Appeal decision

Appeal No. 2019-9561

Appellant HUAWEI TECHNOLOGIES CO.LTD.

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The case of appeal against the examiner's decision of refusal of Japanese Patent Application No. 2017-552852, entitled "CHANNEL MEASUREMENT METHOD, BASE STATION AND UE" [International Publication No. WO2016/161736 published on October 13, 2016, National Publication of International Patent Application No. 2018-516481 published on June 21, 2018] has resulted in the following appeal decision.

Conclusion

The appeal of the case was groundless.

Reason

1. History of the procedures

The present application was filed on August 14, 2015 (Priority claim under the Paris Convention received by the foreign receiving office on April 10, 2015, China) as an international filing date, a notice of reasons for refusal was issued on November 8, 2018, a written amendment was issued on January 31, 2019, an examiner's decision of refusal was issued on March 26, 2019, and an appeal against the examiner's decision of refusal was requested on July 18, 2019.

2. The Invention

The invention according to Claim 1 of the present application (hereinafter referred to as "the Invention") is as follows specified by the matters recited in Claim 1 of the scope of claims of the written amendment dated January 31, 2019.

"A channel measurement method, comprising:

a step of obtaining, by user equipment (UE), a reference signal resource mapping diagram, and obtaining a reference signal according to the reference signal resource mapping diagram; and

a step of performing, by the UE, channel measurement according to the reference signal to determine channel state information, and feeding back the channel state information to a base station, wherein

the reference signal resource mapping diagram is a location to which a time-frequency resource of the reference signal is mapped, the reference signal resource mapping diagram is a first reference signal resource mapping diagram or a second reference signal resource mapping diagram, and an association relationship exists between each of K2 second reference signal resource mapping diagrams and at least one of K1 first reference signal resource mapping diagrams, wherein K2 is a quantity of the second reference signal resource mapping diagrams, K1 is a quantity of the first reference signal resource mapping diagrams, and K1 and K2 are integers greater than or equal to 1; and

the first reference signal resource mapping diagram is a Y-port reference signal resource mapping diagram, the second reference signal resource mapping diagram is an X-port reference signal resource mapping diagram, Y is an integer less than or equal to 8 and satisfying 2^n, and X is an integer greater than 8 or an integer less than 8 and not satisfying 2^n, at least two of the K2 second reference signal resource mapping diagrams have duplicate resources."

3. Reasons for refusal stated in the examiner's decision

(Inventive step) The invention according to the following claim of this application could have been easily made by a person ordinarily skilled in the art of the invention before the filing of the application on the basis of an invention described in the following publication distributed in Japan or abroad before the application was filed or an invention available to the public through electric telecommunication lines. Thus, the Appellant should not be granted a patent under the provisions of Article 29-2 of the Patent Act.

With respect to Claim 1

International publication No. 2015/045696

4. Cited Document

The following matters are described in International publication No. 2015/045696 (hereinafter referred to as "Cited Document 1") published on April 2, 2015 as an international filing date, which is before the priority date of the present application, and cited in the reasons for refusal stated in the examiner's decision.

"[0006] Furthermore, reference signals (CSI-RS: Reference Signal for CSI measurement) for measuring channel state information (CSI: Channel State Information) for a case where the number of the antenna ports is less than or equal to 8 have been specified in Release 10 of the 3GPP standard (cf. 3GPP TS 36.211 V10.7.0 (2013-02) Sec 6.10.5 and 3GPP TS 36.331 V10.0.0 (2013-06) Sec 6.3.2). FIG. 1 shows an example of mapping of the CSI-RS for the case where the number of the antenna ports is less than or equal to 8. To reduce the overhead of the CSI-RS, in a frequency domain, one resource element (RE: Resource Element) is allocated per one antenna port in one resource block (RB: Resource Block). Additionally, in a time domain, the CSI-RS is transmitted with a transmission period of 5, 10, 20, 40, or 80 milliseconds. The transmission period of the CSI-RS is set by Radio Resource Control (RRC) signaling.
[0007] To signal, to a mobile station, the mapping of the CSI-RS onto resource elements within a resource block, a table (CSI-RS configuration) that is shown in FIG. 2 is used (cf. Table 6.10.5.2-1 of Sec 6.10.5 of 3GPP TS 36.211 V10.7.0 (2013-02)). FIG. 2 shows an example of a table that is used for specifying a resource configuration of the CSI-RS.
[0008] For example, for a case where the number of the antenna ports is 2, there are twenty types of CSI-RS mapping, which are shown in (A) of FIG. 1. To signal, to a mobile station, which one of the twenty types of the mapping is to be used, one of the indexes from 0 to 19 (CSI reference signal configuration) in the table of FIG. 2 is used."

