

Petition for *Inter Partes* Review of USP 10,447,450

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re *Inter Partes* Review of:)
U.S. Patent No. 10,447,450)
Issued: Oct. 15, 2019)
Application No.: 15/676,421)
Filing Date: Aug. 14, 2017)

For: **Method And System For Multi-Carrier Packet Communication With
Reduced Overhead**

**PETITION FOR *INTER PARTES* REVIEW
OF U.S. PATENT NO. 10,447,450**

TABLE OF CONTENTS

I.	Introduction.....	1
II.	Background.....	2
A.	The '450 Patent (Ex. 1005)	2
B.	Prosecution History (Ex. 1002).....	6
1.	Original Prosecution	6
2.	Dell IPR (IPR2021-01486)	6
3.	VW IPR (IPR2022-01567)	7
C.	Person of Ordinary Skill in the Art	7
D.	Claim Construction	8
1.	Agreed-upon constructions: preamble, configured to, time-frequency coordinate, modular coding	8
2.	“time-frequency resource unit”	9
III.	Ground 1: Claims 7 and 11 are unpatentable over Park and 802.16- 2004	9
A.	Overview of the Prior Art.....	10
1.	Park (Ex. 1005)	10
2.	802.16-2004 (Ex. 1006)	12
B.	Motivation to Combine	14
C.	Claim 7	16
1.	Preamble[a] – mobile device using frames with time intervals	16
2.	Preamble[b] – OFDM symbols with frequency subcarriers	23
3.	Preamble[c] – configured to.....	24

4.	Element 1: receive an identifier from a base station.....	25
5.	Element 2(a) – receive a signal over a segment of time-frequency resource	27
6.	Elements 2(b) and 2(d) – segment having a starting time-frequency coordinate and 2, 4 or 8 time-frequency resource units	31
7.	Element 2(c) – units contain frequency subcarriers in a group of OFDM symbols	41
8.	Element 3: recover the information using the starting time-frequency coordinate, N, and the identifier	43
D.	Dependent claim 11	46
IV.	Secondary Considerations	49
V.	The Board Should Reach the Merits of This Petition	49
A.	Section 325(d) does not warrant denial.....	49
B.	<i>General Plastic</i> does not warrant denial	51
1.	Factor 1: different and unrelated petitioners.....	54
2.	Factors 2, 4 and 5: knew of the art, length of time, and explanation	57
3.	Factor 3: POPR, but no Institution Decision received.....	59
4.	Factors 6-7: finite resources of the Board and ability to meet the one-year deadline	61
5.	Balancing the <i>General Plastic</i> factors	62
C.	<i>Fintiv</i> does not warrant denial	62
VI.	Mandatory Notices under 37 C.F.R. § 42.8.....	63
A.	Real Parties-in-Interest	63
B.	Related Matters.....	63

C.	Grounds for Standing	63
D.	Lead and Backup Counsel and Service Information.....	63
E.	Fee for <i>Inter Partes</i> Review	64
VII.	Conclusion	65

TABLE OF AUTHORITIES

Page(s)

CASES

<i>Advanced Bionics, LLC v. Med-El Elektromedizinische Geräte GMBH</i> , IPR2019-01469, Paper 6 (Feb. 13, 2020) (<i>precedential</i>)	50, 51
<i>Apple Inc. v. Fintiv, Inc.</i> , IPR2020-00019, Paper 11 (Mar. 11, 2020) (<i>precedential</i>)	62
<i>Aylus Networks, Inc. v. Apple Inc.</i> , 856 F.3d 1353 (Fed. Cir. 2017)	52
<i>Code200, UAB v. Bright Data Ltd.</i> , IPR2022-00861, Paper 14 (June 20, 2022)	59
<i>Code200, UAB v. Bright Data Ltd.</i> , IPR2022-00861, Paper 18 (Aug. 23, 2022) (<i>precedential</i>)	59, 61
<i>Dell, Inc. v. Neo Wireless, LLC</i> , IPR2021-01486, Paper 3 (Sept. 16, 2021)	50
<i>Facebook, Inc. v. Express Mobile Inc.</i> , IPR2021-01455, Paper 11 (Mar. 4, 2022)	<i>passim</i>
<i>General Plastic Indus. Co. v. Canon Kabushiki Kaisha</i> , IPR2016-01357, Paper 19 (Sept. 6, 2017) (<i>precedential</i>)	<i>passim</i>
<i>Google LLC v. Neonode Smartphones LLC</i> , IPR2021-01041, Paper 19 (Jan. 13, 2022)	55, 57, 60
<i>Google LLC v. Parus Holdings, Inc.</i> , IPR2020-00846, Paper 9 (Oct. 21, 2020)	57, 61
<i>Illumina, Inc. v. Ravgen, Inc.</i> , IPR2021-01271, Paper 12 (Jan. 26, 2022)	55, 57, 61
<i>Krippelz v. Ford Motor Co.</i> , 667 F.3d 1261 (Fed. Cir. 2012)	36

Petition for *Inter Partes* Review of USP 10,447,450

<i>LG Elecs., Inc. v. Bell N. Rsch., LLC</i> , IPR2020-00319, Paper 15 (June 23, 2020).....	58
<i>Shenzhen AOTO Elecs. Co. v. Ultravision Techs., LLC</i> , IPR2021-00190, Paper 7 (June 9, 2021).....	59, 60
<i>Shenzhen Apaltek Co. v. Asetek Danmark A/S</i> , IPR2022-01318, Paper 7 (Feb. 6, 2023).....	57
<i>Siemens Gamesa Renewable Energy, Inc. v. General Elec. Co.</i> , IPR2022-01479, Paper 11 (Mar. 7, 2023)	59
<i>Twitter, Inc. v. Palo Alto Rsch. Ctr., Inc.</i> , IPR2021-01458, Paper 11 (Apr. 6, 2022).....	56
<i>Valve Corp. v. Electronic Scripting Prods., Inc.</i> , IPR2019-00062, Paper 11 (Apr. 2, 2019) (<i>precedential</i>).....	54
<i>Volkswagen Grp. of Am., Inc. v. Michigan Motor Techs. LLC</i> , IPR2020-00452, Paper 12 (Sept. 9, 2020).....	51
<i>Volkswagen Grp. of Am., Inc. v. Neo Wireless, LLC</i> , IPR2022-01567, Paper 2 (Sept. 27, 2022).....	50

STATUTES

35 U.S.C.	
§ 102(a)	13
§ 102(e)	10
§ 103.....	16
§ 325(d).....	49, 50

REGULATIONS

37 C.F.R.	
§ 42.8.....	63
§ 42.8(b)(3)	63
§ 42.8(b)(4)	63
§ 42.10(a)	63
§ 42.10(b).....	64
§ 42.15(a)	64
§ 42.104(b)(3)	52

Exhibit List

Ex.	Description
1001	U.S. Patent No. 10,447,450 (“’450 Patent”)
1002	File History for U.S. Patent No. 10,447,450 (“’450 FH”)
1003	Declaration of Dr. Todor Cooklev (“Cooklev Decl.”)
1004	<i>Curriculum Vitae</i> of Dr. Todor Cooklev
1005	U.S. Patent Application Publication No. 2006/0039274 A1 (“Park”)
1006	IEEE, <i>IEEE Standard for Local and Metropolitan Area Networks, Part 16: Air Interface for Fixed Broadband Wireless Access Systems</i> , IEEE STANDARDS 802.16 (Oct. 2004) (“802.16-2004”)
1007	Declaration of David Ringle (Mar. 1, 2023) (“Ringle Decl. (802.16-2004)”)
1008	Certified Translation of Korean Patent Application No. 65099/2004 (“Park Translation”)
1009	Opinion and Order Granting in Part and Denying in Part Defendants’ Motion to Reduce Number of Asserted Claims (ECF No. 96), <i>In re Neo Wireless, LLC Patent Litig.</i> , No. 2:22-md-03034 (E.D. Mich. Nov. 18, 2022), ECF No. 99 (“ <i>In re Neo</i> Reduction of Asserted Claims Op. (ECF 99)”)
1010	Opinion and Order on Further Prior Art and Claim Narrowing, <i>In re Neo Wireless, LLC Patent Litig.</i> , No. 2:22-md-03034 (E.D. Mich. Dec. 9, 2022), ECF No. 102 (“ <i>In re Neo</i> Claim Narrowing Op. (ECF 102)”)
1011	Joint Claim Construction Statement, <i>In re Neo Wireless, LLC Patent Litig.</i> , No. 2:22-md-03034 (E.D. Mich. Jan. 18, 2023), ECF No. 114 (“Joint Claim Construction Statement”)
1012	United States District Courts – National Judicial Caseload Profile (Sept. 30, 2017–Sept. 30, 2022)

Ex.	Description
1013	Transfer Order, <i>In re Neo Wireless, LLC Patent Litig.</i> MDL No. 3034 (J.P.M.L. June 14, 2022), ECF No. 50 (“MDL Transfer Order”)
1014	IEEE, <i>IEEE Standard for Local and Metropolitan Area Networks, Part 16: Air Interface for Fixed Broadband Wireless Access Systems – Amendment 2: Physical and Medium Access Control Layers for Combined Fixed and Mobile Operation in Licensed Bands and Corrigendum 1</i> , IEEE STANDARDS 802.16e (Dec. 2005) (“802.16e-2005”)
1015	Declaration of David Ringle (Mar. 16, 2023) (“Ringle Decl. (802.16e-2005)”)
1016	IEEE, <i>IEEE 802.16 Published Standards and Drafts</i> , https://www.ieee802.org/16/published.html (last visited Mar. 14, 2023, 2:43 PM)
1017	IEEE, <i>IEEE Standard 802.16-2004: Publication History (Updated 2004-04-04)</i> , https://www.ieee802.org/16/pubs/80216-2004.html (last visited Mar. 15, 2023, 8:34 AM)
1018	Patent Owner’s Preliminary Response, <i>Volkswagen Grp. of Am., Inc. v. Neo Wireless, LLC</i> , IPR2022-01567 (Patent 10,447,450), Paper 7 (P.T.A.B. Feb. 8, 2023) (“IPR2022-01567, Paper 7 (POPR)”)
1019	Plaintiff Neo Wireless, LLC’s Opening Claim Construction Brief, <i>In re Neo Wireless, LLC Patent Litig.</i> , No. 2:22-md-03034 (E.D. Mich. Feb. 16, 2023), ECF No. 127 (“Neo Opening Claim Construction Brief”)
1020	Declaration of William Alberth in Support of Neo Wireless’s Opening Claim Construction Brief, <i>In re Neo Wireless, LLC Patent Litig.</i> , No. 2:22-md-03034 (E.D. Mich. Feb. 16, 2023), ECF No. 127-3 (“ <i>In re Neo</i> (ECF 127-3)”)
1021	Patent Owner’s Preliminary Response, <i>Dell, Inc. v. Neo Wireless, LLC</i> , IPR2021-01486 (Patent 10,447,450), Paper 7 (P.T.A.B. Dec. 20, 2021) (“IPR2022-01486, Paper 7 (POPR)”)

Ex.	Description
1022	Roger Marks, Presentation: <i>IEEE 802.16 WirelessMAN® Standard: Myths and Facts</i> , 2006 Wireless Communications Conference, Wash., D.C. (Doc. No. IEEE C802.16-06/007r1) (June 29, 2006) (“Marks”)
1023	Soon Young Yoon, Presentation: <i>Introduction to WiBro Technology</i> , Telecom R&D Center, Samsung Electronics Co., Ltd. (Sept. 10, 2004) (“Yoon”)
1024	Kim Tong-hyung, <i>Seoul Chooses Standard for Wireless Broadband Access</i> , THE KOREA HERALD (July 29, 2004)
1025	IEEE, <i>IEEE Standards Wireless Networks Series: WirelessMan®, Inside the IEEE 802.16™ Standard for Wireless Metropolitan Networks</i> (2006) (“Eklund”)
1026	<i>Wireless Internet Operators to Be Picked</i> , KOREA TIMES (July 30, 2004)
1027	Sorour Falahati et al., <i>Adaptive Modulation Systems for Predicted Wireless Channels</i> , 52 IEEE TRANSACTIONS COMMC’NS 307 (Feb. 2004) (“Falahati”)
1028	Exhibit C to Defendants’ Joint Motion to Reduce the Number of Asserted Claims, Plaintiff’s Infringement Contentions to Ford, <i>In re Neo Wireless, LLC Patent Litig.</i> , No. 2:22-md-03034 (E.D. Mich. Oct. 21, 2022), ECF No. 96-4 (excerpts)

I. Introduction

Petitioner Ford Motor Company (“Ford”) requests *inter partes* review of claims 7 and 11 of U.S. Patent No. 10,447,450, titled “Method and System for Multi-Carrier Packet Communication with Reduced Overhead” (“’450 Patent”). The records of the United States Patent and Trademark Office (“Office”) indicate that the ’450 Patent is currently assigned to Neo Wireless LLC, formerly known as CFIP NCF LLC (“Neo”).

The ’450 Patent purports to reduce overhead in a well-known “wireless system based on the IEEE 802.16 standard” by decreasing the number of information bits necessary to transmit control information for mapping packet streams to a portion of available time-frequency resource. To do so, the ’450 Patent proposes dividing the time-frequency resource into what it refers to as “time-frequency resource units,” grouped into segments. The patent then proposes expressing the “segment” in terms of an indexed “starting time-frequency coordinate” and a number of “time-frequency resource units.” But this approach is neither new nor inventive. Park (Ex. 1005) taught the exact same technique, applied to the same IEEE 802.16-based wireless communication system, to achieve the same result of reducing overhead. Park further provided specific instructions regarding how to implement its technique within the IEEE 802.16 standard.

Accordingly, the Board should institute review of the '450 Patent and find the challenged claims unpatentable.

II. Background

A. The '450 Patent (Ex. 1005)

The '450 Patent is directed to “[a] method and system for minimizing the control overhead in a multi-carrier wireless communication network.” '450 Patent at Abstract. The '450 Patent purports to accomplish its goal of minimizing overhead through “grouping applications of a similar type” (such as voice-over-IP applications) and by using “modular coding schemes.” *Id.*; Cooklev Decl. (Ex. 1003) ¶¶ 26-35.

