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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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*Ex parte* MURALI NARASIMHA, VIJAY NANGIA, COLIN D. FRANK, and HYEJUNG JUNG

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Appeal 2017-009653
Application 12/976,117
Technology Center 2600

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Before NATHAN A. ENGELS, JAMES W. DEJMEK, and MICHAEL M. BARRY, *Administrative Patent Judges*.

BARRY, *Administrative Patent Judge.*

DECISION ON APPEAL

Pursuant to 35 U.S.C. § 134(a), Appellants[1] appeal from the Examiner's final decision to reject claims 20–25, 27–29, and 40. Claims 1–19, 26, 31–39, and 41 have been canceled. App. Br. 5.[2] Claim 30 has been allowed. *Id.* We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

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[1] Appellants identify Google Technology Holdings LLC as the real party in interest. App. Br. 3.

[2] Claim 41 was canceled subsequent to the filing of the Appeal Brief. *See* Reply Br. 1.

*Introduction*

Appellants describe the invention as addressing the problem of interference caused by operating multiple wireless technologies in the same device (e.g., Long Term Evolution ("LTE"), IEEE 802.11 ("WLAN" or "Wi-Fi"), and IEEE 802.15 ("Bluetooth"))—i.e., "Interference due to In-device Coexistence." Spec. ¶¶ 2, 12. A wireless terminal can provide to a base station an indication of periodicity for a planned Wi-Fi/Bluetooth transmission, and/or measurements such as Reference Symbol Receive Power ("RSRP"), Reference Symbol Receive Quality ("RSRQ"), Block Error Rate, and Frame Error Rate. *Id.* ¶¶ 20, 38–39. The base station can then determine whether there will be significant interference at the wireless terminal and, in response, reschedule any downlink LTE transmission that was scheduled to overlap with the terminal's planned Wi-Fi/Bluetooth transmission. *Id.* ¶¶ 20, 40. Also, the base station can schedule downlink gaps on the wireless terminal's LTE interface to enable the wireless terminal to perform Wi-Fi transmissions during the gaps. *Id.* ¶ 45, Fig. 5.

Claim 25 is exemplary:

> 25. A method in a first base station of a first wireless technology operating on a first frequency, the method comprising:
>
> receiving information from a wireless terminal comprising an indication of a periodicity of a planned transmission by the wireless terminal where interference may occur, [and]
>
> performing, at the base station, interference avoidance to avoid interference due to transmissions of signals of a second wireless technology by the wireless terminal to reception of signals of the first wireless technology by the wireless terminal, by rescheduling downlink transmissions based on the indication of a periodicity of a planned transmission by the wireless terminal where interference may occur.

App. Br. App'x A (Claims App'x).

*References*

The prior art relied upon by the Examiner in rejecting the claims consists of eight patent publications:

| | | |
|---|---|---|
| Caspi et al. ("Caspi") | US 2006/0068815 A1 | Mar. 30, 2006 |
| Wang et al. ("Wang") | US 2009/0005029 A1 | Jan. 1, 2009 |
| Malladi et al. ("Malladi") | US 2009/0073922 A1 | Mar. 19, 2009 |
| Kazmi | US 2010/0290435 A1 | Nov. 18, 2010 |
| Thomas et al. ("Thomas") | US 2011/0058510 A1 | Mar. 10, 2011 |
| Dayal et al. ("Dayal_2") | US 2011/0243094 A1 | Oct. 6, 2011 |
| Dayal et al. ("Dayal_3") | US 2011/0256834 A1 | Oct. 20, 2011 |
| Johansson et al. ("Johansson") | US 2013/0083672 A1 | Apr. 4, 2013 |

*Rejections*[3]

1. Claims 25, 27, and 28 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Dayal_3 and Malladi. Final Act. 6–9.

2. Claims 20 and 22–24 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Dayal_2, Johansson, and Dayal_3. *Id.* at 9–13.

3. Claim 21 stands rejected under 35 U.S.C. § 103(a) as unpatentable over Dayal_2, Johansson, Dayal_3, and Kazmi. *Id.* at 13–15.

