

Directed Energy

Research Center

**The energy
behind
innovation**

Energy, above and beyond

The new Directed Energy Research Center (DERC) at the Technology Innovation Institute (TII) has been founded to understand and harness the physics behind high-power electromagnetics to help protect the world around us.

Today, our well-resourced team of internationally recognized scientists is exploring and exploiting capabilities at the forefront of high-power electromagnetics, lasers and acoustics.

Who We Are

The Directed Energy Research Center (DERC) leads the advancement of directed energy systems and technologies in the region. With a community of award-winning and internationally acclaimed scientists, engineers, and global partners, we protect the world around us in areas as diverse as medicine and infrastructure protection.

DERC is part of the Technology Innovation Institute (TII), a global scientific research center attracting the world's foremost scientists and researchers. TII leads worldwide advances in artificial intelligence, autonomous robotics, quantum computing, cryptography and quantum communications, directed energy, secure communication, smart devices, advanced materials, and propulsion and space technologies, and biotechnology fields.

TII belongs to the Abu Dhabi Government's Advanced Technology Research Council (ATRC), which oversees the technology research in the emirate.

What We Do

We leverage the most powerful capabilities in the world in high-power electromagnetics, photonics, and acoustics to create a unique environment for world-class research and scientific discoveries.

We take an agile, contemporary, and results-focused approach in our research, unencumbered by legacy thinking or processes. Cultivating a culture of 'makers,' we deploy rapid prototyping in a spirit of continuous improvement.

Our core research areas

DERC works on multiple research areas in fundamental as well as applied science disciplines.



Electromagnetics

The Electromagnetics Department aims to develop and apply state-of-the art research in diverse fields of Electromagnetic Engineering. The work and expertise of our six divisions are committed to developing innovative solutions and, supporting the roadmap of the industrial sector in the UAE.

Our research domains include:

- Pulsed Power
- High-Power Sources
- Solid State
- RF Sensors
- Stealth/Radar
- EMC Engineering



Signals, Electronics & Acoustics

We work with high-power acoustics, embedded software development, electronics, and radio frequency research and engineering. Our division explores the intersection of these fields and conducts ground-breaking research to push the boundaries of what is possible. We are a team of highly skilled and passionate researchers who are committed to advancing these areas by finding new and innovative solutions to complex problems.

Our research domains include:

- Acoustic Systems
- Sonar Systems & Underwater Communication
- Radio Frequency Engineering

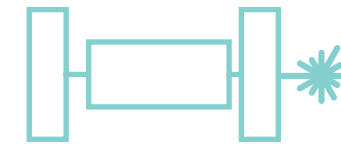


Waves and Machine Intelligence

The Waves and Machine Intelligence (WMI) Department research team specializes in Geophysics Data Imaging, Machine Learning Applications, Computational Sciences, and Complex Systems. The WMI team focuses on merging these different disciplines to provide innovative and efficient solutions that produce and facilitate incremental research.

Our research domains include:

- Sub-surface imaging
- Machine Learning Fundamentals
- System Dynamics and Resilience

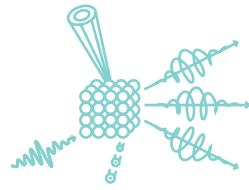


High Power Lasers and Applications

The High-Power Laser Department carries out applied research activities over an extended scope to answer the numerous technical challenges in delivering a high-power laser beam over long distances with a minimal loss of energy and quality through harsh environments. Countless applications are addressed in communication, industry, civil, defense and space sectors. Among these applications, one can cite: atmospheric remote sensing, lidar, laser-induced weather modification, lightning protection, waveguiding, power beaming, ground-to-space laser communication, humanitarian de-mining, laser countermeasure etc.

