

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
12 August 2004 (12.08.2004)

PCT

(10) International Publication Number
WO 2004/068731 A3

(51) International Patent Classification⁷: **H04B 1/10**,
H01H 59/00

CA 90245-0902 (US). CAI, Khiem, V.; c/o Raytheon Company, 2000 E. El Segundo Boulevard, P.O. Box 902 (E4/N119), El Segundo, CA 90245-0902 (US).

(21) International Application Number:
PCT/US2004/002055

(74) Agents: **ALKOV, Leonard, A.** et al.; c/o Raytheon Company, 2000 E. El Segundo Boulevard, P.O. Box 902 (E4/N119), El Segundo, CA 90245-0902 (US).

(22) International Filing Date: 26 January 2004 (26.01.2004)

(25) Filing Language: English

(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.

(26) Publication Language: English

(30) Priority Data:
10/352,407 28 January 2003 (28.01.2003) US

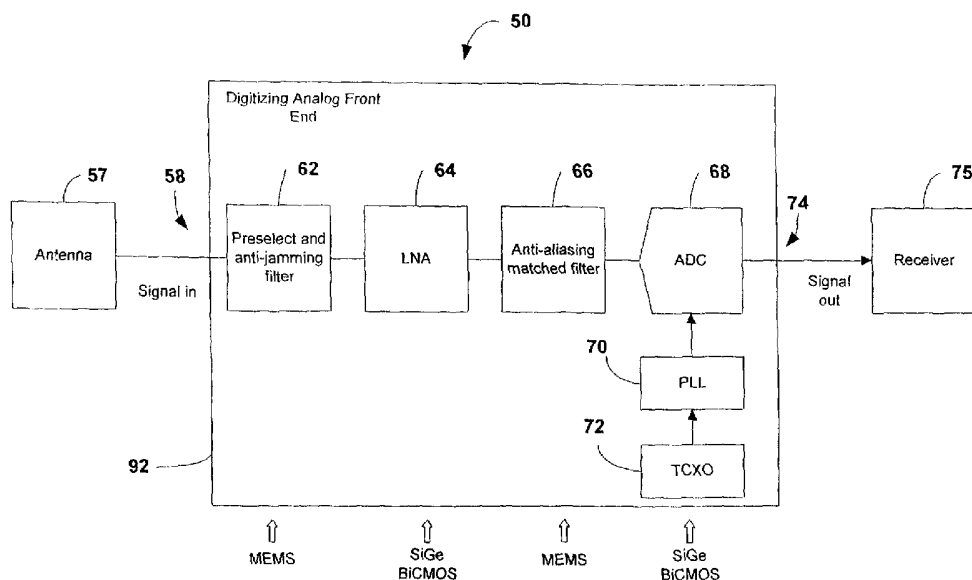
(71) Applicant: **RAYTHEON COMPANY** [US/US]; 2000 E. El Segundo Boulevard, P.O. Box 902 (E4/N119), El Segundo, CA 90245-0902 (US).

(72) Inventors: **KENT, Samuel, D., III**; c/o Raytheon Company, 2000 E. El Segundo Boulevard, P.O. Box 902 (E4/N119), El Segundo, CA 90245-0902 (US). **LINDER, Lloyd, F.**; c/o Raytheon Company, 2000 E. El Segundo Boulevard, P.O. Box 902 (E4/N119), El Segundo,

(84) Designated States (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LS, MW, MZ, 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,

[Continued on next page]

(54) Title: MIXED TECHNOLOGY MEMS/SiGe BiCMOS DIGITIZING ANALOG FRONT END WITH DIRECT RF SAMPLING



(57) Abstract: A digitizing analog front end (DAFE) (50) using mixed technology on a single substrate is described. SiGe BiCMOS technology is implemented for the semiconductor components, which include a low noise amplifier (64) and an analog-to-digital converter (68). Micro Electro Mechanical System (MEMS) switches are used to change the filtering characteristics of several filters, including an anti-aliasing filter (66) and a pre-select and anti-jamming filter (62).



GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK,
TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW,
ML, MR, NE, SN, TD, TG).

(88) Date of publication of the international search report:
7 October 2004

Published:

— with international search 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.

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US2004/002055

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04B1/10 H01H59/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H04B H01H G01S H03H H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, INSPEC, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	T-C NGUYEN C: "COMMUNICATIONS APPLICATIONS OF MICROELECTROMECHANICAL SYSTEMS" PROCEEDINGS, 1998 SENSORS EXPO, 19 May 1998 (1998-05-19), pages 447-455, XP002190275 page 453, left-hand column, line 13 - right-hand column, line 36; figures 2,13	1-9
X	US 2002/012411 A1 (HEINZL JOHANN ET AL) 31 January 2002 (2002-01-31) page 7, paragraph 75 - page 8, paragraph 83	1-9
A	EP 0 987 829 A (TERAYON COMMUNICATION SYSTEMS) 22 March 2000 (2000-03-22) column 3, line 3 - line 35; claim 1 ----- -/--	1-9



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *G* document member of the same patent family

Date of the actual completion of the international search

9 July 2004

Date of mailing of the international search report

20/07/2004

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Lindberg, P

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US2004/002055

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>US 5 325 204 A (SCARPA CARL G) 28 June 1994 (1994-06-28) column 3, line 48 - column 4, line 59; figures 1,2</p> <p>-----</p>	1-9

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US2004/002055

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 2002012411	A1	31-01-2002	AU 5325401 A	23-10-2001
			WO 0177705 A2	18-10-2001
			US 2003112905 A1	19-06-2003
EP 0987829	A	22-03-2000	US 6426983 B1	30-07-2002
			CA 2281863 A1	14-03-2000
			EP 0987829 A2	22-03-2000
			JP 2000101479 A	07-04-2000
US 5325204	A	28-06-1994	US 5325188 A	28-06-1994
			US 5400084 A	21-03-1995
			US 5282023 A	25-01-1994