The '450 Patent explains that in existing wireless systems, such as those based on “the IEEE 802.16 standard,” “multiple packet streams are established for each mobile station to support different applications.” '450 Patent at 1:42-45, 5:34-37. These existing systems, based on 802.16, “utilize[]” “[s]pecial scheduling messages, DL-MAP and UL-MAP” to “broadcast scheduling decisions to the mobile station,” including by using a “connection ID (CID) . . . to identify the mobile stations.” *Id.* at 1:48-55. “DL” refers to “a downlink,” which is “the transmission from a base station to a mobile device” and “UL” refers to “an uplink,” which is “the transmission from a mobile device to a base station.” *Id.* at 3:52-56. Although not recited in the challenged claims, the '450 Patent describes grouping applications of

a “similar type” into “zones” that are “further subdivided into time-frequency segments” as its purported advancement over the prior art. *Id.* at 5:54-6:2 (describing zones), 6:22-29 (describing segments); Cooklev Decl. ¶¶ 28-31.

The '450 Patent describes its segments in terms of an “index” and “basic resource units.” '450 Patent at 7:12-27, 8:27-35. Figure 6 depicts the time-frequency resource divided into zones 605a through 605n with zone 605a divided into segments V_1 through V_m . *Id.* at 6:3-14. The segments are indicated with “an index VZI_1 ” through VZI_m . *Id.* at 7:7-12; Cooklev Decl. ¶¶ 28-31.

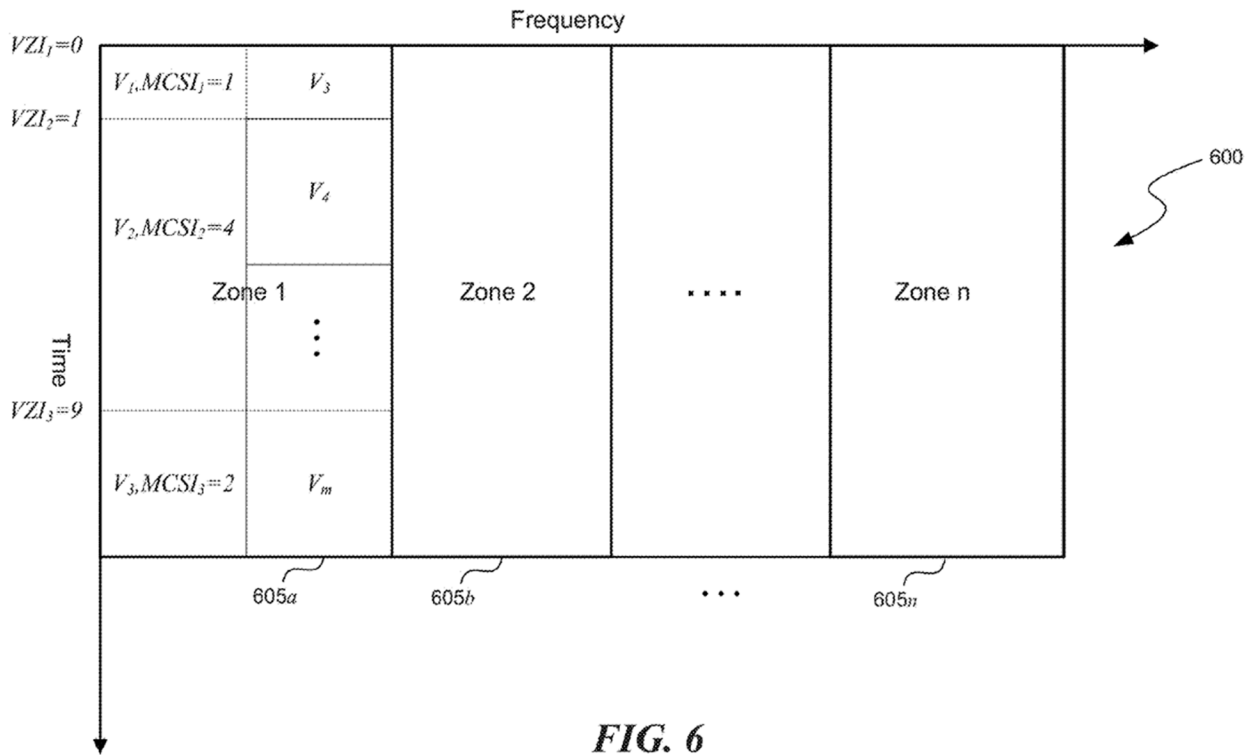


FIG. 6

The index is related to the number of “basic resource units” used. ’450 Patent at 7:10-18. The ’450 Patent provides an example where a first packet stream starts at the index $VZI_1=0$ and uses one basic resource unit. *Id.* at 7:18-21. The second packet stream then starts at $VZI_2=1$ and uses eight basic resource units. *Id.* at 7:21-24. The third packet stream then starts at the index $VZI_3=9$ “arrived [at] by summing the basic resource units used for the preceding first and second packet streams.” *Id.* at 7:24-27; Cooklev Decl. ¶¶ 28-31.

The ’450 Patent further incorporates “MCS” (modulation and coding scheme) information from the 802.16 standard. ’450 Patent at 2:2-6 (explaining that an IEEE 802.16-based system uses “a 4-bit MCS code”). A given MCS indicates information such as coding rate. *Id.* at 6:46-55, Tbl. 1. In the ’450 Patent, MCS information can be conveyed using “MCSI,” a modulation and coding scheme index. *Id.* at 6:55-56. The MCS can also be related to the number of basic resource units used by a packet stream. *Id.* at 6:49-51, 6:55-58, 7:20-24; Cooklev Decl. ¶ 33.

The ’450 Patent also uses a “connection ID (CID)” from the 802.16 standard “to identify the mobile station.” ’450 Patent at 1:51-55, 8:23-26, 9:23-27 (explaining that ACIDs and BCIDs described in the patent are types of connection IDs), 9:9-12 (further explaining that VCID is a type of ACID), 10:11-15 (“VCID (indicative of the packet destination)”). The ’450 Patent contemplates providing index, CID, and MSC information using a “control message, often called Information Elements

(IEs).” *Id.* at 10:1-15. In the downlink, “a base station sends the IE before a downlink packet to inform the mobile device for proper reception of the packet.” *Id.* at 10:27-31; Cooklev Decl. ¶ 34.

The independent claim challenged in this Petition, claim 7, recites:

7. **[Preamble]** A mobile device in a wireless packet system

[a] using a frame structure of multiple frames for transmission, each frame comprising a plurality of time intervals, each time interval comprising a plurality of orthogonal frequency division multiplexing (OFDM) symbols, and

[b] each OFDM symbol containing a plurality of frequency subcarriers,

[c] the mobile device configured to:

[1] receive an identifier from a base station in a cell in which the mobile device is operating; and

[2(a)] receive a signal containing information from the base station over a segment of time-frequency resource,

[2(b)] the segment having a starting time-frequency coordinate and the segment comprising N time-frequency resource units within a time interval,

[2(c)] each unit containing a set of frequency subcarriers in a group of OFDM symbols,

[2(d)] where N=2, 4, or 8; and

[3] recover the information from the received signal using the starting time-frequency coordinate and N in conjunction with the received identifier.

'450 Patent at cl. 7 (element labels added).

B. Prosecution History (Ex. 1002)

1. Original Prosecution

The Examiner did not issue any rejections over any prior art during prosecution. The Examiner issued only a double-patenting rejection, and allowed the claims after Applicant submitted a new claim set along with a terminal disclaimer “[i]n anticipation of an obviousness-type double patenting rejection.” Ex. 1002 at 080-82, 089-96, 103-111.

2. Dell IPR (IPR2021-01486)

The Board denied institution in IPR2021-01486 (“the Dell IPR”), finding that Dell failed to demonstrate a likelihood of prevailing regarding its contention that claims 1-18 would have obvious over Kim (US 2005/0157803) and IEEE 802.16-2004. Ex. 1002 at 040-43.

Relevant here, the Board in the Dell IPR confirmed the construction agreed upon by the current parties in district court (and applied herein) of the claim term “starting time-frequency coordinate,” construing the phrase as a “starting *one-dimensional* time-frequency coordinate.” Ex. 1011 (Joint Claim Construction Statement) at 012 (emphasis added). Specifically, the Board found that Dell

“conflat[ed]” the claimed “*singular* ‘starting time-frequency coordinate’” with a time-frequency coordinate pair, and agreed with Neo that “the asserted combination” taught “only ... independent time and frequency coordinates.” Ex. 1002 at 040-41; *see also id.* (rejecting Dell’s argument that a teaching of “start symbol offset” in time and a “start logical subchannel offset” in frequency “collectively” teach the claimed starting time-frequency coordinate).

Similarly, the Board found that the claimed “time-frequency resource units” must be “singular,” and agreed with Neo that the asserted combination taught “only ... independent time and frequency units.” *Id.*

These points are discussed further in the Claim Construction section below.

3. VW IPR (IPR2022-01567)

The Board has not yet decided whether to institute VW’s IPR, which asserts two primary grounds, (1) obviousness over Vijayan089 (U.S. Pub. No. 2005/0058089) and Laroia (U.S. Pub. No. 2005/0277429); and (2) obviousness over Vijayan475 (U.S. Pub. No. 2005/0141475) and Wu (U.S. Pub. No. 2005/0063345).

C. Person of Ordinary Skill in the Art

A POSA would have a bachelor’s degree in electrical engineering, computer engineering, computer science, or an equivalent field, or an advanced degree in those fields, as well as at least 3-5 years of academic or industry experience in mobile

wireless communications, or comparable industry experience. Cooklev Decl. ¶¶ 36-38.

D. Claim Construction

The prior art relied on in this Petition discloses the subject matter of the challenged claims under any reasonable construction, including their plain meaning.¹ Notably, the parties agreed on several claim constructions in district court, but continue to disagree on another. The claims are unpatentable under either parties' proposed construction.

1. Agreed-upon constructions: preamble, configured to, time-frequency coordinate, modular coding

The parties agreed on the following constructions, which Ford also adopts in this Petition:

- **Preamble** – the preamble is limiting
- **“configured to”** – “designed to”
- **“time-frequency coordinate”** – “one-dimensional time-frequency coordinate”
- **“wherein modular coding is applied...”** – “wherein a modular coding scheme is applied...”

¹ Petitioner reserves the right to argue alternative constructions in other proceedings, and where such a defense is available, that the claims are indefinite.

Ex. 1011 (Joint Claim Construction Statement) at 009, 012-13, 015.²

2. “time-frequency resource unit”

In district court, Neo proposes the plain meaning, arguing that incorporating any further limitation would be improper. Ex. 1011 (Joint Claim Construction Statement) at 017; Ex. 1019 (Neo Opening Claim Construction Brief) at 21-24. Solely for the purposes of this IPR, Ford adopts Neo’s plain meaning construction. Neo cannot argue for a narrow construction to avoid the prior art, and then rely on a broader one for infringement.

In the alternative, Ford adopts the narrower construction the JDG proposed in district court, namely “a combination of time and frequency units *designed according to the application requirements of the application that is being grouped.*” Ex. 1011 (Joint Claim Construction Statement) at 017 (emphasis added).

III. Ground 1: Claims 7 and 11 are unpatentable over Park and 802.16-2004

As will be demonstrated in the following paragraphs, Park and 802.16-2004 teach or suggest every element of the challenged claims. The ’450 Patent purports to reduce overhead in an admittedly prior-art 802.16-based system by using a “starting time-frequency coordinate” and the number of “time-frequency resource

² The parties initially disagreed as to “configured to,” but came to agreement. *See* Ex. 1019 (Neo Opening Claim Construction Brief) at 4.

units” to describe a given resource segment. But Park already disclosed the same result (reducing overhead) in the same system (based on the 802.16 standard) and in the same way.

A. Overview of the Prior Art

1. Park (Ex. 1005)

United States Patent Application Publication No. 2006/0039274 to Park and Yun (“Park”) is prior art at least under pre-AIA § 102(e) because it was originally filed on July 20, 2005, before the ’450 Patent’s earliest claimed priority date, and published on February 23, 2006. Park was not cited or discussed by the Examiner during prosecution. *See generally* Ex. 1002; Cooklev Decl. ¶¶ 54-55.

Like the ’450 Patent, Park presents an improvement to the existing IEEE 802.16-2004 standard in its effort to support “next-generation mobile communications systems.” Park [0005]. Park proposes building on existing IEEE 802.16-based systems, often referring specifically to 802.16-2004 (the 2004 revision, discussed in the next section) and the WiBro mobile wireless service. *E.g., id.* [0007], [0013]. WiBro was a South Korean mobile wireless service that supported mobile devices moving up to 60-70 km/h and was based on the 802.16 standard. Ex. 1024 (Korea Herald article); Cooklev Decl. ¶¶ 56-58.

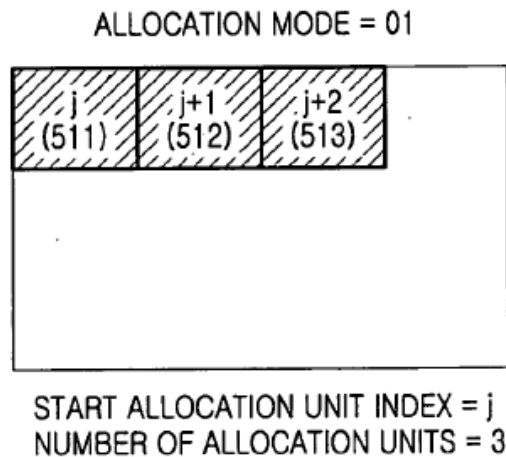
Park relies heavily on the 802.16-2004 standard. For example, Park relies the “DL(/UL)-MAP IE (Information Element)” from IEEE 802.16-2004, which in turn

provides the variable “RCID_IE”—the reduced connection identifier. Park [0013]-[0015], Tbl. 1; *see also* 802.16-2004 (Ex. 1006) at 110-11 (Tbl. 97); Cooklev Decl. ¶¶ 59-60.³ Within this framework of the 802.16-2004 standard, Park discloses an allocation scheme that reduces overhead. Park [0072]-[0073]; Cooklev Decl. ¶ 61. To do so, Park indexes the total available resource region “per each allocation unit.” Park [0043]; Cooklev Decl. ¶¶ 61-63. The allocation units themselves can be different sizes and shapes, and four examples are provided in Figures 3A to 3D. Park [0043], [0045]-[0046]; Cooklev Decl. ¶¶ 62-65.