"[0023] In embodiments of the present invention, there is described a base station (eNB: evolved Node B) having a plurality of antenna ports; more specifically, a base station for implementing a CSI-RS configuration that can support an extended number of antenna ports (a number of antenna ports greater than 8). Additionally, there is described a mobile station (UE: User Equipment) that communicates with a base station having a plurality of antenna ports; more specifically, a mobile station for implementing channel quality measurement by using the CSI-RS that can support the extended number of antenna ports.

[0024] Note that the CSI-RS is reference signals that are used for measuring channel state information (CSI), such as a Channel Quality Indicator (CQI), a Precoding Matrix Indicator (PMI), and a Rank Indicator (RI). Further, an antenna port is a set of one or more antenna elements for transmitting reference signals. There are cases where one antenna port corresponds to one antenna element, and there are cases where one antenna port corresponds to a plurality of antenna elements.

[0025] In the embodiment of the present invention, for designing the CSI-RS that can support the extended number of the antenna ports, the following design concept is considered.

[0026] (A) Various numbers of antenna ports are to be supported

For example, it is desired that not only numbers of antenna ports, such as 16, 32, and 64, but also the numbers of antenna ports, such as 10, 12, 16, 24, 32, 36, 48, 64, 96, and 128 can be supported."

"[0030] In the embodiment of the present invention, while considering these points, configurations of the CSI-RS that can support the extended number of the antenna ports can be achieved by any of the following methods."

"[0032] (2) A method of combining mappings that are defined in Release 10 of the 3GPP standard

For example, if the number of the antenna ports is 16, mapping of the CSI-RS corresponding to the extended number of the antenna ports is generated by combining, within a resource block, two mappings of the CSI-RS for the antenna port numbers from 0 to 7 (cf. (C) of FIG. 1), where each of the two mappings is defined in Release 10 of the 3GPP standard. In order to indicate the mapping of the CSI for the antenna port numbers from 0 to 7 and the mapping of the CSI for the antenna port numbers from 8 to 15, two indexes of the table of FIG. 2 (CSI reference signal configuration) may be used. A base station signals information indicating the generated mapping to a mobile station, and the base station also multiplexes the CSI-RS in one or more resource elements in a resource block in accordance with the generated mapping."

"[0034] The methods are described in detail below, by referring to the drawings.

[0035] (1) The method of newly defining the mapping of the CSI-RS for the extended number of the antenna ports

FIG. 4 is a schematic diagram showing a radio communication system according to an embodiment of the present invention. The radio communication system includes a macro base station 10 that covers a wide range, an FD-MIMO station 20 that is located in the area of or in the vicinity of the area of the macro base station 10, and that includes two-dimensionally arranged antenna elements, and a mobile station 30. It is assumed that the FD-MIMO station 20 includes more than eight antenna elements. The more than eight antenna elements are classified as more than 8 antenna ports. As described above, one antenna element may correspond to one antenna port, and a plurality of antenna elements may correspond to one antenna port. In FIG. 4, the macro base station 10 and the FD-MIMO station 20 are separately arranged. However, the macro base station 10 may be configured as an FD-MIMO station having more than eight antenna elements. Further, it is described that the FD-MIMO station 20 includes two-dimensionally arranged antenna elements. However, the FD-MIMO station 20 may include one-dimensionally arranged antenna elements or three-dimensionally arranged antenna elements.

[0036] The FD-MIMO station 20 generates mapping of a CSI-RS corresponding to the extended number of the antenna ports, and transmits the mapping information of the CSI-RS to the mobile station 30 (S1). For example, the FD-MIMO station 20 may transmit, to the mobile station 30, the number of the antenna ports, and an index indicating the mapping of the CSI-RS (CSI reference signal configuration). The example of the mapping is described below by referring to FIG. 5. Further, the FD-MIMO station 20 multiplexes the CSI-RS in one or more resource elements in a resource block in accordance with the generated mapping, and transmits the CSI-RS to the mobile station 30 (S2). The mobile station 30 can extract the CSI-RS in accordance with the mapping information of the CSI-RS. The mobile station 30 measures channel quality by using the CSI-RS, generates the CSI, and transmits the CSI to the FD-MIMO station 20 (S3)."

"[0065] (2) The method of combining mappings of the CSI-RS that are defined in Release 10 of the 3GPP standard

For this method, the radio communication system is configured similar to FIG. 4. However, the mapping of the CSI-RS corresponding to the extended number of the antenna ports is generated by combining mappings of the CSI-RS that are defined for a predetermined number or less of the antenna ports, which are shown in FIG. 1.

