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 IPR2015-01377
U.S. Patent No. 7,435,982

PATENT OWNER'S RESPONSE
UNDER 37 C.F.R. § 42.120

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I. INTRODUCTION

This case is about a light source that generates a "high brightness light" that is so much brighter than what preceded it, that it has essentially replaced the arc lamps previously used in semiconductor wafer inspection, lithography, and metrology tools.

Energetiq's invention solved a fundamental problem – how to generate a light *brighter* than arc lamps. Energetiq patented a novel approach that uses a laser that provides energy to a gas in a chamber to produce a "high brightness light."

Petitioners allege that the challenged claims—all of which require a "high brightness light"—are rendered obvious based on an incomplete system described in a 20 year old reference (Gärtner) that would be *incapable* of achieving the claimed "high brightness light." For certain of the claim terms, Petitioners cite Beterov for the concept of providing laser energy near a resonance transition line, as required by these dependent claims, but fail to explain how such an addition would remedy Gärtner's failure to enable a high brightness light. Since Petitioners rely only on Gärtner (not Beterov) for the "high brightness light" limitation, and Gärtner does not disclose, let alone enable, to one of ordinary skill in the art the claimed "high brightness light"—which properly construed must be at least as

bright as arc lamps—Petitioners' obviousness arguments must fail and the claims must be confirmed.[1]

II. THE STATE OF THE ART AND THE CLAIMED INVENTION

A. State of the Art and Prior Arc Lamps

For at least a decade prior to the invention, the semiconductor industry used xenon or mercury arc lamps to produce a light for use in wafer inspection and metrology systems. (See Smith Decl. at ¶ 8 (Ex. 2016); '982 Patent at 1:20-22 (Ex. 1201) ("The state of the art in, for example, wafer inspection systems involves the use of xenon or mercury arc lamps to produce light.").)

Arc lamps use an anode and cathode to provide an electrical discharge to a gas within the lamp that excites the gas, causing it to emit light. (See '982 Patent at 1:20-35 (Ex. 1201).) However, they suffer from a number of shortcomings that constrain the accuracy and efficiency of the equipment that uses them. These problems include instability of the arc, undesirably short time to failure, and limits on how bright such sources can get (the spectral brightness of arc lamps is limited by the maximum current density—if too high, it would melt the arc lamps'

[1] This Response is supported by the declaration of Dr. Philip H. Bucksbaum, a professor in Physics, Applied Physics, and Photon Science at Stanford University.

electrodes). (*See, e.g.*, '982 Patent at 1:20-35 (Ex. 1201); Smith Decl. at ¶ 8 (Ex. 2016).)

Over time, the industry demanded improvements in the brightness level of light sources beyond that which could be met by traditional xenon and mercury arc lamps (ordinarily in the range of about 1 to 9 mW/mm^2-sr-nm). (Smith Decl. at ¶ 8 (Ex. 2016).) For instance, in 2005, Energetiq was approached by an industry leader to see whether Energetiq could use a plasma to develop a high brightness light source. The industry required light that was at least many times higher brightness than that of existing arc lamps. (Smith Decl. at ¶ 10 (Ex. 2016).) Petitioner ASML agrees that "[s]ignificant . . . brightness improvements" are necessary over arc lamps. (*Id.*; U.S. Pub. No. US 2013/0329204 A1 at ¶ 0008 (Ex. 2009).)

B. Energetiq's Patented Laser Driven Light Source

To satisfy the industry's need for a higher brightness light source, Energetiq developed a laser-driven light source that uses fundamentally different technology and physics principles than arc lamps.

Energetiq's invention is directed at a light source comprising a chamber, an ignition source for ionizing a gas within the chamber, and at least one laser for providing energy to the ionized gas to produce a "high brightness light." Energetiq's patented laser-driven light source produces a "high brightness light"

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