FORM 2

THE PATENTS ACT, 1970
(39 of 1970)
AND
THE PATENTS RULES, 2003

COMPLETE
SPECIFICATION

(See Section 10; rule 13)

TITLE OF THE INVENTION

"APPARATUS AND METHOD FOR CSI CALCULATION AND REPORTING"

APPLICANT

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The following specification particularly describes
the invention and the manner in which
it is to be performed

CLAIMS

1.   A method of measuring Channel State Information (CSI) in a multiple input/multiple output (MIMO) communication system comprising at least one base station (eNodeB) and at least one User Equipment (UE), the method comprising:

   receiving a Channel State Information Reference Signal (CSI-RS) carried in a sub-frame of a radio frame of the communication system at said at least one UE from said at least one eNodeB over at least one downlink channel therebetween;

   extracting CSI-RS Resource Elements (RE) from the CSI-RS sub-frame; and

   using the extracted CSI-RS REs to perform downlink channel estimations for active pairs of receiving and transmitting antennas of the UE and the eNodeB respectively to derive said CSI.

2.   A method as claimed in claim 1, further comprising:

   receiving a Cell Specific Reference Signal (CRS) carried in a sub-frame of said radio frame at said at least one UE from said at least one eNodeB over said downlink channel;

   extracting CRS Resource Elements (RE) from said sub-frame; and

   using the extracted CRS REs to perform further downlink channel estimations for said active pairs of said receiving and said transmitting antennas of the UE and the eNodeB respectively to further derive said CSI.

3.   A method as claimed in claim 2, further comprising:

   using the further downlink channel estimations to perform sub-band noise power estimations for said active pairs of said receiving and said transmitting antennas of the UE and the eNodeB respectively.

4.   A method as claimed in claim 3, further comprising:

   using the sub-band noise power estimations and the downlink channel estimations for said active pairs of said receiving and said transmitting antennas of the UE and the eNodeB respectively to perform sub-band signal power estimations to derive sub-band Signal to Noise (SNR) estimations.

5.   A method as claimed in claim 4, further comprising:

   using the downlink channel estimations to derive a sub-band CSI-RS channel matrix for said active pairs of said receiving and said transmitting antennas of the UE and the eNodeB

respectively.

6.   A method as claimed in claim 5, further comprising:

using the sub-band CSI-RS channel matrix and the sub-band SNR estimations to derive

5   sub-band Signal to Interference Noise Ratio (SINR) estimations.

7.   A method as claimed in claim 6, further comprising:

using the sub-band Signal to Interference Noise Ratio (SINR) estimations to perform

wideband and sub-band Precoding Matrix Information (PMI) calculations for all Rank

10   Indicatorss (RI) and for all Precoding Type Indicators (PTI).

8.   A method as claimed in claim 7, further comprising:

using the sub-band Signal to Interference Noise Ratio (SINR) estimations to perform

wideband and sub-band Channel Quality Indicator (CQI) calculations.

15

9.   A method as claimed in claim 8, wherein said CSI comprises said wideband and said sub-

band PMI, said wideband and said sub-band CQI, said RI and said PTI.

10.   A User Equipment (UE) arranged to measure Channel State Information (CSI) in a

20   multiple input/multiple output (MIMO) communication system comprising at least one base

station (eNodeB) and at least one of said UE, the UE comprising:

a controller configured to:

receive a Channel State Information Reference Signal (CSI-RS) carried in a sub-

frame of a radio frame of the communication system at the UE from said at least one

25   eNodeB over at least one downlink channel therebetween; and to

extract CSI-RS Resource Elements (RE) from the CSI-RS sub-frame; and

a CSI measuring unit configured to use the extracted CSI-RS REs to perform downlink

channel estimations for active pairs of receiving and transmitting antennas of the UE and the

eNodeB respectively to derive said CSI.

Dated this 26 day of May 2014

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