

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ASML NETHERLANDS B.V., EXCELITAS TECHNOLOGIES CORP., AND QIOPTIQ
PHOTONICS GMBH & Co. KG,
Petitioners

v.

ENERGETIQ TECHNOLOGY, INC.,
Patent Owner.

Case IPR2016-00554

**DECLARATION OF J. GARY EDEN, PH.D.
REGARDING U.S. PATENT NO. 8,309,943
CLAIMS 2, 5, AND 10**

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I, J. Gary Eden, Ph.D., declare as follows:

1. My name is J. Gary Eden.

I. BACKGROUND

2. I am the Gilmore Family Professor of Electrical and Computer Engineering and Director of the Laboratory for Optical Physics and Engineering at the University of Illinois in Urbana, Illinois.

3. I received a B.S. in Electrical Engineering (High Honors) from the University of Maryland, College Park in 1972 and an M.S. and Ph.D. in Electrical Engineering from the University of Illinois in 1973 and 1976, respectively.

4. After receiving my doctorate, I served as a National Research Council Postdoctoral Research Associate at the United States Naval Research Laboratory (“NRL”), Optical Sciences Division, in Washington, DC from 1975 to 1976. As a research physicist in the Laser Physics Branch (Optical Sciences Division) from 1976 to 1979, I made several contributions to the visible and ultraviolet lasers and laser spectroscopy field, including the co-discovery of the KrCl rare gas-halide excimer laser and the proton beam pumped laser (Ar-N₂, XeF). In 1979, I received a Research Publication Award for this work at the NRL.

5. In 1979, I was appointed assistant professor in the Department of Electrical and Computer Engineering at the University of Illinois. In 1981, I became associate professor in this same department, and in 1983, I became

professor in this department. In 1985, I was named the Director of the Laboratory for Optical Physics and Engineering, and in 2007, I was named the Gilmore Family Professor of Electrical and Computer Engineering. I continue to hold both positions today. In addition, I am also Research Professor in the Coordinated Science Laboratory and the Micro and Nanotechnology Laboratory, and I hold academic appointments at the University of Illinois in the Departments of Materials Science and Engineering, Bioengineering, and Nuclear, Plasma, and Radiological Engineering.

6. Since joining the faculty of the University of Illinois in 1979, I have been engaged in research in atomic, molecular and ultrafast laser spectroscopy, the discovery and development of visible and ultraviolet lasers, and the science and technology of microcavity plasma devices. My research has been featured in Laser Focus, Photonics Spectra, Electronics Weekly (UK), the Bulletin of the Materials Research Society, Microwaves, Optical Spectra, Electro-Optical Systems Design, Optics and Laser Technology, Electronics, Optics News, Lasers and Optronics, IEEE Potentials, IEEE Spectrum, and IEEE Circuits and Devices. My work was also highlighted in the National Academy of Sciences report Plasma 2010, published in 2007.

7. I have made several major contributions to the field of laser physics, plasma physics, and atomic and molecular physics. I co-invented a new form of

lighting, “light tiles”, that are thin and flat. This culminated in the formation of a company known as Eden Park Illumination. I discovered numerous ultraviolet, visible and near-infrared atomic and molecular lasers, including the KrCl ultraviolet (excimer) laser, the optically-pumped XeF, HgCl, and rare gas lasers and the CdI, CdBr, ZnI, Li, Fe, and Cd visible and near-infrared lasers. I demonstrated the first long pulse ($> 1 \mu\text{s}$) excimer laser and the first lasers (Ar – N₂, XeF) pumped by a proton beam. The excimer lasers are now used worldwide in photolithography, surgical procedures (such as corneal refractive correction) and micromachining of materials. I discovered the laser excitation spectroscopy of photoassociation (the absorption of optical radiation by free atomic pairs) of thermal atoms as a probe of the structure of transient molecules. I demonstrated with my graduate students the first ultraviolet and violet glass fiber lasers. I discovered the excimer-pumped atomic lasers (lasing on the D1 and D2 lines of Na, Cs, and Rb) for laser guide stars and mesosphere probing by LIDAR. I conducted the first observation (by laser spectroscopy) of Rydberg series for the rare gas diatomics (Ne₂, Ar₂, Kr₂, Xe₂) and the first measurement of the rotational constants for Ne₂ and Ar₂, as well as the vibrational constants for Ne₂⁺. I pioneered the development of microcavity plasma devices and arrays in silicon, Al/Al₂O₃, glass, ceramics, and multilayer metal/polymer structures. For this, I was the recipient of the C.E.K. Mees Award from the Optical Society of America, the

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