An index value corresponds to a particular allocation unit. For example, in Figure 3C “an index value of the allocation unit c is in a range of $c(0)$ to $c(M-1)$.” Park [0049]. The indexed allocation units can be used to express allocation regions for subscribers. *Id.* [0050]-[0051]. For example, using the indexing in Figure 3C, a resource allocation region can be “represented as $c(0)$ and $c(1)$.” *Id.* [0053]; Cooklev Decl. ¶¶ 62-65.

³ The table numbers in 802.16-2004 are two higher than the table numbers provided in Park, perhaps because Park was using a draft version of the standard. Park’s original application was filed on August 18, 2004, but the final version 802.16-2004 was not published until October 1, 2004. Ex. 1017 (IEEE Publication History webpage); Cooklev Decl. ¶ 60.

Park uses “allocation mode[s]” to represent resource allocation regions using allocation units. Park [0064]-[0067]. In “allocation mode ‘01’”, for example, “the corresponding allocation region is indicated using the index value of the start allocation unit and the total number of allocation units.” *Id.* [0066]. Allocation mode “01” is depicted below:



Id. at Fig. 5B; Cooklev Decl. ¶¶ 64-65. In Figure 5B, the resource allocation region is made of “allocation units 511, 512, and 513,” which is expressed as “a start allocation unit” represented by the index value “j” and the number of allocation units used, which is three. Park [0070]. Park then implements this scheme by, for example, adapting the DL(/UL)-MAP IE of 802.16-2004. *Id.* [0075]-[0079], Tbl. 2; Cooklev Decl. ¶¶ 52-53, 59-60.

2. 802.16-2004 (Ex. 1006)

802.16-2004, the IEEE standard for “Air Interface for Fixed Broadband Wireless Access Systems,” was the operative IEEE 802.16 standard in 2004. It is

prior art at least under pre-AIA § 102(a) because it was published on October 1, 2004, before the '450 Patent's earliest claimed priority date. 802.16-2004 at ii;⁴ Ex. 1007 (Ringle Decl. (802.16-2004)). 802.16-2004 was not cited or discussed by the Examiner during prosecution. *See generally* Ex. 1002.

802.16-2004 “revises and consolidates IEEE Std 802.16-2001, IEEE Std 802.16a-2003, and IEEE Std 802.16c-2002.” 802.16-2004 at ii. As the '450 Patent recognizes, “802.16” refers generally to this family of standards, encompassing all iterations, including 802.16-2004 and its predecessors. '450 Patent at 1:42-45; Cooklev Decl. ¶¶ 46-47, 66-69.

The '450 Patent also refers to “WiMAX,” recognizing that WiMAX systems were based on the 802.16 standard. '450 Patent at 1:42-45; Cooklev Decl. ¶¶ 66-68.

The 802.16-2004 standard provides a range of structures, features, and formats for wireless data transmissions between base stations and subscriber stations. 802.16-2004 at vii-xviii; Cooklev Decl. ¶ 69. For example, 802.16-2004 describes transmitting downlink data from the base station to the subscriber station. 802.16-2004 at 8 (downlink is from the base station (BS) to the subscriber station (SS)), 31 (describing the MAC layer downlink), 267 (H-ARQ packets downlinked in a burst transmission); Cooklev Decl. ¶¶ 70-72.

⁴ All cites to this exhibit refer to the original pagination used by the IEEE.

Relevant to both Park and the '450 Patent, 802.16-2004 describes DL-MAP_IEs, where “DL-MAP” refers to the “downlink map,” a “MAC message” generated by the base station that defines a subscriber’s access to the downlink information, e.g., burst start times in the frame. 802.16-2004 at 7, 110-11 (Tbl. 97); Cooklev Decl. ¶¶ 51-53, 73. The DL-MAP includes syntax entries for CID/RCID, i.e., a “connection identifier” or a “reduced connection identifier.” 802.16-2004 at 7, 105, 110-11. These connection identifiers are used to specify the connection between a base station and a subscriber station. *Id.* at 7; Cooklev Decl. ¶¶ 52-53, 73.

B. Motivation to Combine

A POSA would have been motivated to combine the teachings of Park and 802.16-2004 as proposed because Park directs the POSA to implement its teachings in a system based on that standard to reduce overhead and improve flexibility. Park [0031] (improve flexibility), [0073]-[0074] (reduce bits), [0075]-[0079] (stating that it “can be applied to the Wi[B]ro or IEEE 802.16 standards in various manners,” specifically referencing “802.16-2004”), [0085]; Cooklev Decl. ¶¶ 54-65, 74-101.

As discussed in the Park Overview section above, Park teaches an improvement to an existing IEEE 802.16-2004 system, allowing it to support “[n]ext-generation mobile communications systems.” Park [0005]. Park first explains some relevant portions of 802.16-2004, including the DL-MAP IE “used for indicating resource allocation information of the AMC area.” *Id.* [0013]. In

doing so, Park refers to “Table 95 (/101) of IEEE 802.16-2004” to show the 802.16-2004 DL-MAP IE format. *Id.* [0013]-[0014], Tbl. 1; 802.16-2004 at 110-11 (Table 97, same as Park’s Table 1).⁵ Park also describes the “sub-channel allocation modes defined in Table [97] of the IEEE 802.16-2004 standard,” and Park’s Figure 2 depicting those allocation modes is identical to Figure 23 in 802.16-2004. Park [0017]-[0018], [0037], Fig. 2; 802.16-2004 at 112; Cooklev Decl. ¶¶ 54-65, 73-101.

Park also describes its improvements to 802.16-2004’s allocation scheme. To reduce overhead relative to 802.16-2004, Park divides its time-frequency resource into allocation units and regions. Park [0072]-[0074] (comparing bits required in IEEE 802.16 to bits required in the “present invention”). Park explains that “[t]he present invention can be applied to the Wi[B]ro^[6] or IEEE 802.16 standards in various manners,” including by adapting the IEEE 802.16-2004 DL(/UL)_MAP IE fields. *Id.* [0075]-[0079], [0085]; Cooklev Decl. ¶¶ 54-65, 73-101.

Because Park improves and builds upon IEEE 802.16-2004 systems, a POSA implementing Park at the relevant time would have looked to the teachings of

⁵ When referring to 802.16-2004, Park’s table numbers are off by two. *See supra* Park Overview.

⁶ WiBro was a mobile wireless service based on 802.16. *See supra* Park Overview above.

802.16-2004 to provide the underlying structure for Park's disclosed improvements. A POSA would have also looked to Park to reduce overhead in 802.16-based systems and to improve flexibility. *See* Park [0031] (improve flexibility), [0073]-[0074] (reduction in bits); Cooklev Decl. ¶¶ 54-101.

A POSA would have had a reasonable expectation of success in combining these teachings because Park directs the POSA to implement its teachings in a 802.16-2004-based system, and provides details of that implementation by presenting specific modifications to, e.g., 802.16-2004's DL-MAP IE format. Park [0075]-[0079]; Cooklev Decl. ¶¶ 54-101.

C. Claim 7

Claim 7 is unpatentable under 35 U.S.C. § 103 over the combination of Park (Ex. 1005) and 802.16-2004 (Ex. 1006) for the reasons explained in this Petition.

1. Preamble[a] – mobile device using frames with time intervals

Park and 802.16-2004 teach the preamble, which this Petition breaks down into three parts. Starting with the first part, claim 7's preamble recites:

A mobile device in a wireless packet system using a frame structure of multiple frames for transmission, each frame comprising a plurality of time intervals, each time interval comprising a plurality of orthogonal frequency division multiplexing (OFDM) symbols, ...

'450 Patent at cl. 7. The '450 Patent admits these features were disclosed in the 802.16 standard. *Id.* at 1:34-2:16. And Park and 802.16-2004 do indeed disclose these features.

Specifically, Park discloses an “Orthogonal Frequency Division Multiple Access [OFDMA] wireless network system” that constitutes the claimed “wireless packet system.” Park at Abstract, [0033] (same); *see also id.* [0003] (describing the “present invention” as relating to an OFDMA “wireless communication system”), [0015], Tbl. 1⁷ (“encoder packet”); *id.* [0057], Tbl. 2 (encoder packet); Cooklev Decl. ¶¶ 48-49, 106-110 (explaining that OFDMA refers to a multiple-user system that transmits data over OFDM symbols). As discussed, Park directs POSAs to implement Park’s improvements in a system based on the 802.16-2004 standard. Park [0075]. 802.16-2004 further explains that it relates to a wireless system that transmits packets, as the '450 Patent admits. *See, e.g.*, 802.16-2004 at 267; *see also* '450 Patent at 1:42-45 (describing the 802.16 standard as a “wireless system” with “multiple packet streams”); Cooklev Decl. ¶¶ 102-110.

Park also discloses the claimed mobile device in its wireless packet system, which it calls a “subscriber” or “terminal.” *E.g.*, Park at Abstract, [0005]-[0006],

⁷ Park’s Table 1 is Table 97 in 802.16-2004 (not Table 95). *See* 802.16-2004 at 110; *supra* Park Overview; Cooklev Decl. ¶ 60.

[0031]-[0033]; *see also* 802.16-2004 at 11 (using the term “subscriber station (SS)”). In particular, Park discloses improvements to existing 802.16-based systems that enabled the “[n]ext-generation *mobile* communication systems [to] transmit data with superior quality at a high transmission rate to provide subscribers with various improved multimedia services.” Park [0005] (emphasis added). Park built upon existing 802.16-based systems/services, including the South Korean “WiBro” *mobile* wireless system. *Id.* [0007], [0073]-[0075]; Cooklev Decl. ¶¶ 54-101, 125-128; *see also supra* Park Overview (discussing WiBro’s support for mobile devices moving 60-70 km/h).

Park, which is presumed enabled, directs POSAs to implement its improvements in 802.16-based mobile systems using the teachings of the then-current 802.16-2004 standard and refers to the 802.16-2004 standard to illustrate its technique for reducing overhead in a mobile wireless system. Park [0073]-[0079]; Cooklev Decl. ¶¶ 54-101; *supra* Motivation to Combine section. A POSA would have had a reasonable expectation of success implementing Park (and the 802.16-2004 teachings referenced in Park) to improve a mobile wireless system with Park’s benefits of reduced overhead and increased flexibility. Further, 802.16-based systems included mobile subscribers, as the ’450 Patent admits, despite its title “Air Interface for *Fixed* Broadband Wireless Systems.” ’450 Patent at 1:42-45 (“in a wireless system based on the IEEE 802.16 standard ... multiple packet streams are

established for each *mobile* station”) (emphasis added), 5:34-37;⁸ *see also* Ex. 1022 at 007-08, 012; Ex. 1023 at 004, 009, 012, 024-25; Ex. 1025 (Eklund) at 3-4, 6-7, 24-25, 67-68⁹; Cooklev Decl. ¶¶ 54-101, 125-128.

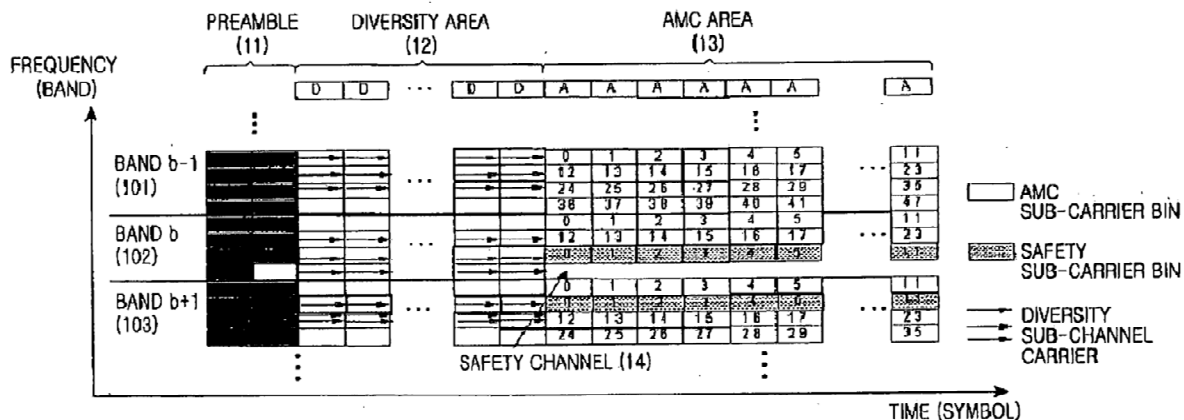
Thus—as the ’450 Patent admits and Park recognizes—messages such as “DL-MAP” in 802.16-2004 “are utilized to broadcast the scheduling decisions to the *mobile* stations.” ’450 Patent at 1:48-50 (emphasis added); Park [0055] (Table 2, DL-MAP IE format); Cooklev Decl. ¶¶ 76-101, 125-128 (noting that compliance with the 802.16-2004 standard did not guarantee the mobility of a mobile system, but compliant systems could and did serve mobile devices). And even if the teachings in 802.16-2004 were limited to “fixed” devices (they are not), the ’450 Patent admits that the claimed “mobile devices” may be “fixed.” ’450 Patent at 3:40-42 (“*mobile devices* (not shown) *may be fixed* or may roam”) (emphases added);

⁸ Notably, this admission also appears in the provisional application to which the ’450 Patent claims priority, which was filed on September 28, 2005—when 802.16-2004 was the current standard. Ex. 1002 at 017. IEEE’s later amendment to the 802.16-2004 standard, 802.16e-2005, further guaranteed mobility of subscriber stations even at “vehicular speeds.” Ex. 1014 (802.16e-2005) at cover, 1; Cooklev Decl. ¶¶ 97-101.

