

RECRUITMENT – COMPANY INFORMATION

# TeraView

MAY 2019

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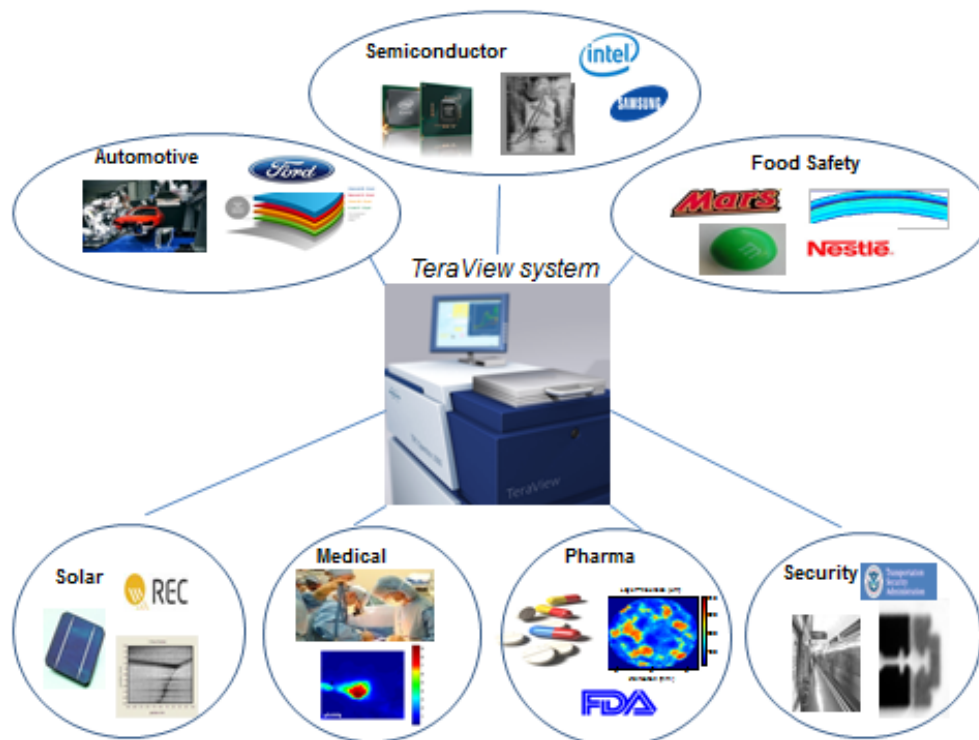
## Overview

TeraView Ltd is the world's first and leading provider of Terahertz solutions to Fortune 500 companies, in a variety of industries. TeraView's advanced portfolio of Terahertz applications knowledge, system design, product range and intellectual property (63 patents granted) is unrivalled in breadth and depth. There now exists an unprecedented opportunity to exploit this first mover advantage in select, commercially validated markets, to establish a commercially dominant position in this last unconquered region of the electromagnetic spectrum.

TeraView's primary goal is to accelerate adoption of TeraView products by key clients in markets with high growth potential, with focus on the **semiconductor** and **high value industrial coating** (e.g. **automotive paint** and **food safety**) industries. By producing Terahertz-enabled quality assurance (QA) and high volume manufacturing (HVM) inspection solutions, capable of providing benefits not possible until now, the Company has the potential to build a \$Bn business comparable to those that have historically been solution providers using conventional inspection technologies such as X-Ray and Infrared. TeraView also has clients in the solar, medical, pharmaceutical and security industries.

TeraView's vision is to establish Terahertz as the premier imaging tool for the 21<sup>st</sup> century, comparable to the enormous success of X-Ray the latter half of the last century, and more recently ultrasound. Ultrasound progressed from research to become an extensively used tool in inspection and other applications, as a result of technological advances similar to those now transforming Terahertz. The current ultrasound market is valued at close to \$3.2B per annum, and has an annual growth rate of 30% +.

## Revenue Generating Markets Validated by Customer Sales



## Terahertz History

For over a century, advances in exploiting the electromagnetic spectrum have progressed steadily, with occasional breakthrough developments sparking rapid economic growth, interspersed with decades of linear improvement. At the turn of the 21st century, the collective advances in development, manufacturing and commercialization of devices utilizing light had become so pervasive that they effectively 'flattened' the globe technologically. The affordability of cellular phones, computers, digital video and the Internet, indicates the maturity and efficient commercialization of the regions of the electromagnetic spectrum in which those devices operate.

