

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
1 February 2001 (01.02.2001)

PCT

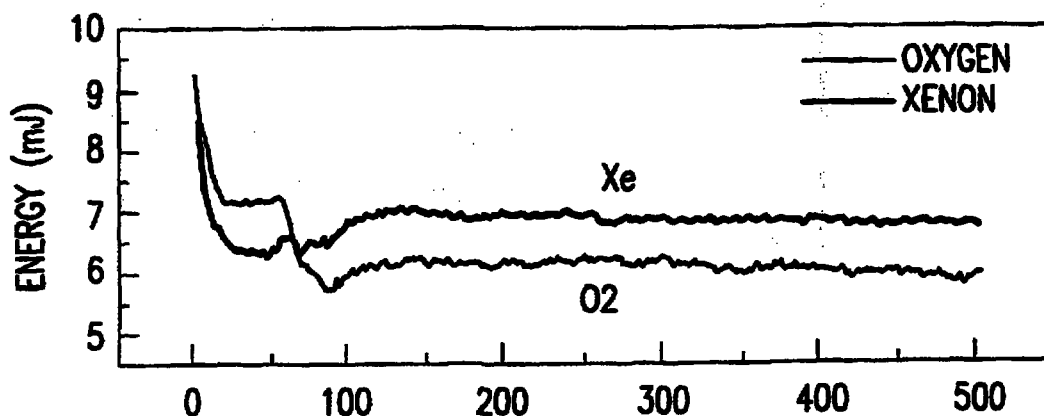
(10) International Publication Number
WO 01/08278 A1

- (51) International Patent Classification⁷: H01S 3/22 (74) Agent: ROSS, John, R.; Cymer, Inc., Legal Department
- M/S 3-2A, 16750 Via Del Campo Court, San Diego, CA
92127-1712 (US).
- (21) International Application Number: PCT/US00/18141
- (22) International Filing Date: 29 June 2000 (29.06.2000) (81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data: 09/361,551 27 July 1999 (27.07.1999) US (84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).
- (71) Applicant (*for all designated States except US*): CYMER, INC. [US/US]; 16750 Via Del Campo Court, San Diego, CA 92127-1712 (US).
- (72) Inventors; and
- (75) Inventors/Applicants (*for US only*): BESAUCELE, Herve, A. [FR/US]; 3583 Utah Street, San Diego, CA 92104 (US). ISHIHARA, Toshihiko [JP/US]; 7447 Salizar Street, San Diego, CA 92111 (US). HOFMANN, Thomas [DE/US]; 4794 Arizona Street #205, San Diego, CA 92116 (US).

Published:
— With international search report.

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: NARROW BAND GAS DISCHARGE LASER WITH GAS ADDITIVE



(57) Abstract: The present invention provides a very narrow band pulse excimer laser capable of producing pulses at a rate in the range of about 500 to 2000 Hz with enhanced energy dose control and reproducibility. Very small quantities of a stabilizing additive consisting of oxygen or a heavy noble gas (xenon or radon for KrF lasers, or krypton, xenon or radon for ArF lasers), are added to the gas mixture. Tests performed show substantial improvements in energy stability with the addition of about 30 ppm of xenon to a KrF laser. Tests show improved performance for the ArF Lasers with the addition of about 6-10 ppm of Xe or 40 ppm of Kr. In a preferred embodiment, very narrow bandwidth is achieved on a KrF laser by reducing fluorine partial pressure to less than 0.10 percent and by increasing the reflectance of the output coupler to greater than 25 percent. In a preferred embodiment, prior art fused silica beam expansion prisms used in the prior art line narrowing module were replaced with calcium fluoride prisms (see fig - specification devoid of reference numerals).

WO 01/08278 A1