

THz Applications

Compared to other parts of the electromagnetic spectrum, the application of terahertz waves is still in its infancy. However, its ability to penetrate through many common non-metallic materials and provide material specific information has made terahertz waves a compelling option for non-destructive testing and stand-off evaluation of materials (such as explosives detection). The following are just a few of the application areas that hold promise for THz technology:

- **Security & Defense:** stand-off identification of materials, including explosives, and other related chemicals and materials.
- **Non-destructive Testing & Evaluation:** both material and structural information can be obtained using CW and Time Domain systems.
- **Pharmaceutical:** THz spectroscopy or imaging can be utilized for improving quality and uniformity of pharmaceutical products (QC).
- **Medical:** THz can be utilized to identify various medical conditions based on biological chemical markers.

The above list only begins to scratch the surface for THz applications and, if the history of adjacent bands of the electromagnetic spectrum are any guide, the most compelling and beneficial applications of Terahertz technology are yet to come!

ALVA Labs-Zomega A Collaborative Effort

Leveraging to stay ahead of the THz curve

ALVA Labs' military experience and its future of non-linear THz Technology SEED patent + Zomega's world renowned THz scientific expertise and research capability = a winning combination that will push the frontiers of Terahertz science and the commercialization of new technologies and products where no one has gone before.

Offices

ALVA Labs

5 Blueberry Hill
Marlboro, New Jersey 07746

Zomega

15 Tech Valley Dr, Suite 102
East Greenbush, NY 12061

POINTS OF CONTACT

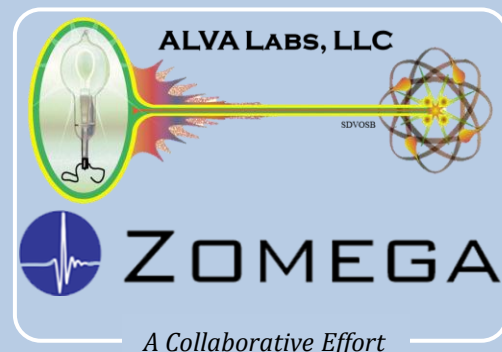
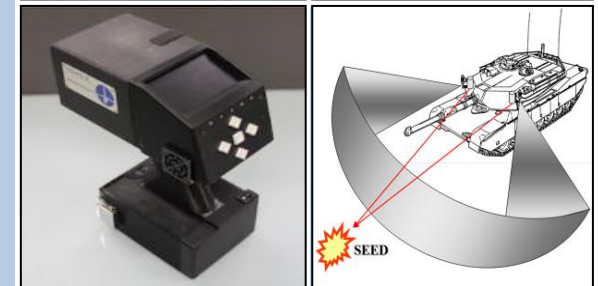
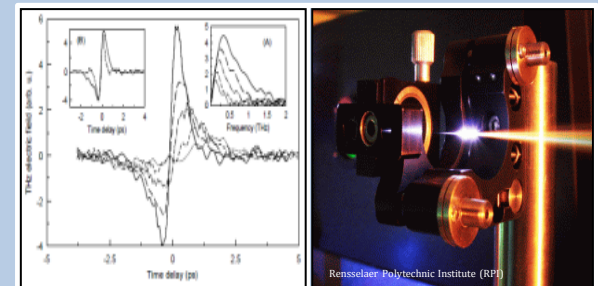
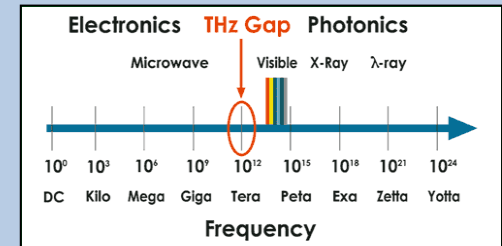
ALVA Labs

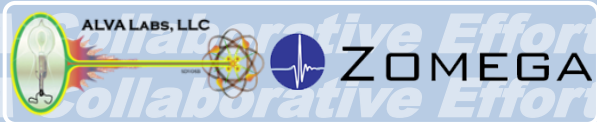
JD Lock
(908) 872-4200
JDLock82@aol.com

Zomega

Thomas Tongue
(518) 833-0577
www.z-thz.com
ttongue@z-thz.com

The Cutting Edge of Terahertz (THz) Technology





Terahertz

What Is THz?

Terahertz (THz) waves, or sub millimeter/far-infrared waves, refer to electromagnetic radiation in the frequency interval from 0.1 to 10 THz. that lies between the mid-infrared and microwave bands.

This spectral domain hosts low-frequency crystalline lattice vibrations (phonon modes), hydrogen bonding stretches, and other intermolecular vibrations of molecules in many chemical and biological materials, including explosives and related compounds (ERCs), drugs and other biomolecules. Many polar gases also have distinctive spectroscopic fingerprints in the THz range. The transmitted and reflected THz spectra of these materials contain THz absorption fingerprints characterizing these vibrational modes, providing information not readily available in other parts of the electromagnetic spectrum.