Since the Millennium, these maturing technologies fueled ongoing technical progress, enabling critical breakthroughs in what is the last unexploited region of the electromagnetic spectrum - Terahertz (THz) which sits between Microwave and Infrared in the spectrum. The potential real world benefits that lie within what has been called the "Terahertz Gap" include 2D and 3D imaging - with applications in quality assurance and defect / contamination detection in markets such as semiconductor chip inspection, automotive paints, food safety and many other applications.

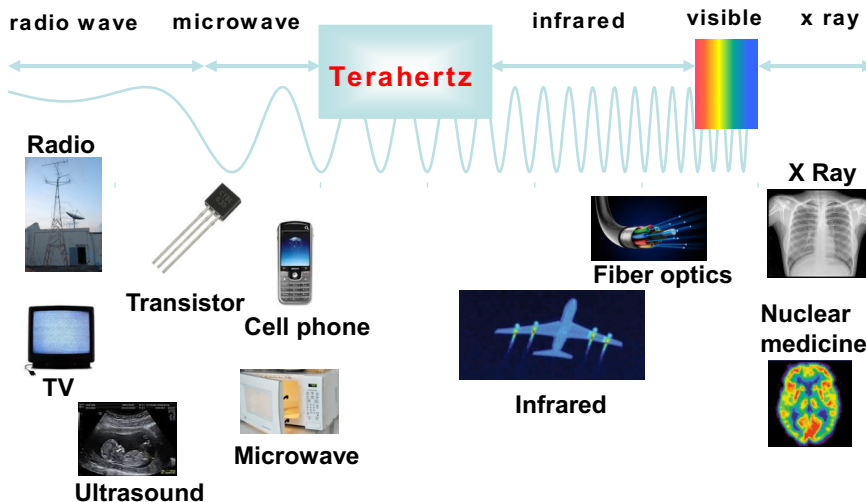
## Terahertz in the Electromagnetic Spectrum

Market sizes – present & future

**\$300B+** **\$250B**

**\$300B+**

**\$100B+**



## TeraView History

In 2001, TeraView Ltd was created from a relationship between the Toshiba Corporation and the Cavendish Laboratory at the University Cambridge. By 2004 TeraView had developed the world's first Terahertz system, capable of identifying cancerous tissues and concealed threats in clothing and mail. Later, in cooperation with GlaxoSmithKline and Pfizer, the Company demonstrated the ability to precisely map the position of the active ingredients in pharmaceutical tablets - drugs are more efficacious when this can be optimized. By 2010, TeraView had developed a Terahertz system (in cooperation with Samsung and other major semiconductor manufacturers) to detect microscopic faults in electrical interconnects - critical in the rapidly growing mobile computing and communications markets.

## **Attributes of Terahertz Light**

Terahertz light has unique properties, making it suitable for a variety of high value market opportunities. Critically, Terahertz light is non-ionizing (unlike X-Ray) and therefore does not represent a hazard to operating personnel or the public.

Terahertz light passes through clothing and many common materials, producing 2D or 3D images of some concealed objects. It is therefore ideally suited to inspection of defects in integrated circuits, or to evaluate the thickness and density of coatings, such as pharmaceutical (tablet) coatings and automobile paint layers. Most complex molecules have characteristic spectra ('Terahertz fingerprints') which allow them to be uniquely identified. Through Terahertz fingerprinting, it is possible to unambiguously detect counterfeit pharmaceutical products, harmful chemicals, contaminants in some food and explosives concealed by travellers at airports, without the invasive imaging required with current systems.

## **CUSTOMER DRIVEN TARGET MARKETS**

TeraView's business is focused on a number of high value inspection markets, where its technology and products have demonstrated their unique benefits to the Company's Fortune 500 customers.

### **1. Semiconductor Market**

Driven by the needs of the smart phone and tablet computing markets, TeraView developed its inspection product in collaboration with Samsung and other major semiconductor companies, for fault detection and quality assurance (QA) of advanced integrated circuits. According to TeraView's customers, the failure of integrated circuit packages and related chip components can amount to a "significant percentage of components received" from suppliers for those advanced devices used in smart phones and mobile computing. TeraView's QA system can filter out these poorly constructed components with unprecedented accuracy and speed. Furthermore, the margins for error in semiconductor packages are narrowing at an unprecedented rate due to the rapid reduction in the overall height and form factor of integrated circuit packaging, driven by the proliferation of smart phones and tablet computers.

