Appeal decision

Appeal No. 2015-8510

USA
Appellant QUALCOMM INC.

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The case of appeal against the examiner's decision of refusal of Japanese Patent Application No. 2012-500936, entitled "Feedback Mechanism to Beamforming Operation" (International Publication No. WO 2010-107945 dated September 23, 2010, National Publication dated September 10, 2012, National Publication of International Patent Application No. 2012-521180) has resulted in the following appeal decision.

Conclusion

The appeal of the case was groundless.

Reason

1 History of the procedures

The application of the invention was filed on March 17, 2010 as an international filing date (claim of priority under the Paris Convention was received by the foreign receiving office (US) on March 20, 2009, (US) on March 16, 2010), and the examiner's decision of refusal was issued on December 12, 2014. Against that, an appeal against the examiner's decision of refusal was requested on May 7, 2015 and a written amendment was submitted on the same day, and then, a notice of reasons for refusal was issued on February 1, 2016, and a written amendment was submitted on May 25, 2016.

The invention relating to Claim 1 (hereinafter referred to as the "Invention") is acknowledged as follows, as described in Claim 1 of the scope of claims for patent amended by the written amendment dated May 25, 2016.

"A method for generating feedback data with a wireless communication device,

the method comprising:

receiving a downlink message from a base station;

determining a mode to feedback data generation;

generating the feedback data on the basis of the determined mode; and

transmitting the feedback data to the base station,

wherein if the determined mode is a closed-loop mode or a partial feedback mode relating to information about channel directionality, the feedback data include a channel quality indicator (CQI), a rank, and one or more precoding vectors, and

wherein if the determined mode is an open-loop mode relating to information about channel directionality, the feedback data include a CQI and a rank, the CQI and the rank being computed on the basis of whether or not full channel reciprocity or partial channel reciprocity is usable in a transmitter of the base station."

2 Cited Invention

(1) Regarding when the Cited Document became publicly available through a telecommunication line

First, we will examine when Qualcomm Europe, Feedback options in support of dual-stream beamforming [online], 3GPP TSG-RAN WG1#56b R1-091449, the Internet <URL:http://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_56b/Docs/R1-091449.zip> (hereinafter, referred to as the "Cited Document) cited in reasons for refusal notified by the body became publicly available through a telecommunication line.

A Official view by 3GPP

(A) The homepage of 3GPP (http://www.3gpp.org/) has FAQ pages (http://www.3gpp.org/about-3gpp/3gpp-faqs), the section "How can I determine when a meeting contribution document (TDoc) became publicly available?" thereof describes the following.

"How can I determine when a meeting contribution document (TDoc) became publicly available?"

TDoc numbers start to be allocated some weeks before a 3GPP meeting, and the authors then create them and they or the group's secretary uploads them to the public file server as soon as possible. Some may have been distributed to the group's members in draft form for review, using an email exploder, in advance of the final one becoming available, and for some groups, it is normal to distribute even the final TDoc via the email exploder, where the secretary picks it up and copies it to the public server. Typically, at the start of a meeting, around 50% of the TDocs are available.

This distribution on the group's email exploder is important, because once that happens, the document is effectively in the public domain, since membership in the exploder is open to all and is unpoliced.

During the meeting, further TDocs are created, mostly revisions of ones available before the meeting, but probably some brand new ones too - for example, outgoing liaison statements. These are uploaded to the meeting server, but (until recently) may or may not be uploaded to the public server during the meeting. (Since 2014, for most meetings, meeting server contents have been mirrored to a folder on the public server, but these copies are deleted shortly after the end of the meeting.)

Soon after the end of the meeting – the same day, or at worst within a few days - the TDocs created during the meeting are uploaded by the secretary to the public server. Occasionally, some matters from the meeting cannot be resolved until maybe one week later, and these might result in some very late TDocs which are produced well after the end of the meeting, and thus uploaded onto the public server correspondingly late.

When the secretary copies from the meeting server (or from his own PC) to the public server, he may opt to only copy the missing files (i.e., the new ones), which is the best approach; or he may decide to overwrite everything and thus do a complete refresh of the files on the public server, which will now get an upload date/time-stamp of the new upload. This latter approach is now deprecated but has sometimes happened; you can detect this most easily when a meeting shows the same date/time-stamp for all TDoc files.

In cases such as this, one has to descend to greater subterfuge to narrow down the likely "public availability" moment. The zip file for a TDoc typically contains a Word file which has a particular date/time-stamp, which puts an absolute limit on the earliest moment that the TDoc could have become available in that form.

Searching the group's email exploder archive (http://list.etsi.org/scripts/wa.exe?INDEX) on or about the suspected production date gleaned from the file date/time-stamp may well reveal the message in which the TDoc was first distributed, or perhaps the message by which the group's secretary announced that it was available on the server. Note, however, that this technique does not reveal any earlier versions of the TDoc which might have been circulated, either as draft versions of the identified TDoc or as other Tdocs which were ultimately revised into the actual TDoc of interest. In order to identify this latter case, it is necessary to refer to the official secretary's report of the meeting, where the train of revisions will be evident."

(B) Similarly, the section "Is it possible to determine the date and time of publication of a particular version of a 3GPP Spec?" describes the following.
"Is it possible to determine the date and time of publication of a particular version of a 3GPP Spec?

During the drafting phase (versions lower than 3.0.0), 3GPP TSs and TRs ("Specs") are under the control of their authors ("rapporteurs") and are handled like normal meeting contributions (see above). Revised versions incorporating text agreed upon by the responsible working group are often made available by the rapporteur via the group's email exploder shortly after the end of the meeting at which such text was discussed. Again, consultation of the email exploder archives can reveal this. Alternatively, a revised draft may be sent directly to the 3GPP Support Team, and it will be uploaded to the public file server (specs archive directory) shortly afterwards. Again, the time stamp of the Zip file can be relied upon to indicate when the upload occurred.

