

Table 1: Comparing Select Sections of Almeroth Declaration to Corresponding Sections of Petition

Section/Topic	Almeroth Declaration (EX1002)	Petition re: '337 Patent
<p>Grounds for Unpatentability:</p> <p>Overview and Motion to Combine</p>	<p>VI. GROUND: Chincholi In Combination With Riggert Renders Claims 1-30 Obvious²</p> <p>A. Overview and Motivation to Combine</p> <p>68. In my opinion, Chincholi in combination with Riggert renders claims 1-30 obvious. As I explain below, Chincholi teaches the same architecture as the '337 patent, including a wireless networking device with multiple transceivers, each having actual MAC and PHY interfaces. Chincholi uses a single "Opportunistic Multiple-Medium Access Control (MAC) Aggregation layer," positioned above the actual MAC-PHY layers of each transceiver, to aggregate available bandwidth portions to efficiently meet the requirements of data streams from one or more applications. (EX1005 at [0122-0123].)</p> <p>EX1002 ¶ 68.</p>	<p>VII. GROUND: Chincholi In Combination With Riggert Renders Claims 1-30 Obvious¹</p> <p>A. Overview and Motivation to Combine</p> <p>As discussed in more detail below, Chincholi teaches the same architecture as the '337 patent, including a wireless networking device with multiple transceivers, each having actual MAC and PHY interfaces. (EX1002, ¶¶68-75.) Chincholi uses a single "Opportunistic Multiple-Medium Access Control (MAC) Aggregation layer," positioned above the actual MAC-PHY layers of each transceiver, to receive feedback information available bandwidth portions to efficiently meet the requirements of data streams from one or more applications. (EX1005, [0122-0123].)</p> <p>Petition at 9-10.</p>
	<p>69. Chincholi expressly discloses receiving, at the OMMA layer, feedback information regarding bandwidth availability on a per-transceiver basis and feeding that information back to the OMMA layer's virtual MAC function. (EX1005 at [0137].) In my opinion, because Chincholi already discloses a partial virtualization of the MAC function at the OMMA layer, a POSITA would have been motivated to leverage this virtualization at the OMMA/transceiver interfaces to further increase flexibility in the system. Specifically, in my opinion, rather than implement static (and limited) interfaces between Chincholi's OMMA layer and each RAT—i.e., each network protocol stack and associated transceiver—a POSITA would have recognized the opportunity to implement "virtual PHY" interfaces. By 2013, virtualization was a well-understood and widely used tool in computing. A POSITA would have recognized that applying virtualization at the OMMA/transceiver interface—by adding one or more virtual PHY interfaces—would have been a straightforward extension of Chincholi's basic architecture and system design.</p>	<p>Chincholi expressly discloses receiving, at the OMMA layer, feedback information regarding bandwidth availability on a per-transceiver basis and feeding that information back to the OMMA layer's virtual MAC function. (EX1002, ¶69; EX1005, [0137].) Because Chincholi already discloses a partial virtualization of the MAC function at the OMMA layer, a POSITA would have been motivated to leverage this virtualization at the OMMA/transceiver interfaces to further increase flexibility in the system. (EX1002, ¶69.) Specifically, rather than implement static (and limited) interfaces between Chincholi's OMMA layer and each RAT, a POSITA would have recognized the opportunity to implement "virtual PHY" interfaces. (<i>Id.</i>)</p> <p>Petition at 10-11.</p>

Comparison of Almeroth Decl. (Ex. 1002) vs. Petition
Identical, Minor Changes, Paraphrased

Samsung v. XiFi (IPR2025-01203)
Patent Owner XiFi's Exhibit 2006, Page 2

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	<p>EX1002 ¶ 69.</p> <p>70. Providing a “virtualized” PHY interface between the OMMA layer and the RATs in Chincholi would have been particularly beneficial in implementing an 802.11-based system. This is because implementing virtualized PHY interfaces would allow the system to accommodate communication channels with wireless devices that may operate using various different generations of the 802.11 standards. (EX1005 at [0134] (teaching that “[a] Wi-Fi RAT may be a IEEE802.11n RAT, a IEEE802.11ac RAT, a IEEE802.11af RAT, etc.”).) Virtualization of the physical interface for this purpose is taught, for example, in U.S. Patent Application 2009/0141691 (“Jain”), (EX1007 at [0034-0037]). In my opinion, a POSITA would have recognized that virtualizing the interfaces between Chincholi’s OMMA layer and individual RATs would result in a flexible and “reconfigurable” PHY interface that could be used to match the different needs of potential recipient devices and networks. (EX1007 (Jain) at [0033]).</p> <p>EX1002 ¶ 70.</p> <p>72. In my opinion, a POSITA would have been motivated to modify Chincholi according to the teachings of Riggert’s “virtual PHY” to improve the system of Chincholi. The references both arise in the same field of endeavor and are similarly addressed to increasing bandwidth efficiency and throughput in multi-transceiver, wireless communication networks. (EX1005 at [0002] (“Wireless technologies have been demanding higher data throughput rates and lower latencies”); EX1006 at [0004] (“In the field of data streaming in a network, there is</p>	<p>Providing a “virtualized” PHY interface between the OMMA layer and the RATs in Chincholi would have been particularly beneficial in implementing an 802.11 system. This is because implementing virtualized PHY interfaces would allow the system to accommodate communication channels with wireless devices that may operate using various different generations of the 802.11 standards. (EX1002, ¶70; EX1005, [0134] (teaching that “[a] Wi-Fi RAT may be a IEEE802.11n RAT, a IEEE802.11ac RAT, a IEEE802.11af RAT, etc.”).) Virtualization of the physical interface for this purpose is taught, for example, in U.S. Patent Application 2009/0141691 (“Jain”), (EX1007, [0034-0037]); (EX1002, ¶70.) A POSITA would have recognized that virtualizing the interfaces between Chincholi’s OMMA layer and individual RATs would result in a flexible and “reconfigurable” PHY interface that could be used to match the different needs of potential recipient devices and networks. (EX1002, ¶70; EX1007, [0033].)</p> <p>Petition at 11.</p> <p>A POSITA would have been motivated to modify Chincholi according to the teachings of Riggert’s “virtual PHY” to improve the system of Chincholi. (EX1002, ¶72.) The references both arise in the same field of endeavor and are similarly addressed to increasing bandwidth efficiency and throughput in multi-transceiver, wireless communication networks. (EX1005, [0002] (“Wireless technologies have been demanding higher data throughput rates and lower latencies”); EX1006, [0004] (“In the field of data streaming in a network, there is a problem in that data streaming from a sending endpoint to a recipient endpoint may be detrimentally affected by limited network bandwidth”)). Both references address 802.11 type systems specifically. (EX1005, [0138]; EX1006, [0057].)</p>

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	<p>a problem in that data streaming from a sending endpoint to a recipient endpoint may be detrimentally affected by limited network bandwidth . . ."). Both references address 802.11 type systems specifically. (See, e.g., EX1005 at [0137]; EX1006 at [0057].)</p> <p>EX1002 ¶ 72.</p>	<p>Petition at 12-13.</p>
	<p>73. In my opinion, Riggert's "bondable virtual interface" would improve the system of Chincholi by providing a flexible, universal interface between the OMMA layer and the actual transceiver resources. (EX1006 at [0065] ("The bondable virtual interfaces 236 and 336 conform to an interface, which allows them to be used generically in the framework.")) The combined system would improve Chincholi by providing a universal interface between the OMMA controller and sets of potentially differently configured RATs, a benefit that cannot be achieved alone by Chincholi's system. This combination would allow Chincholi's system to operate seamlessly with a wider variety of recipient devices operating on different versions of the 802.11 standards.</p> <p>EX1002 ¶ 73.</p>	<p>Riggert's "bondable virtual interface" would improve the system of Chincholi by providing a flexible, universal interface between the OMMA layer and the actual transceiver resources. (EX1002, ¶73; EX1006, [0065] ("The bondable virtual interfaces 236 and 336 conform to an interface, which allows them to be used generically in the framework.")) The combined system would improve Chincholi by providing a universal interface between the OMMA controller and sets of potentially differently configured RATs, a benefit that cannot be achieved alone by Chincholi's system. (EX1002, ¶73.) This combination would allow Chincholi's system to operate seamlessly with a wider variety of recipient devices operating on different versions of the 802.11 standards. (Id.)</p> <p>Petition at 13.</p>
	<p>74. In my opinion, implementing Riggert's virtualized PHY interfaces into Chincholi would have been straightforward, requiring no more than the exercise of ordinary skill in the art, given that Chincholi already contemplates a virtualization of the MAC function at the OMMA layer. A POSITA would have been well aware of virtualization as a general technique in computing by 2013 and, given the guidance provided by Riggert in combination with the architecture of Chincholi,</p>	<p>Implementing Riggert's virtualized PHY interfaces into Chincholi would be straight-forward, requiring no more than the exercise of ordinary skill in the art, given that Chincholi already contemplates a virtualization of the MAC function at the OMMA layer. (EX1002, ¶74.) Based on the above, a POSITA would have recognized that the combination could be accomplished with a reasonable expectation of success. (Id.)</p> <p>Petition at 13.</p>

