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Appellants seek our review under 35 U.S.C. § 134(a) of the
Examiner’s Final Rejection of claims 1–20, all the pending claims in the
present application (see Claims Appendix). We have jurisdiction over the

We AFFIRM.

1Appellants name Samsung Electronics, Co. Ltd. as the real party in interest
(App. Br. 1).
STATEMENT OF THE CASE

Appellants’ invention generally relates to deriving multi-user channel quality information (MU-CQI) indicating demodulation interference at user equipment. See Abstract. Claim 1, reproduced below, is illustrative of the claimed subject matter:

1. A user equipment, comprising:
   a receiver configured to receive, via a first set of demodulation reference signal (DMRS) antenna ports, a set of physical resource blocks (PRBs) in a single subframe on a physical downlink shared channel (PDSCH) from a transmission point in a wireless communication system, each of the PRBs including a demodulation interference measurement resource (DM-IMR) received via at least one DMRS antenna port other than the first set of DMRS antenna ports;
   a controller configured to demodulate the PDSCH, to estimate a signal part of channel quality information (CQI) from a PRB in the set of PRBs received via the first set of DMRS antenna ports, and to determine an interference part of the CQI based upon DM-IMRs within PRBs in the set of PRBs received via the at least one other DMRS antenna port; and
   a transmitter configured to transmit, to the transmission point, an indication of the CQI,
   wherein the first set of DMRS antenna ports comprises a subset of a predetermined group of DMRS antenna ports and the at least one other DMRS antenna port comprises all DMRS antenna ports within the predetermined group other than the first set of DMRS antenna ports.


Appellants appeal the following rejections:

Claims 1–8, 10–18, and 20 are rejected under 35 U.S.C. § 103 as being unpatentable over Cheng et al. (US 2015/0078190 A1, pub. Mar. 19,
Appeal 2018-007560
Application 14/581,636


We review the appealed rejections for error based upon the issues identified by Appellants and in light of the arguments and evidence produced thereon. Ex parte Frye, 94 USPQ2d 1072, 1075 (BPAI 2010) (precedential).

ANALYSIS

Claims 1, 4–8, 10, 11, 14–18, and 20

Appellants argue Cheng and Gong fail to teach or suggest all the features of claim 1. Specifically, Appellants contend,

Cheng does not disclose “determin[ing] an interference part of the [channel quality information]” (separately from “estimat[ing] a signal part of [the] channel quality information”) “based upon demodulation interference measurement resources . . . received via . . . at least one other [demodulation reference signal] antenna port” “compris[ing] all [demodulation reference signal] antenna ports . . . other than the first set of [demodulation reference signal] antenna ports” on which demodulation reference signals are transmitted/received.

App. Br. 20. In support of this contention, Appellants argue, “Cheng does not teach or suggest allowing different neighboring serving cells to transmit demodulation reference signals on the same antenna ports.” Id. at 15.

Appellants further argue Cheng does not teach or suggest “using a portion of the demodulation reference signal antenna ports for transmitting/receiving a
different signal that specifically enables determination of the interference between demodulation reference signals from different neighboring serving cells.” *Id.*

The Examiner finds, and we agree, that “Cheng is directed to a method for using DMRS signals to facilitate inter-cell interference cancellation and suppression.” Ans. 6 (citing Cheng, Abstract). The Examiner also finds, and we agree, that “Cheng . . . illustrates two set[s] of DMRS ports (7, 8, 11, 13) and (9, 10, 12, 14) for transmission of DMRS signals, and these signals are performed by a UE [user equipment] to support more effective reduction of interference.” *Id.* at 6–7 (citing Cheng ¶¶ 57, 98, Fig. 9).

Appellants’ arguments do not persuasively distinguish the claims from Cheng’s teachings because Appellants’ arguments are not commensurate with the scope of the claim. For instance, claim 1 does not recite “allowing different neighboring serving cells to transmit demodulation reference signals on the same antenna ports.” Likewise, claim 1 does not recite “using a portion of the demodulation reference signal antenna ports for transmitting/receiving a different signal that specifically enables determination of the interference between demodulation reference signals from different neighboring serving cells.”

Appellants also contend,

Gong does not disclose that the “DM-IMRs” for “determin[ing] an interference part of the [channel quality information]” are “received via . . . at least one other [demodulation reference signal] antenna port” “compr[ising] all [demodulation reference signal] antenna ports . . . other than the first set of [demodulation reference signal] antenna ports” on which demodulation reference signals are transmitted/ received.