After formal approval by the TSG (versions 3.0.0 or greater), Specs are edited only by the Support Team. The first approved version is based upon the draft version formally approved by the TSG, and thereafter versions are generated whenever Change Requests are approved by the TSG. These versions are made available shortly after the TSG meeting at which such approval occurred. The date (year and month) shown at the top of the Spec's cover page indicates either the date of (the last day of) the meeting, or the month in which the new version was prepared. However, a more precise indication of the date of availability can be obtained from the Spec's web page (via the table at http://www.3gpp.org/specifications/) where a precise date is shown in the "available" column.

More information on the procedures relating to Spec handing can be found in 3GPP TR 21.900.

Note that, in accordance with the statement at the foot of the cover page of all 3GPP Specs, 3GPP does not "publish" its Specs per se. Formal publication is the responsibility of the individual Standards Development Organizations which constitute the Organizational Partners of 3GPP. For further information, see http://www.3gpp.org/specifications/63-official-publications."

(C) 3GPP (3rd Generation Partnership Project) is the project among standardizing bodies established in December, 1998 by standardizing bodies of countries and regions such as ATIS in the US, ETSI in Europe, ARIB and TTC in Japan, and TTA in Korea, and is an international standardizing organization which examines and produces specifications of a mobile communication system such as LTE corresponding to the 3rd generation cellular phone system based on W-CDMA and GSM evolution network and the 3.9th generation mobile communication system following that, and LTE-Advanced corresponding to the 4th generation mobile communication system, so that information on the homepage thereof is sufficiently reliable. Since the IPR policy in the project has been stipulated and the importance of a date of publication in IPR is sufficiently recognized, it is understood that a way of determining the date of publication (when it became publicly available) of TDoc or specifications is described in detail in the FAQ above. Therefore, it is apparent that an official view of 3GPP about how to determine a point in time when specific versions of a meeting contribution document (TDoc) and specifications (Spec) became publicly available is indicated, in the FAQ above.

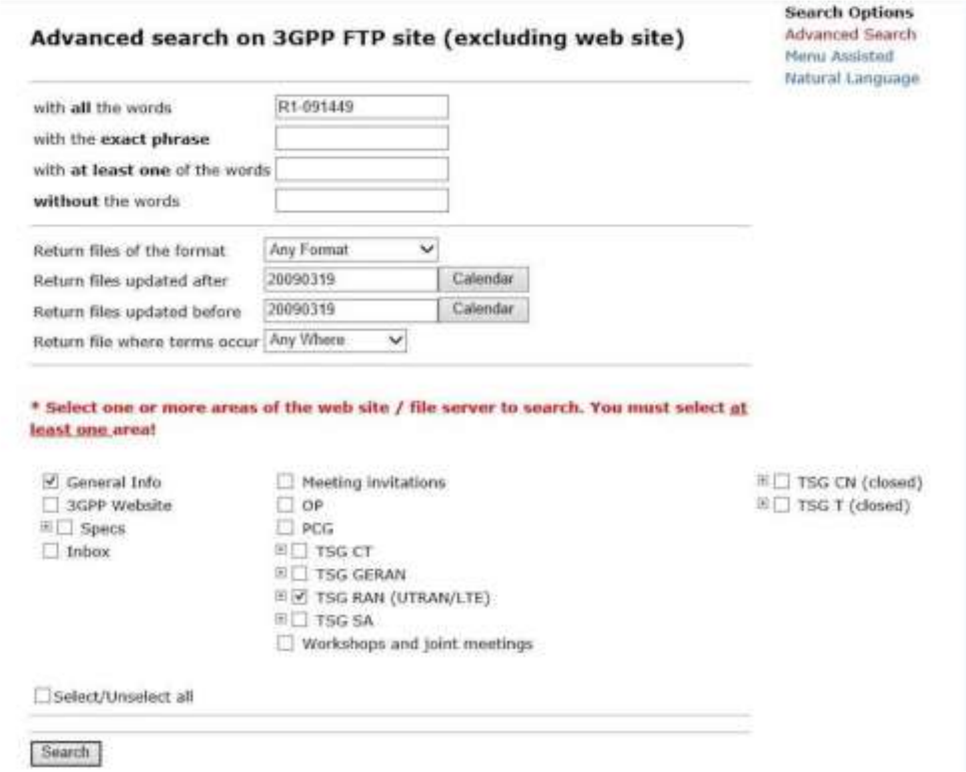
Then, according to the descriptions of the FAQ above, it can be said that the meeting contribution document (TDoc) of 3GPP becomes publicly available at least when the authors themselves who created the TDoc or the group's secretary uploads them to the public file server (refer to the first paragraph the document (A) above). Then, the date and time of uploading is shown in an upload date/time-stamp of TDoc files (refer to the fifth paragraph of the document (A) above, and the first paragraph of the document (B) above).

B Information about the public file server of 3GPP relating to the Cited Document (R1-91449)

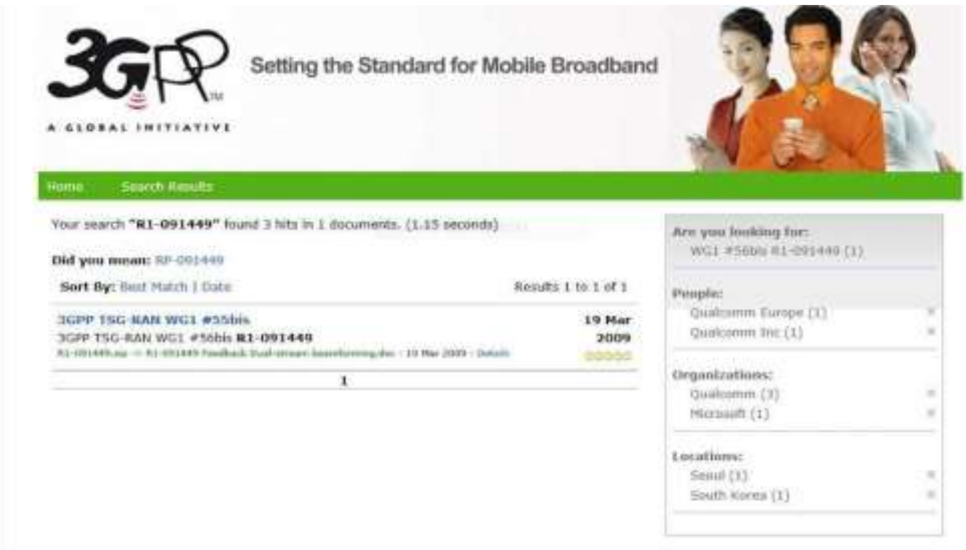
(A) In the "Search" column in the 3GPP homepage (http://www.3gpp.org/), the button "ADVANCED FTP SEARCH" is indicated, and when clicking the button, a screen for searching opens.