[0066] For example, for a case where the number of the antenna ports is 32, by combining four mappings for 8-antenna ports, which are shown in (C) of FIG. 1, the CSI-RS for 32 antenna ports can be obtained. For a case of 8-antenna ports, five types of mappings of the CSI-RS, which are indicated by indexes from 0 to 4 (CSI reference configurations), are available. For example, by using 0 to 3 of these indexes, the CSI-RS for 32 antenna ports can be obtained. Thus, the FD-MIMO station 20 may signal, to the mobile station 30, two bits that indicate the number of the antenna ports, and the indexes 0, 1, 2, and 3 in the table of FIG. 2. Here, the indexes 0, 1, 2, and 3 may be signaled as four individual indexes, or the indexes 0, 1, 2, and 3 may be signaled as an interval of (0, 3).

[0067] The relationship between the indexes to be signaled and the antenna ports may be explicitly signaled to the mobile station 30, or the relationship may follow a predetermined rule. For example, the following information may be signaled to the mobile station 30: the index 0 in the table of FIG. 2 is allocated to the antenna port numbers from 0 to 7; the index 1 is allocated to the antenna port numbers from 8 to 15; the index 2 is allocated to the antenna port numbers from 16 to 23; and the index 3 is allocated to the antenna port numbers from 24 to 31. Alternatively, a rule may be defined, in advance, in the base station 20 and the mobile station 30 such that the indexes 0, 1, 2, and 3 are allocated to the antenna port numbers from 0 to 7, from 8 to 15, from 16 to 23, and from 24 to 31, in this order.

[0068] For example, for a case where the number of the antenna ports is 10, the CSI-RS for 10-antenna ports can be obtained by combining the mapping for 2-antenna ports, which is shown in (A) of FIG. 1, and the mapping for 8-antenna ports, which is shown in (C) of FIG. 1. For a case of 2-antenna ports, twenty types of mappings of the CSI-RS that are indicated by the indexes from 0 to 19 are available, and for a case of 8-antenna ports, five types of mappings of the CSI-RS that are indicated by the indexes from 0 to 5 are available. For example, by combining the index 0 for 2-antenna ports and the index 1 for 8-antenna ports among these indexes, the CSI-RS for 10-antenna ports can be obtained. Thus, the base station 20 may signal, to the mobile station, the two bits that indicate the number of the antenna ports that is 2, the index 0 in the table of FIG. 2, the two bits that indicate the number of the antenna ports that is 8, and the index 1 in the table of FIG. 2.

[0069] In this manner, by combining mappings of the CSI-RS for 1-, 2-, 4-, and 8-antenna ports, which are shown in FIG. 1, various numbers of the antenna ports can be supported.

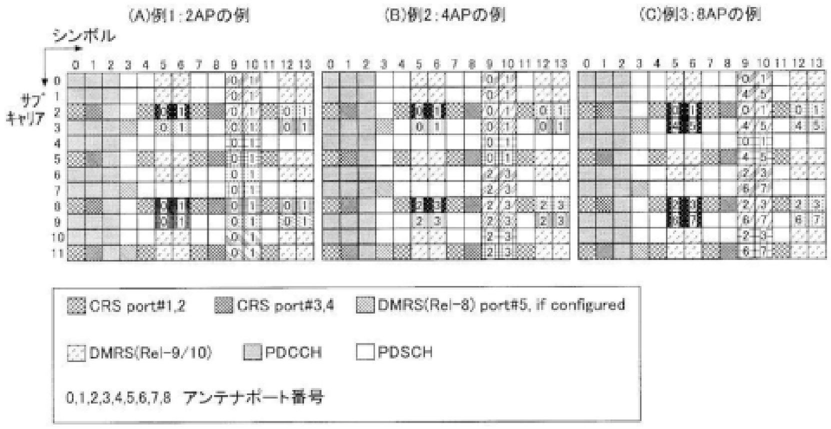
[0070] Note that a combination of mappings of the CSI-RS for 1-, 2-, 4-, and 8-antenna ports may be signaled to the mobile station together with a CSI Process for CSI calculation. The CSI process is information indicating details of CSI feedback by a mobile station, which is defined in Release 11 of the 3GPP standard. As shown in FIG. 8, the CSI process is defined by a combination of a resource for measuring signal power (CSI-RS resource) that is used for CSI calculation, and a resource for measuring interference signals (CSI-IM (CSI-interference management) resource). The resource for transmitting signal power is an index indicating a resource configuration for measuring signal power within own cell, and the resource for measuring interference signals is for a case where there is no signal in own cell and an index indicating a resource configuration for measuring signal power in another cell. According to Release 11, for each CSI process, one resource for measuring signal power, and one resource for measuring interference signals can be specified. By specifying, for each CSI process, a plurality of resources for measuring signal power (e.g., #1 and #2) and a plurality of resources for measuring interference signals (e.g., #1 and #2), mapping for the CSI-RS for the extended number of antenna ports may be signaled to a mobile station.