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	<p>would have understood how to implement virtualized PHY interfaces to extend Chincholi's basic architecture and system. In my opinion, based on the above, a POSITA would have recognized that the combination could be accomplished with a reasonable expectation of success.</p> <p>EX1002 ¶ 74.</p>	
<p>Grounds for Unpatentability:</p> <p>Preamble</p>	<p>76. In my opinion, and to the extent limiting, Chincholi/Riggert discloses the preamble of claim 1. Chincholi discloses "[s]ystems, methods, and instrumentalities . . . for managing multiple radio access technology (RAT) interfaces to enable opportunistic RAT selection and aggregation for sending data traffic over the multiple RAT interfaces." (EX1005 at Abstract; <i>see also</i> [0003].)</p> <p>77. Chincholi discloses that its system may be implemented in connection with the RAT interfaces of a ("NT"), such as an access point, or a wireless transmit/receive unit ("WTRU"). These terminals "may be configured to work in an infrastructure mode or an adhoc mode, for example, in an IEEE802.11 based Wi-Fi system. (<i>Id.</i> at [0115].) Both are "wireless networking devices."</p> <p>78. Chincholi's methods improve the performance of the disclosed wireless networking device, for example, by enabling dynamic selection and aggregation of wireless interfaces (<i>id.</i> at [0003]), which enhances throughput and reduces latency (<i>id.</i> at [0002]).</p> <p>EX1002 ¶¶ 76-78.</p>	<p>Chincholi discloses "[s]ystems, methods, and instrumentalities . . . for managing multiple radio access technology (RAT) interfaces to enable opportunistic RAT selection and aggregation for sending data traffic over the multiple RAT interfaces." (EX1005, Abstract; [0003]; EX1002, ¶¶ 76-78.)</p> <p>Chincholi discloses that its systems and methods may be implemented in connection with the RAT interfaces of a ("NT"), such as an access point, or a wireless transmit/receive unit ("WTRU"). These terminals "may be configured to work in an infrastructure mode or an adhoc mode . . . in an IEEE802.11 based Wi-Fi system." (<i>Id.</i>, [0115].) Each is a "wireless networking device." (EX1002, ¶77.)</p> <p>Chincholi's methods improve the performance of the disclosed wireless networking device, for example, by enabling dynamic selection and aggregation of wireless interfaces (<i>id.</i>, [0003]), which enhances throughput and reduces latency (<i>id.</i>, [0002]; EX1002, ¶78.). As discussed in the below limitations, Chincholi/Riggert discloses a method of improving the performance of a wireless networking device, as claimed. (<i>Id.</i>)</p> <p>Petition at 14.</p>

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<p>Grounds for Unpatentability:</p> <p>Claim 1(a)</p>	<p>b) 1[a]: connecting an application interface to a processing interface, the application interface being associated with a first application, the first application providing, when the wireless networking device is being used, a first data stream and having a first wireless bandwidth requirement;</p> <p>79. In my opinion, Chincholi/Riggert discloses this limitation.</p> <p>80. "a first application . . .": Chincholi discloses that "[u]sing multiple RATs simultaneously may provide the benefit of increased bandwidth for an application (e.g., an IP flow) as well as increased reliability." (EX1005 at [0191].)</p> <p>81. "providing, when the wireless networking device is being used, a first data stream . . .": The first data stream of a first application is referred to as an "IP flow." (EX1005 at [0132] ("A single IP flow may refer to a stream of IP packets belong[ing] to a particular application.").)</p> <p>82. "application interface being associated with [the] first application": In an 802.11 embodiment (Figure 5), IP packets associated with the application data stream come from or are destined to an IP layer 504. Thus the IP flow (i.e., the first data stream) is provided by the application when the wireless networking device is being used. (EX1005 at [0138], Table 1 ("S" interface is for "Incoming/Outgoing IP Packets").) The "[S]" interface from the IP layer for the IP stream is therefore an "application interface associated with a first application."</p>	<p>b) 1[a]: connecting an application interface to a processing interface, the application interface being associated with a first application, the first application providing, when the wireless networking device is being used, a first data stream and having a first wireless bandwidth requirement;</p> <p>"a first application . . .": Chincholi discloses that "[u]sing multiple RATs simultaneously may provide the benefit of increased bandwidth for an application (e.g., an IP flow) as well as increased reliability." (EX1005, [0191]; EX1002, ¶¶79-85.)</p> <p>"providing, when the wireless networking device is being used, a first data stream . . .": The first data stream of a first application is referred to as an "IP flow." (EX1005, [0132] ("A single IP flow may refer to a stream of IP packets belong[ing] to a particular application."); EX1002, ¶81.)</p> <p>"application interface being associated with [the] first application": In an 802.11 embodiment (Figure 5), IP packets associated with the application data stream come from or are destined to an IP layer 504. Thus, the IP flow (i.e., the first data stream) is provided by the application when the wireless networking device is being used. (EX1005, [0138], Table 1 ("S" interface is for "Incoming/Outgoing IP Packets").) The interface from the IP layer for the IP stream "[S]" is therefore an application interface associated with a first application. (EX1002, ¶82.)</p>

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	<p>83. “connecting an application interface to a processing interface”: Chincholi teaches an “Opportunistic Multiple-Medium Access Control (MAC) Aggregation (OMMA) layer.” (EX1005 at [0003].) A POSITA would have understood that the plain meanings of “interface” and “layer” in the context of the '337 patent are congruent, which is underscored by the specification describing layers having the same functionality as the claimed interfaces, and the prosecution history of the prior related '591 patent, where Applicant interchangeably used the terms “layer” and “interface” to describe Figure 1. (EX1017, Aug. 8, 2023 Applicant Remarks; Sep. 28, 2023 Applicant Remarks.) The OMMA layer is a common layer/module between the IP layer/module and the multiple RAT layers/modules. (EX1005 at [0137]; see also <i>id.</i> at [0120] (“[T]he single thin software layer may enable one RAT to operate over industrial scientific medical (ISM) and another RAT to operate over a TVWS band for the same IP flow.”).) An exemplary OMMA layer enabling a dual-RAT aggregation device in a 802.11n network is shown in Figure 5:</p> <p>84. The IP layer interface (<i>i.e.</i>, the <i>application interface</i>) is connected to the OMMA layer and provides IP packets that the OMMA layer processes. (EX1005 at [0137].) The OMMA “may allow for enhanced throughput and reduced latency for a single IP flow.” (EX1005 at [0120].) The OMMA layer therefore processes IP packets and provides an <i>interface</i> between the IP layer interface (the <i>application interface</i>) and the actual MAC interfaces, <i>i.e.</i>, a <i>processing interface</i>.</p> <p>85. “first application . . . having a first wireless bandwidth requirement”: Chincholi teaches “a bandwidth requirement for an IP flow.” (EX1005 at [0260].) It thus teaches that the first application has a first bandwidth requirement. EX1002 ¶¶ 80-85 (identical figure omitted).</p>	<p>“connecting an application interface to a processing interface”: Chincholi teaches an “Opportunistic Multiple-Medium Access Control (MAC) Aggregation (OMMA) layer.” (EX1005, [0003]; EX1002, ¶83.) A POSITA would have understood that the plain meanings of “interface” and “layer” in the context of the '337 patent are congruent, which is underscored by the specification describing layers having the same functionality as the claimed interfaces, and the prosecution history of the prior related '591 patent, where Applicant interchangeably used the terms “layer” and “interface” to describe Figure 1. (EX1002, ¶83; EX1017, Aug. 8, 2023 Applicant Remarks; Sep. 28, 2023 Applicant Remarks.) The OMMA layer is a common layer/module between the IP layer/module and the multiple RAT layers/modules. (EX1005, [0137]; [0120] (“[T]he single thin software layer may enable one RAT to operate over industrial scientific medical (ISM) and another RAT to operate over a TVWS band for the same IP flow.”).) An exemplary OMMA layer enabling a dual-RAT aggregation device in an 802.11n network is shown in Figure 5:</p> <p>The IP layer interface (<i>i.e.</i>, the <i>application interface</i>) is connected to the OMMA layer and provides IP packets that the OMMA layer processes. (EX1005,</p>