4
App. Br. 20. In particular, Appellants contend, “Gong describes signal[s] that it terms ‘DM-IMRs,’ but which are not the same type of signals as the demodulation interference measurement resources described in the present application.” Id. at 15. “Rather than using a demodulation reference signal with a different scrambling identifier for a demodulation interference measurement resource as taught in the specification,” Appellants contend, “Gong suggests using one of three [different] signals.” Id.

Appellants’ attempts to distinguish Gong are unpersuasive because the Examiner relies not only on Gong, but also Cheng, for the disputed limitation. Specifically, the Examiner finds, and we agree, that Cheng teaches or suggests “each of the PRBs including a demodulation interference measurement resource (DM-IMR) (DMRS for interference measurement) received via at least one DMRS antenna port other than the first set of DMRS antenna ports.” Final Act. 3 (emphasis added). Appellants also concede “Cheng discloses . . . demodulation reference signals,” i.e., DMRS. App. Br. 13. And the Specification defines “DM-IMR” essentially as one type of DMRS, stating, “DM-IMR is DMRS other than those DMRS scrambled according to specified scrambling initialization parameter(s) carried on a set of antenna ports indicated in a DCI.” Spec. ¶ 37; App. Br. 15 (relying on Spec. ¶ 37). Appellants do not attempt to distinguish the claimed DM-IMR from the Examiner’s finding that Cheng’s DMRS teaches or suggests the claimed DM-IMR. Accordingly, Appellants’ arguments attacking Cheng and Gong in isolation do not persuasively rebut the underlying factual findings made by the Examiner, which are based upon the combined teachings and suggestions of the cited references. One cannot
show non-obviousness by attacking references individually, where the rejections are based on combinations of references. In re Merck & Co., Inc., 800 F.2d 1091, 1097 (Fed. Cir. 1986).

Appellants’ final argument in support of claim 1 is that “Gong does not teach or suggest that ‘DM-IMRs’ are transmitted/received via DMRS antenna ports.” App. Br. 20. Specifically, Appellants contend that Gong’s “CSI-RS resources are configured as ‘DM-IMRs’ and transmitted/received on the respective CSI-RS antenna ports.” Id. at 19. But Appellants ignore that the Examiner also finds, and we agree, that Cheng discloses “a demodulation interference measurement resource (DM-IMR) (DMRS for interference measurement) [is] received via at least one DMRS antenna port other than the first set of DMRS antenna ports.” Final Act. 3 (emphasis added). Thus, Appellants again impermissibly argue the references individually.

Accordingly, we sustain the Examiner’s rejection of claim 1. Appellants’ arguments regarding the rejection of independent claim 11 rely on the same arguments as for claim 1, and Appellants do not argue separate patentability for claim 1’s and claim 11’s dependent claims except for claims 2, 3, 9, 12, 13, and 19, which we address separately below. See App. Br. 20–28. We therefore also sustain the Examiner’s rejection of claims 4–8, 10, 11, 14–18, and 20. See 37 C.F.R. § 41.37(c)(1)(iv).

Claims 2 and 12

Appellants contend Cheng and Gong fail to teach or suggest claim 2’s “wherein the first set of DMRS antenna ports are allocated to the user equipment and the at least one other DMRS antenna port is not allocated to
the user equipment.” App. Br. 21. Appellants argue Cheng does not “state that the interfering signal from a neighboring serving cell is received on an antenna port not assigned to the user equipment determining an interference part of the channel quality information based upon demodulation interference measurement resource(s).” Id. at 22. Rather, Appellants contend, “Cheng describes the interference problem as arising from two neighboring serving cells each transmitting different and at least partially overlapping demodulation reference signals in the same resource elements using the same antenna ports.” Id.

The Examiner finds:

Cheng further teaches wherein the first set of DMRS antenna ports are allocated (interpreted as antenna ports from the serving base station) to the user equipment, and the at least one other DMRS antenna port is not allocated (interpreted as antenna ports from the neighboring base station) to the user equipment ([Para. 0007, 0010, 0079] the UE receives a first DMRS signal from a serving base station transmitted on a first antenna port (i.e. allocated antenna port) and receives an interfering signal from a neighboring base station transmitted on a second antenna port (the antenna port is not allocated).

Final Act. 6. Specifically, Cheng discloses “receiving a first signal from a serving base station transmitted on a first antenna port, the first signal including a first demodulation reference signal (DRMS), and receiving an interfering signal from a neighboring base station transmitted on a second antenna port.” Cheng ¶ 7.