[0071] The base station 20 and the mobile station 30 are configured to be the same as shown in FIG. 6 and FIG. 7, respectively, except for the following points.

[0072] The CSI-RS mapping information storage unit 203 stores mapping information, as shown in (A) to (C) of FIG. 1.

[0073] The CSI-RS mapping information communication unit 205 signals information indicating the mapping of the CSI-RS to a mobile station. For example, for a case of combining, for 32-antenna ports, four types of mappings of the CSI-RS that are indicated by the indexes from 0 to 3, the CSI-RS mapping information communication unit 205 may signal information indicating the number of the antenna ports that is 32, and the indexes from 0 to 3. For example, for a case of combining, for 10-antenna ports, the mapping of the CSI that is indicated by the index 0 for 2-antenna ports and the mapping of the CSI that is indicated by the index 1 for 8-antenna ports, the CSI-RS mapping information communication unit 205 may signal information indicating the numbers of the antenna ports that are 2 and 8, and the indexes of 0 and 1. Additionally, the mapping information may be signaled together with the CSI process."

[FIG. 1]

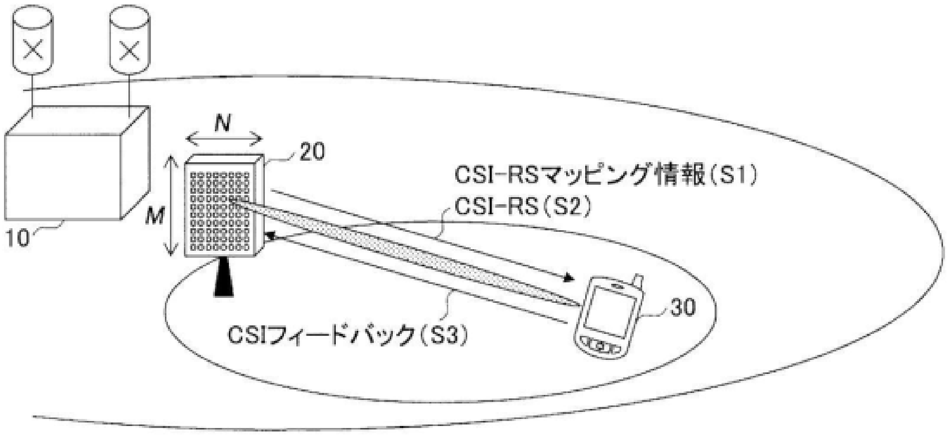


（Ａ）例１：２ＡＰの例　(A) Example 1: Example of 2 APs
（Ｂ）例２：４ＡＰの例　(B) Example 2: Example of 4 APs
（Ｃ）例３：８ＡＰの例　(C) Example 3: Example of 8 APs
シンボル　symbol
サブキャリア　subcarrier
アンテナポート番号　antenna port number

[FIG. 2]

	CSI reference signal configuration	Number of CSI reference signals configured					
		1 or 2		4		8	
		(k', l')	n_2 mod 2	(k', l')	n_2 mod 2	(k', l')	n_2 mod 2
Frame structure type 1 and 2	0	(9,5)	0	(9,5)	0	(9,5)	0
	1	(11,2)	1	(11,2)	1	(11,2)	1
	2	(9,2)	1	(9,2)	1	(9,2)	1
	3	(7,2)	1	(7,2)	1	(7,2)	1
	4	(9,5)	1	(9,5)	1	(9,5)	1
	5	(8,5)	0	(8,5)	0		
	6	(10,2)	1	(10,2)	1		
	7	(8,2)	1	(8,2)	1		
	8	(6,2)	1	(6,2)	1		
	9	(8,5)	1	(8,5)	1		
	10	(3,5)	0				
	11	(2,5)	0				
	12	(5,2)	1				
	13	(4,2)	1				
	14	(3,2)	1				
	15	(2,2)	1				
	16	(1,2)	1				
	17	(0,2)	1				
	18	(3,5)	1				
	19	(2,5)	1				

[FIG. 4]



ＣＳＩ－ＲＳマッピング情報	CSI-RS mapping information
ＣＳＩフィードバック	CSI feedback

According to [0006] and FIG. 1, "mapping of the CSI-RS" is a figure which specifies locations of subcarriers and symbols of CSI-RS.

According to [0006] to [0008] and FIG. 2, there are twenty types of mapping using indexes 0 to 19 when the number of antenna ports is 1 or 2, ten types of mapping using indexes 0 to 9 when the number of antenna ports is 4, and five types of mapping using indexes 0 to 4 when the number of antenna ports is 8.

The description in [0068], "five types of mappings of the CSI-RS that are indicated by the indexes from 0 to 5", is obviously an error for the description, "five types of mappings of the CSI-RS that are indicated by the indexes from 0 to 4".