Our research domains include:

- High Power Laser Source
- Laser Beam Control
- Laser Matter Interaction
- Laser System Engineering



Advanced Photonics Research

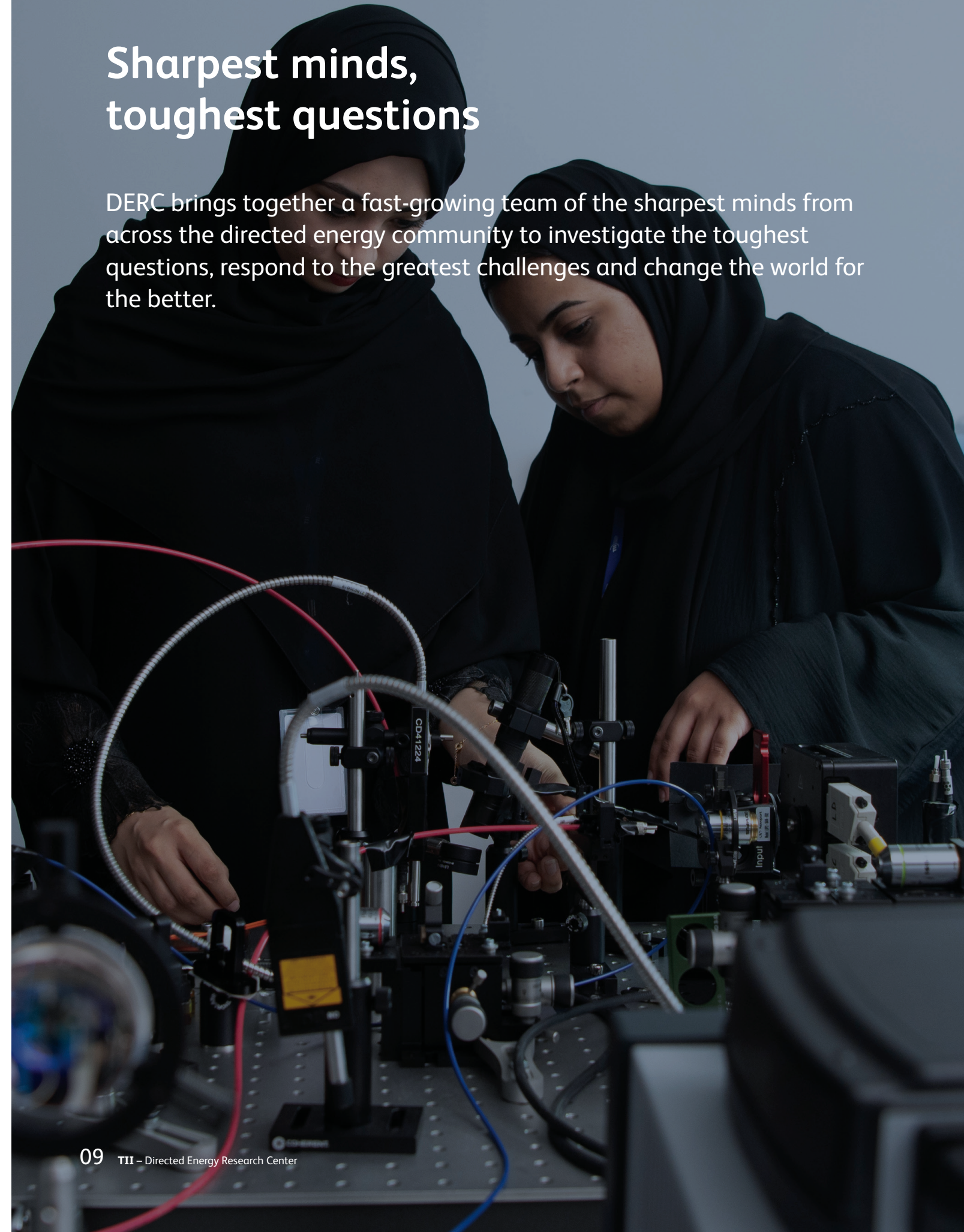
The Advanced Photonics Research Department conducts cutting-edge research at its state-of-the-art laboratory - developing disruptive innovation based on Photonics technologies (over free-space, fiber-based, and down to the chip level integration). Motivated by the underlying challenges met by industries, our proposed innovations and new concepts are harnessing the benefits of linear and non-linear interaction of light with matter, to manipulate the photon properties, and maximize the performances of strategic building blocks. The defined Advanced Photonics Research roadmap focuses on six key areas: Light Communication, Light Computing, Light Sensing, Light in Space & Underwater, Light Powering, Light on Chip.