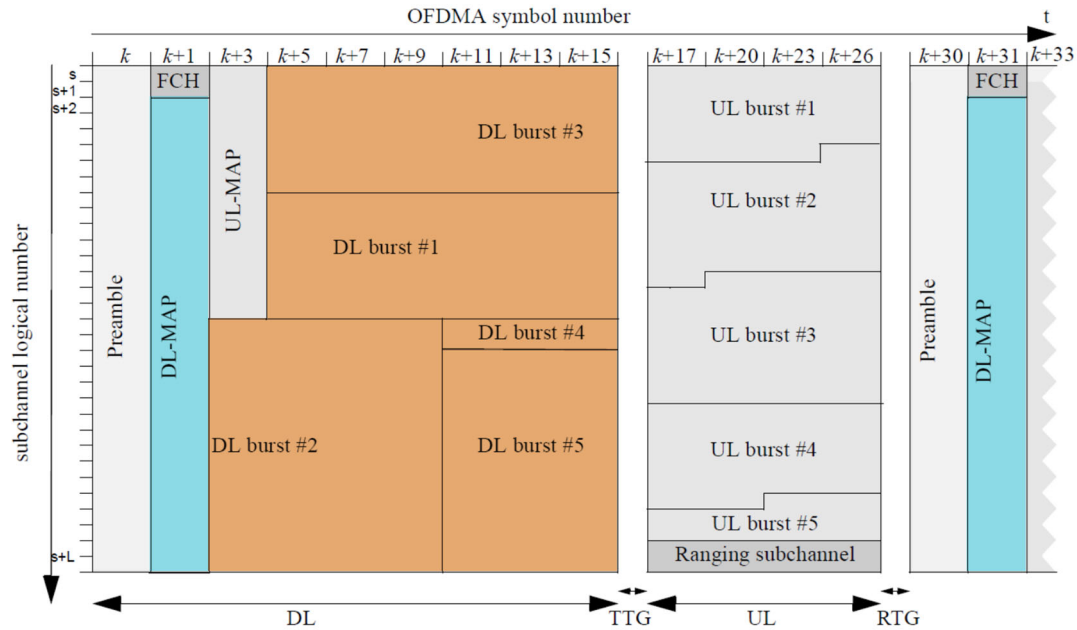
⁹ All cites to this exhibit refer to the original pagination used by Eklund.

Cooklev Decl. ¶¶ 125-128; *see also supra* Motivation to Combine section. Accordingly, Park and 802.16-2004 disclose “[a] mobile device in a wireless packet system” as recited in the preamble.

Park and 802.16-2004 also disclose “using a frame structure of multiple frames for transmission,” as recited in the preamble. In particular, Park depicts “a frame structure of . . . an IEEE 802.16-2004 system applied to an OFDMA system.” Park [0007], [0036]. Park’s frame structure exists in “time (symbol)” and “frequency (band)” space:



Id. at Fig. 1, [0007] (explaining that Figure 1 is an exemplary frame structure for a WiBro or 802.16 OFDMA system); Cooklev Decl. ¶¶ 48-51, 104-124. Likewise, Figure 218 in 802.16-2004 shows an exemplary frame structure:



802.16-2004 at 500 (showing Figure 218, reproduced and annotated above, and explaining “[t]he OFDMA frame may include multiple zones,” including “AMC”); Cooklev Decl. ¶¶ 48-51, 104-124. Figure 218, reproduced and annotated above, shows an OFDMA frame (displaying mandatory sections only) and the beginning of the next frame, with: (1) each “preamble” in the figure indicating the start of a frame; (2) “DL-MAP” sections (blue) coming after the preamble; and (3) DL burst sections (orange) that carry data transferred from the base station to a subscriber. 802.16-2004 at 500; Cooklev Decl. ¶¶ 112-113.

As will be discussed in detail later, Park provides exemplary modifications to 802.16-2004’s DL-MAP for allocations in an AMC area. Park [0055]-[0057] (Tbl. 2); 802.16-2004 at 110-11 (Tbl. 97); Cooklev Decl. ¶¶ 84-96. The DL-MAP that Park modifies allocates space in the AMC zone/area of the OFDMA frame:

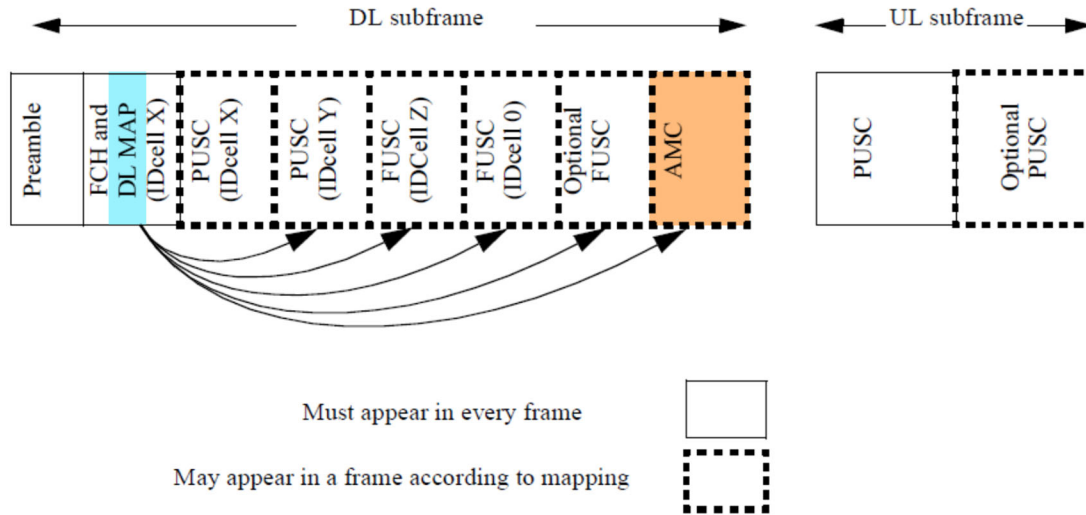


Figure 219—Illustration of OFDMA frame with multiple zones

802.16-2004 at 500-01; *see also id.* 505-07 (dedicated channels for AMC in the AAS DL frame), 574 (using AMC/AAS “superframes”); Cooklev ¶¶ 113-124.

Park and 802.16-2004 also both disclose “each frame comprising a plurality of time intervals each time interval comprising a plurality of orthogonal frequency division multiplexing (OFDM) symbols.” As illustrated in the figures above, OFDMA frames have time (in units of symbols) on the horizontal (x) axis with a plurality of time intervals. In 802.16-2004’s Figure 218 (reproduced and annotated above), the time intervals are shown as two-symbol slots in the DL burst regions (e.g., $k+5$, $k+7$, etc.). This is because in the data region, “[e]ach slot shall span . . . two OFDMA symbols in the time axis.” 802.16-2004 at 497-98; *see also id.* at 496 (“OFDMA . . . is a two-dimensional allocation of a group of contiguous subchannels, in a group of contiguous OFDMA symbols,” and citing § 8.4.6.3), 574-75 (§ 8.4.6.3 relating to AAS/AMC subchannels). Cooklev ¶¶ 111-113, 121-124. Similarly,

Park's frames include "a plurality of time slots (for example, 20 to 30 time slots) provided in a time domain." Park [0006]; Cooklev Decl. ¶¶ 111-113, 121-124.

These disclosures match the '450 Patent, which states that a "frame consists of a number of time slots" and "each time slot is comprised of one or more OFDM symbols." '450 Patent at 4:64-66, Fig. 3; Cooklev Decl. ¶¶ 121-124.

2. Preamble[b] – OFDM symbols with frequency subcarriers

The second part of the preamble recites:

...and each OFDM symbol containing a plurality of frequency subcarriers,

'450 Patent at cl. 7. 802.16-2004 expressly states that "[a]n OFDMA¹⁰ symbol is made up of subcarriers," as required by this claim element. 802.16-2004 at 494-95, 496 (noting that in "adjacent subcarrier permutation," also called the AMC permutation, "one slot is one subchannel by one OFDMA symbol" and citing

¹⁰ OFDMA symbols are the claimed "OFDM symbols" when used in a OFDMA system (i.e., a system that allows multiple access). See '450 Patent at 3:6-14 (explaining that the "following discussion" addresses an OFDMA system); Cooklev Decl. ¶¶ 48-49, 107-110.

§ 8.4.6.3), 517 (an “AMC Subchannel” is defined as “1 bin¹¹ x 6 symbol slots or 2 bins by 3 symbol slots”); 802.16-2004 at 574-75 (§ 8.4.6.3 relating to AAS/AMC subchannels); Eklund at 293-94 (In AMC, “Subchannels are then mapped to a single such group [of nine contiguous subcarriers] over six contiguous OFDM symbols or to two such contiguous groups [of nine subcarriers] over three contiguous OFDM symbols.”); Cooklev Decl. ¶¶ 129-132. The same is true for Park. Park [0009] (describing bins and tiles with multiple subcarriers per symbol); *id.* at Fig. 1; Cooklev Decl. ¶¶ 129-132.

3. Preamble[c] – configured to

The last part of the preamble recites “the mobile device configured to....” ’450 Patent at cl. 7. The asserted art further teaches that the mobile device is configured to perform the recited elements under the plain meaning of the term “configured to,” as discussed in the following sections—the mobile device is arranged to perform the receiving and recovering elements. The asserted art also teaches that the mobile device is “designed to” perform the recited elements because a POSA would have designed the device, using programming, software, and/or

¹¹ In “adjacent subcarrier permutation” (AMC), a bin “is the set of nine contiguous subcarriers within an OFDMA symbol.” 802.16-2004 at 574; Park [0009]; Cooklev Decl. ¶¶ 129-132, 185-186.

hardware to perform the recited receiving and recovering, as explained in the steps below. Cooklev Decl. ¶ 133.

4. Element 1: receive an identifier from a base station

Park and 802.16-2004 teach this element, which recites that the mobile device is configured to “receive an identifier from a base station in a cell in which the mobile device is operating.”

The ’450 Patent admits that 802.16-2004 discloses the claimed identifier: a “connection ID (CID),” which 802.16-2004 refers to as the “connection identifier” or “CID.” ’450 Patent at 1:52-55; 802.16-2004 at 3, 7 (definition of “connection identifier (CID)”). The ’450 Patent also admits that this CID is “included in the [IEEE 802.16] MAP message to identify the mobile station,” such as the DL-MAP message that is “broadcast[ed]” from the base station “to the mobile stations.” ’450 Patent at 1:48-55; Cooklev Decl. ¶¶ 134-145.

And indeed, the 802.16 standard discloses the same identifier (CID or RCID) in the same DL-MAP message broadcast from the base station to the subscribers, as identified by the ’450 Patent in that admission. 802.16-2004 at 46 (“The DL-MAP message defines the access to the downlink information.”), 110-11 (Table 97, DL-MAP IE format for band AMC); Cooklev Decl. ¶¶ 34-35, 73, 134-145. The same identifier (CID or RCID) is also disclosed in Park, which (like the ’450 Patent) is based on the 802.16 standard. Park [0013]-[0015] (Table 1, which is Table 97 in

IEEE 802.16), [0055]-[0057] (Table 2, Park’s DL-MAP IE format); Cooklev Decl. ¶¶ 58-59, 73, 134-145.¹²

Park and 802.16-2004’s CID/RCID is a value that “represents an assignment of the IE [Information Element].” Park [0013], [0015], [0055]-[0057]; 802.16-2004 at 111 (“RCID_IE [r]epresents the assignment of the IE”). Park’s RCID thus identifies the mobile device to which the IE is assigned. Cooklev Decl. ¶¶ 58-59, 73, 134-145. 802.16-2004 further explains that a CID/RCID “identifies a connection to equivalent peers in the MAC of the base station (BS) and subscriber station (SS).” 802.16-2004 at 7; *see also id.* (“connections are identified by a connection identifier (CID)”), 110-11 (Table 97, including an RCID in the DL-MAP). The “MAC” (medium access control layer) is the portion of the base station and subscriber station that controls multi-user network access, i.e., when there is one base station and multiple subscriber stations. Cooklev Decl. ¶¶ 70-73. Each CID/RCID thus

¹² Table 97 in 802.16-2004, and Tables 1 and 2 in Park, use a Reduced CID (“RCID”) that requires fewer bits. 802.16-2004 at 104-05 (RCID refers to a “CID Type” called “Reduced CID” that can be used “instead of [a] basic CID ... to reduce the size of the ... MAP message”); Cooklev Decl. ¶¶ 59, 73, 136-138. When Park refers to “Table 95” in 802.16-2004, it is referring to Table 97 in the standard. *See supra* Park Overview.

identifies “a connection” between the base station and a subscriber station. *Id.* ¶¶ 134-145. Identifying the connection is equivalent to identifying the subscriber station. *Id.*

Park and 802.16-2004 also disclose that the mobile station receives the CID/RCID “from a base station.” Park describes CID/RCID as a component of the DL-MAP IE. Park [0015] (“[i]n Table 1, the ‘DL-MAP Type’ is a value for specifying the type of the DL-MAP IE, and the ‘RCID_IE’ represents an assignment of the IE”). “DL-MAP” refers to “downlink map,” which means it is transmitted by the base station and received by the mobile station. 802.16-2004 at 8 (defining “downlink map (DL-MAP)”), 46 (“The DL-MAP message defines the access to the downlink information.”); Cooklev Decl. ¶¶ 139-145.

5. Element 2(a) – receive a signal over a segment of time-frequency resource

Park and 802.16-2004 also teach Element 2. This Petition breaks this element into multiple parts, labeled (a)-(d).¹³ Part (a) of Element 2 recites that the mobile device is configured to “receive a signal containing information from the base station over a segment of time-frequency resource.” ’450 Patent at cl. 7.