Therefore, Cited Document 1 includes the following description (hereinafter referred to as "Cited Invention").

"A method,

in a base station for implementing a CSI-RS configuration that can support an extended number of antenna ports (more than eight), wherein

the CSI-RS is reference signals that are used for measuring channel state information (CSI),

in a frequency domain, one resource element is allocated per one antenna port in one resource block,

mapping of the CSI-RS is a figure which specifies locations of subcarriers and symbols of CSI-RS,

there are twenty types of mapping using indexes 0 to 19 when the number of antenna ports is 1 or 2, ten types of mapping using indexes 0 to 9 when the number of antenna ports is 4, and five types of mapping using indexes 0 to 4 when the number of antenna ports is 8,

a macro base station 10 is configured as an FD-MIMO station having more than eight antenna elements,

mapping of the CSI-RS corresponding to the extended number of the antenna ports is generated, the mapping information of the CSI-RS is transmitted to a mobile station 30,

the mobile station 30 extracts the CSI-RS in accordance with the mapping information of the CSI-RS, measures channel quality by using the CSI-RS, generates the CSI, and transmits the CSI to the FD-MIMO station,

the method of combining mappings of CSI-RS that are defined in Release 10 of the 3GPP standard, wherein

the mappings of the CSI-RS are generated by combining mappings of the CSI-RS that are defined for a predetermined number or less of the antenna ports,

for a case where the number of the antenna ports is 32, by combining four mappings for 8-antenna ports, the CSI-RS for 32 antenna ports can be obtained,

for a case of 8-antenna ports, five types of mappings of the CSI-RS, which are indicated by indexes from 0 to 4, are available, for example, by using 0 to 3 of these indexes, the CSI-RS for 32 antenna ports can be obtained,

the following information is signaled to the mobile station 30: the index 0 is allocated to the antenna port numbers from 0 to 7; the index 1 is allocated to the antenna port numbers from 8 to 15; the index 2 is allocated to the antenna port numbers from 16 to 23; and the index 3 is allocated to the antenna port numbers from 24 to 31,

for a case where the number of the antenna ports is 10, the CSI-RS for 10-antenna ports can be obtained by combining the mapping for 2-antenna ports and the mapping for 8-antenna ports,

for a case of 2-antenna ports, twenty types of mappings of the CSI-RS that are indicated by the indexes from 0 to 19 are available, and for a case of 8-antenna ports, five types of mappings of the CSI-RS that are indicated by the indexes from 0 to 4 are available, for example, by combining the index 0 for 2-antenna ports and the index 1 for 8-antenna ports, the CSI-RS for 10-antenna ports can be obtained, the two bits that indicate the number of the antenna ports that is 2, the index 0, the two bits that indicate the number of the antenna ports that is 8, and the index 1 are signaled to the mobile station,

by combining mappings of the CSI-RS for 1-, 2-, 4-, and 8-antenna ports, various numbers of the antenna ports can be supported."

5. Comparison between the Invention and the Cited Invention

(1) The "mobile station 30" in the Cited Invention corresponds to the "user equipment (UE)" in the Invention. The "macro base station 10" and the "FD-MIMO station" in the Cited Invention correspond to the "base station" in the Invention.

(2) The specification [0555] of the present application includes the following description, "a reference signal used for channel state information measurement is referred to as a CSI-RS (Channel State Information Reference Signal)". The "CSI-RS" in the Cited Invention is a reference signal used for measuring Channel State Information (CSI). Thus, the "CSI-RS" in the Cited Invention is included in the "reference signal" in the Invention.

The "mapping of the CSI-RS" in the Cited Invention is a figure which specifies locations of subcarriers and symbols of CSI-RS. The subcarrier and the symbol are frequency resource and time resource, respectively, which represent a location where the "time-frequency resource" is mapped.

Therefore, the "mapping of the CSI-RS" in the Cited Invention is included in the "reference signal resource mapping diagram" in the Invention and indicates "a location to which a time-frequency resource of the reference signal is mapped".

(3) The Cited Invention generates mapping of the CSI-RS corresponding to the extended number of the antenna ports and transmits the mapping information of the CSI-RS to the mobile station 30. The mobile station 30 extracts the CSI-RS in accordance with the mapping information of the CSI-RS, measures channel quality by using the CSI-RS, generates the CSI, and transmits the CSI to the FD-MIMO station 20.

Thus, it can be said that the "mobile station 30" receives mapping information of the CSI-RS, acquires the CSI-RS in accordance with the mapping information of the CSI-RS, measures channel quality by using the CSI-RS, generates the CSI, and transmits the CSI to the base station 20 as feedback.

