

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
12 January 2006 (12.01.2006)

PCT

(10) International Publication Number
WO 2006/004829 A2

(51) International Patent Classification:

G01R 31/3193 (2006.01) **G01R 31/319** (2006.01)
G01R 31/317 (2006.01)

(21) International Application Number:

PCT/US2005/023088

(22) International Filing Date: 30 June 2005 (30.06.2005)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:

10/881,373 30 June 2004 (30.06.2004) US

(71) Applicant (for all designated States except US): **TERADYNE, INC.** [US/US]; 321 Harrison Avenue, Boston, MA 02118 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **GAGE, Robert, Bruce** [US/US]; 13475 S.W. Tapadera Street, Beaverton, OR 97008 (US). **SALMI, Jacob, Alvin** [US/US]; 1358 138th Lane N.W., Andover, MN 55304 (US).

(74) Agents: **MOOSEY, Anthony, T.** et al.; Teradyne, Inc., Legal Department, MS-H61, 321 Harrison Avenue, Boston, MA 02118 (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, KM, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

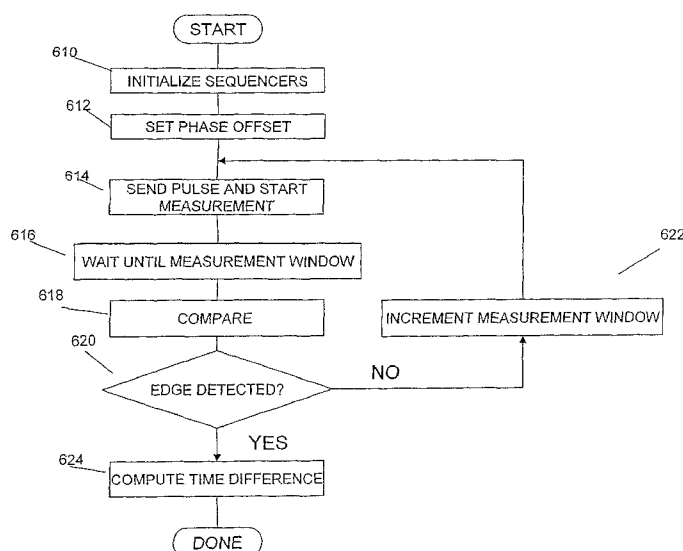
(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, 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).

Declarations under Rule 4.17:

— as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii)) for the following designations 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, KM, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV,

[Continued on next page]

(54) Title: PRECISE TIME MEASUREMENT APPARATUS AND METHOD



(57) Abstract: A time measurement system that uses two signals generated by direct digital synthesis. The generated signals have the same frequency but different phase. One signal is used to identify the start of the measurement interval and the other signal is used to identify a measurement window in which a signal indicating the end of the measured interval might be detected. The time measurement system is used as part of a time domain reflectometry (TDR) system. An incident pulse is synchronized to the first signal and launched down on a line. In the measurement window, the signal on the line is compared to a threshold value to determine whether the pulse has been reflected and traveled back to the source. By iteratively repeating the measurement with a different measurement window, the time of arrival of the reflected pulse can be determined. This time domain reflectometry approach is incorporated into automatic test equipment for testing semiconductor devices and is used to calibrate the test equipment.

WO 2006/004829 A2



MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW, ARIPO patent (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)

— as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii)) for all designations

Published:

— without international search report and to be republished upon receipt of that 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.