4. Claim 29 stands rejected under 35 U.S.C. § 103(a) as unpatentable over Dayal_3, Malladi, and Wang. *Id.* at 15–17.

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[3] The rejections of claim 41 under 35 U.S.C. §§ 112, second paragraph and 103(a) are moot in view of the cancellation of claim 41. *See supra* note 2.

5. Claim 40 stands rejected under 35 U.S.C. § 103(a) as unpatentable over Dayal_2, Johansson, Dayal_3, and Caspi. *Id.* at 17–18.

## ISSUES

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). Accordingly, the issues are whether the Examiner errs in finding:

(1) the combination of Dayal_3 and Malladi teaches or suggests "receiving information from a wireless terminal comprising an indication of a periodicity of a planned transmission by the wireless terminal where interference may occur" and "rescheduling downlink transmissions based on the indication of a periodicity of a planned transmission by the wireless terminal where interference may occur," as recited in claim 25 (App. Br. 11–18; Reply Br. 1–4);

(2) the combination of Dayal_3 and Malladi teaches or suggests "transmitting a message configuring the wireless terminal to perform one or more measurements during periods that overlap periods during which the wireless terminal transmits signals of a second wireless technology," as recited in claim 27 (App. Br. 18–19);

(3) the combination of Dayal_2, Johansson, and Dayal_3 teaches or suggests "based on the comparison, sending, by the wireless terminal, an indication of a periodicity of a planned transmission by the wireless terminal where interference may occur," as recited in claim 20 (*Id.* at 19–20; Reply Br. 4); and

(4) the combination of Dayal_2, Johansson, Dayal_3, and Caspi teaches or suggests "wherein the wireless terminal is configured to operate as a Wi-Fi access point and wherein the wireless terminal indicates to the first base station that a planned Wi-Fi transmission is expected to occur at a particular time," as recited in claim 40 (App. Br. 21; Reply Br. 4–5).

ANALYSIS

We have reviewed the Examiner's rejections in light of Appellants' contentions of reversible error. We disagree with Appellants' conclusions. Instead, we adopt the Examiner's findings and reasons for the 35 U.S.C. § 103(a) rejections, as set forth in the Final Rejection and in the Answer. We highlight the following for emphasis.

*Claims 25, 28, and 29*

Appellants acknowledge Dayal_3 teaches specifying parameters associated with a traffic pattern but argue it does not teach "an indication of a periodicity of a planned transmission by the wireless terminal where interference may occur," as recited in claim 25. Reply Br. 1–2 (citing Dayal_3 ¶¶ 102–104); *see also* App. Br. 16 –17 (contending the Examiner engages in impermissible speculation in finding Dayal_3 teaches the disputed claim language). Appellants further argue Dayal_3's parameters are not used by the base station for "rescheduling downlink transmissions," as further recited in claim 25, "but instead . . . are used to create 'measurement gaps' . . . for a handover determination." Reply Br. 1–2 (emphasis omitted) (citing Dayal_3 ¶¶ 86, 104); App. Br. 17–18.

Appellants' arguments are unpersuasive. We begin our analysis with a brief review of Dayal_3. Similar to Appellants' Specification, Dayal_3 is directed to mitigating interference caused by multi-radio co-existence. Dayal_3 ¶¶ 6–8, 32. Dayal_3 describes embodiments in which LTE User Equipment ("UE") can send a message to an eNB (i.e., a base station) indicating the UE is experiencing a coexistence issue (e.g., with Bluetooth or a WLAN), or that some LTE events are being denied. *Id.* ¶¶ 32, 82, 85, 86, 89, 102. In the message, the UE may report the average number of uplink

and downlink subframes denied due to coexistence every T milliseconds. *Id.* ¶ 102. The UE also may report parameters associated with the traffic pattern on the interfering technology (e.g., mode of operation under Bluetooth). *Id.* ¶¶ 103–104. Having received the message from the UE, the eNB may schedule a measurement gap pattern for the UE to mitigate interference by creating measurement gaps (on the uplink, downlink, or both) in the radio transmission, e.g., the eNB may instruct the UE to be silent for a certain number of milliseconds of a cycle. *Id.* ¶¶ 86, 104.