As described in (1) and (2), the "mobile station 30" in the Cited Invention corresponds to the "user equipment (UE)" in the Invention, and the "CSI-RS" in the Cited Invention is included in the "reference signal" in the Invention. Thus, it can be said that the Cited Invention "receives a reference signal resource mapping diagram, and acquires a reference signal in accordance with the reference signal resource mapping diagram" by means of user equipment, and "performs channel measurement using the reference signal to generate CSI, and feeds back the CSI to a base station" by means of the user equipment.

Since the Cited Invention is a "method" of performing channel measurement in accordance with a mapping of received SCI-RS and feeding back a generated CSI to a base station, it can be said that the Cited Invention is a "channel measurement method" on the whole.

(4) In the Cited Invention

There are twenty types of mapping using indexes 0 to 19 when the number of antenna ports is 1 or 2,

ten types of mapping using indexes 0 to 9 when the number of antenna ports is 4,

and five types of mapping using indexes 0 to 4 when the number of antenna ports is 8. The numbers 1, 2, 4, 8 representing the number of antenna ports are integers less than or equal to 8 and satisfying 2^n.

Thus, it can be said that a case for "1- or 2-antenna ports", a case for "4-antenna ports", and a case for "8-antenna ports" have "twenty (types)", "ten (types)", and "five (types)" of mapping of the CSI-RS, respectively.

The "five types of mapping of the CSI-RS for 8-antenna ports", "ten types of mapping of the CSI-RS for 4-antenna ports", and "twenty types of mapping of the CSI-RS for 1- or 2-antenna ports" in the Cited Invention are thirty-five "mappings of the CSI-RS" in total. Thus, the mappings in the Cited Invention correspond to the "K1 first reference signal resource mapping diagrams" in the Invention, and the numbers "8", "4", and "1 or 2" representing the number of antenna ports are included in the description, "Y is an integer less than or equal to 8 and satisfying 2^n". Accordingly, they also correspond to the "Y-port reference signal resource mapping diagram".

Meanwhile,

In the case of "combining the index 0 of the mapping of the CSI-RS for 2-antenna ports with the index 1 of the mapping of the CSI-RS for 8-antenna ports" in a CSI-RS for 10 ports, the "index 0 of the mapping of the CSI-RS for 2-antenna ports" and the "index 1 of the mapping of the CSI-RS for 8-antenna ports" are used. An association relationship exists with the "index 0 of the mapping of the CSI-RS for 2-antenna ports" and the "index 1 of the mapping of the CSI-RS for 8-antenna ports".

In the case of using "the indexes 0 to 3 of the mapping of the CSI-RS for 8-antenna port" in a CSI-RS for 32 ports, the "index 0 of the mapping of the CSI-RS for 8-antenna ports", the "index 1 of the mapping of the CSI-RS for 8-antenna ports", the "index 2 of the mapping of the CSI-RS for 8-antenna ports", and the "index 3 of the mapping of the CSI-RS for 8-antenna ports" are used. An association relationship exists with the "index 0 of the mapping of the CSI-RS for 8-antenna ports", the "index 1 of the mapping of the CSI-RS for 8-antenna ports", the "index 2 of the mapping of the CSI-RS for 8-antenna ports", and the "index 3 of the mapping of the CSI-RS for 8-antenna ports".

Thus, since each of the mappings of the CSI-RS for 32 ports and 10 ports is generated by "combining the mappings of the CSI-RS for 2- and 8-antenna ports", an association relationship exists with "at least one of the mappings of the CSI-RS for 1-, 2-, 4-, and, 8-antenna ports". The numbers representing the number of antenna ports "10" and "32" are integers greater than 8.

Accordingly, the "mappings of the CSI-RS for 10- and 32-ports" in the Cited Invention correspond to the "second reference signal resource mapping diagram" in the Invention and also correspond to the "X-port reference signal resource mapping diagram" since the numbers representing the number of ports "10" and "32" are integers greater than 8 and included in the description "X is an integer greater than 8 or an integer less than 8 and not satisfying 2^n ".

Therefore, it can be said that "an association relationship exists between at least one of the second reference signal resource mapping diagram and the K1 first reference signal resource mapping diagram".

Thus, the Invention and the Cited Invention are identical in the following points.

"A channel measurement method, comprising:

a step of obtaining, by user equipment (UE), a reference signal resource mapping diagram, and obtaining a reference signal according to the reference signal resource mapping diagram; and

a step of performing, by the UE, channel measurement according to the reference signal to determine channel state information, and feeding back the channel state information to a base station, wherein the reference signal resource mapping diagram is a location to which a time-frequency resource of the reference signal is mapped, the reference signal resource mapping diagram is a first reference signal resource mapping diagram or a second reference signal resource mapping diagram, and an association relationship exists between the second reference signal resource mapping diagram and at least one of K1 first reference signal resource mapping diagrams, wherein K1 is a quantity of the first reference signal resource mapping diagrams, and K1 is an integer greater than or equal to 1; and

the first reference signal resource mapping diagram is a Y-port reference signal resource mapping diagram, the second reference signal resource mapping diagram is an X-port reference signal resource mapping diagram, Y is an integer less than or equal to 8 and satisfying 2^n, and X is an integer greater than 8 or an integer less than 8 and not satisfying 2^n ".