On the screen for searching, in addition to a search item by a keyword such as "with all the words," input fields "Return files updated after," "Return files updated before" exist.

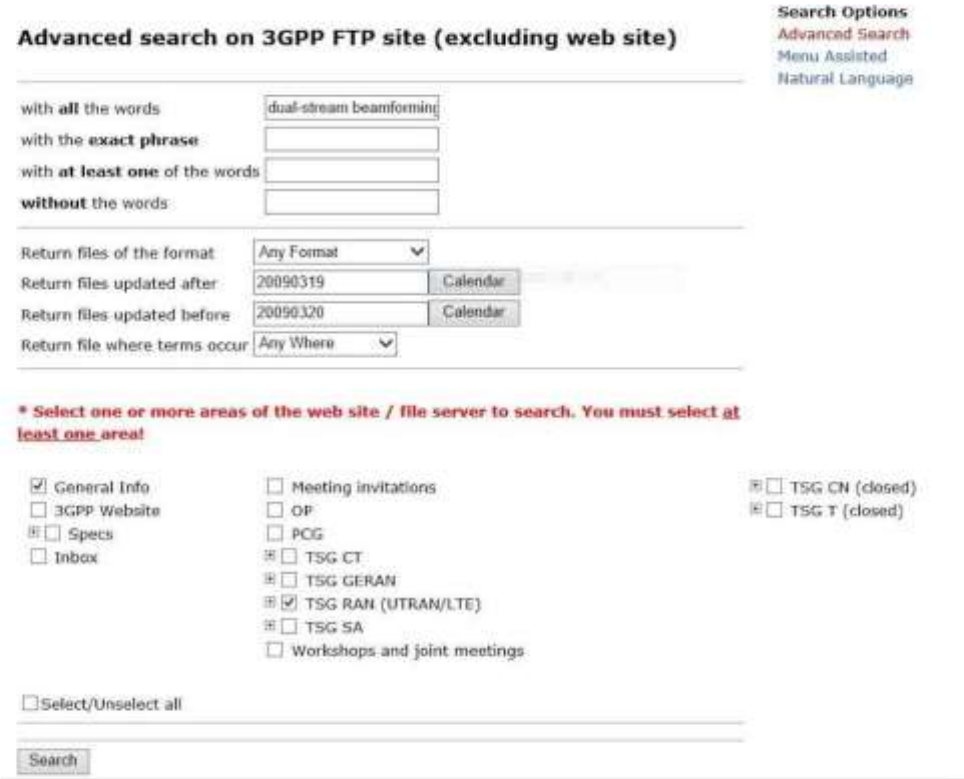
Here, the actions are inputting "R1-091449" in the field of "with all the words," selecting "TSG RAN (UTRAN/LTE)" as a search area, inputting "20090319" in the fields of "Return files updated after" and "Return files updated before" according to Calendar, and clicking the Search button,



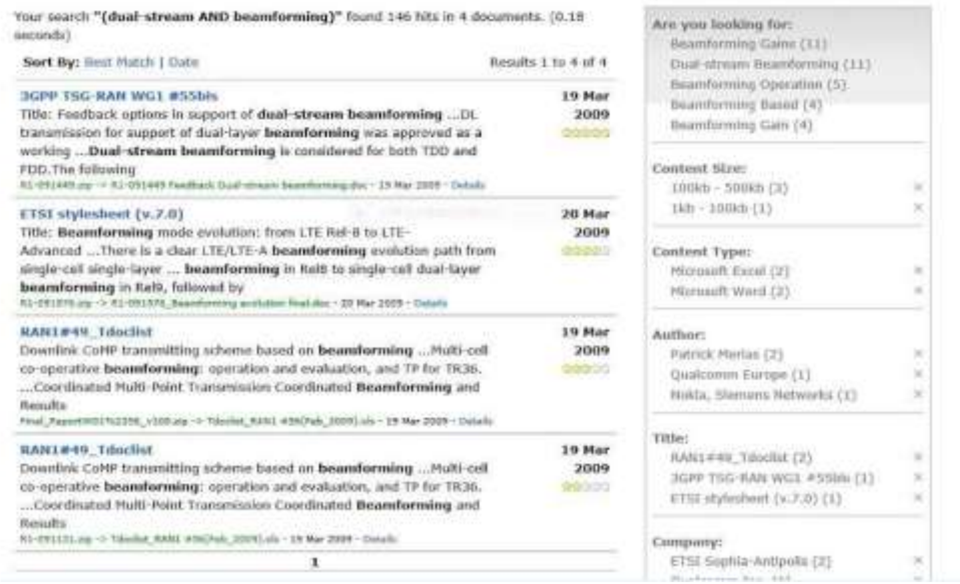
A search result screen presenting one hit is shown, and
an item "3GPP TSG-RAN WG #55bis 19 Mar 2009
3GPP TSG-RAN WG #56bis R1-091449
R1-091449.zip-> R1-091449 Feedback Dual-stream beamforming.doc -
19 Mar 2009 - Details"
is displayed thereon.



