

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
27 December 2007 (27.12.2007)

(10) International Publication Number  
**WO 2007/149794 A3**

(51) International Patent Classification:  
*H04L 12/50* (2006.01)

(74) Agents: AMIN, Himanshu S. et al.; Amin & Turocy, LLP,  
1900 E. 9th Street, 24th Floor, National City Center, Cleve-  
land, OH 44114 (US).

(21) International Application Number:  
PCT/US2007/071414

(81) Designated States (unless otherwise indicated, for every  
kind of national protection available): AE, AG, AL, AM,  
AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH,  
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, PG, PH, PL,  
PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY,  
TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA,  
ZM, ZW.

(22) International Filing Date: 16 June 2007 (16.06.2007)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
11/424,639 16 June 2006 (16.06.2006) US  
11/424,664 16 June 2006 (16.06.2006) US  
11/424,614 16 June 2006 (16.06.2006) US

(71) Applicant (for all designated States except US): CINGU-  
LAR WIRELESS II LLC [US/US]; 5565 Glenridge Con-  
nector, Atlanta, GA 30342 (US).

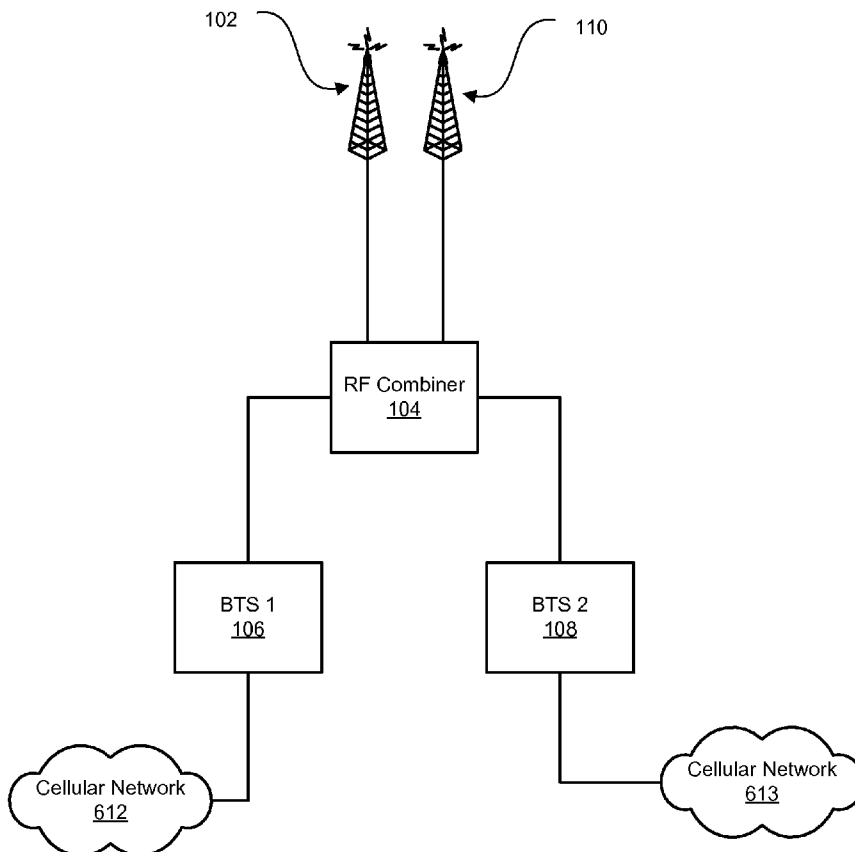
(84) Designated States (unless otherwise indicated, for every  
kind of regional protection available): ARIPO (BW, GH,  
GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM,  
ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),  
European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI,  
FR, GB, GR, HU, IE,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

(72) Inventor; and

(75) Inventor/Applicant (for US only): LOYET, Lowell L.  
[US/US]; 20115 183rd Place NE, Woodinville, WA 98077  
(US).

[Continued on next page]

(54) Title: MULTI-BAND RF COMBINER



(57) Abstract: An RF (radio frequency) combiner utilizes RF filtering cavities and transmission paths incorporated into an RF impervious material. This allows traditional stand-alone multiplexers to be integrated into a single device without using signal loss-inducing cables and connections between the multiplexers. The simplicity of the RF combiner allows for RF filters to be milled out of the same RF impervious material without requiring an external RF connection and avoids a cascading of multiple RF filters. In one instance, the RF combiner is employed with two BTS (base transceiver stations) to allow the sharing of antennas without the power losses associated with traditional cascading duplexers.

WO 2007/149794 A3



PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM,  
GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

— *before the expiration of the time limit for amending the  
claims and to be republished in the event of receipt of  
amendments*

**Published:**

— *with international search report*

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

15 January 2009

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 07/1414

<b>A. CLASSIFICATION OF SUBJECT MATTER</b> IPC(8) - H04L 12/50 (2008.04) USPC - 370/382 According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b> Minimum documentation searched (classification system followed by classification symbols) IPC(8): H04L 12/50 (2008.04) USPC: 370/382 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched USPC: 370/351, 360, 382 Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) Electronic databases: USPTO WEST (PGPB, USPT, EPAB, JPAB); Google Scholar Search Terms Used: combining or mixing radio frequency or RF signals, shared or common antennas, communication network or path, material or metal, RF multiplexer or duplexer, RF waveguide or cavity or filtering, base or transceiver stations etc.		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2006/0068723 A1 (Khorram) 30 May 2006 (30.05.2006), (abstract, figs. 1-2, and para [0018]-[0030], [0035]-[0043])	1-20
A	US 2005/0093647 A1 (DeCormier et al.) 05 May 2005 (05.05.2005), entire document	1-20
A	US 2005/0073456 A1 (Sievenpiper et al.) 07 April 2005 (07.04.2005), entire document	1-20
A	US 2004/0266485 A1 (Paramesh et al.) 30 December 2004 (30.12.2004), entire document	1-20
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/>		
* 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 application or patent 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 "&" document member of the same patent family		
Date of the actual completion of the international search 06 November 2008 (06.11.2008)		Date of mailing of the international search report <b>17 NOV 2008</b>
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201		Authorized officer: Lee W. Young PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774