the elements of the array are fired, the individual wave fronts mix and interfere with each other
- The principle of phased-array is to fire the elements in such a way that the wave fronts interfere constructively or destructively in predictable ways that effectively steer and shape the sound beam.
- This is accomplished by pulsing the individual elements at slightly different times.



When all the elements of the array are fired, the individual wave fronts are going to mix and interfere with each other

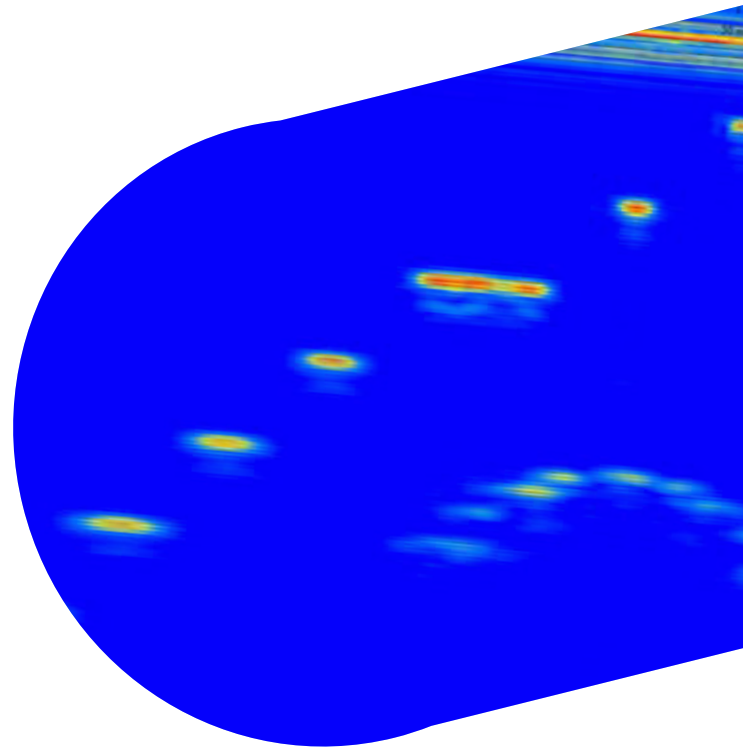
PHASED ARRAY VS. FMC/TFM

FULL MATRIX CAPTURE (FMC):

Full matrix capture is a specific data-acquisition process using ultrasonic array probes where each element in an array is successively used as the transmitter, while all elements are used as receivers for each transmitted pulse

TOTAL FOCUSING METHOD OR TOTAL ELECTRONIC FOCUSING (TFM):

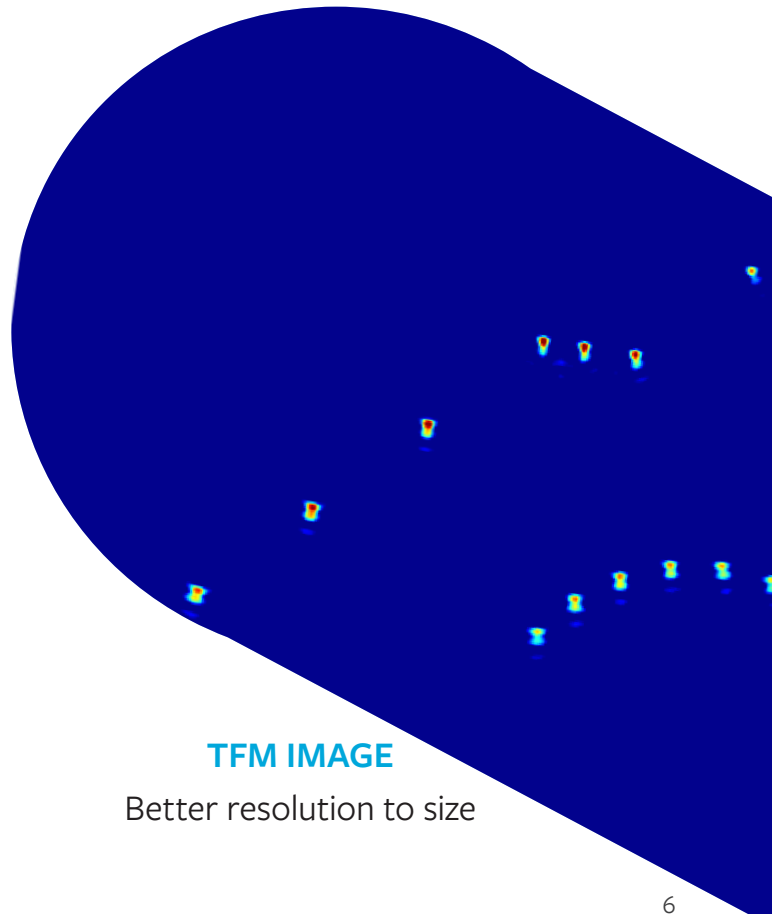
Electronic focusing consists of adapting the receiving delay laws to focus at many points that form a grid after a single pulse, which generates a large and/or divergent ultrasonic beam.



PHASED ARRAY IMAGE



PHASED ARRAY IMAGE



TFM IMAGE

Better resolution to size



THE ELEMENT ADVANTAGE

Our ultrasonic testing experts provide in-house, onsite and field inspections and certifications. Whether your inspection requirements are for raw materials or fracture-critical components, we offer the equipment, expertise and capacity for the task.

For more information about our ultrasonic inspection services or to request a quote, contact us today.

For more information, please visit [element.com](https://www.element.com)



Contact.us@element.com +1 888 786 7555

www.element.com