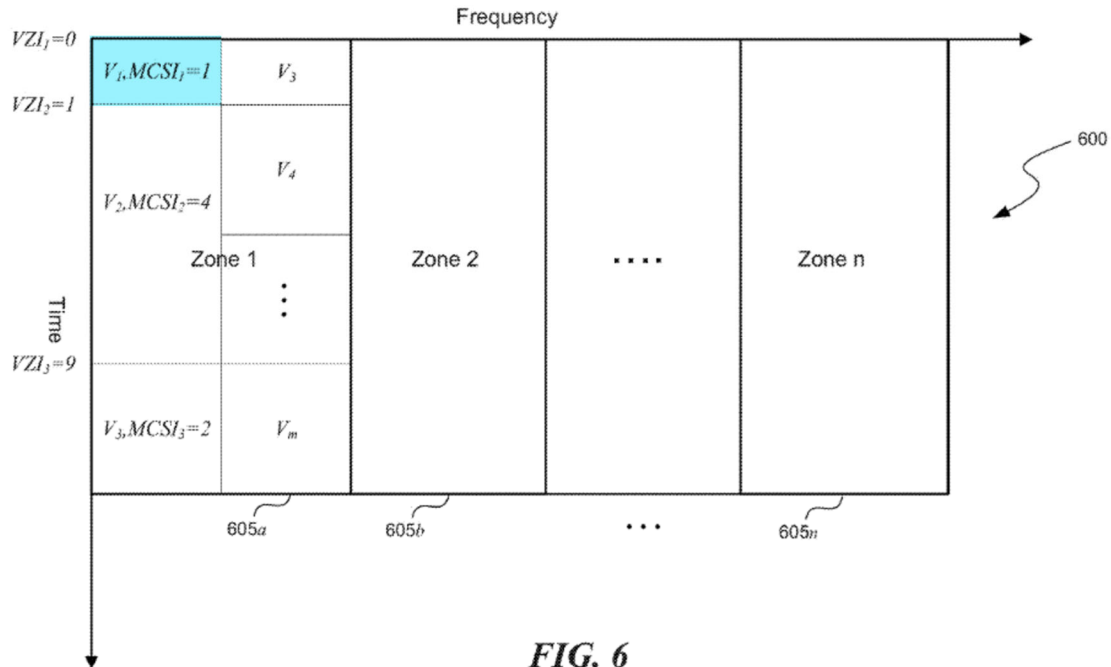
Park and 802.16-2004 teach this. To start, Park teaches that its mobile devices receive a signal containing information from a base station. Park [0005]-[0006]

¹³ See *supra* Background, The ’450 Patent subsection for claim labeling.

(discussing “mobile communications systems” with “subscribers,” i.e., mobile devices, that receive “downstream data,” i.e., data sent from a base station to a mobile/subscriber device); Cooklev Decl. ¶¶ 146-149.

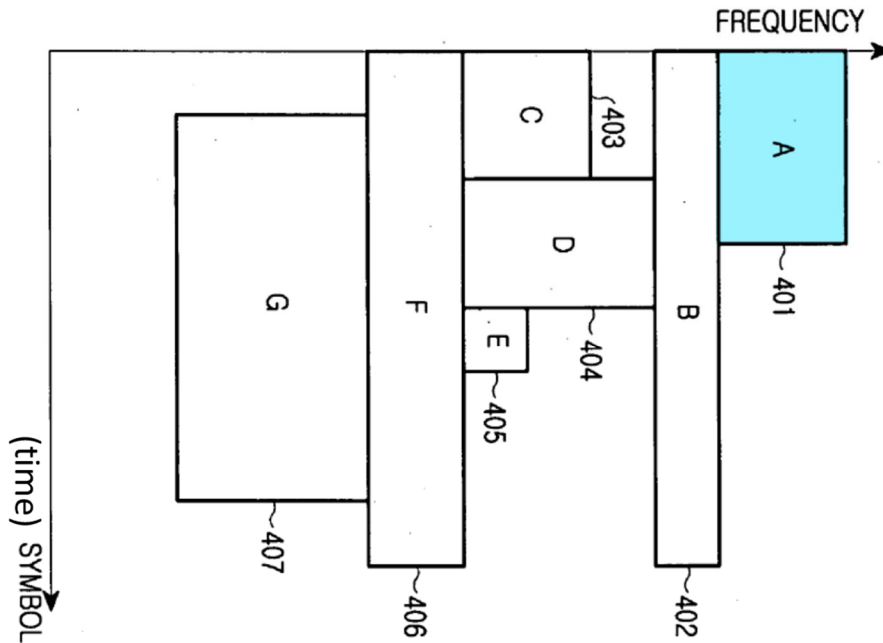
Further, Park discusses 802.16-2004 at length, and directs a POSA to apply Park’s techniques to that standard. Park [0075]; *supra* Motivation to Combine section. Like Park, 802.16-2004 teaches subscriber devices (also called subscriber stations or SSs) configured to receive the claimed signal containing information from a base station. *E.g.*, 802.16-2004 at 8 (“downlink: [t]he direction from the base station (BS) to the subscriber station (SS)”), 31 (discussing the “downlink” from a “central BS” (base station) to its “SSs” (subscriber stations)); *see also* ’450 Patent at 1:42-45, 5:34-37 (twice admitting that “in a typical wireless system based on the IEEE 802.16 standard (‘WiMAX’), multiple packet streams are established for each mobile device”); Cooklev Decl. ¶¶ 48-49, 70, 147-149.

Park’s mobile subscribers also receive this information “over a segment of time-frequency resource,” as recited in claim 7. The ’450 Patent explains that a “time-frequency resource” may be “divided” into multiple “segment[s]” such as V_1 , V_2 , etc., shown in its Figure 6:



'450 Patent at Fig. 6 (highlighting segment V_1 of time-frequency resource 600 in blue), 6:3-14 (“For example, V_1 is the resource segment to be used for the first voice packet stream, V_2 is the resource segment to be used for the second voice packet stream, etc.”); Cooklev Decl. ¶¶ 149-151.

Park teaches the same thing. Park discloses a “resource allocation region” that corresponds to the 450 Patent’s “[resource] segment.” Both terms refer to a portion or segment of time-frequency resource. As Park explains, its “FIG. 4 illustrates resource allocation regions for plural subscribers,” labeled “A 401, B 402, C 403, D 404, E 405, F 406 and G 407.” Park [0039], [0051], Fig. 4.



Id. at Fig. 4 (highlighting segment A 401 in blue, rotating Figure 4 to match the orientation of Figure 6 from '450 Patent, and indicating the time axis), [0050]-[0051]; Cooklev Decl. ¶¶ 152-155 (explaining that the “symbol” label for one axis indicates units of time); *see also* Park at Figs. 6A, 6B (showing allocation regions of various sizes), [0080]-[0083].¹⁴

Park’s use of variable allocation regions (the claimed segments) is one of Park’s improvements to 802.16-2004 that increases flexibility and reduces overhead. Park [0031] (improve flexibility), [0073]-[0074] (reduction in bits), [0075]-[0079]

¹⁴ The time-frequency resource shown in Park’s Figure 4 resides in, e.g., an AMC area in a DL burst region in an OFDMA frame. Park [0057]; Cooklev Decl.

¶¶ 112-132, 159, 180-181, 206-207; *supra* Preamble[a].

(directing a POSA to implement this improvement); *supra* Motivation to Combine section; Cooklev Decl. ¶¶ 74-101. These improvements will be discussed further in the next subsection.

6. Elements 2(b) and 2(d) – segment having a starting time-frequency coordinate and 2, 4 or 8 time-frequency resource units

Element 2 further recites:

[2(b)] the segment having a starting time-frequency coordinate and the segment comprising N time-frequency resource units within a time interval,

...

[2(d)] where N=2, 4, or 8;

'450 Patent at cl. 7. Park teaches both of these limitations.

As an initial matter, Park discloses the claimed “time-frequency resource units.” As described above, the recited signal received by the mobile device contains the recited segments, which in turn contains the recited time-frequency resource units under the plain meaning of the term. Like the '450 Patent's time-frequency resource units, Park's allocation units are smaller, unit-sized divisions of the time-frequency resource. *Compare* '450 Patent at 7:28-30 (“Using basic resource units as the granularity of a location offset.”), 6:49-52 (“The resource utilized by other MCS is simply an integer multiple of the basic unit.”), 8:27-35 *with* Park [0033] (“indexing a total resource region per each allocation unit”), [0038] (similar),

[0043]-[0044] (similar), [0047] (“The allocation unit is a unit for resource allocation and can be variously defined according to time, frequency, code, and direction of indexing.”), [0050]; Cooklev Decl. ¶¶ 45, 62-65, 156-159. And as explained at length in the next section, the Park’s allocation units are used to define a larger area (“segment”) in the time-frequency resource.

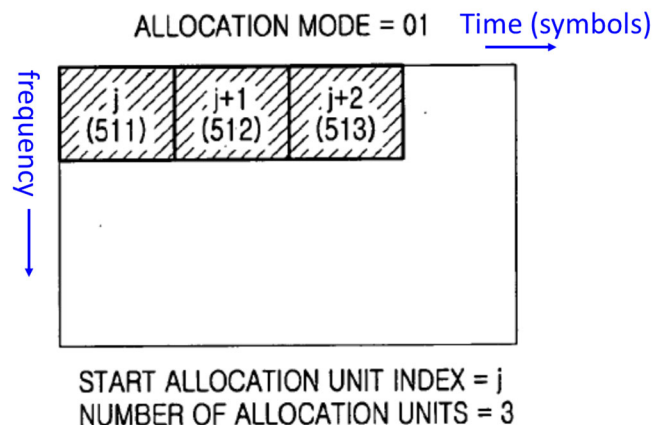
Park’s allocation units also meet a narrower construction that Neo rejects in district court. *See supra* Claim Construction section. Park’s signal includes the recited units, even if the units were “designed according to the application requirements of the application that is being grouped” as required by the narrower construction. Park explains that the size and shape of its units “can be properly selected according to the type of system,” i.e., a POSA would have taken into account the system’s needs for different types of data, such as voice or video. Park [0046]; Cooklev Decl. ¶¶ 45, 160-161.

In the context of the above-described allocation units, Park discloses “the segment having a starting time-frequency coordinate and the segment comprising N time-frequency resource units within a time interval . . . where N=2, 4, or 8.”

Specifically, in Park’s “allocation mode ‘01’,” Park’s “allocation region” (i.e., segment) has: (1) an “index value of the start allocation unit” (i.e., a one-dimensional starting time-frequency coordinate) that identifies the start of the allocation region and; (2) the total number of allocation units (i.e., N time-frequency

resource units). Park [0066] (“In the allocation mode ‘01’, the corresponding allocation region can be indicated by using the *index value of the start allocation unit* and the *total number of allocation units*.”) (emphases added); *see also id.* [0053], [0070], cl. 4 (“allocation region is indicated by using an index value of a start allocation unit and a total number of allocation units”); Cooklev Decl. ¶¶ 162-170 (explaining that this is part of Park’s improvement to 802.16-2004, which uses two-dimensional starting time-frequency coordinates (start symbol offset and start logical channel offset)).

Park illustrates an example of its allocation mode 01 in Figure 5B, where the allocation region starts at the allocation unit with index “j,” a one-dimensional integer, and has a total number of three allocation units, “N” number of one-dimensional time-frequency units:



Park at Fig. 5B (annotated); Cooklev Decl. ¶¶ 64, 164-173.¹⁵ This “index value” “j” is associated with “a predetermined allocation unit.” Park [0033]. Park further explains:

FIG. 5B represents the allocation mode “01” indicating that continuous allocation units 511, 512 and 513 are allocated in the allocation region. To indicate the allocation region, “j” which is an index value of a start allocation unit 511 and “3” which is the total number of the allocation units are used.

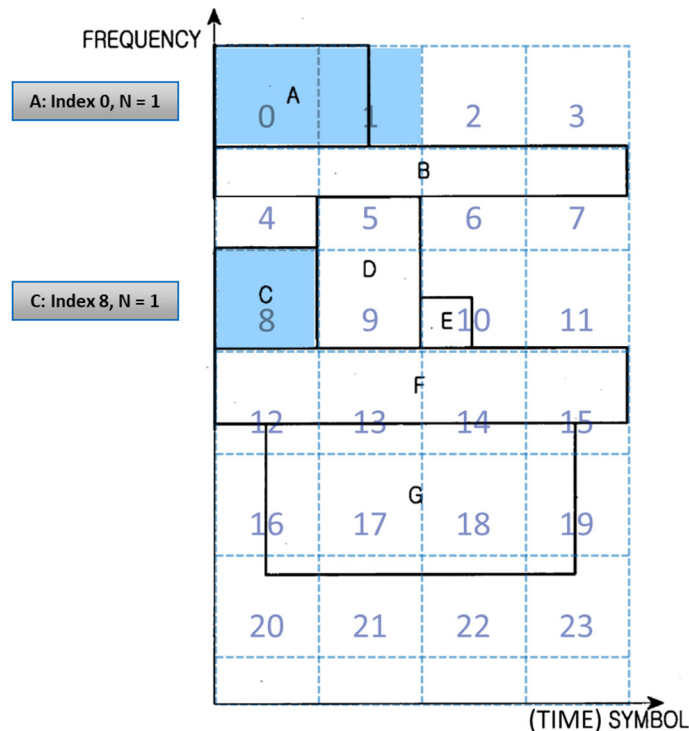
Id. [0070]. Thus, this particular segment has a starting time-frequency coordinate “j,” which is a one-dimensional integer value. Cooklev ¶¶ 164-173. The number of units (i.e., N) in this example is three, all within the time interval indicated on the graph. Park also discloses another example where $N = 2$, as recited in claim 7.

In addition, [allocation region] A 401 can be represented as $c(0)$ and $c(1)$. This means continuous resource allocation regions can be simply represented by assigning a start allocation unit index and a total number of the allocation units.

Park [0053], [0051] (explaining that Figure 4 shows “resource allocation regions,” including A 401); *see also id.* [0046]-[0049] (explaining that Figures 3A-3D

¹⁵ Note that Park Figure 5 has not been rotated to put frequency on the y axis and time on the x axis to match the '450 Patent's figures, like Park Figure 4 was in the previous section.