The Invention and the Cited Invention are different in the following points.

In the Invention, regarding the second reference signal resource mapping diagram,
(A) with respect to K2, which is an integer greater than or equal to 1,
(B) an association relationship exists between each of K2 second reference signal resource mapping diagrams and at least one of K1 first reference signal resource mapping diagrams,
(C) at least two of the K2 second reference signal resource mapping diagrams have duplicate resources.

In the Cited Invention, regarding the second reference signal resource mapping diagram,

"one" second reference signal resource mapping diagram is presented, and an association relationship exists with at least one of K1 reference signal resource mapping diagrams; however, the Cited Invention does not include descriptions about the following matters:
(a) with respect to K2, which is an integer greater than or equal to 1,
(b) an association relationship exists between "each of K2 second reference signal resource mapping diagrams" and at least one of K1 first reference signal resource mapping diagrams,
(c) at least two of the K2 second reference signal resource mapping diagrams have duplicate resources.

6. Judgment by the body

Regarding the different features

(a) In the Cited Invention, for the case of 32-antenna ports, "four" of the 0 to 4 five types of mappings of the CSI-RS for 8-antenna ports are "combined". The "combination of four" includes five combinations of indexes in total, such as "0, 1, 2, 4", "0, 1, 3, 4", "0, 2, 3, 4" and "1, 2, 3, 4" other than "0, 1, 2, 3". This is a matter of mathematical common sense as described as follows in [0095] of Cited Document 2 in the notice of reasons for refusal dated November 8, 2018: "As a method of selecting M 8-port CSI-RS transmission patterns from among five 8-port CSI-RS transmission patterns, 5CM may be used."

The indexes "0, 5, 10, 11" of the mappings of the CSI-RS for 2-antenna ports and the index "0" of the mappings of the CSI-RS for 8-antenna ports,

the indexes "1, 6, 12, 13" of the mappings of the CSI-RS for 2-antenna ports and the index "1" of the mappings of the CSI-RS for 8-antenna ports,

the indexes "2, 7, 14, 15" of the mappings of the CSI-RS for 2-antenna ports and the index "2" of the mappings of the CSI-RS for 8-antenna ports,

the indexes "3, 8, 16, 17" of the mappings of the CSI-RS for 2-antenna ports and the index "3" of the mappings of the CSI-RS for 8-antenna ports,

the indexes "4, 9, 18, 19" of the mappings of the CSI-RS for 2-antenna ports and the index "4" of the mappings of the CSI-RS for 8-antenna ports,

are allocated to resource elements in a duplicated manner obviously from the time-frequency resources shown in FIG. 1 and FIG. 2.

The Cited Invention includes the description, "in a frequency domain, one resource element is allocated per one antenna port in one resource block", that is, different resource elements are allocated to each of antenna ports. Thus, in the case of 10-antenna ports, in combining one of twenty types of mapping of the CSI-RS for 2-antenna ports indicated by the indexes 1 to 19 with one of five types of mapping of the CSI-RS for 8-antenna ports indicated by the indexes 0 to 4, the above duplicate combinations cannot be accepted.

In the Cited Invention, in the case of 10-antenna ports, with respect to each of the twenty types of mapping of the CSI-RS for 2-antenna ports, four types of mappings of the CSI-RS for 8-antenna ports can be selected. Accordingly, it is a matter of mathematical common sense that there are eighty "combinations of the mappings of the CSI-RS for 2-antenna ports and the mappings of the CSI-RS for 8-antenna ports" in total.

According to the above, for 32-antenna ports and 10-antenna ports, there are a plurality of mappings of the CSI-RS, obviously. It is obvious that there are also a plurality of mappings of the CSI-RS regarding mappings of the CSI-RS for M-antenna ports other than 32 or 10, which are generated by combining "mappings of the CSI-RS for 1-, 2-, 4-, and 8-antenna ports".

It is a matter of mathematical common sense that the numbers "1, 2, 4, 8" are 2^n and that all integers equal to or greater than 1 can be represented by combinations of 2^n, which is known as the binary system. Thus, the "various numbers of the antenna ports" in the description of the Cited Invention "by combining mappings of the CSI-RS for 1-, 2-, 4-, and 8-antenna ports, various numbers of the antenna ports can be supported" are "integers greater than 8 or an integer less than 8 and not satisfying 2^n " which are not limited to 32 or 10.