Figures 12A and B of Dayal_3 are illustrative and are reproduced below:

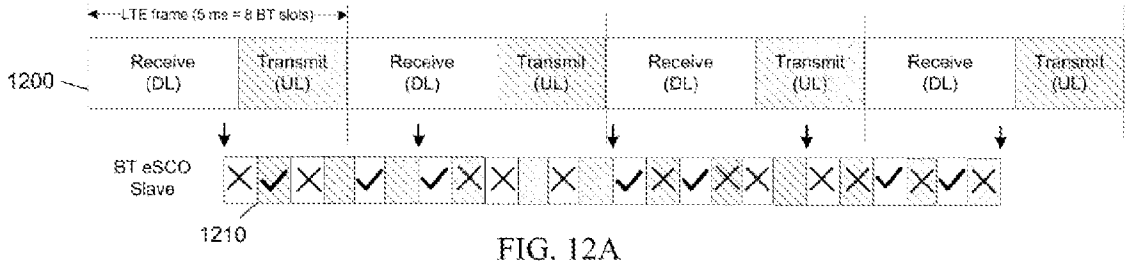


FIG. 12A

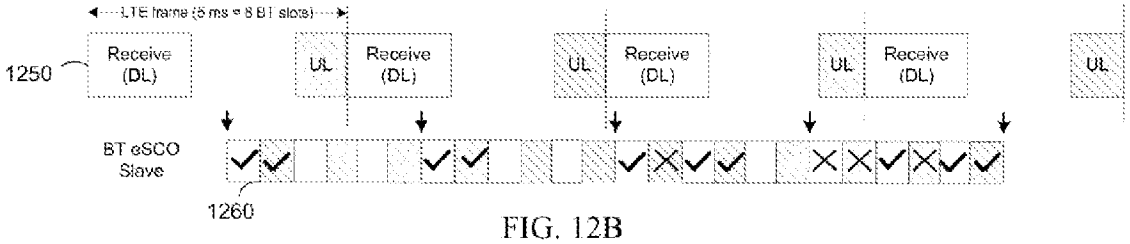


FIG. 12B

Figures 12A and B of Dayal_3 show exemplary timelines of UE Bluetooth extended synchronous connection (BT eSCO) transmissions and LTE transmissions between a UE and an eNB. *Id.* ¶ 31, Figs. 12A–B. Downlink time slots are shown as solid, whereas uplink slots are shaded. *Id.* ¶ 90. The slots with "X's" represent lost packets, whereas the slots with "checkmarks"

represent successfully transmitted packets. *Id.* In Figure 12A, LTE and BT eSCO transmissions are attempted over the same time period, resulting in the loss of BT eSCO packets in three out of four 3.75ms intervals. *Id.* By contrast, in Figure 12B, which illustrates an embodiment of Dayal_3's invention, in which the eNB has created a short term gap of 2ms every 5ms in LTE, there are fewer lost Bluetooth packets. *Id.* ¶ 91.

We agree with the Examiner that Dayal_3's disclosure that a UE can provide an eNB with parameters associated with the traffic pattern on the UE's interfering technology (e.g., BT eSCO) teaches or suggests "an indication of a periodicity of a planned transmission," as recited. *See* Final Act. 6 (citing Dayal_3 ¶¶ 103–104). We disagree with Appellants that the Examiner's rejection requires impermissible speculation because, as the Examiner explains, the traffic pattern sent from the UE to the eNB in Dayal_3 can be based on the BT eSCO technology, such that data is transmitted and received with a fixed periodicity, as evidenced by Dayal_3's Figures 12A–B. Ans. 19–20 (citing Dayal_3 Figs. 12A–B, ¶¶ 90–95, 102–104). We note that Dayal_3's disclosure of a BT eSCO traffic pattern reflects both the periodicity of previous BT eSCO transmissions on the UE and the periodicity of future or planned BT eSCO transmissions where interference may occur. *See* Dayal_3 ¶ 102.