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		<p>[0137]); (EX1002, ¶84.) The OMMA “may allow for enhanced throughput and reduced latency for a single IP flow.” (EX1005, [0120].) The OMMA layer therefore processes IP packets and provides an interface between the IP layer interface (the application interface) and the actual MAC interfaces, i.e., a processing interface. (EX1002, ¶84.)</p> <p>“first application . . . having a first wireless bandwidth requirement”: Chincholi teaches “a bandwidth requirement for an IP flow.” (EX1005, [0260].) It thus teaches that the first application has a first bandwidth requirement (EX1002, ¶85.)</p> <p>Petition at 15-18 (identical figure omitted).</p>
<p>Grounds for Unpatentability:</p> <p>Claim 1(b)</p>	<p>c) 1[b]: connecting first and second actual MAC interfaces to the processing interface;</p> <p>86. In my opinion, Chincholi/Riggert discloses this limitation. Chincholi discloses connecting first and second actual MAC interfaces to the processing interface (i.e., the common OMMA layer). Figure 5, for example, depicts a “dual-RAT aggregation” with the common OMMA layer existing above and connected to two RATs 501a and 501b, which comprise first and second actual MAC interfaces 502, respectively. (EX1005 at [0138] (“The RATs 501a, 501b may comprise a MAC layer/module 502 and one or more physical layers/modules 503.”).)</p> <p>87. Consistent with Figure 5, Chincholi explains that a given RAT can comprise a “PHY/MAC,” i.e., includes an actual MAC interface. (EX1005 at [0135].) A POSITA would have understood that in a typical 802.11 implementation, each RAT would have actual MAC and PHY interfaces.</p> <p>EX1002 ¶¶ 86-87 (identical figure omitted).</p>	<p>c) 1[b]: connecting first and second actual MAC interfaces to the processing interface;</p> <p>Chincholi discloses connecting first and second actual MAC interfaces to the processing interface (i.e., the common OMMA layer). (EX1002, ¶¶86-87.) Figure 5, for example, depicts a “dual-RAT aggregation” with the common OMMA layer existing above and connected to two RATs 501a and 501b, which comprise first and second actual MAC interfaces 502, respectively. (EX1005, [0138] (“The RATs 501a, 501b may comprise a MAC layer/module 502 and one or more physical layers/modules 503.”).)</p> <p>Consistent with Figure 5, Chincholi explains that a given RAT can comprise a “PHY/MAC,” i.e., includes an actual MAC interface. (EX1005, [0135].) A POSITA would have understood that in a typical 802.11 implementation, each RAT would have actual MAC and PHY interfaces. (EX1002, ¶87.)</p> <p>Petition at 18-19 (identical figure omitted).</p>

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<p>Grounds for Unpatentability:</p> <p>Claim 1(d)</p>	<p>e) 1[d]: respectively associating first and second wireless transceivers with the first and second actual PHY interfaces, wherein each of the first and second wireless transceivers (i) is suitable for use in a wireless local area network, (ii) has a first and second bandwidth availability up to first and second actual bandwidths, and (iii) is adapted to emit radio waves in first and second different bands of frequencies;</p> <p>89. In my opinion, Chincholi/Riggert discloses this limitation.</p> <p>90. “respectively associating first and second wireless transceivers with the first and second actual PHY interfaces ... suitable for use in a wireless local area network”: The system shown in annotated Figure 5 associates each actual PHY interface of each RAT with an antenna/radio frequency (RF) front-end pair. (EX1005, [0133].)</p> <p>91. The antenna/radio frequency (RF) front-end pairs in Figure 5 include first and second transceivers. A POSITA would have understood that a “transceiver” is a physical device that can both transmit and receive information. (Id.) Thus, each</p>	<p>e) 1[d]: respectively associating first and second wireless transceivers with the first and second actual PHY interfaces, wherein each of the first and second wireless transceivers (i) is suitable for use in a wireless local area network, (ii) has a first and second bandwidth availability up to first and second actual bandwidths, and (iii) is adapted to emit radio waves in first and second different bands of frequencies;</p> <p>“respectively associating first and second wireless transceivers with the first and second actual PHY interfaces ... suitable for use in a wireless local area network”: The system shown in annotated Figure 5 associates each actual PHY interface of each RAT with an antenna/radio frequency (RF) front-end pair. (EX1005, [0133]; EX1002, ¶¶89-98.)</p> <p>The antenna/radio frequency (RF) front-end pairs in Figure 5 include first and second transceivers. (EX1002, ¶91.) A POSITA would have understood that a “transceiver” is a physical device that can both transmit and receive information. (Id.) Thus, each of Chincholi’s disclosed “antenna/RF front-end pairs” is a wireless</p>

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	<p>of Chincholi's disclosed "antenna/Rf front-end pairs" is a wireless transceiver because each operates according to wireless protocols for transmitting and receiving data, such as IEEE802.11, IEEE802.11ac, IEEE802.11af, LTE, WCDMA, etc. (EX1005, [0134].) A POSITA would have further understood that the transceivers in Figure 5 are associated with the actual PHY layer of each respective RAT, because the PHY layer is understood to be the physical connection between a transceiver and the rest of the RAT.</p> <p>92. Chincholi also teaches that each RAT may be implemented as a Wi-Fi RAT, and thus their associated transceivers are suitable for use in a wireless local area network. (Ex. 1005 [0134].)</p> <p>93. "each of the first and second wireless transceivers ... has a first and second bandwidth availability up to first and second actual bandwidths": The plain meaning of this limitation is that each of the wireless transceivers has at least two bandwidth availabilities and two respective actual bandwidths. However, Patent Owner has alleged in the parallel litigation that this limitation may be met by each of the two wireless transceivers having one respective bandwidth availability up to an actual bandwidth. (EX1012; EX1013.) Regardless, Chincholi discloses or renders obvious this limitation under either interpretation.</p> <p>94. Consistent with PO's infringement contentions, a POSITA would have recognized that each transceiver has an "actual" bandwidth (i.e., total bandwidth of</p>	<p>transceiver because each operates according to wireless protocols for transmitting and receiving data, such as IEEE802.11, IEEE802.11ac, IEEE802.11af, LTE, WCDMA, etc. (EX1005, [0134].) A POSITA would have further understood that the transceivers in Figure 5 are associated with the actual PHY layer of each respective RAT, because the PHY layer is understood to be the physical connection between a transceiver and the rest of the RAT. (EX1002, ¶91.)</p> <p>Chincholi also teaches that each RAT may be implemented as a Wi-Fi RAT, and thus their associated transceivers are suitable for use in a wireless local area network. (Ex. 1005 [0134]; EX1002, ¶92.)</p> <p>"each of the first and second wireless transceivers ... has a first and second bandwidth availability up to first and second actual bandwidths": The plain meaning of this limitation is that each of the wireless transceivers has at least two bandwidth availabilities and two respective actual bandwidths. However, Patent Owner has alleged in the parallel litigation that this limitation may be met by each of the two wireless transceivers having one respective bandwidth availability up to an actual bandwidth. (EX1012; EX1013, 19-20.) Regardless, Chincholi discloses or renders obvious this limitation under either interpretation.</p> <p>Consistent with PO's infringement contentions, a POSITA would have recognized that each transceiver has an "actual" bandwidth (i.e., total bandwidth of the transceiver) with a "bandwidth availability" that may be a subset of the actual</p>

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	<p>the transceiver) with a "bandwidth availability" that may be a subset of the actual bandwidth (i.e., sub-portions of the total bandwidth that are available for use). Indeed, as Chincholi teaches, the RATs associated with each transceiver provide "meta-data feedback" allowing the OMMA layer to split IP packets amongst the RATs based on their available bandwidth. (EX1005 at [0138]; [0161] (listing "Channel bandwidth(s)" sent by the PHY layer as an example of "feedback metric[]" used by an OMMA layer"); see also <i>id.</i> at [0167] ("At startup, the OMMA layer may receive the available bandwidth of each of the one or more RATs.")) Thus, Chincholi discloses that each of the two transceivers has a bandwidth availability up to an actual bandwidth.</p> <p>95. Chincholi also discloses that there are multiple available bandwidths for each transceiver, specifically that a transceiver's feedback metrics include available "[c]hannel bandwidth(s)" in the form of a "Vector/list of elements which are multiple of 0.5 MHz." EX1005 [0161], Table 2. A POSITA would have understood a "vector" or "list" data structure is a data structure for transferring multiple data elements of indeterminate count, and would therefore understand that the number of available "channel bandwidths" stored in the vector could and would exceed two.</p> <p>EX1002 ¶¶ 88-95.</p> <p>96. "each of the first and second wireless transceivers ... is adapted to emit radio waves in first and second different bands of frequencies". The plain</p>	<p>bandwidth (i.e., sub-portions of the total bandwidth that are available for use). (EX1002, ¶94.) Indeed, as Chincholi teaches, the RATs associated with each transceiver provide "meta-data feedback" allowing the OMMA layer to split IP packets amongst the RATs based on their available bandwidth. (EX1005, [0138]; [0161] (listing "Channel bandwidth(s)" sent by the PHY layer as an example of "feedback metric[]" used by an OMMA layer"); [0167] ("At startup, the OMMA layer may receive the available bandwidth of each of the one or more RATs.")) Thus, Chincholi discloses that each of the two transceivers has a bandwidth availability up to an actual bandwidth.</p> <p>Chincholi also discloses that there are multiple available bandwidths for each transceiver, specifically that a transceiver's feedback metrics include available "[c]hannel bandwidth(s)" in the form of a "Vector/list of elements which are multiple of 0.5 MHz." (EX1005, [0161], Table 2.) A POSITA would have understood a "vector" or "list" data structure is a data structure for transferring multiple data elements of indeterminate count, and would therefore have understood that the number of available "channel bandwidths" stored in the vector could and would exceed two. (EX1002, ¶95.)</p> <p>Petition at 20-23.</p> <p>"each of the first and second wireless transceivers ... is adapted to emit radio waves in first and second different bands of frequencies". The plain meaning of this limitation is that each of the transceivers emit radio waves in the same two</p>