Also, for example, actions are inputting "dual-stream beamforming" that is a part of the title of the Cited Document in the field of "with all the words," selecting "TSG RAN (UTRAN/LTE)" as a search area, respectively inputting "20090319" and "20090320" in the fields of "Return files updated after" and "Return files updated before," and clicking the Search button,



A search result screen presenting four hits is shown, and for any hit item, the date described is within the range between the date of "Return files updated after" and the date of "Return files updated before."



Therefore, it is apparent that on the screen for searching, when inputting a keyword, selecting a search area, inputting dates in "Return files updated after" and "Return files updated before," and clicking the Search button, documents including the keyword are searched while specifying the updated date of the files.

(B) Next, so as to see detailed information about the hit item, when clicking a part of "Details" in the item of the search result screen presenting one hit in (A) above, Document information of "R1-091449" is displayed. The field "Filename:" thereof is filled with "http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_56b/Docs/R1-091449.zip", and it is understood that the file corresponds to the TDoc files of the public file server, from its file name. The file name is the same as URL information in the Cited Document list of the notice of reasons for refusal in the body.

Then, the field "Date:" is filled with "19-Mar-2009", and this corresponds to the date "19 Mar 2009" on the search result screen of (A) above, so that it is natural to be understand that the date corresponds to the updated date of the file "http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_56b/Docs/R1-091449.zip" in the public server.

3GPP TSG-RAN WG1 #55bis

R1-091449.zip -> R1-091449 Feedback Dual-stream beamforming.doc

Document Information

Title:	3GPP TSG-RAN WG1 #55bis
Filename:	http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_56b/Docs/R1-091449.zip
Size:	102K
Date:	19-Mar-2009
Date Indexed:	01-Feb-2014
Date In Document:	
Category:	
Hit Count:	3

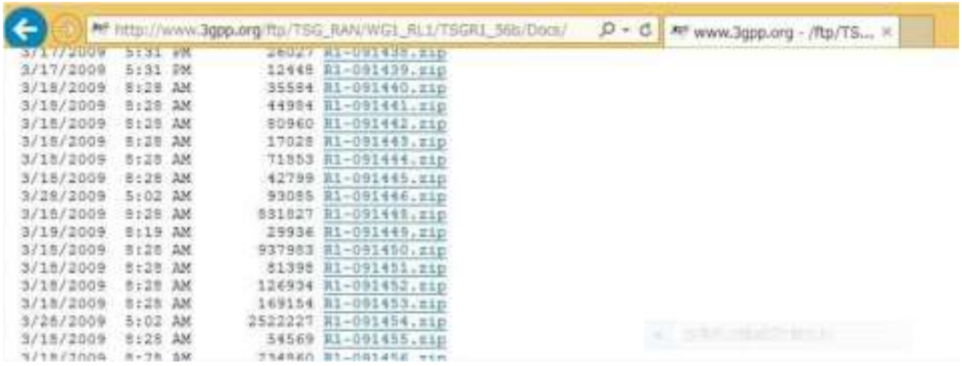
Meta Data

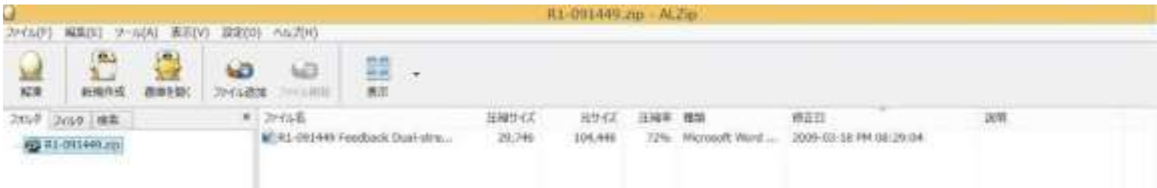
Title:	3GPP TSG-RAN WG1 #55bis
AppName:	Microsoft Office Word
Author:	Qualcomm Europe
Byte Count:	12800
Character Count:	14364
Company:	Qualcomm Inc.
Creation Date:	Thu, 19 Mar 2009 4:29:00 AM
Last Author:	Qualcomm
Last Printed:	Wed, 18 Mar 2009 7:22:00 PM
Last Saved Date:	Thu, 19 Mar 2009 4:29:00 AM
Line Count:	119
Links Up To Date:	False
Page Count:	5
Paragraph Count:	33
Revision Number:	2
Scale Crop:	False
Security:	0
Template:	3gpp_70
Total Editing Time:	01:00
Word Count:	2520
isys:SubType:	Word 97/2003

Entities

People:	Qualcomm Europe, Qualcomm Inc
Organizations:	Qualcomm, Microsoft
Locations:	Seoul, South Korea

(C) Furthermore, a screen of a list of TDoc of a 56bis meeting of 3GPP TSG-RAN WG1 is displayed in "http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_56b/Docs/" that is a part of the URL information, and also by clicking "R1-091449.zip" therein, the zip file "http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_56b/Docs/R1-091449.zip" opens, and word files therein can be selected.





Here, on the screen of the list, date and time are displayed at the left end of the column of the TDoc name, and the column of "R1091449.zip" is displayed as "3/19/2009 8:19 AM", and at least the date of the display corresponds to the date on the search result screen and the date in the field "Date:" of the Document Information.

C. Judgment by the body

As described above, according to the FAQ of the 3GPP homepage, it can be said that the TDoc becomes publicly available at least when the authors themselves who created the TDoc or the group's secretary uploads them to the public file server.

The appellant alleges in the written opinion dated May 25, 2016 that TDoc is not necessarily published immediately after uploading and that upload date and time and publication date and time do not always match, by giving examples that publication date and time are separately set at uploading or the file may be published after getting permission after uploading. Also, the appellant alleges that it becomes publication date and time when a file attached to a mail is actually published after coping to public server by a secretary. That is, the appellant alleges that uploading to the publication file server and publishing are separate. However, to the question "How can I determine when a meeting contribution document (TDoc) became publicly available?", the FAQ depicts in detail about uploading to the publication file server, and does not reply assuming that uploading and publishing are separate. Then, if uploading and publishing are separate as the appellant alleges, since the FAQ does not reply to the question "How can I determine when a meeting contribution document (TDoc) became publicly available?" at all, such a thing is unnatural. Also, the allegation of the appellant is only based on mere probability as a general example, is not based on the specific procedures of 3GPP, and does not present specific facts or evidence. Therefore, the allegation of the appellant is groundless, and is unnatural in light of contents of the FAQ, so that it cannot be accepted.