Further, the Examiner finds Dayal_3's eNB may use the received BT eSCO traffic pattern to configure measurement gaps on the downlink. Final Act. 6–7 (citing, *inter alia*, Dayal_3 ¶ 104). The Examiner also finds that Dayal_3's measurement gaps are created and scheduled between LTE time slots to mitigate LTE-Bluetooth interference issues experienced by the UE. *Id.* (citing, *inter alia*, Dayal_3 ¶¶ 86, 90, 91; Figs. 12A–B). We agree

with the Examiner that these disclosures satisfy "rescheduling downlink transmissions based on the indication of a periodicity" as claimed, because measurement gaps can be configured based on the BT eSCO traffic pattern and because implementing such measurement gaps on the downlink between LTE time slots changes the schedule of LTE downlink transmissions. Figure 12B of Dayal_3 depicts LTE downlink frames with created and scheduled measurement gaps between LTE time slots at time periods that differ from those in Figure 12A. This technique is analogous to the teaching of Appellants' Specification, which discloses that the eNB can receive indications of an expected WiFi transmission event and its periodicity, after which the base station can create and schedule downlink gaps on the wireless terminal's LTE interface to enable the wireless terminal to perform Wi-Fi transmissions during the gaps. *See* Spec. ¶¶ 20, 45, Fig. 5.

Regarding Appellants' arguments that a handover in Dayal_3 is "not a rescheduling of downlink transmissions based on an indication of a periodicity," as claimed, App. Br. 14, even if a handover of the UE's LTE communications to another channel occurs sometime after implementing the measurement gaps, this does not affect the above teachings of Dayal_3. Furthermore, claim 25 does not preclude such an additional handover step.

Accordingly, Appellants do not persuade us the Examiner errs in rejecting claim 25, and we sustain its rejection. We also, therefore, sustain the rejection of claims 28 and 29, which depend therefrom and for which Appellants present no substantive arguments separate from those for claim 25.

*Claim 27*

Claim 27 recites "[t]he method according to claim 25 further comprising transmitting a message configuring the wireless terminal to perform one or more measurements." The Examiner finds Dayal_3 teaches or suggests this requirement by disclosing a UE that uses a cell-specific reference signal ("CRS") received from an eNB to perform RSRP and RSRQ measurements. Final Act. 8 (citing Dayal_3, ¶¶ 52, 53, 78). Appellants acknowledge Dayal_3 teaches an eNB sending a CRS to each cell in the eNB used by UEs for, *inter alia*, RSRQ measurements, but argue "[t]here is no teaching of the eNB also sending a message that configures the wireless terminal to perform one or more measurements during periods that overlap periods during which the wireless terminal transmits signals of a second wireless technology." App. Br. 18–19 (citing Dayal_3 ¶¶ 52, 53, 78). In response, the Examiner explains that the cited disclosure of Dayal_3 teaches or suggests the disputed limitation because "the UE does not measure RSRQ and RSRP without the CRS." Ans. 44.

Appellants' arguments do not persuasively rebut the Examiner's rejection as explained in the Examiner's Answer. We agree with the Examiner that transmitting the CRS provides the UE with symbols that enable the UE to perform an RSRP measurement specific to those symbols carrying the CRS, and thus Dayal_3 teaches, or least reasonably suggests, the limitation of claim 27. *See, e.g.*, Dayal_3 ¶ 53 ("The eNB may send a [CRS] for each cell in the eNB. The CRS may be sent in symbols 0, 1, and 4 of each slot in case of the normal cyclic prefix, and in symbols 0, 1, and 3 of each slot in case of the extended cyclic prefix. The CRS may be used by UEs for . . . [RSRP] and [RSRQ] measurements . . . .").

In view of the foregoing, we sustain the rejection of claim 27.