Our research domains include:

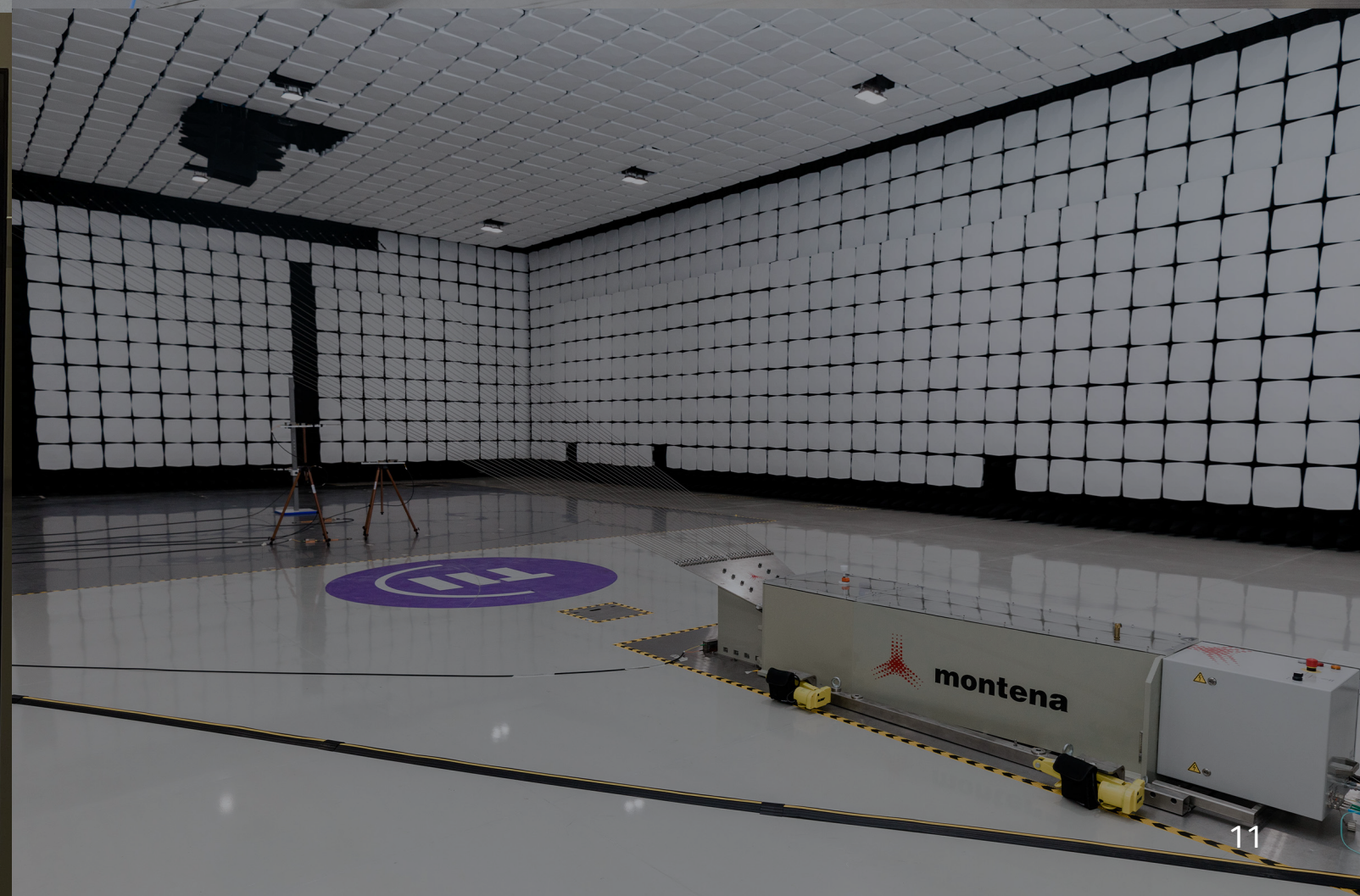
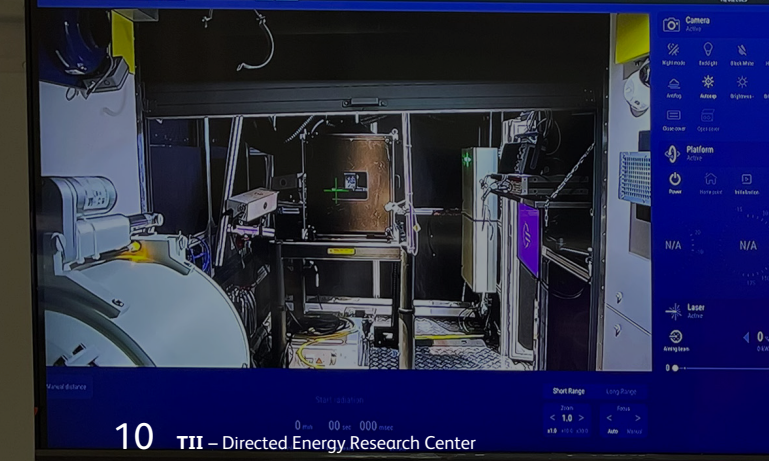
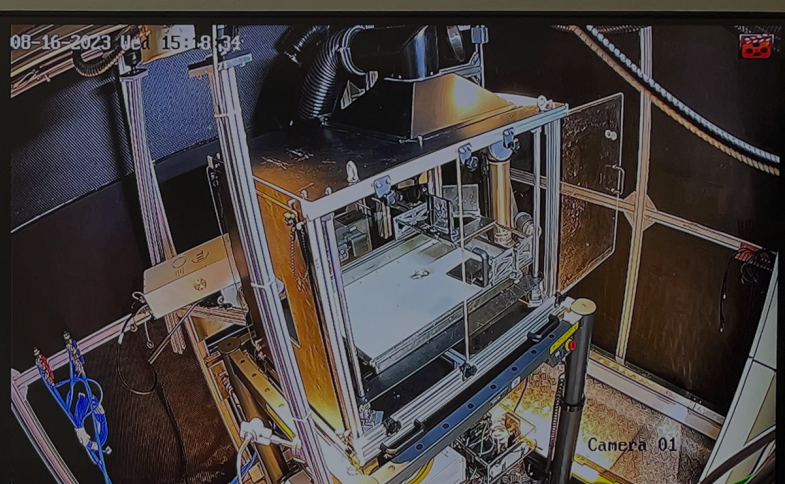
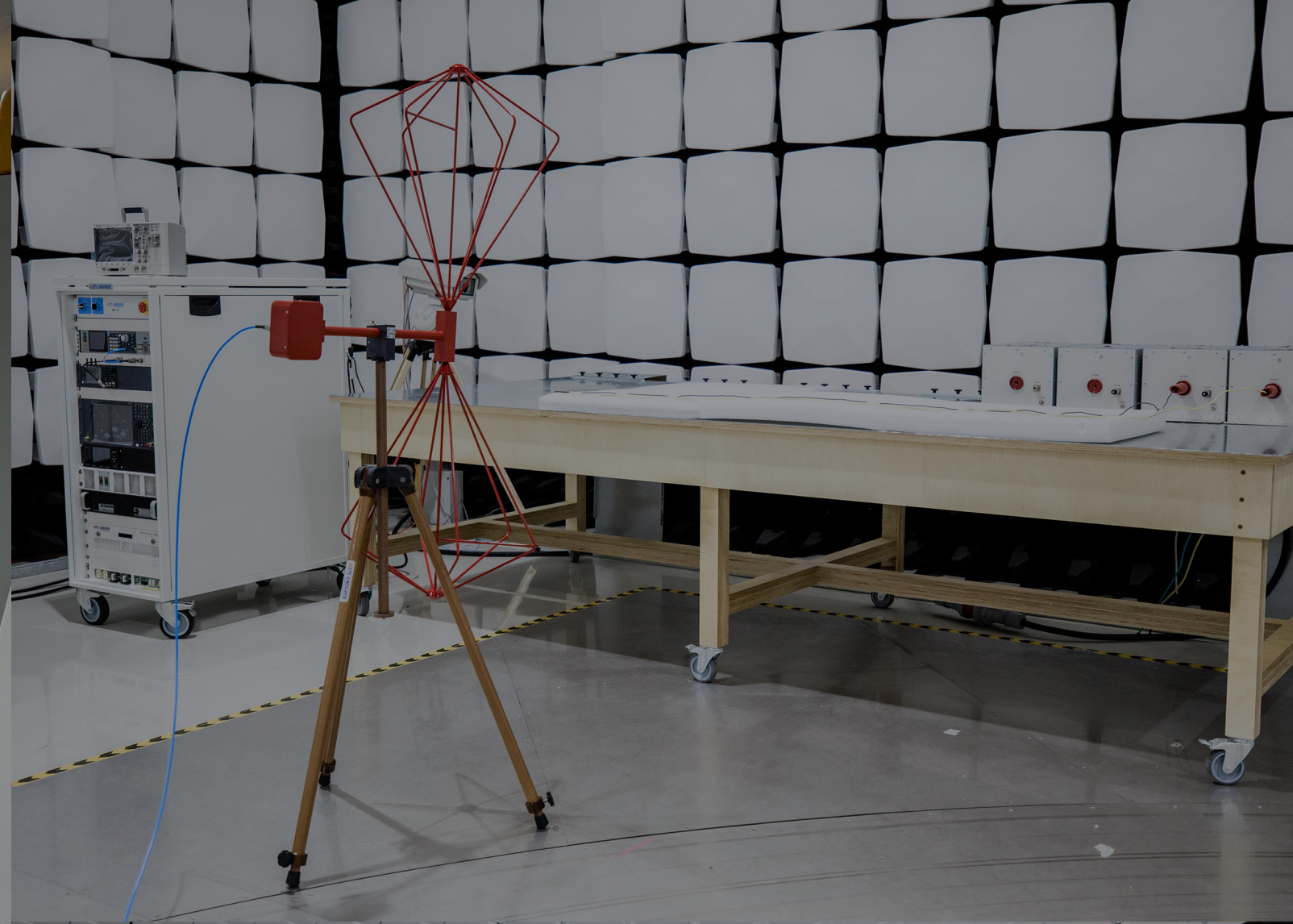
- Light Processing
- Light Sensing
- Light on Chip

Sharpest minds, toughest questions

DERC brings together a fast-growing team of the sharpest minds from across the directed energy community to investigate the toughest questions, respond to the greatest challenges and change the world for the better.



A unique facility in the region



The energy behind innovation

A large diversity of technologies delivered to our clients since inception



Innovation for a better world

TII helps build a better world by developing the most advanced, transformative technological innovations designed to benefit society. As a key component of the Abu Dhabi Government's Advanced Technology Research Council (ATRC), it promotes a culture of exploration with the aim of establishing Abu Dhabi and the UAE as an R&D hub and one of the next global leaders in breakthrough technology solutions.



DERC is dedicated to innovation at the very frontiers of physics – in electromagnetics, lasers, plasma physics, particle beams and far beyond.



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