### **2. Automotive Market**

TeraView is developing its inspection product, in collaboration with major car manufacturers, for multi-layer thickness monitoring and quality assurance (QA) for automotive paints. Led by Ford, the industry is moving to new 'wet on wet' technology, in which multiple layers of paint are applied sequentially, with drying times for successive layers considerably reduced. The goal is to achieve at least a 25% increase in efficiency, allowing the average production line to move from 50,000 to close on 65,000 vehicles a year. As this new method is to be rolled out to Ford's production plants (circa 100 worldwide), Ford was searching for a new inspection technology with the throughput and capabilities to monitor the quality and thickness of paint layers. Terahertz has been identified by Ford and others as having this potential. As well as increasing production line throughput, the technology can also save up to \$800,000 per instrument per year in reduced paint costs, yielding a 5 month capex payback, on this basis alone. Terahertz capabilities with car paints are suitable for other high value coatings applications; for example, in the solar, food, pharmaceutical and aerospace industries - all being sectors where the Company already has existing customers.

## **PROFILE OF THE SENIOR MANAGEMENT TEAM**

### **Chief Executive Officer - Dr Don Arnone**

Don Arnone has over 25 years' experience in Terahertz and semiconductors, and its commercialisation, at the University of Cambridge and then for ten years at the Toshiba Corporation in Cambridge and Japan. He spent one year in Japan, working with the semiconductor, wireless and medical business units of Toshiba, as well as in the USA and the EU with customers. Dr Arnone spun out the TeraView business in 2001. Since then, he has been CEO responsible for transforming the Company from laboratory R&D into revenues, operating in a number of global markets and approaching sustainable profitability. He has also been responsible for leadership of the team through several phases of growth of the Company.

### **Chief Scientific Officer - Prof Sir Michael Pepper**

Prof. Sir Michael Pepper was awarded a knighthood for his services to Physics in 2006. Sir Michael held positions at Plessey and then GEC. He later founded Toshiba Cambridge Research. He also headed the Semiconductor Physics Group at the University of Cambridge. Through the discovery of the 'Quantum Hall' effect he has made significant contributions to semiconductor nanostructures. Sir Michael is a Fellow of Trinity College, Cambridge, and of the Royal Society. He has acted as a scientific advisor to the Home Office and the US Army. He has co-authored over 600 papers.

### **Chief Operating Officer - Padraig O'Kelly**

Padraig has over 25 years' experience in high technology industries. Prior to joining TeraView he held posts during a 14 year span at Applied Imaging, a medical device manufacturer, including Managing Director of its UK subsidiary, as well as Corporate Vice President of Product Development. He was also responsible for manufacturing, sales and product support. He spent 10 years in GE-Marconi in Business Development and Project Management within the Simulation Division. His career started at Ferranti Ltd where he was responsible for mathematical modelling of inertial navigation systems.

### **Semiconductor Business Director - Martin Igarashi**

Martin has over 25 years' experience selling instrumentation to the semiconductor and solar industries, as well as managing new product development projects in these industries. He has also managed worldwide sales and service organizations. He was previously head of Semiconductor Business and M&A at ESI (USA) and served in general management and product management roles at Toppan, ETEC, Applied Materials, and Tektronix. He is experienced at both establishing and running distribution networks in Asia and speaks Japanese fluently. Martin is currently based in Portland, Oregon.

### **Chairman – Dr. Robert Mehalso**

Dr Mehalso has over forty years of management experience in academia and industry in research, engineering, manufacturing, business development, and operations emphasizing materials/fabrication process development and implementation of micro/nano/biosystems. He is experienced in strategy, planning, commercialization, and funding of programs, products, and companies. Dr. Mehalso has been successful in a wide variety of management, technical, business, and venture activities internationally in the areas of micro/nano/biosystems. These include senior management positions at Xerox, as well as establishing and directing AMTX, the world's first micro/nanofabrication/packaging business. From his early days at the RCA Corporation through AMTX and other ventures, Dr Mehalso also has experience transferring new technology and process from development into production at customer facilities.

As a result of recent market successes and investment, we are now in a period of substantial growth. In order to enhance our position as world leader in commercialization of terahertz technology, we are looking to recruit in a number of positions. In particular,

- Product Manager – Semiconductor
- Software Development Team Leader
- Software Developers
- Mechanical Designers
- Financial Controller
- Instrument Assembly Technician