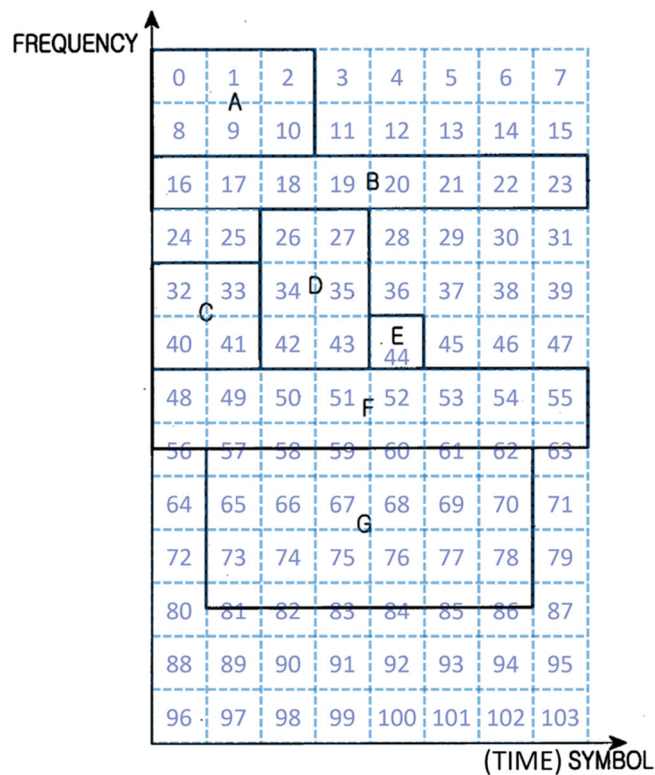
illustrate various size/shape allocation units mapped and indexed to the total resource region); Cooklev Decl. ¶¶ 171-175. In the example block-quoted above, Park’s exemplary allocation region A 401 (which was highlighted in blue in the previous section’s reproduction of Park’s Figure 4), has a starting time-frequency coordinate “0” (Park’s “start allocation index” is “0”), which is a single-dimension integer. Cooklev Decl. ¶¶ 171-175. This example also has at a total N=2 time-frequency resource units (“allocation units”), c(0) and c(1). This is illustrated below, where Park allocates N=2 allocation units to region A (the claimed segment).



Id. (combining Park Figures 3C and 4); Park [0052]-[0054].¹⁶ As illustrated in the Figure above, Park discloses two examples using the indexed allocation units shown in Figure 3C: (1) allocation region “A” with a starting index of 0 and a total number of allocation units (“N”) of 2 (discussed above); and (2) allocation region “C” where the starting index is 8 and the total number of units is 1. Park [0052]-[0053] (“C 403 can be represented as . . . c(8)”). This teaching meets the claim language for N=2, and also shows that Park is consistent with the ’450 Patent’s specification more broadly. ’450 Patent at 6:35-39 (Table 1, also showing N=1 and N=2), 6:51-52 (N is “simply an integer multiple of the basic unit”); Cooklev Decl. ¶¶ 171-175.

¹⁶ As drawn, the second allocation unit (indexed with “1”) is larger than the actual amount allocated. That could be due to the inconsistent scaling between Park’s figures. *Krippelz v. Ford Motor Co.*, 667 F.3d 1261, 1268 (Fed. Cir. 2012) (cannot assume patent figures are drawn to scale). It could also be that allocation region A did not require a whole number of units to transfer all of its information bits. This mismatch would have been dealt with by, for example, the transmitting device (a base station, in the downlink) transmitting more information or correction bits in that unit. Cooklev Decl. ¶ 175.

To be clear, Park indexes the entire time-frequency resource per a given size and shape of resource allocation unit (time-frequency resource unit) that it will use, as illustrated below for another exemplary allocation unit size:



Cooklev Decl. ¶¶ 62-63, 157-159, 180; Park at Figs. 3C, 4, Abstract (“indexing a total resource region”), [0038] (Figures 3A-3D illustrate indexing different size/shape units to “the total resource region”), [0044] (“the total resource region is indexed”), [0049] (indexing the entire region from 0 to M).

This allows the starting time-frequency coordinate to be referenced by the appropriate index number, i.e., a one-dimensional integer equal to 0 or greater, no matter where the allocation region (segment) is within the resource, as is clear in the

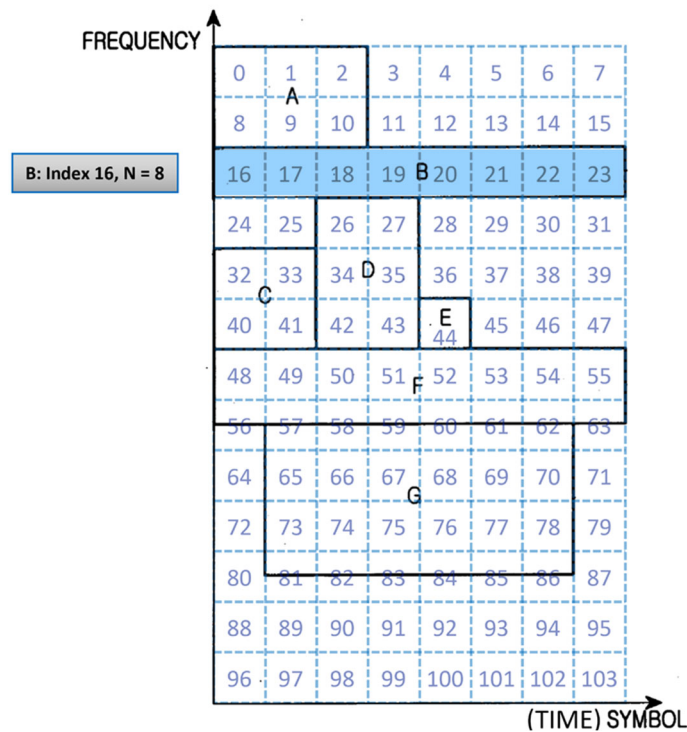
example above. Cooklev Decl. ¶¶ 168-182. Park also explains that it may use the same or different allocation unit type(s) (AUT, referring to the size and shape of the resource allocation unit) and same allocation mode(s) (AM, referring to, for example, using a starting index and the number of allocation units) for a particular user (i.e., a mobile subscriber associated with a particular RCID). *See* Park [0055]-[0064], Tbl. 2; Cooklev Decl. ¶ 181 (explaining that Table 2 loops through all of a user's allocated segments). Park therefore discloses a range of options for expressing a resource allocation region using resource allocation units.

Notably, the '450 Patent does not describe any particular advantages from using $N=2$, 4, or 8. Rather, the patent states that the value of N in the described example is “simply an integer multiple of the basic unit” ('450 Patent at 6:51-52), and the as-filed claims merely recited that “ N is an integer number” (Ex. 1002 at 168). The claimed $N=2$, 4, and 8 are merely three of the four values in the '450 Patent's examples, which further indicate that the value of N may be any integer 1 or greater, depending on the unit size and the segment size. Cooklev Decl. ¶ 168-182.

The same is true in Park. As discussed above, “ N ” is simply the “total number of the allocation units [that] are used” to fill a particular allocation region, whatever that number may be. Park [0070]; *see also id.* [0066]; Cooklev ¶¶ 168-182 (explaining this will be some positive integer). Thus, Park's mobile device is “configured” (as recited in the claim) for all reasonable N , which includes at least

N=1-8 (and thus the claimed N=2, 4, or 8). Park includes examples of N=1 and 2, as already demonstrated.

Park also teaches an specific example of N=8. That is, Park's mobile device is configured to use allocation mode 01 for any allocation region (i.e., a "segment"), including allocation region B. *E.g.*, Park [0066], [0070]. Park's mobile device is also configured to use smaller allocation units (i.e., "time-frequency resource units"), such as those shown in Figure 3D, when allocating units to any allocation region using any allocation mode, including allocation mode 01. *Id.* [0051]-[0054] (explaining that different allocation regions can be described in terms of different sized allocation units and also pointing out that both region A 401 and C 403 can be described in terms of the same indexing), [0066] (explaining that allocation mode 01 can be used for "the corresponding allocation region," which can be any region). For example, using the allocation units in Figure 3D, segment B would have a starting index of 8 (a one-dimensional time-frequency coordinate) and N=8 allocation units (time-frequency resource units) in the time interval for resource allocation region B, as illustrated below:



Cooklev Decl. ¶¶ 176-182 (explaining that Park indexes the total resource according to smaller units and larger ones at the same time to efficiently allocate the space); Park at Figs. 3C, 4, [0053], [0066], [0070].

In sum, Park’s mobile device is configured to receive a signal with $N=2$, 4, and 8, as well as other integers. Park explains that its allocation units (i.e., time-frequency resource units) can have “various sizes and shapes,” and allows the POSA implementing the system to select a suitable “shape and size.” Park [0046]. Conversely, Park acknowledges that its “resource allocation regions” (i.e., segments) such as A 401, B 402, etc., may vary in size, shape, and location. *Id.* [0081]-[0083]; Cooklev Decl. ¶¶ 157-180. Accordingly, Park’s mobile devices may receive a signal containing any start allocation index (one-dimensional starting time-

frequency coordinate) up to the highest number index in the resource region, and any integer equal to or greater than 1 for the total number of allocation units (N time-frequency resource units), including N=2, 4, or 8. Cooklev Decl. ¶¶ 62-65, 74-75, 156-182.

7. Element 2(c) – units contain frequency subcarriers in a group of OFDM symbols

Element 2 also recites:

[2(c)] each unit containing a set of frequency subcarriers in a group of OFDM symbols,

'450 Patent at cl. 7.

This was nothing new. Park and 802.16-2014 teach achieving the same granularity (unit size) as the '450 Patent because Park's resource allocation units likewise contain a set of frequency subcarriers in a group of OFDM symbols. Park's allocation units may be any suitable size and shape, and Park leaves that determination to a POSA's judgment. Park [0044]-[0047] ("The allocation unit is a unit for resource allocation and can be variously defined according to time, frequency, code, and direction of indexing."); *id.* at Figs. 3A-3D; Cooklev Decl. ¶¶ 157-159, 183-188.

A POSA implementing Park in an 802.16-2004-compliant system would have understood that Park's allocation units would be no smaller than, and often larger

than,¹⁷ the standard's basic allocation unit for AMC of "nine contiguous subcarriers within an OFDMA symbol." 802.16-2004 at 574 ("defin[ing]" the "basic allocation for both downlink and uplink" for "adjacent subcarrier permutation"); Park [0009] (reciting the same definition of bin as "9 sub-carriers sequentially provided in one OFDMA symbol"); Cooklev Decl. ¶¶ 183-191. Thus, Park teaches units each having "a set of" at least nine "frequency subcarriers in a group of" at least one, but often more "OFDM symbols" as recited in the claims. Indeed, Park expressly discloses four exemplary unit sizes, and at least two of them (illustrated in Figs. 3A and 3C) are larger than the ones in Fig. 3D – and thus more than one symbol wide in the time dimension. Cooklev Decl. ¶¶ 183-191.

Moreover, Park discloses that its smallest exemplary allocation unit, which is illustrated in Figure 3D, is one "sub-channel," which may be nine subcarriers in six symbols or eighteen subcarriers in three symbols—easily meeting the claim's requirement for a "set" of subcarriers in a "group" of symbols. Park [0049] (Fig. 3D's unit is "one sub-channel"); Eklund at 293-94 (explaining that, in AMC, "[s]ubchannels are then mapped to a single such group [of nine contiguous subcarriers] over six contiguous OFDM symbols or to two such contiguous groups [of nine subcarriers] over three contiguous OFDM symbols."); 802.16-2004 at 517

¹⁷ As discussed above, Park teaches allocation units having various shapes and sizes.

(an AMC subchannel is “1 bin¹⁸ x 6 symbol slots or 2 bins x 3 symbol slots”); Cooklev Decl. ¶¶ 183-191. Likewise, Park’s Figure 3C illustrates units that are “four sub-channels” and thus either 2 bins (18 subcarriers) x 12 symbols or 4 bins (36 subcarriers) x 6 symbols; and Figure 3A is “one Band,” which is all of the symbols in the resource area by 4 bins (36 subcarriers). Cooklev Decl. ¶¶ 183-191; 802.16-2004 at 575 (four rows of bins is one Band).

8. Element 3: recover the information using the starting time-frequency coordinate, N, and the identifier

Element 3 recites:

recover the information using the starting time-frequency coordinate
and N in conjunction with the provided identifier.

’450 Patent at cl. 13.

Park and 802.16-2004 teach this. Both Park and 802.16-2004 disclose a base station transmitting data to a mobile station. Park [0005] (“[n]ext-generation mobile communication system will transmit data with superior quality at a high transmission rate to provide subscribers with various improved multimedia services.”), [0006] (“transmit upstream and downstream data”); 802.16-2004 at 316 (“The downlink

¹⁸ A “bin” “is the set of nine contiguous subcarriers within an OFDMA symbol.”

802.16-2004 at 574; Park [0009]; Cooklev Decl. ¶¶ 185-186.

data sections are used for transmitting data . . . messages to the specific SSs.”); Cooklev Decl. ¶¶ 48-51, 75, 142-145, 192-195.

A POSA would have understood that a base station transmits data to the mobile station via an encoded signal, and the mobile station decodes that signal to recover the data. Cooklev Decl. ¶¶ 136-144, 192-195. As the ’450 Patent admits, in a “multi-carrier wireless communication network,” a mobile station has a “receiver [that] recovers data from the signal and outputs the data for use by the mobile device.” ’450 Patent at 4:12-13. A POSA would understand that this refers to the process of decoding the signal from the base station. Cooklev Decl. ¶¶ 136-144, 192-195.

OFDMA allows multiple mobile devices (and receivers), allocating subcarriers to a specific mobile device (and receiver). *Id.* ¶¶ 49, 108, 142, 193-194. As explained above, Park discloses that a DL-MAP IE is “used for indicating resource allocation information in the AMC area.” Park [0013]. 802.16-2004 further explains that “[t]he DL-MAP message defines the access to the downlink information” and “defines the usage of the downlink intervals.” 802.16-2004 at 46, 152; *see also id.* at 316 (“The downlink data sections are used for transmitting data . . . messages to the specific SSs.”). In other words, the DL-MAP provides the mobile station with the parameters it uses to extract/decode the information from the base station’s encoded signal. Cooklev Decl. ¶¶ 136-144, 192-195. This works in

the same way as the '450 Patent, which notes that “[a] mobile device can identify its own resource by decoding the MAP message.” ’450 Patent at 8:18-19. The ’450 Patent further explains that the “MAP message” it references is the same “MAP scheduling message defined by IEEE802.16.” *Id.* at 1:51-52; Cooklev Decl. ¶¶ 136-144.