We agree with the Examiner. Appellants have not persuasively distinguished claim 2’s “first set of DMRS antenna ports allocated to the user equipment and the at least one other DMRS antenna port is not allocated to the user equipment” from Cheng’s “receiving a first signal from
a serving base station transmitted on a first antenna port” and “receiving an interfering signal from a neighboring base station transmitted on a second antenna port.” See id. Accordingly, we sustain the Examiner’s rejection of claim 2.

Appellants argue claim 12 recites similar features as claim 2. App. Br. 23. Accordingly, we also sustain the Examiner’s rejection of claim 12.

Claims 3 and 13

Appellants contend Cheng and Gong fail to teach or suggest claim 3’s “wherein the DM-IMR is DMRS other than those scrambled according to a specified scrambling initialization parameter.” Id. at 24. Appellants echo their arguments with respect to claim 1, contending “the cited portions of Gong disclose ‘DM-IMRs . . . configured as ZP-CSI-RSs or CSRs,’ not demodulation interference measurement resources that are demodulation reference signals.” Id.

However, the Examiner relies not only on Gong for this feature, but also Cheng. Final Act. 6. The Examiner finds “the combination of Cheng and Gong disclose[s] coordinated configuration of DMRS port assignments for transmission from cells in a group of neighboring cells and feedback CQI based on Interference Measurement Resources for Demodulation (DM-IMRs).” Id. (emphasis added). Further, claim 3 depends from claim 1, and as we stated above, the Examiner finds, and Appellants do not dispute, Cheng discloses “each of the PRBs including a demodulation interference measurement resource (DM-IMR) (DMRS for interference measurement) received via at least one DMRS antenna port other than the first set of DMRS antenna ports.” Id. at 3. Appellants also concede “Cheng discloses
Thus, Appellants’ arguments attacking Cheng and Gong individually are not persuasive. Accordingly, we sustain the Examiner’s rejection of claim 3. Appellants argue claim 13 recites similar features as claim 3. *Id.* at 26. Accordingly, we also sustain the Examiner’s rejection of claim 13.

**Claims 9 and 19**

Appellants contend Cheng, Gong, and Chae fail to teach or suggest claim 9’s “wherein the user equipment is configured to report DMRS-CQI together with a hybrid automatic repeat request-acknowledge (HARQ-ACK) feedback on a physical uplink control channel (PUCCH), and wherein the DMRS-CQI is estimated in a subframe in which the user equipment received the set of PRBs.” *Id.* Specifically, Appellants contend, “Chae does not teach or suggest demodulation interference measurement resources, and the interpretation that any channel quality information derived from demodulation reference signals is sufficient to satisfy the ‘DMRS-CQI’ limitation is contrary to the explicit definition of that term in the Office Action.” *Id.* at 27.

Here, the Examiner finds, as noted above, “the combination of Cheng and Gong disclose DM-IMRs.” Final Act. 13. The Examiner further finds Chae discloses, “Chae ([Para. 0065-68] describes UE reports CQI information estimated in DMRS resource can be reported with HARQ ACK/NACK on PUCCH formats 2/2a/2b).” *Id.* Specifically, Chae discloses “[a]n SR channel reuses an ACK/NACK channel structure in PUCCH formats 1a/1b . . . . [I]n implementing transmission of a positive SR, the UE transmits HARQ ACK/NACK through resources allocated for
the SR.” Chae ¶ 65. Chae further discloses, “[a] report period of the channel measurement feedback (hereinafter, referred to as CQI information)” and “a slot may be used to transmit a Demodulation Reference Signal (DMRS), and CQI information may be transmitted.” Id. ¶¶ 67–68.

We agree with the Examiner. Appellants have not persuasively distinguished claim 9’s “the user equipment is configured to report DMRS-CQI together with a hybrid automatic repeat request-acknowledge (HARQ-ACK) feedback” from Chae’s “UE transmits HARQ ACK/NACK,” “CQI information,” and “slot . . . used to transmit a Demodulation Reference Signal (DMRS), and CQI information.” See id.

Accordingly, we sustain the Examiner’s rejection of claim 9.

Appellants argue claim 19 recites similar features as claim 9. App. Br. 27. Accordingly, we also sustain the Examiner’s rejection of claim 19.

DECISION

We affirm the Examiner’s § 103 rejection of claims 1–20.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED