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(54) **Title:** APPARATUS AND METHODS FOR ADJUSTING ADAPTIVE CONTROL LOOP BEHAVIOR BASED ON MEASURED ARTIFACTS

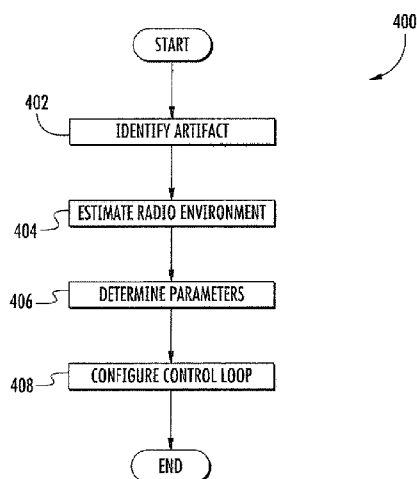


FIG. 4

(57) **Abstract:** Methods and apparatus for adjusting adaptive control loop behavior based on, for example measured artifacts of the radio environment. In one embodiment, a Long Term Evolution (LTE) user equipment (UE) adjusts one or more Automatic Gain Control (AGC) loops based on a measured Doppler spread of received signals. Specifically, one or more AGC parameters (e.g., set-point, loop gain, etc.) are selected based on a measured Doppler spread. The one or more AGC parameters are configured to optimize both the AGC headroom (e.g., dynamic range) and the signal to quantization plus noise ratio (SQNR) of the receiver under dynamic wireless fading channels for the detected Doppler.



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INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER

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ADD.

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)

H03G H04L

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 practicable, search terms used)

EP0-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 2 367 385 A1 (ERICSSON TELEFON AB L M [SE]) 21 September 2011 (2011-09-21) paragraphs [0009], [0016] - [0020], [0027] - [0028] paragraphs [0033], [0048] - [0050], [0053] - [0056], [0062] -----	1-24
A	US 2009/060064 A1 (FUTAKI HISASHI [JP] ET AL) 5 March 2009 (2009-03-05) paragraphs [0101], [0102], [0189] - [0191]; figure 1 -----	1-24
A	US 2008/101215 A1 (TANAKA MASATO [JP] ET AL) 1 May 2008 (2008-05-01) paragraph [0069]; figure 5 -----	1-24



Further documents are listed in the continuation of Box C.



See patent family annex.

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INTERNATIONAL SEARCH REPORT

Information on patent family members

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Patent document cited in search report		Publication date		Patent family member(s)	Publication date
EP 2367385	A1	21-09-2011	CN	102907145 A	30-01-2013
			EP	2367385 A1	21-09-2011
			US	2013003584 A1	03-01-2013
			WO	2011113919 A1	22-09-2011

US 2009060064	A1	05-03-2009	US	2009060064 A1	05-03-2009
			WO	2006107037 A1	12-10-2006

US 2008101215	A1	01-05-2008	US	2008101215 A1	01-05-2008
			US	2011069771 A1	24-03-2011
