

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
9 December 2004 (09.12.2004)

PCT

(10) International Publication Number
WO 2004/107042 A1

(51) International Patent Classification⁷: **G03C 5/00**,
G03F 9/00

(21) International Application Number:
PCT/US2004/015693

(22) International Filing Date: 19 May 2004 (19.05.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
10/249,944 21 May 2003 (21.05.2003) US

(71) Applicant (for all designated States except US): **INTERNATIONAL BUSINESS MACHINES CORPORATION** [US/US]; New Orchard Road, Armonk, NY 10504 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **FONSECA, Carlos, A.** [US/US]; 3849 Amboy Road, E-1, Staten Island, NY 10308 (US). **BUKOFSKY, Scott, J.** [US/US]; 51 Clearview Circle, Hopewell Junction, NY 12533 (US). **LAI, Kafai** [CN/US]; 108 Hillis Terrace, Poughkeepsie, NY 12603 (US).

(74) Agent: **LI, Todd, M., C.**; IBM Corporation, Zip 482, 2070 Route 52, Hopewell Junction, NY 12533 (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, 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
- 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.

(54) Title: METHOD FOR EVALUATING THE EFFECTS OF MULTIPLE EXPOSURE PROCESSES IN LITHOGRAPHY

(57) Abstract: A method of evaluating process effects of multiple exposure photolithographic processes by first determining a set of expected images for each exposure step or process of the multiple exposure process individually (SET1, SET2) and then obtaining a composite set of images (FINALSET) by sequentially perturbing images from a first or previous exposure step (SET1) by weighted images from the subsequent exposure step (SET2). Preferably, the expected images are determined by simulation in the form of normalized aerial images over a range of defocus for each exposure step, and the weighting factor used is the dose-ratio of the subsequent exposure dose to the prior step exposure dose. The resulting composite set of images may be used to evaluate multiple exposure processes, for example, to provide an estimate of yield for a given budget of dose and focus errors, or alternatively, to provide specifications for tool error budgets required to obtain a target yield.

WO 2004/107042 A1