

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property
Organization
International Bureau

(43) International Publication Date
26 October 2023 (26.10.2023)



(10) International Publication Number
WO 2023/204840 A1

(51) International Patent Classification:
H01J 37/32 (2006.01) *H03H 7/38* (2006.01)

(21) International Application Number:
PCT/US2022/046214

(22) International Filing Date:
11 October 2022 (11.10.2022)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
17/726,930 22 April 2022 (22.04.2022) US

(71) Applicant: **APPLIED MATERIALS, INC.** [US/US];
3050 Bowers Avenue, Santa Clara, California 95054 (US).

(72) Inventors: **GUO, Yue**; 974 E. Arques Avenue, M/S 81312,
Sunnyvale, California 94085 (US). **KAWASAKI, Kat-**

sumasa; 974 E. Arques Avenue, M/S 81312, Sunnyvale,
California 94085 (US). **RAMASWAMY, Kartik**; 974 East
Arques Avenue, Sunnyvale, California 94085 (US). **YANG,**
Yang; 974 E. Arques Avenue, Sunnyvale, California 94085
(US). **BRIGHT, Nicolas John**; 29 Oak Lane, Mountain
Lakes, New Jersey 07046 (US).

(74) Agent: **MASURE, Eric** et al.; 1040 Broad Street, Suite 103,
Shrewsbury, New Jersey 07702 (US).

(81) Designated States (unless otherwise indicated, for every
kind of national protection available): AE, AG, AL, AM,
AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ,
CA, CH, CL, CN, CO, CR, CU, CV, CZ, DE, DJ, DK, DM,
DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT,
HN, HR, HU, ID, IL, IN, IQ, IR, IS, IT, JM, JO, JP, KE,
KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU,
LY, MA, MD, MG, MK, MN, MW, MX, MY, MZ, NA, NG,
NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS,

(54) Title: METHODS AND APPARATUS FOR PROCESSING A SUBSTRATE

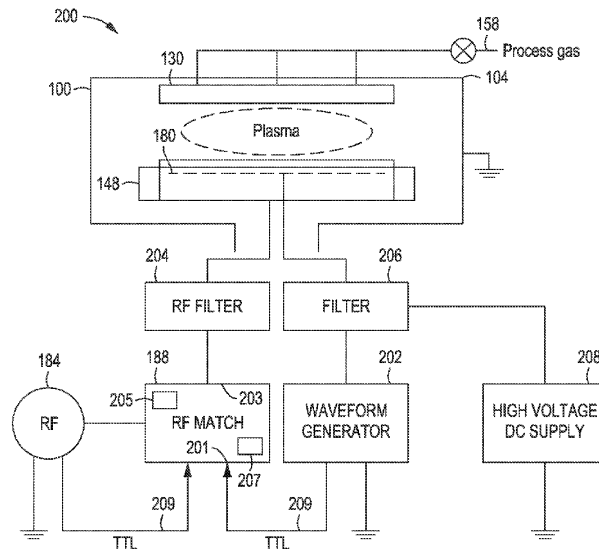


FIG. 2

(57) Abstract: Methods and apparatus for processing a substrate are provided herein. For example, a matching network configured for use with a plasma processing chamber comprises an input configured to receive one or more radio frequency (RF) signals, an output configured to deliver the one or more RF signals to a processing chamber, a first sensor operably connected to the input and a second sensor operably connected to the output and configured to measure impedance during operation, at least one variable capacitor connected to the first sensor and the second sensor and a controller, based on a measured impedance, configured to tune the at least one variable capacitor of the matching network to a first target position based on weighted output impedance values measured at pulse states of a voltage waveform and to tune the at least one variable capacitor to a second target position based on weighted input impedance values measured at the pulse states of the voltage waveform.

[Continued on next page]

RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ,
TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA,
ZM, ZW.

(84) Designated States (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SC, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, ME, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*