NON-DESTRUCTIVE TESTING TERAHERTZ IMAGING

There are many types of automated non-destructive testing (NDT) systems and processes for ensuring manufactured components are created within specified parameters and without flaws. These include optical analysis, radiography, eddy current, ultrasonic and physical measurement. The market for these testing and analysis systems is in excess of $50 billion annually according to BCC research. The market is growing continuously as companies work to achieve higher manufacturing efficiencies with reduced defects.

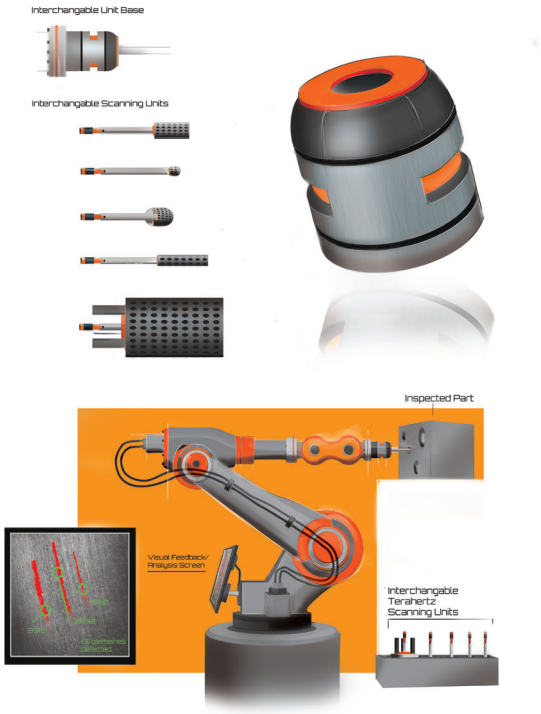
However, there exists a significant gap in technology to perform automated NDT in systems that are coated with lubricants and/or systems which include non-linear bored surfaces requiring inspection. This deficiency has been highlighted by multiple manufacturing partners. The presence of lubricants prevents components from being inspected in real time, requiring that the component be diverted from the assembly line, cleaned, inspected, and then inserted back into the process. This is a frequent occurrence in multiple manufacturing companies and creates significant cost.

CDME is proposing a joint applied research project with industry partners to develop a commercially available terahertz NDT imaging and analysis system.

RESEARCH

CDME and the center's partners have performed an analysis of existing NDT systems and their ability to perform adequate analysis on coated surfaces. Each system evaluated was not able to meet the requirements for in-line NDT – due to either geometry concerns, lack of resolution, or the inability to provide accurate results in the presence of machining lubricants. As a result of this analysis, CDME worked to identify applicable technologies within The Ohio State University that could be commercialized for this purpose.

Based on the requirements from our industry partners and internal evaluation, CDME believes that terahertz imaging would be well suited for the scanning system. This proven technology was designed by researchers at Ohio State and is currently being commercialized by university start-up TeraProbes, Inc. as a commercially available terahertz non-contact testing system for the semiconductor industry. It is proposed that industry partners, TeraProbes and CDME would jointly collaborate on developing this commercially available NDT terahertz imaging system.



Intellectual Property

US20140191351A1
"Miniature Phase-Corrected Antennas for High Resolution Focal Plane THz Imaging Arrays"

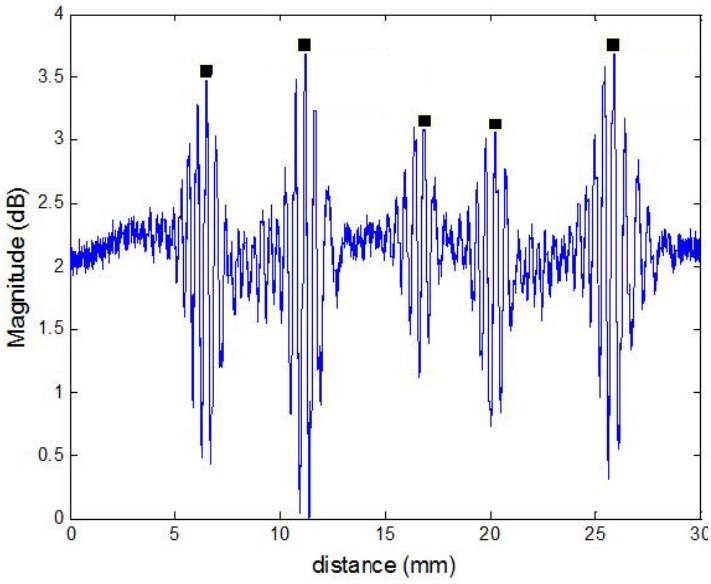
US20150102225A1
"Non-contact probe measurement test bed for millimeter wave and terahertz circuits, integrated devices/components, systems for spectroscopy using sub-wavelength-size-samples"

GOALS

The goal of this project is to deliver a turnkey commercial system that meets the needs of not only CDME's manufacturing partners, but those of any Ohio manufacturing company with a requirement to evaluate machined components without having to modify the system.

PROGRAM MANAGER

It is proposed that Mr. John Bockbrader will lead this project for CDME. John holds a Bachelor's degree from The Ohio State University and a Masters from Purdue University in Mechanical Engineering. He spent 7 years at General Motors in the Noise and Vibration Center where he worked to apply engineering principles to solve NVH issues for a variety of vehicles, including two new vehicle platforms. He then started an 11-year career at Battelle where he continued applying his expertise as chief engineer on multiple large-scale commercial develop and integration efforts. He then joined Ohio State as an Engineering Manager overseeing multiple industry collaborations.



INITIAL RESULTS

CDME developed a testing protocol which generated scratches of known lengths and depths and covered them with various lubricants which would be present in many manufacturing processes. Dr. Sertel then imaged the surfaces with his terahertz systems. It was shown that the imperfections were imaged with a very high degree of accuracy under the various testing conditions.

FUTURE DEVELOPMENT

CDME is actively seeking additional industry partners to collaborate with the current team to advance the development of a terahertz imaging system.

While the proposed system is focused on developing an NDT imaging system, terahertz has shown great promise in other closely parallel applications. Terahertz can be effectively utilized for corrosion detection, surface inspection, thin film analysis, weld inspection, medical imaging and many other applications.

By working together in a collaborative manner, CDME members are able to leverage their capital investment more effectively to successfully advance university technology into the commercial market.

INVENTOR

Dr. Kubilay Sertel received his PhD from the University of Michigan in 2003. He has been with The Ohio State University ElectroScience Laboratory since January of 2003 as a research scientist and was appointed assistant professor of electrical and computer engineering in 2012.

Dr. Sertel is a Senior Member of IEEE, and a member of the IEEE Antennas and Propagation and IEEE Microwave Theory and Techniques Societies. He is also an elected member of URSI Commission B. His expertise lies in electromagnetic theory, analysis and design of THz and mmW sensors, antenna arrays and spectroscopy systems for biomedical and non-destructive imaging. Dr. Sertel's research pioneered curvilinear fast multipole modeling of hybrid EM integral equation/finite element systems and efficient solution of large-scale, real-life problems on massively parallel supercomputing platforms.

CONTACTS

CDME

1314 Kinnear Road, Columbus OH, 43212
cdme.osu.edu

John Bockbrader, Project Lead
bockbrader.2@osu.edu • 614-292-6570

Eric Wagner, Collaboration Manager
wagner.293@osu.edu • 614-477-0303

Technology Commercialization Office

Jason “Jay” Dahlman, Licensing Manager
dahlman.3@osu.edu • 614-292-7945