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Declarations under Rule 4.17:

- as to the identity of the inventor (Rule 4.17(i))
- of inventorship (Rule 4.17(iv))

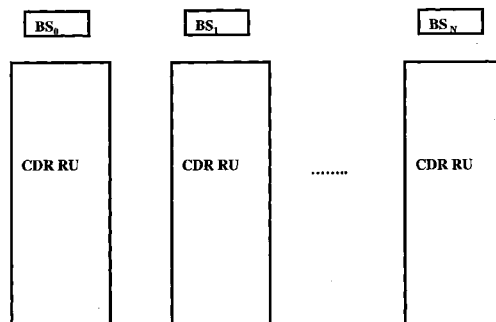
Published:

- 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))

(88) Date of publication of the international search report:
14 May 2010

(54) Title: METHODS AND SYSTEMS FOR INTERFERENCE MITIGATION

FIG. 8



(57) Abstract: Embodiments herein provide methods and systems for enhancing interference mitigation using conjugate symbol repetition and phase randomization on a set of subcarriers. The repeated data tone in the signal is complex-conjugated before transmission, when the repetition factor is two. When the repetition factor is greater than two, a combination of conjugate repetition and random/deterministic phase variation of the repeated tones is used to mitigate the interference mitigation. Embodiments further disclose Collision Free Interlaced Pilot PRU Structures that can be used with or without conjugate symbol repetition and phase randomization for interference mitigation.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/IN2009/000350

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - H04W 28/02 (2010.01)

USPC - 370/203

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(8) - H04W 28/02 (2010.01)

USPC - 370/203

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)

PatBase, MicroPatent

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,867,478 A (BAUM et al) 02 February 1999 (02.02.1999) entire document	1-61, 66-67, 72-89
Y	US 2002/0191535 A1 (SUGIYAMA et al) 19 December 2002 (19.12.2002) entire document	1-41, 46-61, 66-67, 72-89
Y	US 6,115,406 A (MESECHER) 05 September 2000 (05.09.2000) entire document	23-53
Y	US 7,292,650 B2 (LEE et al) 06 November 2007 (06.11.2007) entire document	54-61, 66-67, 72
Y	US 6,990,059 B1 (ANIKHINDI et al) 24 January 2006 (24.01.2006) entire document	55
Y	US 6,438,367 B1 (CRAWFORD) 20 August 2002 (20.08.2002) entire document	56
Y	US 6,215,819 B1 (HYAKUDAI et al) 10 April 2001 (10.01.2001) entire document	56
Y	US 2008/0125154 A1 (ZIRWAS et al) 29 May 2008 (29.05.2008) entire document	59-60
Y	US 2004/0179480 A1 (ATTAR et al) 16 September 2004 (16.09.2004) entire document	73-89

☐ Further documents are listed in the continuation of Box C.

* 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

01 March 2010

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/IN2009/000350

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

See extra sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☒ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/IN2009/000350

Continuation of Box III.

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I, claims 1-22, drawn to a method and transmitter for transmitting repeated and encoded symbols in a synchronized transmission. Group II, claims 23-53, drawn to a method and transmitter comprising assigning a unique pilot pattern corresponding to a sector number of a sector such that no two sectors with different sector number have pilots in the same location in their respective pilot patterns, wherein said pilot pattern comprises pilot tones and null tones.

Group III, claims 54-72, drawn to a method and receiver for decoding and filtering signals to obtain a decision matrix and demodulating the signals to obtain the original data.

Group IV, claims 73-89, drawn to a method and wireless communication network comprising receiving quality metric data from users.

The inventions listed as Groups I, II, III or IV do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: the special technical feature of the Group I invention: transmitting repeated and encoded symbols in a synchronized transmission as claimed therein is not present in the invention of Groups II, III or IV as a novel special technical feature. The special technical feature of the Group II invention: assigning a unique pilot pattern corresponding to a sector number of a sector such that no two sectors with different sector number have pilots in the same location in their respective pilot patterns, wherein said pilot pattern comprises pilot tones and null tones as claimed therein is not present in the invention of Groups I, III or IV. The special technical feature of the Group III invention: decoding and filtering signals to obtain a decision matrix and demodulating the signals to obtain the original data as claimed therein is not present in the invention of Groups I, II or IV. The special technical feature of the Group IV invention: receiving quality metric data from users as claimed therein is not present in the invention of Groups I, II or III.

Groups I, II lack unity of invention because even though the inventions of these groups require the technical feature of enhancing interference mitigation in a wireless network, repeating incoming modulation symbols, encoding the repeated symbols using a combination of complex conjugation and phase variation, and spatially separated transmitters which transmit the encoded symbols in a synchronized transmission, this technical feature is not a special technical feature as it does not make a contribution over the prior art in view of US 5,867,478 A (BAUM et al) 02 February 1999 (02.02.1999) column 3, lines 15-25; figures 21-23.

Since none of the special technical features of the Group I, II, III or IV inventions are found in more than one of the inventions, unity of invention is lacking.