Advantages of THz Waves

THz waves have low photon energies—one million times weaker than x-rays—and will not cause harmful photoionization in biological tissues—an advantage for both imaging biological materials and in operational contexts where an operator or other subjects may be exposed to THz radiation.

In addition to being considered "safe" for most applications, THz radiation can penetrate through many commonly used nonpolar dielectric materials such as paper, cardboard, textiles, plastics, wood, leather and ceramic with moderate attenuation. This allows THz waves to be used in non-invasive and non-destructive inspection using spectroscopy and imaging techniques.

Thomas F. Metz, Lieutenant General, US Army (Ret)
USMA '71/Army Ranger



Currently is a mentor, advisor and consultant for a broad range of international activities; nearly 40 years of service; assignments have included senior level command and staff positions to include III Corps and Fort Hood Commander, MNC-I Commander, Deputy TRADOC Commander and Director, Joint IED Defeat Organization (JIEDDO); additionally, was Vice Director J8, Joint Staff, Commander Fort Riley and CENTCOM Chief of Staff; holds a Masters degree in mechanical engineering from North Carolina State University.

ALVA Labs, LLC

ALVA Labs LLC, a Service Disabled Veteran Owned Small Business (SDVOSB), is composed of nearly all United States Military Academy (USMA), West Point, graduates, most of whom are also qualified US Army Rangers.

In August 2012, ALVA Labs was issued a US patent on a 'Stimulated Emission Enhanced Detection' (SEED) device that can perform the following:

A method to detect target materials, comprising the steps of: emitting electromagnetic radiation in the Terahertz range; modulating the electromagnetic radiation to excite molecules in the target materials; and detecting signature emissions of excited molecules in the target materials; wherein the target materials do not require sample preparation, and the steps of emitting, modulating and detecting are performed at a distance of at least 10 meters from the target materials.

ALVA Labs, in collaboration with Zomega, will explore, develop and expand SEED's non-linear application of THz excitation and enhanced detection of molecular material at stand-off distances to its fullest potential.

- John (JD) Lock**, President/CEO
USMA '82/Army Ranger, LTC, US Army (Ret)
- Rich Graziano**, Research
- John (JB) Black**, Contracts
USMA '83/Army Ranger, LTC, US Army (Ret)
- Richard (Rick) Lavosky**, Research/Patent
USMA '82/Army Ranger
- David Thomas**, Business Development
USMA '82, CEO Lasik Plus / LCA Vision
- Robert (Bob) Wines**, General Counsel
USMA '72, COL, USAR (Ret)

ALVA Board of Advisors

Paul (Bud) Bucha, Medal of Honor recipient
USMA '65/Army Ranger

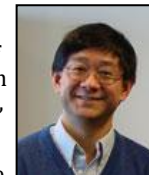
Currently president of Paul W. Bucha and Company, Inc., assisting U.S. companies in the export of goods and services overseas, as well as the development and management of real estate; recipient of the Medal of Honor as a Company Commander while leading his troops against enemy forces in Vietnam; following active duty, served as a Senior Vice President for EDS Corporation and Chairman of the Board of Wheeling-Pittsburgh Steel Corporation; the recipient of numerous honors and awards, holds an MBA from Stanford University.



Zomega Terahertz Corporation

Zomega Terahertz Corporation is focused on developing and deploying Terahertz-based technology solutions for both the public and private sector. We produce both pre-designed and custom systems for Time Domain Spectroscopy (TDS) and CW applications in both point measurement and imaging modalities.

Dr. X.-C. Zhang, Chairman, President
M. Parker Givens Professor and Director of Optics



Xi-Cheng Zhang joined The Institute of Optics at the University of Rochester on January 1, 2012. Prior to Rochester, he spent 20 years at Rensselaer Polytechnic Institute (RPI), where he was Professor and Acting Head of the Department of Physics, Applied Physics and Astronomy, Professor in the Department of Electrical, Computer and System, and Founding Director of the Center for THz Research.

Prof. Zhang is an internationally recognized scientist and leader in Terahertz science and technology. Zhang's contribution to the development of terahertz time-domain spectroscopy, together with other leading researchers, has recently altered this scientifically and technologically important, but historically inaccessible, spectroscopic region. Dr. Zhang's vision reflects the Meliora focus as he works with The Institute of Optics to continue and augment its reputation as a Jewel in the Crown of the U of R.

- Thomas Tongue** Chief Executive Officer
- Dr. Brian Schulkin** Chief Technology Officer
- Wendy Zhang** Chief Financial Officer
- Dr. Albert Redo-Sanchez** Director Business Dvlmt

Michael L. Oates, Major General, US Army (Ret)
USMA '79/Army Ranger

Currently the Vice President for Army and Special Operations Programs, Lockheed Martin Corporation; 32 years of service and four combat tours in Iraq; assignments have included senior level command and staff positions, to include Commanding General, 10th Mountain Division and Director, Joint Improvised Explosive Device Defeat Organization (JIEDDO); holds a Masters degree in National Security and Strategic Studies from the United States Naval War College, Newport, Rhode Island.

