

(43) International Publication Date
17 December 2009 (17.12.2009)(10) International Publication Number
WO 2009/152416 A3(51) International Patent Classification:
G01V 1/46 (2006.01)(21) International Application Number:
PCT/US2009/047184(22) International Filing Date:
12 June 2009 (12.06.2009)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
12/137,980 12 June 2008 (12.06.2008) US(71) Applicant (for all designated States except US):
CHEVRON U.S.A. INC. [US/US]; P.O. Box 6006, San Ramon, CA 94583 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **JOHNSON, Paul, A.** [US/US]; 04 CR 113 South, Santa Fe, NM 87506 (US). **GUYER, Robert** [US/US]; 2020 Dickerson Rd., Reno, NV 89503 (US). **LE BAS, Pierre-Yves** [FR/US]; 625 La Bajada, Los Alamos, NM 87544 (US). **VU, Cung** [US/US]; 2811 Lafayette Dr., Huston, TX 77005 (US). **NIHEL, Kurt** [US/US]; 5839 Amy Dr., Oakland, CA 94618 (US). **SCHMITT, Denis, P.** [FR/US]; 3903 S. Mason Rd. #1131, Katy, TX 77450 (US). **SKELT, Christopher** [GB/US]; 10219 Inwood Dr., Houston, TX 77042 (US).(74) Agents: **PEREZ, Robert** et al.; Pillsbury Winthrop Shaw Pittman LLP, P.O. Box 10500, McLean, VA 22102 (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, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, 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, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, 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 (Art. 21(3))
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

[Continued on next page]

(54) Title: METHOD AND SYSTEM FOR GENERATING A BEAM OF ACOUSTIC ENERGY FROM A BOREHOLE, AND APPLICATIONS THEREOF

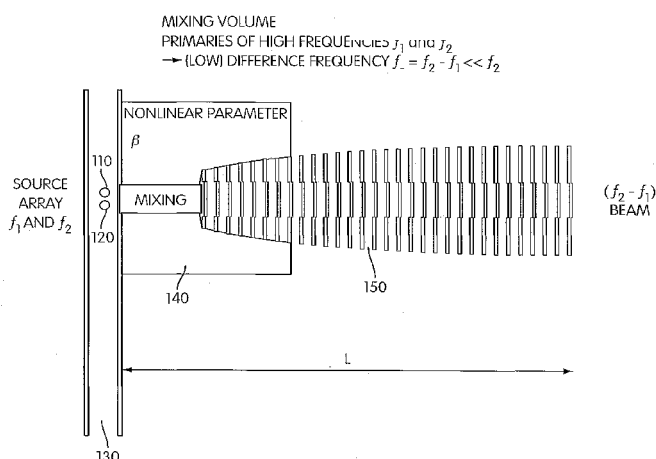


FIG. 1

(57) Abstract: A compact array of transducers (110, 120) is employed as a downhole instrument for acoustic investigation of the surrounding rock formation. The array is operable to generate simultaneously a first acoustic beam signal (110) at a first frequency and a second acoustic beam signal (120) at a second frequency different than the first frequency. These two signals can be oriented through an azimuthal rotation of the array and an inclination rotation using control of the relative phases of the signals from the transmitter elements or electro-mechanical linkage. Due to the non-linearity of the formation (140), the first and the second acoustic beam signal (110, 120) mix into the rock formation where they combine into a collimated third signal (150) that propagates in the formation along the same direction than the first and second signals and has a frequency equal to the difference of the first and the second acoustic signals. The third signal is received either within the same borehole, after reflection, or another borehole, after transmission, and analyzed to determine information about rock formation.



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

25 February 2010