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	<p>meaning of this limitation is that each of the transceivers emit radio waves in the same two frequency bands. Patent Owner, however, has read this limitation to only require that each transceiver emit on a single, mutually exclusive frequency band. For example, in its infringement contentions, Patent Owner alleges that this limitation is met by implementation of the Wi-Fi 7 Draft Standard where "[t]he first transceiver is the 2.4 GHz transceiver," the second is "one of the 5 GHz and 6 GHz transceivers." (EX1012; EX1013 at 19-20.) Regardless, Chincholi discloses or renders obvious this limitation under either interpretation.</p> <p>97. The transceivers of each RAT are adapted to emit radio waves in respective different bands of frequencies, consistent with PO's infringement contentions. In the context of Figure 4, Chincholi discloses that "[f]or multiple RATs 401, each RAT 401 may be operating on a specific band. For example, a 802.11n PHY/MAC operating over 2.4GHz ISM band, a 802.11af PHY/MAC operating over 512 MHz-698 MHz TVWS band, an LTE RAT operating of a licensed band (e.g., 700 MHz band), a Bluetooth RAT operating on 2.4 GHz ISM band, etc." (EX1005 at [0135].) Thus, a POSITA would have understood that Chincholi discloses this limitation under PO's interpretation.</p> <p>98. Chincholi also discloses that each transceiver can emit radio waves within all of the at least two frequency bands. For example, Chincholi describes that an NT and WTRU "may communicate with each other over a single radio frequency</p>	<p>frequency bands. (EX1002, ¶96.) Patent Owner, however, has read this limitation to only require that each transceiver emit on a single, mutually exclusive frequency band. For example, in its infringement contentions, Patent Owner alleges that this limitation is met by implementation of the Wi-Fi 7 Draft Standard where "[t]he first transceiver is the 2.4 GHz transceiver," the second is "one of the 5 GHz and 6 GHz transceivers." (EX1012; EX1013, 19-20.) Regardless, Chincholi discloses or renders obvious this limitation under either interpretation. (EX1002, ¶96.)</p> <p>The transceivers of each RAT are adapted to emit radio waves in respective different bands of frequencies, consistent with PO's infringement contentions. In the context of Figure 4, Chincholi discloses that "[f]or multiple RATs 401, each RAT 401 may be operating on a specific band. For example, a 802.11n PHY/MAC operating over 2.4GHz ISM band, a 802.11af PHY/MAC operating over 512 MHz-698 MHz TVWS band, an LTE RAT operating of a licensed band (e.g., 700 MHz band), a Bluetooth RAT operating on 2.4 GHz ISM band, etc." (EX1005, [0135].) Thus, a POSITA would have understood that Chincholi discloses this limitation under PO's interpretation. (EX1002, ¶97.)</p> <p>Chincholi also discloses that each transceiver can emit radio waves within all of the at least two frequency bands. For example, Chincholi describes that an NT and WTRU "may communicate with each other over a single radio frequency (RF) spectral band" such as "2.4 GHz ISM band, or 5 GHz ISM band," even when the</p>

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	<p>(RF) spectral band" such as "2.4 GHz ISM band, <i>or</i> 5 GHz ISM band," even when the devices are "multi-RAT capable devices," <i>i.e.</i> comprising multiple transceivers. (EX1005 at [0118].) Chincholi further describes that the frequency band is comprised of "multiple contiguous or noncontiguous channels" within the band over which the devices communicate. <i>Id.</i> Accordingly, a POSITA would have understood that each transceiver operating on the 2.4 GHz ISM band is adapted to emit radio waves in any one of two contiguous channels, <i>i.e.</i>, the first and second different bands of frequencies, and thus satisfies the claim limitation under the alternative interpretation.</p> <p>EX1002 ¶¶ 96-98</p>	<p>devices are "multi-RAT capable devices," <i>i.e.</i> comprising multiple transceivers. (EX1005, [0118].) Chincholi further describes that the frequency band is comprised of "multiple contiguous or noncontiguous channels" within the band over which the devices communicate. <i>Id.</i> Accordingly, a POSITA would have understood that each transceiver operating on the 2.4 GHz ISM band is adapted to emit radio waves in any one of two contiguous channels, <i>i.e.</i>, the first and second different bands of frequencies, and thus satisfies the claim limitation under the alternative interpretation. (EX1002, ¶98.)</p> <p>Petition at 23-25.</p>
<p>Grounds for Unpatentability:</p> <p>Claim 1(e)</p>	<p>f) <i>1[e]: forming in the processing interface (i) at least one virtual MAC interface and (ii) first and second virtual PHY interfaces that, during operation of the wireless networking device, feed information regarding the bandwidth availabilities of the first and second wireless transceivers back to the at least one virtual MAC interface;</i></p> <p>99. In my opinion, Chincholi/Riggert discloses or renders obvious this limitation. According to the '337 patent, the claimed virtual MAC and PHY layers "enable simultaneous allocation of multiple PHY resources for different signal types associated with different applications." (EX1001 at 3:41-47.) The patent states that the virtual MAC layer comprises the functionality of "decision," "processing," and "ultra-streaming" blocks, while the virtual PHY layer may comprise one or more "RF blocks." (EX1001 at 4:39-44.) The virtual PHY layer may include multiple RF</p>	<p>f) <i>1[e]: forming in the processing interface (i) at least one virtual MAC interface and (ii) first and second virtual PHY interfaces that, during operation of the wireless networking device, feed information regarding the bandwidth availabilities of the first and second wireless transceivers back to the at least one virtual MAC interface;</i></p> <p>According to the '337 patent, the claimed virtual MAC and PHY layers "enable simultaneous allocation of multiple PHY resources for different signal types associated with different applications." (EX1001, 3:41-47.) The patent states that the virtual MAC layer comprises the functionality of "decision," "processing," and "ultra-streaming" blocks, while the virtual PHY layer may comprise one or more "RF blocks." (EX1001, 4:39-44.) The virtual PHY layer may include multiple RF blocks, each representing the virtual use of some set of allocated transceiver resources. (<i>Id.</i>, 4:41-44; Fig. 3 (depicting two RF blocks associated with "two sets"</p>

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	<p>blocks, each representing the virtual use of some set of allocated transceiver resources. (<i>Id.</i> at 4:41-44; <i>see also</i> Fig. 3 (depicting two RF blocks associated with "two sets" of transceiver resources).) "By employing a virtual MAC and virtual PHY between an application layer and an actual MAC and PHY layer, wireless transceiver resources may be allocated more efficiently to handle various data bandwidth requirements from different applications." (EX1001 at 5:60-64.)</p> <p>100. <i>First</i>, Chincholi discloses that the OMMA (<i>i.e.</i>, the processing interface) includes the claimed "virtual MAC interface." Indeed, "OMMA" is an abbreviation for "opportunistic multi-medium access control (MAC) aggregation," which refers to the fact that the OMMA layer aggregates multiple MAC interfaces, as depicted in Figure 5. (EX1005 at [0120].) The OMMA layer includes an interface acting as a "virtual MAC interface" because it transparently "distributes and/or combines" packets between the IP layer and the RATs. (EX1005 at [0192].) A POSITA would have recognized that this "virtualizes" a MAC interface because the OMMA would effectively appear to the IP layer as a single interface for exchanging packets that are ultimately sent or received by the actual MAC-PHY pairs.</p> <p>101. Chincholi's OMMA layer also includes all of the functionality that the '337 patent associates with the "virtual MAC interface." Specifically, Figure 6 of Chincholi is a block diagram of an OMMA layer, comprising an IP QoS Scheduler 603, a MAC Resource Reservation module 602, and a Traffic Shaping Module 601. (EX1005 at [0139].)</p> <p>EX1002 ¶¶ 99-101.</p>	<p>of transceiver resources).) "By employing a virtual MAC and virtual PHY between an application layer and an actual MAC and PHY layer, wireless transceiver resources may be allocated more efficiently to handle various data bandwidth requirements from different applications." (EX1001, 5:60-64.)</p> <p><i>First</i>, Chincholi discloses that the OMMA "the processing interface" includes the claimed "virtual MAC interface." (EX1002, ¶¶99-108.) Indeed, "OMMA" is an abbreviation for "opportunistic multi-medium access control (MAC) aggregation," which refers to the fact that the OMMA layer aggregates multiple MAC interfaces, as depicted in Figure 5. (EX1005, [0120].) The OMMA layer includes an interface acting as a "virtual MAC interface" because it transparently "distributes and/or combines" packets between the IP layer and the RATs. (EX1005, [0192].) A POSITA would have recognized that this "virtualizes" a MAC interface because the OMMA would effectively appear to the IP layer as a single interface for exchanging packets that are ultimately sent or received by the actual MAC-PHY pairs. (EX1002, ¶100.)</p> <p>Chincholi's OMMA layer also includes all of the functionality that the '337 patent associates with the "virtual MAC interface." (<i>Id.</i>, ¶101.) Specifically, Figure 6 of Chincholi is a block diagram of an OMMA layer, comprising an IP QoS Scheduler 603, a MAC Resource Reservation module 602, and a Traffic Shaping Module 601. (EX1005, [0139].)</p> <p>Petition at 25-26.</p>