Here, even if looking at information relating to the TDoc on the public server (refer to B above), although information relating to update exists, it is not clear about upload. Then, "Return files updated after" and "Return files updated before" on the search screen mean "update," not "upload," and in the Document Information above, it is merely written "Date:", but it is not clear whether or not it is the date of upload.

However, as mentioned above, the file "http://www.3gpp.org/ftp/TSG_RAN /WG1_RL1/TSGR1_56b/Docs/R1-091449.zip" is the TDoc file of the public file server, from its file name, so that it is apparent that the update thereof means that the public file server of 3GPP had updated its TDoc file "http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_56b/Docs/R1-091449.zip". Namely, the update is a matter relating to the file of the public file server, and does not mean that for example, the author updates a word file in his/her own PC before sending that to 3GPP. Then, it is apparent that the public file server is updated by uploading the TDoc, from technical common sense in a server technology.

Furthermore, in consideration of the facts that the FAQ does not distinguish update and upload and mentions only "an upload date/time-stamp," and it is described as "he may decide to overwrite everything and thus do a complete refresh of the files on the public server, which will now get an upload date/time-stamp of the new upload. This latter approach is now deprecated but has sometimes happened; you can detect this most easily when a meeting shows the same date/time-stamp for all TDoc files." (refer to A(A) above) and "the time stamp of the Zip file can be relied upon to indicate when the upload occurred."(refer to A(B) above), date and time at the left end of the screen of the TDoc list of the meeting (refer to B(C) above) can be understood as the upload date/time-stamp at the time of uploading. Also, as described above, the date of the date and time corresponds to Date of Document Information of the TDoc files.

Then, it is reasonable to understand that the TDoc file "http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_56b/Docs/R1-091449.zip" became publicly available by being uploaded to the public file server of 3GPP on 19 Mar. 2009.

Therefore, it is acknowledged that the Cited Document had become publicly available through a telecommunication line on March 19, 2009, before March 20, 2009 which is the earliest priority date of the application of the case.

(2) Invention described in the Cited Document

The Cited Document describes the following matters with the drawings.

A "

2.1 Beamforming Operation

Transmitter side beamforming can provide significant gains as shown in [4], [5] when channel knowledge is available at the transmitter. For single-layer beamforming, the transmission happens along the eigenvector of the channel covariance matrix corresponding to the largest eigenvalue. Capacity gains are obtained by improving received SINR in this case.

In a MIMO setup, ***eigen-beamforming*** can be applied by transmitting along the eigenvectors corresponding to largest eigenvalues, hence providing beamforming and multiplexing gains. Rank selection and CQI computation can be done assuming these vectors are the transmitted beams.

Finally, in scenarios where the knowledge of the channel at the transmitter is not complete or is partial, one can use ***pseudo-eigen beamforming*** for transmission of multiple streams.

- In pseudo-eigen beamforming, the beamforming vectors are constructed based on the knowledge about the direction of the channel. For part of the channel that is not observable, one can assume random directions in the subspace orthogonal to the known eigen-directions.

- As an example consider an 8Tx, 2Rx setup in downlink. Suppose that the eNodeB has knowledge of the channel to one of the Rx antennas at the UE (through SRS transmission) and is provided with quantized channel information for another Rx antenna. The NodeB can then uses the eigenvectors corresponding to the channel to these two receive antennas as the beam directions.

- As another example suppose that eNodeB has knowledge of channel to only one of the Rx antennas. In this case, eNodeB can transmit in the direction of the channel to this receiver antenna and a random beam direction orthogonal to the former direction. Random beams used can be different across frequency and time to provide better diversity and/or more accurate rate prediction.

- The transmission and feedback in this case can be aligned by UE following similar beamforming construction in computing rank and CQI.

" (Pages 1/5 to 2/5)

B "

2.2 Channel Knowledge at UE and eNodeB

Let us first define two notations that are used frequently in this document. Let **N_BF** be the number of antennas used for beamforming. Also define **N_RS** as the number of RS ports for which the user can obtain estimate of the channel from the transmitter for CQI/RI and possibly PMI computation.

The feedback mechanism design depends on the knowledge available at the UE and eNodeB regarding the DL channel:

1. *Channel knowledge at UE*: Release 8 LTE CRS can provide channel estimate for at most 4 antenna ports. It is probable that the number of antennas used for beamforming (N_BF) is greater than the number of CRS ports. In this case UE feedback can be based only on the channels observed from the N_RS antenna ports and can not capture the beamforming gains fully. This will affect the performance of dual-stream beamforming for FDD and possibly in TDD systems.

   Release 8 LTE CRS ports are used for both demodulation and feedback purposes. By introducing a feedback RS with low duty cycle, different UEs can obtain knowledge of channel for feedback purposes. The overhead of such a reference signal is very small. Having such a RS structure will provide beamforming gains from all the transmit antennas (and not only the antenna ports that are used for RS transmission) for both FDD and TDD systems.
2. *Channel knowledge at eNodeB:* In TDD systems, because of the reciprocity of the DL and UL channel, eNodeB may be able to acquire estimate of the channel in the DL through sounding reference signal (SRS) transmissions in the UL. However, in cases where the number of transmit antennas at UE for UL is not equal to the Rx antennas in DL, eNodeB may have partial knowledge of the DL channel to some particular Rx antennas at UE. We refer to this case as “partial channel reciprocity” and address the operation in such a scenario as well. We should note that, in Release 8 LTE, antenna switching SRS transmission at UL is possible. However, it is not a mandatory feature and may be undesirable in some UE implementations, *e.g.* because of insertion loss introduced by a switch. Due to antenna switching, eNodeB can obtain knowledge of the DL channel for all the Rx antennas at the UE.