Therefore, a person skilled in the art could easily conceive of the recognition that there are K2 (K2>1) mappings of the CSI-RS even for integers greater than 8 or an integer less than 8 and not satisfying 2^n.

Regarding the description "X is an integer greater than 8 or an integer less than 8 and not satisfying 2^n" about the X-port in the second reference signal resource mapping diagram, it is not a different feature since the Cited Invention includes a description about 10, 32, or "X is an integer greater than 8". As described above, "an integer less than 8 and not satisfying 2^n" could be also easily conceived.

(b) Each of the combinations of "mappings of the CSI-RS for 1-, 2-, 4-, and 8-antenna ports" is generated by using one of "mapping of the CSI-RS for 1- or 2-antenna ports", "mapping of the CSI-RS for 4-antenna ports", and "mapping of the CSI-RS for 8-antenna ports", which are elements for combination. Therefore, it can be said that the description in (a), "mappings of the CSI-RS corresponding to various numbers of the antenna ports generated by combining mappings of the CSI-RS for 1, 2, 4, 8-antenna ports" has an association relationship with the "mapping of the CSI-RS for 1-, 2-, 4-, and 8-antenna ports".

Accordingly, as described in (a), the "mappings of the CSI-RS corresponding to various numbers of the antenna ports" are "K2 second reference signal resource mapping diagrams". As described in 5. (4), the "mappings of the CSI-RS for 1-, 2-, 4-, and 8-antenna ports" are "K1 first reference signal resource mapping diagrams". Thus, it can be said that "each of K2 second reference signal resource mapping diagrams" has an association relationship with "K1 first reference signal resource mapping diagrams".

(c) In combining "mappings of the CSI-RS for 1-, 2-, 4-, and 8-antenna ports",

a "specific mapping diagram of the first reference signal resource mapping diagrams" is used in generating "a plurality of second reference signal resource mapping diagrams"

such as, for example, the "index 0" of the mapping of the CSI-RS for 32-antenne ports is used in the four "combination of four" of "0, 1, 2, 3", "0, 1, 2, 4", "0, 1, 3, 4" and "0, 2, 3, 4" out of five "combinations of four" described in (a),

and the "index 0 of the mapping of the CSI-RS for 2-antenna ports" of the mapping of the CSI-RS for 10-antenna ports is used in the following four combinations out of eighty combinations described in (a): "the index 0 of the mapping of the CSI-RS for 2-antenna ports and the index 1 of the mapping of the CSI-RS for 8-antenna ports", "the index 0 of the mapping of the CSI-RS for 2-antenna ports and the index 2 of the mapping of the CSI-RS for 8-antenna ports", "the index 0 of the mapping of the CSI-RS for 2-antenna ports and the index 3 of the mapping of the CSI-RS for 8-antenna ports", and "the index 0 of the mapping of the CSI-RS for 2-antenna ports and the index 4 of the mapping of the CSI-RS for 8-antenna ports".

Thus, it is obvious that at least two of "mappings of the CSI-RS for 10-, 32-antenna ports" have the same index or have duplicate resources. For other combinations, a predetermined index is used in multiple combinations. Therefore, it can be said that "at least two of the K2 second reference signal resource mapping diagrams have duplicate resources".

Accordingly, the different feature can be easily conceived based on the Cited Invention and mathematical common sense.

7. The Appellant's allegation

The Appellant alleges in the written opinion dated January 31, 2019 and the written appeal as follows:

"In FIG. 2 of the Cited Document 1, each of the mapping diagrams for 8-ports can be obtained by multiple 2-ports, and more importantly, resources of the different mapping diagrams for 8-ports are not duplicate completely. The same principle can be maintained naturally."

Of course, in the Cited Invention, five types of "mappings of the CSI-RS for 8-antenna ports" are not duplicate. However, the mappings of the CSI-RS for 8-antenna ports are the "first reference signal resource mapping diagrams", while in the Invention, at least two of the "second reference signal resource mapping diagrams" have duplicate resources and two of the "first reference signal resource mapping diagrams" do not.

In addition, as described in [0670] to [0672] of the specification and FIG. 5, five reference signal resource mapping diagrams for 8-ports are not duplicate even in the embodiment of the present application. Thus, there is no difference from the Cited Invention even by reference to the embodiments of the Invention, and the Appellant's allegation cannot be accepted.

8. Closing

As above, the Invention could have been easily invented by a person skilled in the art on the basis of the Cited Invention and mathematical common sense. Thus, the Appellant should not be granted a patent for the invention under the provisions of Article 29-2 of the Patent Act.

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

April 6, 2020

Chief administrative judge: SATO, Tomoyasu
Administrative judge: YOSHIDA, Takayuki
Administrative judge: NAKANO, Hiromasa