

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
16 June 2005 (16.06.2005)

PCT

(10) International Publication Number
WO 2005/054949 A3

(51) International Patent Classification⁷: **H01S 3/22**

(21) International Application Number:
PCT/US2004/037617

(22) International Filing Date:
12 November 2004 (12.11.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
10/722,992 26 November 2003 (26.11.2003) US
10/781,251 18 February 2004 (18.02.2004) US
10/884,547 1 July 2004 (01.07.2004) US

(71) Applicant (for all designated States except US): **CYMER, INC.** [US/US]; 17075 Thornmint Court, San Diego, CA 92127-2413 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **PARTLO, William, N.** [US/US]; 12634 Pedriza Street, Poway, CA 92064 (US). **DAS, Palash, P.** [US/US]; 2029 Paseo de Anza, Vista, CA 92084 (US). **HUDYMA, Russell** [US/US]; 218 East Ridge Drive, San Ramon, CA 94583 (US). **THOMAS, Michael** [US/US]; 23 Bow Road, Belmont, MA 02478 (US).

(74) Agent: **CRAY, William, C.**; Cymer, Inc., Legal Department MS/4-2C, 17075 Thornmint Court, San Diego, CA 92127-2413 (US).

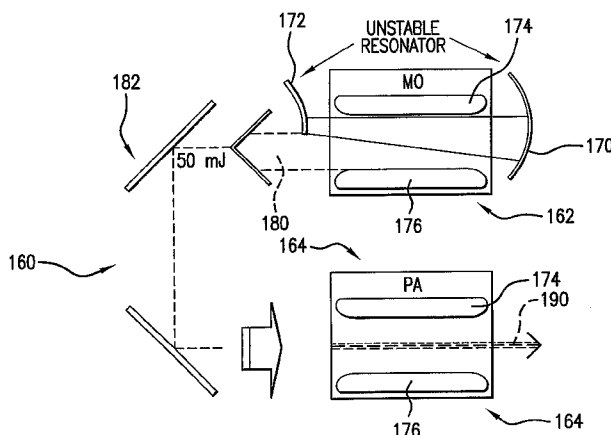
(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— with international search report

[Continued on next page]

(54) Title: LASER THIN FILM POLY-SILICON ANNEALING SYSTEM



(57) Abstract: A gas discharge laser crystallization apparatus and method for performing a transformation of a crystal makeup or orientation in a film on a workpiece is disclosed, which may comprise a master oscillator power amplifier MOPA or power oscillator power amplifier configured XeF laser system producing a laser output light pulse beam at a high repetition rate and high power with a pulse to pulse dose control; an optical system producing an elongated thin pulsed working beam from the laser output light pulse beam. The apparatus may further comprise the laser system is configured as a POPA laser system and further comprising: relay optics operative to direct a first output laser light pulse beam from a first laser PO unit into a second laser PA unit; and, a timing and control module timing the creation of a gas discharge in the first and second laser units within plus or minus 3 ns, to produce the a second laser output light pulse beam as an amplification of the first laser output light pulse beam. The system may comprise divergence control in the oscillator laser unit. Divergence control may comprise an unstable resonator arrangement. The system may further comprise a beam pointing control mechanism intermediate the laser and the workpiece and a beam position control mechanism intermediate the laser and the workpiece. Beam parameter metrology may provide active feedback control to the beam pointing mechanism and active feedback control to the beam position control mechanism.



WO 2005/054949 A3



— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

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.

(88) Date of publication of the international search report:

15 December 2005