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	<p>102. The IP QoS Scheduler classifies incoming packets of a packet stream and may segregate them into distinct IP QoS streams (EX1005 at [0143]), which a POSITA would have recognized to fulfill the functionality of the "decision block" of the '337 patent's "virtual MAC interface" (EX1001 at 3:21-24). The MAC Resource Reservation module determines the time duration or spectral fragment/bandwidth required by a packet or set of packets (EX1005 at [0142]), which a POSITA would have recognized to fulfill the functionality of the "processing block" of the '337 patent's "virtual MAC interface" (EX1001 at 3:24-26). Finally, the Traffic Shaping module determines the way packets are routed across RATs using either policy based routing or feedback based routing (EX1005 at [0139]), which a POSITA would have recognized to fulfill the functionality of the "ultra-streaming block" of the '337 patent's "virtual MAC interface" (EX1001 at 3:26-30). Thus, a POSITA would have recognized that Chincholi's OMMA layer includes a "virtual MAC interface."</p> <p>EX1002 ¶ 102 (identical figure omitted).</p>	<p>The IP QoS Scheduler classifies incoming packets of a packet stream and may segregate them into distinct IP QoS streams (EX1005, [0143]), which a POSITA would have recognized as the functionality of the "decision block" of the '337 patent's "virtual MAC interface" (EX1002, ¶102; EX1001, 3:21-24). The MAC Resource Reservation module determines the time duration or spectral fragment/bandwidth required by a packet or set of packets (EX1005, [0142]), which a POSITA would have recognized as the functionality of the "processing block" of the '337 patent's "virtual MAC interface" (EX1002, ¶102; EX1001, 3:24-26). Finally, the Traffic Shaping module determines the way packets are routed across RATs using either policy based routing or feedback based routing (EX1005, [0139]), which a POSITA would have recognized as the functionality of the "ultra-streaming block" of the '337 patent's "virtual MAC interface" (EX1002, ¶102; EX1001, 3:26-30). Thus, a POSITA would have recognized that Chincholi's OMMA layer includes a "virtual MAC interface." (EX1002, ¶102.)</p> <p>Petition at 27-28 (identical figure omitted).</p>

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	<p>103. <i>Second</i>, Chincholi discloses that its processing interface comprises “<i>first and second virtual PHY interfaces that, during operation of the wireless networking device, feed information regarding the bandwidth availabilities of the first and second wireless transceivers back to the at least one virtual MAC interface.</i>” Chincholi discloses that the traffic shaping module of the OMMA (<i>i.e.</i>, part of the “virtual MAC interface”) may determine packet routing using “feedback based routing.” (EX1005 at [0139].) In feedback based routing, “the OMMA transmitter may use measurement metrics fed back from each RAT,” which include “channel quality metrics and the <i>number of available resources on the medium.</i>” (EX1005 at [0161].)</p> <p>104. Figures 28, 29, and their associated descriptions describe how Chincholi collects feedback from each RAT for the traffic shaping module. Figure 28 illustrates how the OMMA layer includes an OMMA Controller, which interfaces with each RAT to collect metrics regarding the channel quality and number of resources available on the medium. Specifically, using interface “A2” in Figure 28, “[a] RAT (<i>e.g.</i>, <i>each RAT</i>) may provide feedback metrics (<i>e.g.</i>, a vector comprising a value of serving rate, jitter, packet delay, and packet loss rate on its MAC) to the OMMA Controller 2900 <i>per device (e.g., WTRU or NT) per access category supported at that RAT.</i>” (EX1005 at [0205].) It would have been obvious to a POSITA to incorporate first and second virtual PHY interfaces into the OMMA Controller of Chincholi to collect the disclosed feedback metrics from each RAT over the “A2” interface and feed them back to the virtual MAC interface.</p> <p>EX1002 ¶¶ 103-04.</p>	<p><i>Second</i>, Chincholi discloses that its processing interface comprises “<i>first and second virtual PHY interfaces that, during operation of the wireless networking device, feed information regarding the bandwidth availabilities of the first and second wireless transceivers back to the at least one virtual MAC interface.</i>” (<i>Id.</i>, ¶103.) Chincholi discloses that the traffic shaping module of the OMMA (<i>i.e.</i>, part of the “virtual MAC interface”) may determine packet routing using “feedback based routing.” (EX1005, [0139].) In feedback based routing, “the OMMA transmitter may use measurement metrics fed back from each RAT,” which include “channel quality metrics and the <i>number of available resources on the medium.</i>” (EX1005, [0161].)</p> <p>Figures 28 and 29 and their associated descriptions describe how Chincholi collects feedback from each RAT for the traffic shaping module. Figure 28 illustrates how the OMMA layer includes an OMMA Controller, which interfaces with each RAT to collect metrics regarding the channel quality and number of resources available on the medium. Specifically, using interface “A2” in Figure 28, “[a] RAT (<i>e.g.</i>, <i>each RAT</i>) may provide feedback metrics (<i>e.g.</i>, a vector comprising a value of serving rate, jitter, packet delay, and packet loss rate on its MAC) to the OMMA Controller 2900 <i>per device (e.g., WTRU or NT) per access category supported at that RAT.</i>” (EX1005, [0205].) It would have been obvious to a POSITA to incorporate first and second virtual PHY interfaces into the OMMA Controller of Chincholi to collect the disclosed feedback metrics from each RAT over the “A2” interface and feed them back to the virtual MAC interface. (EX1002, ¶104.)</p> <p>Petition at 28-29.</p>

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	<p>105. Further details regarding the implementation of virtual PHY interfaces are disclosed by Riggert. As discussed above, <i>supra</i> Section IV, Riggert teaches a "bondable virtual interface" that provides one or more virtualized physical interfaces to the actual PHY layers of the communication channels, allowing for easy substitution of the interface throughout the system. (EX1006 at [0065].) Providing this sort of virtualized physical interface for transceivers in an 802.11 system is particularly beneficial as it allows an access point to accommodate communication channels with wireless devices that may operate using various different generations of the 802.11 standards. Virtualization of the physical interface for this purpose is taught, for example, in background reference U.S. Patent Application 2009/0141691 ("Jain"). (See EX1007 at [0034-0037]).</p> <p>106. Figure 5 of Riggert teaches the basic architecture for implementing "bondable physical interfaces" in the wireless network devices of a multi-channel network:</p> <p>107. The "bondable virtual interface" in Figure 5 on the server side is denoted as a "bondable PHY" (240). While the exemplary architecture depicts only a single "bondable virtual interface" associated with four actual transceiver resources, Riggert teaches that <i>multiple</i> physical bondable interfaces are possible in a single device. For example, each network endpoint may comprise a "plurality of</p>	<p>Further details regarding the implementation of virtual PHY interfaces are disclosed by Riggert. As discussed above, <i>supra</i> Section IV.B.2, Riggert teaches a "bondable virtual interface" that provides one or more virtualized physical interfaces to the actual PHY layers of the communication channels, allowing for easy substitution of the interface throughout the system. (EX1006, [0065].) Providing this sort of virtualized physical interface for transceivers in an 802.11 system is particularly beneficial as it allows an access point to accommodate communication channels with wireless devices that may operate using various different generations of the 802.11 standards. (EX1002, ¶105.) Virtualization of the physical interface for this purpose is taught, for example, in background reference U.S. Patent Application 2009/0141691 ("Jain"); (EX1007, [0034-0037]); EX1002, ¶105.)</p> <p>Figure 5 of Riggert teaches the basic architecture for implementing "bondable physical interfaces" in the wireless network devices of a multi-channel network:</p> <p>The "bondable virtual interface" in Figure 5 on the server side is denoted as a "bondable PHY" (240). While the exemplary architecture depicts only a single "bondable virtual interface" associated with four actual transceiver resources, Riggert teaches that <i>multiple</i> physical bondable interfaces are possible in a single device. (EX1002, ¶107.) For example, each network endpoint may comprise a "plurality of bondable virtual interface connectors 244 and 344, respectively," each</p>

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	<p>bondable virtual interface connectors 244 and 344, respectively," each one of which may be associated with specific bondable virtual interface. (EX1006 at [0069].)</p> <p>108. For the reasons discussed above, <i>see</i> Section VI.A, a POSITA would have been motivated to combine Riggert's implementation of virtual PHY interfaces into the OMMA Controller of Chincholi for the purposes of receiving the feedback statistics over the "A2" interfaces and passing that feedback data to Chincholi's traffic shaping module. The resulting combination would implement one or more bondable virtual PHY interfaces into Chincholi's OMMA controller, each associated with one or more actual MAC-PHY pairs, thus increasing flexibility in the system.</p> <p>EX1002 ¶¶ 105-08 (identical figure omitted).</p>	<p>one of which may be associated with specific bondable virtual interface. (EX1006, [0069].)</p> <p>For the reasons discussed above, <i>see</i> Section VII.A, a POSITA would have been motivated to combine Riggert's implementation of virtual PHY interfaces into the OMMA Controller of Chincholi for the purposes of receiving the feedback statistics over the "A2" interfaces and passing that feedback data to Chincholi's traffic shaping module. The resulting combination would implement one or more bondable virtual PHY interfaces into Chincholi's OMMA controller, each associated with one or more actual MAC-PHY pairs, thus increasing flexibility in the system.</p> <p>(EX1002, ¶108.)</p> <p>Petition at 30-32 (identical figure omitted).</p>
<p>Grounds for Unpatentability:</p> <p>Claim 1(f)</p>	<p>g) 1[f]: wherein the processing interface is configured to, when the wireless network device is being used in a manner transparent to any layer of the wireless networking device above the processing interface,</p> <p>109. In my opinion, Chincholi/Riggert discloses this limitation. Chincholi discloses that its OMMA layer (<i>i.e.</i>, processing interface) is configured to operate in a manner transparent to any higher layer. For example, Chincholi discloses that "[t]he OMMA layer <i>may be transparent</i> in that it distributes and/or combines packets from different RATs and forwards the packets to the IP layer." (EX1005 at [0192], [0126].) This is as opposed to a "non-transparent" configuration in which the OMMA layer would "add[] additional headers [] at the transmitter, and read and/or remove the headers at the receiver." (<i>Id.</i>)</p> <p>EX1002 ¶ 109.</p>	<p>g) 1[f]: wherein the processing interface is configured to, when the wireless network device is being used in a manner transparent to any layer of the wireless networking device above the processing interface,</p> <p>Chincholi discloses that its OMMA layer ("processing interface") is configured to operate in a manner transparent to any higher layer. (EX1002, ¶109.) For example, Chincholi discloses that "[t]he OMMA layer <i>may be transparent</i> in that it distributes and/or combines packets from different RATs and forwards the packets to the IP layer." (EX1005, [0192], [0126].) This is as opposed to a "non-transparent" configuration in which the OMMA layer would "add[] additional headers [] at the transmitter, and read and/or remove the headers at the receiver." (<i>Id.</i>)</p> <p>Petition at 32.</p>

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<p>Grounds for Unpatentability:</p> <p>Claim 1(g)</p>	<p>h) 1[g]: (i) identify at least one portion of each one of the first and second actual bandwidths of the first and second wireless transceivers that are available for communication.</p> <p>110. In my opinion, Chincholi/Riggert discloses this limitation. Chincholi teaches that NTs and WTRUs communicate with one another over “channels,” which are portions of a transceiver bandwidth availability. Specifically, “[t]he NT and WTRU may communicate with each other over a single radio frequency (RF) spectral band, for example, 2.4 GHz ISM band, or 5 GHz ISM band, or TVSWS band, or 60 GHz band, using a channel within the band or aggregating multiple contiguous or noncontiguous channels.” (EX1005 at [0118]; see also <i>id.</i> at [0121] (“An 802.11 based system may operate in a time division duplexing (TDD) mode, for example, on a band over a single 20/40MHz channel in the case of ISM band or a single 5/10/20 MHz channel in television white space (TVWS) band using contiguous/non-contiguous carrier aggregation.”).)</p> <p>111. Chincholi also discloses identifying available bandwidth channels for communication. The OMMA layer receives various feedback information from each RAT. (EX1005 at [0123].) For example, “the OMMA transmitter may use measurement metrics fed back from each RAT,” which include “channel quality metrics and the number of available resources on the medium.” (EX1005 at [0161].) Amongst the available resources provided as part of the feedback</p>	<p>h) 1[g]: (i) identify at least one portion of each one of the first and second actual bandwidths of the first and second wireless transceivers that are available for communication.</p> <p>Chincholi teaches that NTs and WTRUs communicate with one another over “channels,” which are portions of a transceiver’s bandwidth availability. (EX1002, ¶¶110-12.) Specifically, “[t]he NT and WTRU may communicate with each other over a single radio frequency (RF) spectral band... using a channel within the band or aggregating multiple contiguous or noncontiguous channels.” (EX1005, [0118]; [0121] (“An 802.11 based system may operate in a time division duplexing (TDD) mode ...on a band over a single 20/40MHz channel in the case of ISM band or a single 5/10/20 MHz channel in television white space (TVWS) band using contiguous/non-contiguous carrier aggregation.”).)</p> <p>Chincholi also discloses identifying available bandwidth channels for communication. The OMMA layer receives various feedback information from each RAT. (EX1005, [0123].) For example, “the OMMA transmitter may use measurement metrics fed back from each RAT,” which include “channel quality metrics and the number of available resources on the medium.” (EX1005, [0161].) Amongst the available resources provided as part of the feedback information are the “number of channels” and “channel bandwidth.” (<i>Id.</i>)</p> <p>A POSITA would have understood that the ability of Chincholi’s OMMA layer to receive from each RAT a number of channels and channel bandwidths is an identification of “at least one portion” (i.e., at least one available channel, or an aggregation of multiple contiguous or non-contiguous channels) of the first and second actual bandwidths of the first and second wireless transceivers that are available for communication. (EX1002, ¶112.)</p> <p>Petition at 33-34.</p>

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	<p>information are the "number of channels" and "channel bandwidth." (EX1005 at [0161].)</p> <p>112. A POSITA would have understood that the ability of Chincholi's OMMA layer to receive from each RAT a number of channels and channel bandwidth is an identification of "at least one portion" (i.e., at least one available channel, or an aggregation of multiple contiguous or non-contiguous channels) of the first and second actual bandwidths of the first and second wireless transceivers that are available for communication.</p> <p>EX1002 ¶¶ 110-12.</p>	
<p>Grounds for Unpatentability:</p> <p>Claim 1(h)</p>	<p>i) 1[h] (ii) select one transceiver of the first and second transceivers which has the most bandwidth available, (iii) prepare the first data stream for transmission to a recipient from the selected wireless transceiver using a specific subset of frequencies corresponding to the identified at least one portion of its available bandwidth, and (iv) cause the prepared first data stream to be transmitted from the selected wireless transceiver to thereby at least partially satisfy the first wireless bandwidth requirement of the first application;</p> <p>113. In my opinion, Chincholi/Riggert discloses this limitation. Based on its evaluation of transceiver bandwidth availability with respect to the application bandwidth requirement, Chincholi discloses selecting one transceiver having the most bandwidth available, preparing the first data stream for transmission using a subset of the available bandwidth on that transceiver, and causing the transmission to thereby at least partially satisfy the first application's bandwidth requirement</p>	<p>i) 1[h] (ii) select one transceiver of the first and second transceivers which has the most bandwidth available, (iii) prepare the first data stream for transmission to a recipient from the selected wireless transceiver using a specific subset of frequencies corresponding to the identified at least one portion of its available bandwidth, and (iv) cause the prepared first data stream to be transmitted from the selected wireless transceiver to thereby at least partially satisfy the first wireless bandwidth requirement of the first application;</p> <p>Based on its evaluation of transceiver bandwidth availability with respect to the application bandwidth requirement, Chincholi discloses selecting one transceiver having the most bandwidth available, preparing the first data stream for transmission using a subset of the available bandwidth on that transceiver, and causing the transmission to thereby at least partially satisfy the first application's bandwidth requirement. (EX1002, ¶¶113-18.)</p> <p>First, Chincholi discloses that the OMMA layer uses feedback metrics indicating the amount of available bandwidth on each RAT to select between the first and second transceivers. (Id., ¶114.) For example, in a "cold start" phase, Chincholi teaches how the OMMA layer "may request the individual RATs to</p>

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	<p>114. First, Chincholi discloses that the OMMA layer uses feedback metrics indicating the amount of available bandwidth on each RAT to select between the first and second transceivers. For example, in a "cold start" phase, Chincholi teaches how the OMMA layer "may request the individual RATs to transmit the total channel bandwidths supported by them." (EX1005 at [0163].) Thus, the distribution of IP packets across two separate RATs, operating on two different frequency bands, may be calculated as the simple ratio of available bandwidth on the two RATs:</p> $BW_{ISM} : \sum_{k=1}^N BW_{TVWS}^k$ <p>(EX1005 at [0163].) Chincholi also discloses more sophisticated algorithms for allocating packets based on both available bandwidth and link quality for each of a "ramp-up phase" and a "steady state phase." (EX1005 at [0164]-[0165].)</p> <p>115. A POSITA would have understood from these calculations that a higher ratio of IP packets will be allocated to the transceiver with more available bandwidth. Further, where the available bandwidth of the first transceiver is substantially better than that of the second transceiver, a POSITA would have understood the capability to transmit the entire first data stream using only the first transceiver. Thus, Chincholi teaches a selection of the transceiver with the most available bandwidth for preparation and transmission of the first data stream.</p> <p>EX1002 ¶¶ 113-15.</p>	<p>transmit the total channel bandwidths supported by them." (EX1005, [0163].) Thus, the distribution of IP packets across two separate RATs, operating on two different frequency bands, may be calculated as the simple ratio of available bandwidth on the two RATs:</p> $BW_{ISM} : \sum_{k=1}^N BW_{TVWS}^k$ <p>(EX1005, [0163].) Chincholi also discloses more sophisticated algorithms for allocating packets based on both available bandwidth and link quality for a "ramp-up phase" and a "steady state phase." (EX1005, [0164]-[0165].)</p> <p>A POSITA would have understood from these calculations that a higher ratio of IP packets will be allocated to the transceiver with more available bandwidth. (EX1002, ¶115.) Further, where the available bandwidth of the first transceiver is substantially better than that of the second transceiver, a POSITA would have understood the capability to transmit the entire first data stream using only the first transceiver. (Id.) Thus, Chincholi teaches a selection of the transceiver with the most available bandwidth for preparation and transmission of the first data stream. (Id.)</p> <p>Petition at 34-35.</p>

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	<p>116. <i>Second</i>, after selecting the transceiver, Chincholi discloses that the OMMA layer <i>prepares the data stream for transmission</i> using available spectral fragments (i.e., portions of the transceiver's available bandwidth allocated for transmission). For example, Chincholi teaches that its MAC Resource Reservation module "may determine an amount of time duration and/or spectral fragment/bandwidth required by a packet or a set of packets." (EX1005 at [0142].) A POSITA would have understood that these spectral fragments correspond to the claimed "subset of frequencies" of the transceiver's available bandwidth. Once bandwidth and spectral fragments have been allocated, preparing the data stream for transmission further includes segmenting the data, mapping the data stream to the allocated bandwidth resources, applying appropriate modulation and coding schemes, and generating the physical-layer signals for transmission over the selected transceiver.</p> <p>EX1002 ¶ 116.</p> <p>117. <i>Third</i>, Chincholi further discloses causing the prepared first data stream to be transmitted from the selected transceiver, thereby at least <i>partially satisfying the application's bandwidth requirement</i>. As Chincholi explains, "[u]sing multiple RATs simultaneously may provide increased bandwidth and/or increased reliability for an application." (EX1005 at [0194].)</p> <p>EX1002 ¶ 117.</p> <p>118. Finally, Chincholi discloses that this selection, preparation, and transmission is performed by the OMMA layer in a manner transparent to higher layers: "[t]he OMMA layer <i>may be transparent</i>, in that it distributes and/or combines packets from different RATs and forwards the packets to the IP layer." (EX1005 at [0192], [0126].)</p>	<p><i>Second</i>, after selecting the transceiver, Chincholi discloses that the OMMA layer <i>prepares the data stream for transmission</i> using available spectral fragments (i.e., portions of the transceiver's available bandwidth allocated for transmission). For example, Chincholi teaches that its MAC Resource Reservation module "may determine an amount of time duration and/or spectral fragment/bandwidth required by a packet or a set of packets." (EX1005, [0142].) A POSITA would have understood that these spectral fragments correspond to the claimed "subset of frequencies" of the transceiver's available bandwidth. (EX1002, ¶116.) Once bandwidth and spectral fragments have been allocated, preparing the data stream for transmission further includes segmenting the data, mapping the data stream to the allocated bandwidth resources, applying appropriate modulation and coding schemes, and generating the physical-layer signals for transmission over the selected transceiver. (<i>Id.</i>)</p> <p>Petition at 35-36.</p> <p><i>Third</i>, Chincholi further discloses causing the prepared first data stream to be transmitted from the selected transceiver, thereby at least <i>partially satisfying the application's bandwidth requirement</i>. As Chincholi explains, "[u]sing multiple RATs simultaneously may provide increased bandwidth and/or increased reliability for an application." (EX1005, [0194].)</p> <p>Petition at 36.</p> <p>Finally, Chincholi discloses that this selection, preparation, and transmission is performed by the OMMA layer in a manner transparent to higher layers: "[t]he OMMA layer <i>may be transparent</i>..." (EX1005, [0192], [0126].)</p> <p>Petition at 36.</p>

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	EX1002 ¶ 118.	
Grounds for Unpatentability: Claim 1(i)(i)	<p>j) <i>1[i]: wherein, if the unselected wireless transceiver has more bandwidth availability than the selected transceiver during use of the wireless networking device, the processing interface is adapted to, as a result of the increased bandwidth availability and in a manner transparent to any layer of the wireless networking device above the processing interface, (i) identify at least one portion of the bandwidth of the unselected transceiver that is available for communication and select the unselected transceiver.</i></p> <p>119. In my opinion, Chincholi/Riggert discloses this limitation. Chincholi teaches that the OMMA layer dynamically monitors bandwidth availability and may select a transceiver with greater bandwidth availability as conditions change. Chincholi explains that the OMMA layer may “continuously update . . . the available RAT capability of a device . . . based on feedback metrics from each RAT.” (EX1005 at [0235].) These feedback metrics include both channel quality and the number of available resources on the medium. (EX1005 at [0161].)</p> <p>120. Chincholi further discloses that the processing interface (i.e., the OMMA layer) is adapted to identify a bandwidth portion of an unselected transceiver and select an unselected transceiver if its bandwidth availability exceeds that of the selected transceiver during use of the wireless networking device. Chincholi teaches that “[a]s the channel quality/availability of RATs 1301a, 1301b changes, the best</p>	<p>j) <i>1[i]: wherein, if the unselected wireless transceiver has more bandwidth availability than the selected transceiver during use of the wireless networking device, the processing interface is adapted to, as a result of the increased bandwidth availability and in a manner transparent to any layer of the wireless networking device above the processing interface, (i) identify at least one portion of the bandwidth of the unselected transceiver that is available for communication and select the unselected transceiver.</i></p> <p>Chincholi teaches that the OMMA layer dynamically monitors bandwidth availability and may select a transceiver with greater bandwidth availability as conditions change. (EX1002, ¶¶119-21.) Chincholi explains that the OMMA layer may “continuously update . . . the available RAT capability of a device . . . based on feedback metrics from each RAT.” (EX1005, [0235].) These feedback metrics include both channel quality and the number of available resources on the medium. (EX1005, [0161].)</p> <p>Chincholi further discloses that the processing interface (i.e., the OMMA layer) is adapted to identify a bandwidth portion of an unselected transceiver and select an unselected transceiver if its bandwidth availability exceeds that of the selected transceiver during use of the wireless networking device. Chincholi teaches that “[a]s the channel quality/availability of RATs 1301a, 1301b changes, the best RAT may be selected which may be different from the one previously used.” (EX1005, [0154].) A POSITA would have understood that this includes situations</p>

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	<p>RAT may be selected which may be different from the one previously used.” (EX1005 at [0154].) A POSITA would have understood that this includes situations where bandwidth availability (i.e., the amount of available spectrum or channel resources on a RAT) increases relative to the previously selected transceiver, prompting the OMMA layer to switch and select the RAT with more bandwidth availability.</p> <p>121. Finally, Chincholi discloses that this selection of an unselected transceiver performed by the OMMA layer in a manner transparent to higher layers: “[t]he OMMA layer may be transparent, in that it distributes and/or combines packets from different RATs and forwards the packets to the IP layer.” (EX1005 at [0192], [0126].) Accordingly, a POSITA would have understood that the OMMA’s transparent routing of packets across RATs allows the switching to occur without requiring disassociation and reassociation at the MAC/PHY level.</p> <p>EX1002 ¶¶ 119-121.</p>	<p>where bandwidth availability (i.e., the amount of available spectrum or channel resources on a RAT) increases relative to the previously selected transceiver, prompting the OMMA layer to switch and select the RAT with more bandwidth availability. (EX1002, ¶120.)</p> <p>Finally, Chincholi discloses that this selection of an unselected transceiver is performed by the OMMA layer in a manner transparent to higher layers: “[t]he OMMA layer may be transparent...” (EX1005, [0192], [0126].) Accordingly, a POSITA would have understood that the OMMA’s transparent routing of packets across RATs allows the switching to occur without requiring disassociation and reassociation at the MAC/PHY level. (EX1002, ¶121.)</p> <p>Petition at 37-38.</p>
<p>Grounds for Unpatentability:</p> <p>Claim 1(i)(ii)</p>	<p>k) <i>(ii) prepare the first data stream, without requiring the disassociation of the recipient from the actual MAC and PHY interfaces of any wireless transceiver, for transmission to the recipient from the unselected transceiver using a specific subset of frequencies corresponding to its identified at least one portion of available bandwidth, and</i></p> <p>122. In my opinion, Chincholi/Riggert discloses this limitation. After selecting the unselected transceiver, Chincholi discloses that the OMMA layer prepares the first data stream for transmission to the recipient from the transceiver</p>	<p>k) <i>(ii) prepare the first data stream, without requiring the disassociation of the recipient from the actual MAC and PHY interfaces of any wireless transceiver, for transmission to the recipient from the unselected transceiver using a specific subset of frequencies corresponding to its identified at least one portion of available bandwidth, and</i></p> <p>After selecting the unselected transceiver, Chincholi discloses that the OMMA layer prepares the first data stream for transmission to the recipient from the transceiver using a specific subset of frequencies corresponding to its identified at least one portion of available bandwidth. (EX1002, ¶¶122-25.) For example, Chincholi teaches that the MAC Resource Reservation module “may determine an amount of time duration and/or spectral fragment/bandwidth required by a packet or</p>