The following modes of operation are categorized based on the type of feedback reported by the UE.

" (Page 2/5)

C "

2.3 Closed-loop mode:

In closed-loop operation, UE will compute CQI, rank and *preferred precoding* vectors based on the channel estimate obtained from the available N_RS ports and feedbacks the values to the eNodeB. eNodeB will transmit to the UE using the reported precoding vectors and based on the reported CQI and rank.

Such a scheme is applicable to both FDD and TDD. The operation in this case is not affected by the asymmetric configuration of Tx/Rx antennas at UE and possible calibration mismatches in TX/RX chains as the transmission is along the precoding vectors reported by the UE.

The following mechanisms need to be provided for enabling close-loop operation:

- Precoding design for higher number of transmit antennas at eNodeB.
- Signalling and feedback of rank and preferred precoding matrices.

Also, we should note that if N_RS is less than N_BF, the beamforming gains obtained by such operation will be limited. Therefore, using Release 8 CRS for feedback purposes in this scenario can reduce the gains obtained by beamforming. The loss associated with such limitations needs to be studied further.

An alternative would be providing a low duty cycle channel state information RS (CSI-RS) for the N_BF antennas that are used only for measurement and reporting (and not demodulation); the overhead corresponding to such feedback RS can be very small. Therefore, it is worthwhile to consider introducing low duty cycle CSI-RS for feedback purposes in Release 9, similar to CSI-RS envisioned for higher order MIMO and coordinated transmission in Release 10.

" (Pages 2/5 to 3/5)

D "

2.4 Open-loop mode:

In this scenario, UE will not provide any information about the channel directionality and only reports CQI and possibly rank.

In FDD mode, CQI and rank computation at the UE can be based on a set of predefined precoding matrices. Both UE and NodeB can agree on a precoding operation (i.e., large delay CDD, beam-sweeping) that will be applied in transmission. CQI and rank computation can be based on this knowledge to avoid large rate prediction mismatch. UE will report the computed CQI and rank to eNodeB.

In TDD mode, the following scenarios can be considered:

1. UE reports *only CQI* assuming transmission mode 7 of Release 8 to partially capture interference. eNodeB will select the rank and adjust the CQI for different layers based on the channel knowledge and the reported CQI.

2. If full channel reciprocity is assumed at the transmitter, the following options can be considered:

    a. If feedback RS for all the antennas is present (i.e., *N_RS=N_BF*), UE can perform *CQI, rank* selection assuming eigen-beamforming applied to the channel. Note that the computation of rank and CQI in this case can take into account the interference structure at the receiver as well as the beamforming gains from all the antennas. The UE will report the computed CQI and rank to the eNodeB. In this scenario, there is no need for transmission of the precoder information, as long as CQI computation at the UE is matched to transmit beamforming at eNodeB .

    b. For case that N_*RS<N_BF*, rank and CQI selection can be done at the UE based on the N_RS ports available using eigen-beamforming on the RS ports. eNodeB can adjust the CQI to capture the extra beamforming gain due to a transmission from N_BF antennas as opposed to N_RS that the report is based on.

3. If “partial channel reciprocity” is applicable the following options can be considered:

    a. UE can compute CQI and rank assuming one of the following two operations:

        i. It assumes unprecoded channel in computation of the rank and CQI.

        ii. It assumes pseudo-eigen beamforming in computation of the rank and CQI. In this case, UE will use channel estimates for the Rx antennas that corresponds to SRS transmission in the uplink and assume random beam orthogonal to those channels for other layers. The rank and CQI computation will be based on such a beamforming structure.

    b. eNodeB will use pseudo-eigen beamforming in forming the beam directions. It will use CQI and rank reported by UE to transmit along the directions obtained.

" (Page 3/5)

E "

2.5 Partial feedback mode:

In this case, the UE will provide partial indication of the channel directionality it has observed along with CQI and rank information. This information can be part of the preferred precoding matrix in FDD case or can be a quantized version of the channel seen from the Rx antennas for which SRS transmission does not happen in UL.

In FDD, a UE can compute CQI and rank based on pseudo-eigen beamforming scheme. For rank 2, UE will carry out the CQI computation by using a precoding vector and choosing another direction orthogonal to the selected precoder and computing the CQI using the combined precoding matrix. eNodeB will employ pseudo-eigen beamforming according to the rank and the partial channel information provided through feedback.

We can also consider a partial feedback transmission mode in TDD systems with "partial channel reciprocity" or significant calibration mismatch at UE. In this case UE can provide additional information regarding the channel observed on the RX antenna not observable by the NodeB.

- CQI and rank computation at UE: UE will compute best CQI and rank using the estimate of the channel for the receive antennas known at eNodeB along with precoding vectors approximating the channel to other receive antennas. It will then report CQI, rank and the chosen precoding vectors to eNodeB.

- Scheduling at eNodeB: eNodeB will use the channel feedback information along with its knowledge of the channel to construct beamforming precoder. It will use the CQI and rank selected by the UE along with the constructed precoders to schedule the UE.

" (Pages 3/5 to 4/5)

F "

3 Discussion

The following remarks are in order:

- If a UE can obtain estimate of the channel for all the beamforming antennas, UE report can capture the interference and beamforming gains from all the antennas at transmitter. In this case, dual-stream beamforming gains can be obtained for both FDD and TDD systems.

    - The number of CRS ports advertised in Release 8 is at most 4 (and most probably 2 in commercial deployments) and because of its use in demodulation its associated overhead is large. At the same time, the number of transmit antennas for beamforming operation can be larger than the number of advertised CRS ports,

  - Given the above, it is possible to introduce a low duty cycle reference signal that is only used for channel state information feedback along the lines of CSI-RS envisioned for Release 10. The beamforming gains of using all transmit antennas relative to using only CRS antenna ports can be large. Having a low overhead CSI-RS for all the transmit antennas can provide us with the beamforming gains in FDD and possibly TDD systems.