*Claims 20–24*

Independent claim 20 recites:

> 20. A method in a wireless terminal supporting operation on a first wireless technology and a second wireless technology, the method comprising:
>
> performing a first set of measurements on a received signal on first operating frequency of the first wireless technology,
>
> wherein the first set of measurements are performed during time periods that overlap time periods during which the wireless terminal transmits signals of the second wireless technology;
>
> performing a second set of measurements on a received signal on first operating frequency of the first wireless technology,
>
> wherein the second set of measurements are performed during time periods that do not overlap time periods during which the wireless terminal transmits signals of the second wireless technology;
>
> comparing the first set of measurements with the second set of measurements; and
>
> *based on the comparison, sending, by the wireless terminal, an indication of a periodicity of a planned transmission by the wireless terminal where interference may occur.*

App. Br. App'x A (Claims App'x) (disputed limitation emphasized). The Examiner finds the combination of Dayal_2, Johansson, and Dayal_3 teaches or suggests the disputed limitation. Final Act. 9–12 (citing Dayal_2 ¶¶ 8, 9, 53–55, 69, 75–78, 91, Fig. 7; Johansson ¶¶ 44, 48, 52, 57; Dayal_3 ¶¶ 82–95, 102–104, Figs. 12A–B).

Appellants argue "Dayal_3, Johansson and Dayal_2 do not teach, inter alia, sending, by the wireless terminal, an indication of a periodicity of

a planned transmission by the wireless terminal where interference may occur based on the comparison of the first set of measurements and the second set of measurements as claimed." App. Br. 20. In particular, Appellants assert none of the cited portions of Dayal_3 teaches the disputed limitation, but instead Dayal_3 "uses parameters associated with the traffic pattern on the interfering technology to configure measurement gaps so that the UE can perform interference measurement." Reply Br. 4.

Appellants' argument that Dayal_3 does not teach or suggest "sending, by the wireless terminal, an indication of a periodicity of a planned transmission by the wireless terminal where interference may occur" is unpersuasive for the reasons discussed above with respect to claim 25. Appellants do not contest the Examiner's reliance on the combination of Dayal_2 and Johansson for teaching the requirements for performing the first and second measurements and then comparing the measurements as a precedent for the step of sending. Final Act. 9–11. Thus, Appellants do not persuasively rebut the Examiner's finding that the combination of Dayal_3, Johansson, and Dayal_2 teaches or suggests claim 20's disputed limitation.

Accordingly, we sustain the rejection of claim 20. We also, therefore, sustain the rejection of its dependent claims 21–24, for which Appellants present no substantive separate arguments.

*Claim 40*

Appellants argue the Examiner errs in finding Dayal_3 teaches or suggests "wherein the wireless terminal is configured to operate as a Wi-Fi access point and wherein the wireless terminal indicates to the first base station that a planned Wi-Fi transmission is expected to occur at a particular

time," as recited in claim 40. App. Br. 21; Reply Br. 4–5. In particular, Appellants assert

> the cited portion of Dayal_3 uses a different approach wherein the wireless devices serves as a slave and not as a Wi-Fi master access point and the cited portions of the Dayal_3 and the other reference[s] fail to teach sending an indication of the periodicity of planned transmission indicating that a planned Wi-Fi transmission is expected to occur at a particular time.

App. Br. 21.

Appellants' arguments are unpersuasive. First, Appellants' argument that Dayal_3 does not teach or suggest a Wi-Fi master access point is unpersuasive because the Examiner relies on Caspi, not Dayal_3, as teaching this element. Final Act. 18 (citing Caspi ¶¶ 53, 55, 63); Ans. 46. Second, Appellants' contention that Dayal_3 does not teach or suggest sending an indication of a periodicity of a planned transmission is unpersuasive for the reasons discussed above with respect to claim 25. Third, contrary to Appellants' assertions, the Examiner relies on Dayal_2, not Dayal_3, for indicating that a planned Wi-Fi transmission is expected to occur at a particular time. Final Act. 17–18 (citing Dayal_2 ¶¶ 9, 69, 78, 84, 96).

Accordingly, Appellants' arguments do not persuasively rebut the Examiner's findings, reasoning, or conclusions in rejecting claim 40, and we sustain its rejection.

## DECISION

For the above reasons, we affirm the 35 U.S.C. § 103(a) rejections of claims 20–25, 27–29, and 40.

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) (2016).

AFFIRMED