

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

APPLE INC.,

Petitioner,

v.

APEX BEAM TECHNOLOGIES LLC,

Patent Owner.

Patent No. 10,944,527

Filing Date: June 3, 2019

Issue Date: March 9, 2021

Inventor: Xiaobo Zhang

Title: METHOD AND DEVICE FOR MULTI-ANTENNA
TRANSMISSION IN UE AND BASE STATION

PATENT OWNER'S PRELIMINARY RESPONSE

Case No. IPR2025-00897

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LIST OF EXHIBITS

Exhibit No.	Description of Document
2001	Scheduling Order, Dkt. 40, <i>Apex Beam Techs. LLC v. Apple Inc.</i> , Case No. 6:24-cv-00223-ADA (W.D. Tex. June 18, 2025)
2002	Apex Beam Technologies LLC's Infringement Contentions and P.R. 3-1 and 3-2 Disclosures in <i>Apex Beam Techs. LLC v. Apple Inc.</i> , Case No. 6:24-cv-00223-ADA (W.D. Tex.), dated May 27, 2025
2003	Complaint, Dkt. 1, <i>Apex Beam Techs. LLC v. Apple Inc.</i> , Case No. 6:24-cv-00223-ADA (W.D. Tex. April 29, 2024)

I. INTRODUCTION

On May 5, 2025, Apple Inc. (“Petitioner”) submitted a petition (Paper 2, “Petition” or “Pet.”) to institute *inter partes* review (“IPR”) of U.S. Patent No. 10,944,527 (APPLE-1001, the “’527 Patent”), challenging Claims 1-20 (the “Challenged Claims”). The Petition asserts that the Challenged Claims are rendered obvious by U.S. Patent Application Publication No. 2013/0182594 (APPLE-1004 or “Kim”) in view of 4G: LTE/LTE-Advanced for Mobile Broadband, Dahlman, 2014 (APPLE-1007 or “Dahlman”) in further view of U.S. Patent Application Publication No. 2015/0162966 (APPLE-1008 or “’Kim-966”). Pet. at 1.

The Board should deny the Petition because the Petition fails to describe how Kim in view of Dahlman and Kim-966 discloses the claimed “first signaling” of Claims 1.3 and 1.6. Petitioner ignores the relationship between the claimed “first radio signal” and “first signaling” that is described by the claim limitations of Claim 1, namely that at least the transmission of the first radio signal through the first antenna port group occurs during the first time resource pool. Even under Petitioner’s understanding of (i) Kim’s CSI-RS as the claimed “first radio signal” of Claim 1.2 (Pet. at 41-43); and (ii) time intervals or subframes as the claimed “time resource pools” (Pet. at 51-53), Petitioner’s argument that Dahlman’s system information block or SIB discloses the claimed “first signaling” (Pet. at 43-45) is not consistent. That is because the Petition fails to describe how a SIB’s purported

“allocation of subframes for uplink/downlink” is an allocation of subframes specifically for uplink/downlink for Kim’s CSI-RS, as required by the relationship between Petitioner’s purported “first radio signal” and “first signaling.”

The Petition is deficient with respect to the ’527 Patent’s dependent claims and analogues to Claim 1 for the same reasons.

Accordingly, the Board should deny institution of the Petition.

II. THE ’527 PATENT

The ’527 Patent discloses and claims “a multiple antenna transmission method in a wireless communication system.” ’527 Patent, at 1:19-20.

The ’527 Patent describes why such a method is necessary in view of “the urgent problem” of “signaling overhead of wireless resource dynamic scheduling,” as in the prior art:

[A]n increase in the number of cell users will lead to a large amount of signaling overhead for dynamic scheduling of wireless time-frequency resources. The signaling overhead of wireless resource dynamic scheduling is an urgent problem to be solved in massive MIMO system.

Id. at 1:40-44.