- In order to capture beamforming gains (especially in FDD setup) for the case that the number of transmit antennas is larger than 4, new precoding structure needs to be considered.
- The granularity of report in time and frequency can be studied further. In particular, frequency selective report (i.e. subband based) or wideband report can be considered as in Release 8.
- Layer shifting for rank 2 transmissions can be considered in different modes of operation outlined in previous section. Such a mechanism can be beneficial in partial feedback mode and can also be used for overhead reduction.
- It is possible to use DM-RS (along with the channel estimate obtained from the N_RS ports) for computation of CQI/RI for next packet transmissions. In this case the CQI/RI reporting needs to be aperiodic with request from the NodeB. Although CQI/RI computation this way captures the beamforming gains, such a mechanism may not be reliable for cases where UE-RS is allocated in small part of the band or for users with bursty traffic sources. Additionally, such reporting mechanism while accurate is not efficient even at moderate mobility as it requires frequent reporting by the UE.
- Methods of signalling information regarding the spatial interference structure and gains associated with them can be investigated further. This is also applicable for the case that UE has partial estimate of the channel. Examples of such signalling are as follows
  - UE can provide CQI/RI/PMI feedback to eNodeB. This case is essentially close-loop precoding mentioned previously. The beamforming operation in this case can capture the interference and channel structure simultaneously.

- Interference covariance structure can be signalled to the eNodeB. For example this can be applicable in case a dominant interfering direction is detected at the UE. This can be achieved based on a low duty cycle (upper layer) signaling and used in the presence of a persistent long-term covariance structure of the interference. eNodeB can use this structure in computing the beamforming vectors, possibly rank, and CQI. The covariance structure used for reporting purposes can be computed with specified time-frequency granularity,

" (Page 4/5)

G "

4 Conclusion

In this paper, we outlined different options for feedback mechanisms in support of dual-stream beamforming in TDD and FDD for Release 9. We address the feedback mechanisms for TDD with asymmetric antenna configuration.

The choice of feedback mechanism depends on the knowledge of DL channel available at the UE and eNodeB. If a UE can estimate the channel from all the transmit antennas, it is possible to exploit dual-beamforming gains in *both FDD and TDD* systems. The gains will be attainable for asymmetric antenna configurations for Tx/Rx at UE and are not affected by calibration mismatch at TX/RX chains at UE.

Furthermore, in such a scenario, the CQI report from the UE can account for interference and capture the beamforming gain. In this case the beamforming gains will be from all the antennas used in transmission and not only the antennas for which CRS is transmitted.

Given that Release 8 supports up to 4 CRS transmission and the large overhead associated with it, it might be worthwhile to consider introducing low duty cycle and low overhead RS, similar to CSI-RS envisioned for Release 10, to enable closed loop or partial feedback operation. While such operation is clearly needed in FDD, it is also beneficial in TDD namely in the scenarios where open loop channel state estimation at eNodeB based on channel reciprocity principle can only provide partial information about the downlink channel or in the presence of calibration issues.

Therefore we recommend:

- Closed loop mode in support of dual stream beamforming for FDD systems which involves support of CSI-RS for channel state measurement and corresponding CQI/PMI/RI reporting mechanisms

▪ Open loop or partial feedback mode for TDD operation. Closed loop operation for TDD should also be considered

" (Pages 4/5 to 5/5)

Also, the descriptions of A to G above are exactly the same as the contents described in US61/162118 which is a basis of priority claim whose priority date is March 20, 2009 of the case.

Considering the descriptions and drawings of A to G above and technical common sense by a person skilled in the art,

a According to the descriptions of A to G above, UE feeds back to eNodeB, and it is apparent that the UE generates feedback information, so that it is acknowledged that the Cited Document describes a way of generating the feedback information by the UE. Also, it is apparent that the feedback information is transmitted to the eNodeB.

b According to the description of B above, it is shown that CRS ports can be used for channel estimate, as channel knowledge at UE. It is respectively described that CSI-RS is provided for measurement and reporting, in C above, and that DM-RS is used for computation of CQI/RS, in F above. Then, it is technical common sense in a person skilled in the art that RS (reference signal) such as CRS, CSI-RS, or DM-RS is information transmitted from eNodeB in downlink.

Therefore, in the Cited Document, it is acknowledged that it is described that information in downlink is received from eNodeB.

c According to the description of B above, the modes of operation are categorized based on the type of feedback reported by the UE, and according to the descriptions of C, D, and E above, although feedback information respectively corresponding to each mode is generated in each mode, according to G above, the select of feedback mechanism depends on the knowledge of DL channel available at the UE and eNodeB.

Therefore, in the Cited Document, it is acknowledged that it is described that the mode to the generation of the feedback information is selected, and that the feedback information is generated on the basis of the selected mode.

d According to C above, in a closed-loop mode, UE feeds back CQI, rank, and preferred precoding vectors to eNodeB.

Also, according to E above, in a partial feedback mode, UE feeds back CQI, rank, and the selected precoding vectors to eNodeB.

Therefore, in the Cited Document, it is acknowledged that it is described that when the selected mode is a closed-loop mode or a partial feedback mode, the feedback information includes the CQI, rank, and the precoding vectors.

e According to the description of D above, in an open-loop mode, UE feeds back CQI and rank to eNodeB. Then, according to the description of D above, it is described that CQI and rank are computed in their respective ways in a case where full channel reciprocity is supposed and a case that partial channel reciprocity is applicable.

Then, it is described in D above that "if full channel reciprocity is assumed at the transmitter, the following options can be considered," and it is described in the option that "transmit beamforming at eNodeB" and "b. eNodeB will use pseudo-eigen beamforming in forming the beam directions. It will use CQI and rank reported by UE to transmit along the directions obtained", so that it is apparent that the "transmitter" here is the transmitter of eNodeB.

