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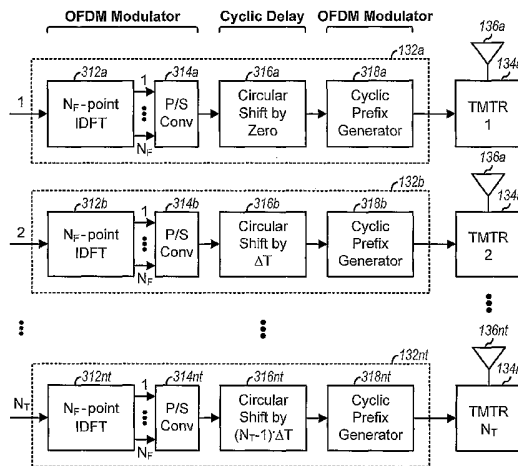
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Declarations under Rule 4.17:

— as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))

[Continued on next page]

(54) Title: SPATIAL SPREADING WITH SPACE-TIME AND SPACE-FREQUENCY TRANSMIT DIVERSITY SCHEMES FOR A WIRELESS COMMUNICATION SYSTEM



(57) Abstract: Techniques for transmitting data using a combination of transmit diversity schemes are described. These transmit diversity schemes include spatial spreading, continuous beamforming, cyclic delay diversity, space-time transmit diversity (STTD), space-frequency transmit diversity (SFTD), and orthogonal transmit diversity (OTD). A transmitting entity processes one or more (ND) data symbol streams based on a transmit diversity scheme (e.g., STTD, SFTD, or OTD) to generate multiple (NC) coded symbol streams. Each data symbol stream may be sent as a single coded symbol stream or as multiple (e.g., two) coded symbol streams using STTD, SFTD, or OTD. The transmitting entity may perform spatial spreading on the NC coded symbol streams with different matrices to generate multiple (N_T) transmit symbol streams for transmission from N_T antennas. Additionally or alternatively, the transmitting entity may perform continuous beamforming on the N_T transmit symbol streams in either the time domain or the frequency domain.

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— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

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INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER H04B7/06 H04L1/06		
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) H04B 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 practical, search terms used) EPO-Internal, WPI Data, PAJ, INSPEC		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2004/136349 A1 (WALTON J. RODNEY ET AL) 15 July 2004 (2004-07-15) abstract figure 3 paragraphs '0026!, '0160! - '0185!, '0235! ----- -/--	1, 2, 9, 10, 13, 15, 17, 19, 21, 23-27, 29, 30, 32
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C.		
<input checked="" type="checkbox"/> See patent family 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. "&" document member of the same patent family		
Date of the actual completion of the international search 7 March 2006	Date of mailing of the international search report 16. 03. 2006	
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 Lustrini, D	

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International application No

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2004/146018 A1 (WALTON J. RODNEY ET AL) 29 July 2004 (2004-07-29) abstract figure 5 paragraphs '0081! - '0097! -----	1,2,13, 15,17, 19,21, 23-27, 29,30,32
P,X	WO 2005/060192 A (QUALCOMM INCORPORATED; WALTON, JAY, RODNEY; KETCHUM, JOHN, W; WALLACE,) 30 June 2005 (2005-06-30) abstract paragraphs '0076! - '0080!, '0112! - '0124! -----	1,2,4-8, 13-15, 17-19, 21-32
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INTERNATIONAL SEARCH REPORT

International application No
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 618 454 B1 (AGRAWAL DAKSHI ET AL) 9 September 2003 (2003-09-09) abstract column 3, line 30 - line 64	1,4-8, 13,14, 17,18, 21,22, 27,28, 30,31
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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2005/031467

Box 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 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 additional 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 an additional fee, this Authority did not invite payment of any additional fee.
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.
- No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1, 2, 13, 15, 17, 19, 21, 23-26, 27, 29,30, 32

Apparatus for transmit diversity, comprising processor to generate coded symbols and to perform spatial processing on the coded symbols; processor further configured to perform spatial spreading by means of matrices.

2. claims: 1, 3, 11-12, 13, 16, 17, 20, 21, 27, 30

Apparatus for transmit diversity, comprising processor to generate coded symbols and to perform spatial processing on the coded symbols; processor further configured to perform beamforming (apply cyclic delays).

3. claims: 1, 4-8, 13, 14, 17, 18, 21, 22, 27, 28, 30, 31

Apparatus for transmit diversity, comprising processor to generate coded symbols and to perform spatial processing on the coded symbols; processor further configured to perform transmit diversity (STTD, SFTD, OTD).

4. claims: 1, 9-10, 13, 17, 21, 27, 30

Apparatus for transmit diversity, comprising processor to generate coded symbols and to perform spatial processing on the coded symbols; processor further configured to perform frequency division multiplexing (OFDM, SC-FDMA).

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2005/031467

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