The exemplary embodiments of the ’527 Patent to address the aforementioned problem have several technical advantages, including that the UE can quickly determine the location of the first time resource pool and quickly determine the antenna virtualization vectors for receiving a radio signal by associating the first

time resource pool with the first antenna port group:

In one embodiment, the foregoing method is advantageous in that, by associating the first time resource pool with the first antenna port group, the UE can quickly determine the location of the first time resource pool in the time domain by the index of the first antenna port group in the K antenna port groups.

In one embodiment, the foregoing method is advantageous in that, by associating the first time resource pool with the first antenna port group, the UE can quickly determine the antenna virtualization vectors which used for receiving radio signal transmitted on the first time resource pool by the location of the first time resource pool in the time domain.

Id., 2:3-14.

III. CLAIM CONSTRUCTION

For the purposes of this Preliminary Response only, Patent Owner believes that “no claim terms need be construed to resolve issues of controversy in the present Petition.” Pet. at 2.

IV. LEVEL OF ORDINARY SKILL IN THE ART

For the purposes of this Preliminary Response only, Patent Owner utilizes Petitioner’s proposed level of skill in the art: “bachelor’s degree in electrical engineering, computer engineering, computer science, or a similar field, along with two years of experience designing or developing wireless networks, including long-term evolution LTE/4G or 5G new radio (NR) cellular technology. Additional education might substitute for some of the experience, and additional substantial

experience might substitute for some of the educational background.” Pet. at 12 (citations omitted).

**V. PETITIONER HAS NOT DEMONSTRATED A REASONABLE
LIKELIHOOD OF SUCCESS FOR THE GROUNDS
ADVANCED IN THE PETITION, AND THE PETITION
SHOULD BE DENIED**

Anticipation under 35 U.S.C. § 102 is a high bar to meet. A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. *Verdegaal Bros., Inc. v. Union Oil Co. of Cal.*, 814 F.2d 628, 631 (Fed. Cir. 1987). The identical invention must be shown in as complete detail as is contained in the claim. *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236 (Fed. Cir. 1989).

The question of obviousness is resolved on the basis of underlying factual determinations, including: (1) the scope and content of the prior art, (2) any differences between the claimed subject matter and the prior art, (3) the level of skill in the art, and (4) so-called secondary considerations where in evidence. *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 17-18 (1966); *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question is not whether the differences themselves would have been obvious, but whether the claimed invention as a whole would have been obvious. *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 1537 (Fed. Cir. 1983).

The Board has held that a failure to identify the differences between the claimed subject matter and the prior art is fatal to an obviousness challenge. *See, Apple, Inc. v. Contentguard Holdings, Inc.*, IPR2015-00355, Decision Denying Institution of *Inter Partes* Review, Paper 9 at 9-10 (P.T.A.B. June 26, 2015) (denying institution for failure to identify the differences between the claimed subject matter and the prior art).

In arriving at an obviousness determination, the Board must sufficiently explain and support the conclusions that the prior art references disclose all the elements recited in the Challenged Claims and a relevant, skilled artisan not only could have made, but would have been motivated to combine all the prior art references in the way the patent claims and reasonably expected success. *Pers. Web Techs., LLC v. Apple, Inc.*, 848 F.3d 987, 994 (Fed. Cir. 2017). That is, even if all the claim elements are found across a number of references, an obviousness determination must consider whether a person of ordinary skill in the art would have the motivation to combine those references. *Intelligent Bio-Sys., Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1368 (Fed. Cir. 2016); *Los Angeles Biomedical Rsch. Inst. at Harbor-UCLA Med. Ctr. v. Eli Lilly & Co.*, 849 F.3d 1049, 1067 (Fed. Cir. 2017) (vacating and remanding an obviousness determination, in part, because the Board did not make factual finding as to whether there was an apparent reason to combine all three prior art references to achieve the claimed invention and whether

a person of skill in the art would have had a reasonable expectation of success from such a combination). This combinability determination, as supported by an articulated motivation to combine, requires a plausible rationale as to why those prior art references would have worked together. *Broadcom Corp. v. Emulex Corp.*, 732 F.3d 1325, 1335 (Fed. Cir. 2013). Absent some articulated rationale, a “common sense” finding is no different than the conclusory statement “would have been obvious.” *In re Van Os*, 844 F.3d 1359, 1361 (Fed. Cir. 2017). Of additional importance, “knowledge of a problem and motivation to solve it are entirely different from motivation to combine particular references” *Innogenetics, N.V. v. Abbott Lab’ys*, 512 F.3d 1363, 1373 (Fed. Cir. 2008).

A. The Petition Fails to Render Obvious Claim 1 in View of Kim in View of Dahlman and Kim-966

1. Kim in View of Dahlman and Kim-966 Does Not Render Obvious “*receiving a first signaling from the base station*” and “*the first signaling is used to determine a first time resource pool*,” as Required by Claim 1.3 and Claim 1.6

Claims 1.3 and 1.6 of the ’527 Patent recite “receiving a first signaling from the base station” and “the first signaling is used to determine a first time resource pool.”

As a preliminary matter, Petitioner argues that Kim’s CSI-RS meets the claimed “first radio signal” of Claim 1.2. Pet. at 41-43. The first radio signal is directly associated with the claimed “first signaling” of Claims 1.3 and 1.6 in light

of other claim limitations in Claim 1. Specifically, “the first radio signal is transmitted by K antenna port groups of the base station,” including the first antenna port group. At least one of the first and second virtualization vectors are associated with that first antenna group (i.e., “at least one of a first antenna virtualization vector and a second antenna virtualization vector is associated with the first antenna port group”) and both the first and second antenna virtualization vectors are available to the base station and the UE respectively in the first time resource pool (i.e., “the first antenna virtualization vector is an antenna virtualization vector available to the base station in the first time resource pool; the second antenna virtualization vector is an antenna virtualization vector available to the user equipment in the first time resource pool”). *See* ’527 Patent, Claim 1. Therefore, at least the transmission of the first radio signal through the first antenna port group occurs during the first time resource pool.

The Petition is necessarily deficient because Petitioner ignores the aforementioned relationship between the first radio signal and first signaling. Petitioner improperly argues that Dahlman’s system information block or SIB discloses the claimed “first signaling.” Pet. at 43-45. Notably, the ’527 Patent describes a System Information Block or a Channel State Information Reference signal(s) (CSI-RS) as both examples of the “first radio signal,” **not** the first signaling. ’527 Patent, 2:29-33. That is because there is no established relationship between an

SIB and a CSI-RS in the '527 Patent. And Petitioner fails to establish any relationship using Kim, Dahlman, or Kim-966.

Instead, Petitioner relies on two different statements that (i) “control information is imperative for proper reception of the CSI-RSs” (Pet. at 44 (citing APPLE-1004, 0065)); and (ii) Dahlman’s generic description of information “which needs to be acquired by terminals [UEs] in order for them to be able to access and, in general, operate properly within the network” (*Id.* (citing APPLE-1007, pp. 355-362)). Despite these general statements, the Petition jumps to the unsupported conclusion that “the SIB is a type of control information sent *from the base station* to the UE” (*id.*) for presumably the proper reception of Kim’s CSI-RSs. However, the cited portion of Dahlman describing SIBs is silent regarding CSI-RSs or whether SIBs provide control information for CSI-RSs. *See generally* APPLE-1007, pp. 355-362.

The Petition’s deficiency is accentuated by Petitioner’s mischaracterization that “the '527 patent claims and specification describe *a first signaling* in a manner consistent with Dahlman’s description of SIB” (Pet. at 44), while ignoring the '527 Patent’s own disclosure of a SIB as an example of a first radio signal, not first signaling. '527 Patent, 2:29-33.

Petitioner’s arguments with respect to Claim [1.6] fare no better because they continue to ignore the relationship between the claimed “first radio signal” and “first

signaling” that is described by the claim limitations of Claim 1, namely that at least the transmission of the first radio signal through the first antenna port group occurs during the first time resource pool. Even under Petitioner’s understanding of time intervals or subframes as the claimed “time resource pools,” (Pet. at 51-53), the Petition fails to describe how a SIB’s purported “allocation of subframes for uplink/downlink” is an allocation of subframes for uplink/downlink for Kim’s CSI-RS. In discussing Claim 1.6, the Petition fails to even mention Kim’s CSI-RS, let alone describe the necessary relationship between a SIB and CSI-RS in the context of the claim language. As a result, the Petition cannot disclose Claim 1.6.

Therefore, the Petition is deficient because it fails to show that Claims 1.3 and 1.6 are rendered obvious by the combination of Kim in view of Dahlman and Kim-966.

B. Claims 2-20 Are Not Rendered Obvious by Kim in View of Dahlman and Kim-966

1. Independent Claims 6, 11, and 16 Are Not Rendered Obvious by Kim in View of Dahlman and Kim-966

Claim 6 recites “[a] method for multi-antenna transmitting in a base station” that mirrors the claim limitations of Claim 1, which recites “[a] method for multi-antenna transmission in a user equipment.” In other words, Claim 6 discloses a method from the perspective of the base station that is in communication with the UE in Claim 1. For at least the same reasons as Claim 1, the Petition fails to show

that Kim in view of Dahlman and Kim-966 renders obvious Claim 6.

Claim 11 recites “[a] user equipment (UE) for multi-antenna transmission,” which is the apparatus claim of Claim 1. For at least the same reasons as Claim 1, the Petition fails to show that Kim in view of Dahlman and Kim-966 renders obvious Claim 11.

Independent Claim 16 recites “[a] base station equipment for multi-antenna transmission” that mirrors the claim limitations of Claim 11, which recites “[a] user equipment (UE) for multi-antenna transmission.” In other words, Claim 16 discloses the base station equipment that is in communication with the UE in Claim 11. For at least the same reasons as Claim 11, the Petition fails to show that Kim in view of Dahlman and Kim-966 renders obvious Claim 16.

2. Dependent Claims 2-5, 7-10, 12-15, and 17-20 Are Not Rendered Obvious by Kim in View of Dahlman and Kim-966

Claims 2-5 are dependent on Claim 1, Claims 7-10 are dependent on Claim 6, Claims 12-15 are dependent on Claim 11, and Claims 17-20 are dependent on Claim 16. Therefore, the Petition fails to render obvious Claims 2-5, 7-10, 12-15, and 17-20 for at least the same reasons as Claims 1, 6, 11, and 16, respectively.

VI. CONCLUSION

For the foregoing reasons, Patent Owner respectfully requests that the Board deny institution of the Petition in its entirety.

Respectfully submitted,

Dated: September 10, 2025

By: /Vincent J. Rubino, III /
Vincent J. Rubino, III
Lead Counsel for Patent Owner
FABRICANT LLP
411 Theodore Fremd Avenue,
Suite 206 South
Rye, New York 10580
Tel. 212-257-5797
Fax. 212-257-5796

CERTIFICATE OF WORD COUNT

The undersigned hereby certifies that the portions of the above-captioned PATENT OWNER'S PRELIMINARY RESPONSE has 2,351 words in compliance with the 14,000 word limit set forth in 37 C.F.R. § 42.24. This word count was prepared using Microsoft Word for Office 365.

Respectfully submitted,

September 10, 2025

By: /Vincent J. Rubino, III /
Vincent J. Rubino, III (Reg. No. 68,594)
Lead Counsel for Patent Owner
FABRICANT LLP
411 Theodore Fremd Avenue,
Suite 206 South
Rye, New York 10580
Tel. 212-257-5797
Fax. 212-257-5796

CERTIFICATE OF SERVICE

A copy of the foregoing PATENT OWNER'S PRELIMINARY RESPONSE
has been served on Petitioner's counsel of record as follows:

Email: IPR50095-0228IP1@fr.com

W. Karl Renner

Jonathan Driesslein

Thomas Rozylowicz

FISH & RICHARDSON P.C.

60 South Sixth Street, Suite 3200

Minneapolis, MN 55402

Attorneys for Apple Inc.

September 10, 2025

By: /Vincent J. Rubino, III /
Vincent J. Rubino, III (Reg. No. 68,594)
Lead Counsel for Patent Owner