Therefore, in the Cited Document, it is acknowledged that it is described in the Cited Document that when the selected mode is a open-loop mode, feedback information includes CQI and rank, and the CQI and the rank are computed on the basis of whether or not full channel reciprocity or partial channel reciprocity is usable in a transmitter of eNodeB.

Consequently, it is acknowledged that the following invention (hereinafter, referred to as the "Cited Invention") is described.

"A method for generating feedback information with UE

the method comprising:

receiving downlink information from eNodeB;

selecting a mode to feedback information generation;

generating the feedback information on the basis of the selected mode; and

transmitting the feedback information to the eNodeB,

wherein if the selected mode is a closed-loop mode or a partial feedback mode, the feedback information includes a CQI, a rank and a precoding vector, and

wherein if the selected mode is an open-loop mode, the feedback information includes a CQI and a rank, the CQI and the rank being computed on the basis of whether or not full channel reciprocity or partial channel reciprocity is usable in a transmitter of the eNodeB."

3 Comparison / Judgment

In comparison of the Invention and the Cited Invention,

(1) "UE," "eNodeB," and "feedback information" of the Cited Invention apparently correspond to "a wireless communication device," "a base station," and "feedback data" of the Invention.

(2) Referring to [0009] of the specification of the Invention, "a downlink message" of the Invention includes a common reference signal (CRS), a channel state information reference signal (CSI-RS), and a demodulation reference signal (DM-RS), so that "downlink information" including the same signals of the Cited Invention corresponds to "a downlink message" of the Invention.

(3) "Determining a mode" of the Invention and "selecting a mode" of the Cited Invention are just different in expression, and there is no substantial difference.

(4) Although it is not clear whether or not "precoding vector" is "one or more" in the Cited Invention, "one or more" includes "one," so that this point is not a difference.

Consequently, the Invention is identical to the Cited Invention in the point of "A method for generating feedback data with a wireless communication device,

the method comprising:

receiving a downlink message from a base station;

determining a mode to feedback data generation;

generating the feedback data on the basis of the determined mode; and

transmitting the feedback data to the base station,

wherein if the determined mode is a closed-loop mode or a partial feedback mode, the feedback data include a channel quality indicator (CQI), a rank, and a precoding vector, and

wherein if the determined mode is an open-loop mode, the feedback data include a CQI and a rank, the CQI and the rank being computed on the basis of whether or not full channel reciprocity or partial channel reciprocity is usable in a transmitter of the base station,"

and they are somehow different in the point that it is said that "a closed-loop mode or a partial feedback mode" and "an open-loop mode" are "a closed-loop mode or a partial feedback mode relating to information about channel directionality" and "an open-loop mode relating to information about channel directionality" in the Invention, whereas, the matter "relating to information about channel directionality" is not clear in the Cited Invention.

The different features are examined as follows.

Although the matter "relating to information about channel directionality" was added by the written amendment dated May 25, 2016, it was said that grounds of the written amendment were [0051], [0074], and [0083] in the written opinion on the same day, and the specification of the Invention describes about "channel directionality" as follows.

"[0051]

In open-loop mode 271, the wireless communication device 201b may not provide any information about the channel directionality to the base station 201a.....In partial feedback mode 225, the wireless communication device 201b may provide a partial indication of the channel directionality observed along with the channel quality indicator (CQI) and rank information as the feedback data 208.....,"

"[0074]

... In open- loop mode 271, the wireless communication device 201b will not provide any information about the channel directionality to the base station 201a....."

"[0083]

... In partial feedback mode 225, the wireless communication device 201b may provide a partial indication of the channel directionality observed along with channel quality indicators (CQI) 438 and rank 439 information. This information can be part of the preferred precoding matrix 441 if the wireless communication device 201b is operating using FDD. Alternatively, this information can be a quantized version of the channel 442 seen from the receive antennas for which sounding reference signal (SRS) 226 transmission in the uplink channel 218 does not occur."

According to the above descriptions, it is natural to understand that "...a partial feedback mode relating to information about channel directionality" of the Invention includes "partial feedback mode provides a partial indication of the channel directionality observed" and "an open-loop mode relating to information about channel directionality" of the Invention includes "open-loop mode will not provide any information about the channel directionality" Here, although there is no reference to a closed-loop mode, according to the disclosure " This information can be part of the preferred precoding matrix 441" of [0083], it is natural to understand that also "a closed-loop mode" of the Invention which feedback precoding vectors provides information about channel directionality as well as "the partial feedback mode."

On the other hand, according to the above description of 2(2) D of the Cited Document, "the open-loop mode" of the Cited Invention provides no information about channel directionality, and according to the description of E of the Cited Document, "the partial feedback mode" of the Cited Invention provides the partial indication of the channel directionality. According to the description of E of the Cited Document, information about the partial indication of the channel directionality can be made into the part of the precoding procession, so that it is natural to understand that also "a closed-loop mode" of the Cited Invention which feed back a preferable precoding procession provides information about the channel directionality as well as "a partial feedback mode."

Therefore, the different features mentioned above are not substantially different.

Concerning working effects of the Invention, difference from the Cited Invention cannot be acknowledged.

Therefore, there is no difference between the Invention and the Cited Invention, and they are identical.

Furthermore, the Invention identical to the Cited Invention could be easily invented by a person skilled in the art on the basis of the Cited Invention.

4 Closing

As described above, the Invention is identical to the Cited Invention, and the appellant should not be granted a patent for the Invention under the provisions of Article 29(1)(iii) of the Patent Act. Also, since the Invention could be easily made by a person skilled in the art on the basis of the Cited Invention, the appellant should not be granted a patent under the provisions of Article 29(2) of the Patent Act.

Therefore, the appeal decision shall be made as described in the conclusion.

October 12, 2016

Chief administrative judge: OTSUKA, Ryohei
Administrative judge: SUGAHARA, Michiharu
Administrative judge: NAKANO, Hiromasa