Park discloses using a DL-MAP IE message with revised syntax to communicate the parameters the mobile device will use to recover the information from the received signal. Cooklev Decl. ¶¶ 78-96, 192-196. Park illustrates an exemplary modification that can be seen by comparing its Table 1 (showing the DL-MAP IE from 802.16-2004) with its Table 2 (showing Park’s modifications). *See also* Park [0055], [0059]; Cooklev Decl. ¶¶ 78-96, 192-196. As shown in Table 2, Park discloses its modified DL-MAP IE includes “Start allocation unit index” (the claimed “starting time-frequency coordinate), “Number of allocation units” (the claimed “N time-frequency resource units”), and “RCID_ID” (the claimed “identifier”). Park and 802.16-2004 therefore disclose a “mobile station configured to . . . recover the information using the starting time-frequency coordinate and N in conjunction with the identifier.” Thus, a POSA reading Park would have understood that the receiver in the mobile device uses the DL-MAP information—including the starting time-frequency coordinate, “N,” and the identifier—to recover the information transmitted to it by the base station. Cooklev Decl. ¶¶ 192-196.

D. Dependent claim 11

Claim 11 is unpatentable for the same reasons as claim 1 and as further explained below. Conversely, claim 7 is unpatentable for the same reasons as its dependent claim 11.

Claim 11 recites:

The mobile device of claim 7, wherein modular coding is applied to the time frequency resource units in the segment of the time-frequency resource.

'450 Patent at cl. 11. The parties have agreed that the phrase “wherein modular coding is applied” should be construed as “wherein a modular coding scheme is applied.” The '450 Patent discloses using well-known modular coding schemes, such as 16QAM and QPSK. *Id.* at 6:22-62; Cooklev Decl. ¶¶ 44, 197-201. In its infringement contentions in district court, Neo contends that Ford’s alleged use of QPSK is sufficient for this limitation. Ex. 1028 (Neo’s Infringement Contentions) at 030.

Park and 802.16-2004 disclose the claimed modular coding scheme. Park uses the 802.16-2004 DL-MAP IE format, which use a “combination of the ‘Nep code’ and ‘Nsch code’” that “indicates the number of allocated sub-channels and coding and modulation schemes for the [DL] burst.” Park [0015] (describing Table 1), [0057] (describing Table 2); Cooklev Decl. ¶¶ 200-205.

802.16-2004 further explains the relationship between “Nep code” and “Nsch code” and a particular modulation coding scheme. Specifically, 802.16-2004’s Table 97 (referred to as Table 95 in Park) refers the reader to § 8.4.9.3.5 for the N_{EP} and N_{SCH} codes. 802.16-2004 at 110-11. There, and much like the ’450 Patent, the standard discloses modular coding schemes QPSK, 16QAM, 64QAM and different coding rates such as “1/2,” “2/3,” etc., as well as using CRC encoding.¹⁹ 802.16-2004 at 603-10 (including Tables 331 and 332, describing the “[m]odulation order of DL traffic burst” for H-ARQ); Cooklev Decl. ¶¶ 200-209.²⁰

¹⁹ CRC refers to “Cyclic Redundancy Check,” a way of automatically detecting transmission errors. Eklund at 48; Cooklev Decl. ¶¶ 72, 175, 209. Forward error correction (FEC) encoding, which is recited in the ’450 patent, is the “most commonly used technique” for error detection and correction. ’450 Patent at 3:59-62, 6:31-34; Eklund at 48; Cooklev Decl. ¶ 209.

²⁰ 802.16-2004 later states “[t]he information of N_{EP} and N_{SCH} shall be signaled in UL MAP.” 802.16-2004 at 605. A POSA would understand this to be a typographical error in this context since the relevant section is related to the “DL traffic burst” and Table 97 shows N_{EP} and N_{SCH} in the DL-MAP IE. Cooklev Decl. ¶ 205.

Park and 802.16-2004 also disclose that QPSK or 16QAM and CRC encoding is applied to the time frequency resource units in the segment of the time-frequency resource as claimed. As explained above, the modulation and coding scheme is included in the DL-MAP IE, which Park teaches is “used for indicating resource allocation information in the AMC area.” Park [0013]; *see also id.* [0057] (“the combination of the ‘Nep code’ and ‘Nsch code’ indicates the number of allocated sub-channels and coding and modulation schemes *for the DL burst*” where the DL burst is in the AMC area) (emphasis added); 802.16-2004 at 604 (“When H-ARQ is applied to a packet, error detection is provided on the padded packet through a Cyclic Redundancy Check (CRC.”); Cooklev Decl. ¶¶ 206-209. The AMC area contains Park’s allocation resource regions, which contain Park’s allocation units. Cooklev Decl. ¶¶ 159, 180-181, 206-209. Additionally, the RCID in the DL-MAP IE indicates a specific mobile station, which has a corresponding resource allocation region (the claimed “segment”) made of a number of resource allocation units (the claimed “time-frequency resource units”). Park [0033] (describing using resource allocation units and indexing for “indicating resource information allocated to each terminal”), [0039], [0043], Tbl. 1 (showing RCID as part of the DL_MAP IE), Tbl. 2 (same); Cooklev Decl. ¶¶ 135-145, 156-182, 206-209. A POSA would therefore understand that MCS is applied to the time-frequency resource units (“resource allocation units”) in the segment (“resource allocation region”), as claimed.

This is consistent with how the '450 Patent uses MCS. As shown in Table 1 of the '450 Patent, a given MCS applies to a number (1, 2, 4, or 8) of “units.” '450 Patent at Tbl. 1. For example, in Table 1, an MCSI of 2 indicates a modulation and coding scheme QPSK, which covers “2” units. *Id.* at Tbl. 1, 6:49-51. N=2 basic resource units would constitute a claimed “segment,” as described above. Table 1 provides additional examples of N=1, N=4, N=8, all of which constitute a “segment” of N time-frequency resource units. *See also id.* at 7:20-27.

IV. Secondary Considerations

There are no secondary considerations known to Ford that affect—let alone overcome—the strong cases of obviousness set forth above. Should Neo offer any relevant evidence of secondary considerations in its preliminary response, Ford should be granted leave to file a reply.

V. The Board Should Reach the Merits of This Petition

Discretionary denial is unwarranted here. Ford reserves the right to reply to the POPR to address patent owner’s arguments and the law and facts as they stand at that time.

A. Section 325(d) does not warrant denial

The patent lists no prior art on its face, the Examiner discussed no prior art, and Applicant submitted no IDSs. Since issuance, however, the Office (in particular, the PTAB) has been presented with some of the prior art in this petition. The Office, however, has *never* been presented with the combination of teachings and arguments

submitted herein—and thus the 35 U.S.C. § 325(d) analysis fails to meet Step 1 of the *Advanced Bionics* test. *Advanced Bionics, LLC v. Med-El Elektromedizinische Geräte GMBH*, IPR2019-01469, Paper 6 at 8 (Feb. 13, 2020) (*precedential*).

In particular, the Office was presented with IEEE 802.16-2004 as a secondary reference in the Dell IPR (IPR2021-01486), but Dell did not present—or even allege—any teaching of a “[one-dimensional] starting time-frequency coordinate” as recited in the claims. Dell did not even argue that such a unitary time-frequency coordinate would have been obvious. Rather, Dell pointed to two-dimensional starting time-frequency coordinates, such as a symbol (time) offset and a subchannel (frequency) offset, and contended that was sufficient to meet the claims. *See* Ex. 1002 at 043 (decision denying institution); *Dell, Inc. v. Neo Wireless, LLC*, IPR2021-01486 (Patent 10,447,450), Paper 3 (Petition) at 46-48 (Sept. 16, 2021) (pointing to these two parameters as “collectively, the claimed ‘starting time frequency coordinate’”) (emphasis omitted). But the Board agreed with Neo that Dell’s art taught only “independent time and frequency coordinates” rather than a single, unitary time-frequency coordinate. Ex. 1002 at 040-41. Similarly, both of VW’s grounds allege the claimed time-frequency coordinate is satisfied by two-parameter teachings. *Volkswagen Grp. of Am., Inc. v. Neo Wireless, LLC*, IPR2022-01567 (Patent 10,447,450), Paper 2 (Petition) at 45-47 (Sept. 27, 2022) (like Dell, pointing to two coordinates); *id.* at 75 (similarly alleging that two

coordinates “collectively” identify a starting time-frequency coordinate), 77-78 (alternatively pointing to time coordinate “Start Offset” value paired with an encoded frequency coordinate).²¹

In contrast, Ford’s petition presents Park as its primary reference. Park teaches this missing claim element, and explains why it would have been obvious to modify 802.16-2004 to encode the starting point as a single, one-dimensional time-frequency coordinate rather than separate time and frequency coordinates. *See supra* Ground 1, Element 2(b). Accordingly, the Board has never been presented with the art and arguments herein.

And even if the Board finds that Step 1 is satisfied, Step 2 of the *Advanced Bionics* test is not satisfied because Dell (and VW) never point to Park’s, or any other reference’s, teaching of a single one-dimensional time-frequency coordinate. *Cf. Volkswagen Grp. of Am., Inc. v. Michigan Motor Techs. LLC*, IPR2020-00452, Paper 12 at 32-33 (Sept. 9, 2020) (error to overlook relevant teachings in a prior-art reference).

B. *General Plastic* does not warrant denial

General Plastic does not provide a basis for denial, either. *General Plastic Indus. Co. v. Canon Kabushiki Kaisha*, IPR2016-01357, Paper 19 (Sept. 6, 2017)

²¹ VW’s petition lists Park as an exhibit, but never asserts it as prior art.

(*precedential*). To start, Dell’s IPR is merely part of the intrinsic evidence—the file history—that Ford is required to take into consideration when construing the claims. It is not unfair for Ford to apply the narrow claim construction that Neo argued for and received in a previous IPR. To the contrary, the Board’s rules *require* it. *See* 37 C.F.R. § 42.104(b)(3) (Petitioner must explain “[h]ow the challenged claim is to be construed.”); *Aylus Networks, Inc. v. Apple Inc.*, 856 F.3d 1353, 1360-62 (Fed. Cir. 2017) (finding POPR arguments constitute prosecution disclaimer). Any so-called “road-mapping” to Dell’s IPR is more accurately characterized as properly construing the claims in view of the intrinsic evidence.

Indeed, the parties agreed in district court on January 18, 2023 (roughly two months before Ford filed this IPR) to construe the previously disputed “time-frequency coordinate” term to mean a “*one-dimensional* time-frequency coordinate,” capturing Neo’s and the Board’s construction in the Dell. *See* Ex. 1011 (Joint Claim Construction Statement) at 012 (emphasis added); Ex. 1002 at 040-41 (“singular ‘starting time-frequency coordinate’”).²²

²² Neo would not agree in district court, however, to limit “time-frequency resource unit” as it had done in the Dell IPR. *Compare* Ex. 1002 at 038-39 (recounting Neo’s argument) *with* Ex. 1011 (Joint Claim Construction Statement) at 017 (Neo insisting on “plain meaning,” while defendants propose Neo’s previous construction).

As for VW's IPR, Neo made this narrower claim construction its lead-off argument in its POPR, just as Neo did in Dell's IPR—but only after complaining that VW did not join the other multidistrict litigation²³ defendants' proposed constructions. *See* Ex. 1018 (IPR2022-01567, Paper 7 (POPR)) at 4-5 (citing the joint claim construction statement as Ex. 2003), 8-29 (arguing that the claims are limited to a single one-dimensional time-frequency coordinate, and therefore not taught by the art). Thus, VW's IPR has nothing that Ford could have (or did) use to gain an unfair advantage or follow as a roadmap. At most, Neo's POPR re-iterated the same claim construction from the Dell IPR and that the parties agreed to in their recent joint claim construction statement.

Accordingly, it is unsurprising that the *General Plastic* factors confirm that discretionary denial is unwarranted here.

²³ Neo originally sued Ford, VW, and five other automobile manufacturers in different district courts, and then later—over Ford's, VW's, and several other defendants' opposition—transferred the seven different cases into a single multidistrict litigation (MDL) for *pretrial* proceedings. *See* Ex. 1013 (MDL Transfer Order). Ford's, VW's and the other five defendants' trials will be separately held in their original district courts.

1. Factor 1: different and unrelated petitioners

This factor weighs strongly in favor of institution. *General Plastic* addressed petitions filed the by *same petitioner*, which is plainly not the case here. *Valve* extended the *General Plastic* doctrine to include cases with a “significant relationship” such as that between HTC and Valve—HTC had incorporated Valve’s technology into its device, under license and with technical assistance from Valve. *Valve Corp. v. Electronic Scripting Prods., Inc.*, IPR2019-00062, Paper 11 at 9-10 (Apr. 2, 2019) (*precedential*).

Here, Ford and Dell are not the same entity, and there is no relevant relationship between Ford and Dell. Neo sued Dell long before it sued Ford, accusing completely different products. Neo cannot be heard to complain that its subsequent suit triggered subsequent IPRs. None of the remaining factors support denial based on the long-ago Dell IPR.

Likewise, Ford and VW are not the same entity, and there is no relevant relationship between these two *direct competitors*. Ford and VW were not even sued in the same court. They are only before the Board now due to Neo’s litigation strategy of filing seven separate infringement complaints against seven different automobile manufacturers in five different courts. *See infra* Related Cases. Even if Ford and VW were co-defendants (and they are not) that would not be enough to establish the significant relationship required for this factor. *Facebook, Inc. v.*

Express Mobile Inc., IPR2021-01455, Paper 11 at 11 (Mar. 4, 2022) (“*Express Mobile*”). And VW and Ford are *not* co-defendants. Neo sued Ford and VW in different district courts (Western District of Missouri and Eastern District of Tennessee), and then over Ford’s, VW’s, and several other defendants’ oppositions, Neo successfully moved to transfer seven different cases into a single multidistrict litigation *for pretrial proceedings only*. See Ex. 1013 (MDL Transfer Order). Ford’s and VW’s trials will be separately held in their respective district courts, with each defendant presenting its own invalidity theories to its respective jury.

And unlike HTC and Valve, Ford did not incorporate VW’s technology under license or receive VW’s technical assistance with respect to the accused products, or vice versa. Neo contends in court (but has not proven) that merely complying with the cellular LTE specification constitutes infringement. But even if true, and even if all seven of the accused defendants fully comply with the relevant aspects of the LTE specification, it takes much more than that to establish the requisite significant relationship. *Illumina, Inc. v. Ravgen, Inc.*, IPR2021-01271, Paper 12 at 14-20 (Jan. 26, 2022) (insufficient relationship even though parties use same supplier for a “key component”); *Google LLC v. Neonode Smartphones LLC*, IPR2021-01041, Paper 19 at 9-12 (Jan. 13, 2022) (“*Neonode*”) (insufficient relationship even though Google’s operating system was installed on Samsung’s accused phones).

That the seven parties submitted coordinated claim constructions and invalidity contentions is Neo's doing—Neo successfully transferred these cases to MDL for pretrial proceedings, as discussed. In any event, it is not enough to establish the significant relationship required for this factor. *Twitter, Inc. v. Palo Alto Rsch. Ctr., Inc.*, IPR2021-01458, Paper 11 at 31-33 (Apr. 6, 2022) (insufficient relationship despite coordinated invalidity contentions).

The Board's *Express Mobile* case, cited above, is particularly instructive. In that case, Express Mobile sued nine parties on the same day, including Google and Facebook, and several others shortly before and after. *Express Mobile*, Paper 11 at 11 (recognizing “myriad” suits). Google (like VW here) filed its IPR early, and Facebook filed its IPR five months later. The Board found that the parties were not related, even though Google and Facebook were sued in the same court on the same day, and despite the “coordination among numerous defendants” that is “often required in multi-defendant patent cases.” *Id.* at 9-11.

The parties are even less related here. The defendants were sued in different courts, and their trials will be held in those different courts. Most of them (including VW and Ford) *opposed* Neo's effort to consolidate pretrial proceedings in MDL. In short, Neo *ensured* that the defendants it sued in different courts would be forced to file, e.g., consolidated invalidity contentions. Neo cannot now *complain* about it.

Finally, Ford had no involvement with, much less input into, VW's IPR, and vice versa. Ford selected what it believed is the best prior art in view of the parties' agreed upon narrow claim construction and scope of the remaining two asserted claims, and independently came to a different conclusion that VW—which filed its IPR without the benefit of, and did not join, the Joint Claim Construction Statement (Ex. 1011).

Accordingly, this factor weighs “strongly” against denial. *Shenzhen Apaltek Co. v. Asetek Danmark A/S*, IPR2022-01318, Paper 7 at 10 (Feb. 6, 2023).

2. Factors 2, 4 and 5: knew of the art, length of time, and explanation

These factors are “less relevant” where, as here, the petitioner is “not the same party as, or significantly related to, the earlier petitioner(s).” *Illumina*, Paper 12 at 20; *Shenzhen Apaltek*, Paper 7 at 11 (citing cases explaining that “the second, fourth, and fifth *General Plastic* factors have a limited relevance” when the petitioners are not the same or related); *Express Mobile*, Paper 11 at 13 (no need to file earlier, absent the requisite relationship in Factor 1); *Google LLC v. Parus Holdings, Inc.*, IPR2020-00846, Paper 9 at 24-26 (Oct. 21, 2020) (“*Parus*”) (these factors are “moot” without the requisite relationship between the petitioners). This is especially so when, as here, the later-filed petitioner relies on different prior art. *Neonode*, Paper 19 at 12-14.

But even if the Board gives these factors some weight (and it should not), Ford was fully justified in waiting until Neo reduced the number of asserted claims to just *two claims* and the parties agreed to certain claim constructions. As a result, Ford knew of, or should have known of, the art in its IPR at the time VW hurriedly filed its IPR. But that is only because VW independently chose to prepare and file its IPR relatively early in this slow-moving multidistrict litigation.

In contrast to VW's hurried approach, Ford conserved party and Board resources by waiting until Neo reduced the number of asserted claims for all six asserted patents on November 28, 2022 (Ex. 1009 (*In re Neo* Reduction of Asserted Claims Op. (ECF 99)) at 7), down to just two claims for this patent,²⁴ and the parties agreed to several constructions in a Joint Statement submitted on January 18, 2023 (Ex. 1011 (Joint Claim Construction Statement) at 009-10 (preamble), 012-13 ("time-frequency coordinate" and the "modular coding" element)). This delay was reasonable and fully justified, as it conserved party and Board resources by focusing the dispute presented to the Board. *See LG Elecs., Inc. v. Bell N. Rsch., LLC*,

²⁴ Ford would have preferred further conserving party and Board resources until after Neo further reduces its number of asserted claims, but that will not happen until well after Ford's one-year bar date. *See* Ex. 1010 (*In re Neo* Claim Narrowing Op. (ECF 102)) at 3-4.

IPR2020-00319, Paper 15 at 13 (June 23, 2020) (finding that “wait[ing] until after Patent Owner’s election of claims” is a sufficient reason for delay); *Shenzhen AOTO Elecs. Co. v. Ultravision Techs., LLC*, IPR2021-00190, Paper 7 at 18-19 (June 9, 2021) (“not unreasonable” to wait until know “which claims will be at issue”).

And as explained in the next section, Ford gained no tactical advantage, other than conserving resources by challenging the only two claims in this patent that were asserted and adopting the parties’ agreed-upon constructions.

3. Factor 3: POPR, but no Institution Decision received

This factor should receive little weight, and is neutral in any event. As the Director explained in *Code200*, “road-mapping concerns are minimized” when, as here, the petitioner did not and could not “refine[]” its petition in view of any “lessons learned from later developments” because the merits of the previous POPR have not been addressed by the Board even though they were extensively addressed in the POPR. *Code200, UAB v. Bright Data Ltd.*, IPR2022-00861, Paper 18 at 5 (Aug. 23, 2022) (*precedential*) (“*Code200*”); *see also id.* Paper 14 (POPR) at 25-70 (June 20, 2022) (extensively addressing the merits). Indeed, the Board recently refused to deny under *General Plastic* despite two previous IPRs by other parties against the same patent, one of which was instituted and terminated due to settlement. *Siemens Gamesa Renewable Energy, Inc. v. General Elec. Co.*, IPR2022-01479, Paper 11 at 10-14 (Mar. 7, 2023).

In *Express Mobile*, for example, the Board was presented with similar circumstances as here: Google and Facebook were sued the same day, but Facebook filed its IPR roughly five months after Google—and thus after Express Mobile filed its POPR, but before the Board issued its institution decision. *Express Mobile*, Paper 11 at 12-13. The Board explained that, because Facebook “filed [its] Petition before the Board issued its decision in the [Google IPR],” Facebook “received limited benefit from having been able to review [the POPR] in that matter.” *Id.* (finding this factor did not favor denial).

And as discussed at the outset, Ford gained no unfair tactical advantage. The parties agreed in district court to adopt the same construction of the critical “time-frequency coordinate” that Neo argued for in its Dell and VW POPRs, i.e., a “*one-dimensional* time-frequency coordinate.” *See* Ex. 1011 (Joint Claim Construction Statement) at 012 (emphasis added). All Ford did was adopt that same construction here. Further, Ford’s prior art and arguments are completely different than VW’s (and Dell’s), showing that Ford did not gain any advantage. *See Shenzhen AOTO*, Paper 7 at 18 (finding this factor is due no weight); *Neonode*, Paper 19 at 13 (finding this factor favors institution).

Accordingly, this factor due little weight and neutral.

4. Factors 6-7: finite resources of the Board and ability to meet the one-year deadline

As mentioned in the previous sections, *Express Mobile* presented the Board with a similar set of facts. And in that case, the Board correctly found that these factors did not favor denial. *Express Mobile*, Paper 11 at 13. As the Director recently explained, “the Board’s mission” is “to improve patent quality and restore confidence in the presumption of validity that comes with issued patents.” *Code200*, Paper 18 at 6. That is true here, as well. Ford should not be prejudiced by VW’s litigation strategy to rush out an IPR as soon as possible, without waiting to see which claims are at issue and disavowing the parties’ agreed-upon constructions in the Joint Claim Construction Statement (Ex. 1011).

In addition, Ford streamlined this IPR by challenging the only two claims at issue in the litigation and adopting the parties’ agreed-upon claim constructions. And due to Dell’s and VW’s previous petitions, the Board “is now familiar with [the ’450 Patent’s] subject matter.” *Parus*, Paper 9 at 26 (“We thus discern no potential efficiency losses by conducting these trials, on different art, with different Petitioners.”); *Illumina*, Paper 12 at 25 (“[T]he panel is already familiar with the [’450] patent and certain prior art, so there are efficiencies gained.”) (footnote omitted).

And if the Board denies institution in VW’s IPR, significant efficiencies will be realized by instituting this IPR. Neo has accused *at least* seven defendants of

infringing these two patent claims. After pretrial proceedings are completed during MDL, each of those defendants will likely litigate the validity of these two claims in their respective district courts.

Accordingly, these factors favor institution, or at worst, are neutral.

5. Balancing the *General Plastic* factors

Ford is not the same party as, or significantly related to, VW or Dell. And because of that lack of relationship, coupled with the fact that Ford gained no unfair advantage from either of those previous petitions, all of the *General Plastic* factors favor institution or are neutral.

C. *Fintiv* does not warrant denial

Should Neo seek denial under *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 11 (Mar. 11, 2020) (“*Fintiv*”) (*precedential*), Ford will seek permission to reply to address the facts and law as they stand at that time. Under the current facts, *Fintiv* is not applicable. There is no trial scheduled. In fact, there is not even a scheduled date for remand from the MDL court to Ford’s trial court (in the Western District of Missouri) that will, upon that remand, schedule a trial date. And the median time to trial for civil actions in the Eastern District of Michigan (where the seven parties cases have been consolidated for pretrial proceedings) is over four years (50.4 months). Ex. 1012 at 040.

VI. Mandatory Notices under 37 C.F.R. § 42.8

A. Real Parties-in-Interest

The real party-in-interest is Ford Motor Company.

B. Related Matters

The USPTO Patent Center indicates that Application Serial Nos. 15/676,421 which issued as U.S. Patent No. 9,735,944; 14/720,554 which issued as U.S. Patent No. 9,042,337; 14/248,243 which issued as U.S. Patent No. 8,693,430; 13/115,055 which issued as U.S. Patent No. 7,948,944; 17/241,794 which issued as U.S. Patent No. 11,329,785; 17/879,011 which issued as U.S. Patent No. 11,528,114; 17/740,502 which issued as U.S. Patent No. 11,424,891; 17/024,089 which issued as U.S. Patent No. 10,958,398; 17/740,511 which issued as U.S. Patent No. 11,424,892; 17/884,733 which is pending; 17/884,725 which is pending; and 17/870,027 which is pending are related to the '450 Patent.

C. Grounds for Standing

Petitioner certifies that the '450 Patent is available for *inter partes* review and that Ford is not barred from requesting this proceeding.

D. Lead and Backup Counsel and Service Information

Pursuant to 37 C.F.R. §§ 42.8(b)(3), 42.8(b)(4), and 42.10(a), Ford designates the following lead counsel:

Petition for *Inter Partes* Review of USP 10,447,450

- Jonathan M. Strang (Reg. No. 61,724), jonathan.strang@lw.com, Latham & Watkins LLP; 555 Eleventh Street, NW, Ste. 1000; Washington, DC 20004-1304; 202.637.2362.

Ford also designates the following backup counsel:

- Matthew J. Moore (Reg. No. 42,012), matthew.moore@lw.com, Latham & Watkins LLP; 555 Eleventh Street, NW, Ste. 1000; Washington, DC 20004-1304; 202.637.2278.
- Ashley N. Finger (Reg. No. 78,093), ashley.finger@lw.com, Latham & Watkins LLP; 555 Eleventh Street, NW, Ste. 1000; Washington, DC 20004-1304; 202.654.7140.

Pursuant to 37 C.F.R. § 42.10(b), a Power of Attorney from Ford is attached.

Ford consents to electronic service.

E. Fee for *Inter Partes* Review

The Director is authorized to charge the fee specified by 37 C.F.R. § 42.15(a) to Deposit Account No. 506269.

VII. Conclusion

For the reasons set forth above, Petitioner Ford respectfully requests *inter partes* review of the challenged claims of the '450 Patent.

Respectfully submitted,

Dated: March 29, 2023

By: / Jonathan M. Strang /

Jonathan M. Strang (Reg. No. 61,724)
jonathan.strang@lw.com
Latham & Watkins LLP
555 Eleventh Street, NW, Ste. 1000
Washington, DC 20004-1304
Telephone: 202.637.2200
Fax: 202.637.2201

*Counsel for Petitioner
Ford Motor Company*

CERTIFICATE OF COMPLIANCE WITH 37 C.F.R. § 42.24

I hereby certify that this Petition complies with the word count limitation of 37 C.F.R. § 42.24(a)(1)(i) because the Petition contains a total of 12,506 words as calculated by Microsoft Word's word-count feature. This total excludes the cover page, signature block, and the parts of the Petition exempted by 37 C.F.R. § 42.24(a)(1).

By: / Jonathan M. Strang /

Jonathan M. Strang (Reg. No. 61,724)
jonathan.strang@lw.com
Latham & Watkins LLP
555 Eleventh Street, NW, Ste. 1000
Washington, DC 20004-1304
Telephone: 202.637.2200
Fax: 202.637.2201

Counsel for Petitioner
Ford Motor Company

CERTIFICATE OF SERVICE

The undersigned certifies that a complete copy of this Petition for *Inter Partes* Review of U.S. Patent No. 10,447,450 and all Exhibits and other documents filed together with this Petition were served on the official correspondence address for the patent shown in Patent Center:

Anthony Volpe
C. Koenig
VOLPE KOENIG
30 SOUTH 17TH STREET, 18TH FLOOR
PHILADELPHIA, PA 19103

via FEDERAL EXPRESS next business day delivery, on March 29, 2023.

By: / Jonathan M. Strang /

Jonathan M. Strang (Reg. No. 61,724)
jonathan.strang@lw.com
Latham & Watkins LLP
555 Eleventh Street, NW, Ste. 1000
Washington, D.C. 20004-1304
Telephone: 1.202.637.2200
Fax: 202.637.2201

*Counsel for Petitioner Ford Motor
Company*