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	<p>using a specific subset of frequencies corresponding to its identified at least one portion of available bandwidth. For example, Chincholi teaches that the MAC Resource Reservation module “may determine an amount of time duration and/or spectral fragment/bandwidth required by a packet or a set of packets.” (EX1005 at [0142].) A POSITA would have understood that, once bandwidth and spectral fragments have been allocated, preparing the data stream for transmission further includes segmenting the data, mapping the data stream to the allocated bandwidth resources, applying appropriate modulation and coding schemes, and generating the physical-layer signals for transmission over the selected transceiver.</p> <p>123. Additionally, Chincholi does not “require” disassociation of recipient WTRUs from actual MAC and PHY interfaces of any wireless transceiver during operation, including during preparation of the first data stream for transmission and transmission by a newly selected transceiver.</p> <p>124. Indeed, a POSITA would have also recognized the desirability of implementing Chincholi combined with the teachings of Riggert to transmit the first data stream to the recipient without requiring “disassociation” of the recipient from either or both of the first and second actual MAC and PHY interfaces. For example, in the field of 802.11 systems—where each associated terminal is assigned a unique association identifier (“AID”)—it was well-known that avoiding disassociation after initial association was desirable, as repeatedly re-forming associations was</p>	<p>a set of packets.” (EX1005, [0142].) A POSITA would have understood that, once bandwidth and spectral fragments have been allocated, preparing the data stream for transmission further includes segmenting the data, mapping the data stream to the allocated bandwidth resources, applying appropriate modulation and coding schemes, and generating the physical-layer signals for transmission over the selected transceiver. (EX1002, ¶122.)</p> <p>Additionally, Chincholi does not “require” disassociation of recipient WTRUs from actual MAC and PHY interfaces of any wireless transceiver during operation, including during preparation of the first data stream for transmission and transmission by a newly selected transceiver. (<i>Id.</i>, ¶123.)</p> <p>Indeed, a POSITA would have also recognized the desirability of implementing Chincholi combined with the teachings of Riggert to transmit the first data stream to the recipient without requiring “disassociation” of the recipient from either or both of the first and second actual MAC and PHY interfaces. For example, in the field of 802.11 systems—where each associated terminal is assigned a unique association identifier (“AID”)—it was well-known that avoiding disassociation after initial association was desirable, as repeatedly re-forming associations was inefficient and disruptive. (EX1002, ¶124; EX1008 (U.S. Patent 9,379,868) (“Wang”), 24:42-43 (“This approach is undesirable, can be blunt and can disrupt the on-going services (e.g., requires disassociation), 24:57-62 (“The lack of</p>

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	<p>inefficient and disruptive. EX1008 (U.S. Patent 9,379,868) ("Wang") at 24:42-43 ("This approach is undesirable, can be blunt and can disrupt the on-going services (e.g., requires disassociation), at 24:57-62 ("The lack of update/change of the AID values . . . after an initial AID assignment is inherently inflexible and can prevent the realization power saving, among other considerations, that an update/change of the AID values can provide.") Indeed, recognizing this issue, background prior art reference Wang described techniques in a multiple transceiver/MIMO system for effectuating an update to a recipient's unique association identifier ("AID") through various interactions with the system without requiring a disassociation of a wireless device from an access point. (EX1008 at 24:63-25:57.)</p> <p>125. In light of this background art, a POSITA would have recognized that in implementing the Chincholi/Riggert combination, it would be desirable implement known dynamic AID reassignment techniques to avoid disassociation of recipients from the actual MAC and PHY interfaces of any wireless transceiver during operation including throughout any process of reallocating transceiver, channel, and/or bandwidth resources to a recipient.</p> <p>EX1002 ¶¶ 122-25.</p>	<p>update/change of the AID values . . . after an initial AID assignment is inherently inflexible and can prevent the realization power saving, among other considerations, that an update/change of the AID values can provide.") Indeed, recognizing this issue, background prior art reference Wang described techniques in a multiple transceiver/MIMO system for effectuating an update to a recipient's unique association identifier ("AID") through various interactions with the system without requiring a disassociation of a wireless device from an access point. (EX1008, 24:63-25:57.)</p> <p>In light of this background art, a POSITA would have recognized that in implementing the Chincholi/Riggert combination, it would be desirable implement known dynamic AID reassignment techniques to avoid disassociation of recipients from the actual MAC and PHY interfaces of any wireless transceiver during operation including throughout any process of reallocating transceiver, channel, and/or bandwidth resources to a recipient. (EX1002, ¶125.)</p> <p>Petition at 38-40.</p>

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<p>Grounds for Unpatentability:</p> <p>Claim 1(i)(iii)</p>	<p>l) <i>(iii) cause the prepared first data stream to be transmitted to the recipient from the unselected transceiver, without requiring the disassociation of the recipient from the actual MAC and PHY interfaces of any wireless transceiver, to thereby continue to at least partially satisfy the first wireless bandwidth requirement of the first application; and</i></p> <p>126. In my opinion, Chincholi/Riggert discloses this limitation. Chincholi further discloses causing the prepared first data stream to be transmitted from the newly selected transceiver, thereby continuing to at least partially satisfy the application's bandwidth requirement. As Chincholi explains, "[u]sing multiple RATs simultaneously may provide increased bandwidth and/or increased reliability for an application." (EX1005 at [0194].)</p> <p>127. As discussed above in the prior limitation, Chincholi does not require disassociation of the recipient from the actual MAC and PHY interfaces of any wireless transceiver during operation including throughout any process of reallocating transceiver, channel, and/or bandwidth resources to a recipient.</p> <p>EX1002 ¶¶ 126-27.</p>	<p>l) <i>(iii) cause the prepared first data stream to be transmitted to the recipient from the unselected transceiver, without requiring the disassociation of the recipient from the actual MAC and PHY interfaces of any wireless transceiver, to thereby continue to at least partially satisfy the first wireless bandwidth requirement of the first application; and</i></p> <p>Chincholi further discloses causing the prepared first data stream to be transmitted from the newly selected transceiver, thereby continuing to at least partially satisfy the application's bandwidth requirement. (EX1002, ¶¶126-27.) As Chincholi explains, "[u]sing multiple RATs simultaneously may provide increased bandwidth and/or increased reliability for an application." (EX1005, [0194].)</p> <p>As discussed above in the prior limitation, Chincholi does not require disassociation of the recipient from the actual MAC and PHY interfaces of any wireless transceiver during operation including throughout any process of reallocating transceiver, channel, and/or bandwidth resources to a recipient.</p> <p>(EX1002, ¶127.)</p> <p>Petition at 40-41.</p>
<p>Grounds for Unpatentability:</p> <p>Claim 1(j)</p>	<p>m) <i>l[j]: wherein the wireless networking device's utilization of the available bandwidth of the selected and unselected transceivers does not prevent other wireless networking device from utilizing a range of frequencies corresponding to the remaining portion of the bandwidth availabilities of the selected and unselected wireless transceivers for data transmission purposes at the same time that processed data is being sent from the selected and unselected wireless transceivers.</i></p> <p>128. In my opinion, Chincholi/Riggert discloses this limitation. Chincholi discloses examples of "multi-WTRU multi-IP flow cases." (EX1005 at [0328].) For example, "[a] system may comprise multiple WTRUs, a single NT, and multiple IP flows from the NT to one or more WTRUs." (EX1005 at [0328].) This is disclosed, for example in Figure 3.</p>	<p>m) <i>l[j]: wherein the wireless networking device's utilization of the available bandwidth of the selected and unselected transceivers does not prevent other wireless networking device from utilizing a range of frequencies corresponding to the remaining portion of the bandwidth availabilities of the selected and unselected wireless transceivers for data transmission purposes at the same time that processed data is being sent from the selected and unselected wireless transceivers.</i></p> <p>Chincholi discloses examples of "multi-WTRU multi-IP flow cases." (EX1005, [0328]; EX1002, ¶¶128-31.) For example, "[a] system may comprise multiple WTRUs, a single NT, and multiple IP flows from the NT to one or more WTRUs." (EX1005, [0328].) This is disclosed, for example in Figure 3.</p>

Comparison of Almeroth Decl. (Ex. 1002) vs. Petition
Identical, Minor Changes, Paraphrased

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	<p>129. To manage data flows for multiple WTRUs, Chincholi teaches techniques for queuing packets according to their access categories and/or WTRU addresses and optimizing the distribution of packets of multiple streams for multiple WTRUs across multiple RATs. (EX1005 at [0351]-[0356].) For example, Chincholi discloses a MAC layer of a given transceiver may implement multiple transmission buffers, denoted Q_n, where "i" refers to the WTRU for which a group of packets is designated and "k" refers to the IP flow associated with the group of packets. (EX1005 at [352].)</p> <p>130. Chincholi further discloses how utilization of the available transceiver bandwidth for one WTRU does not prevent other WTRUs from utilizing a range of frequencies corresponding to the remaining transceiver bandwidth at the same time. As discussed above, Chincholi's OMMA layer receives feedback metrics from each RAT. (EX1005 at [0161].) Amongst the feedback metrics are the "MAC Type," for example "OFDMA." (EX1005 at [0161] & Table 2.) OFDMA stands for "Orthogonal Frequency Division Multiple Access," which was a known wireless communication technique for dividing an available bandwidth into smaller subcarriers (<i>i.e.</i> frequency ranges) which are then allocated to different users. These subcarriers are described as orthogonal because they do not interfere with each other when simultaneously transmitted. A POSITA would have recognized that OFDMA techniques would allow multiple WTRUs to access different channels of the transceiver resources simultaneously and without interference.</p> <p>131. Because Chincholi's RATs may provide feedback to the OMMA indicating that they are operating as an OFDMA MAC Type, a POSITA would have recognized that Chincholi discloses the capability to allow multiple WTRUs to simultaneously utilize different portions of the bandwidth availabilities of the selected and unselected transceivers.</p>	<p>To manage data flows for multiple WTRUs, Chincholi teaches techniques for queuing packets according to their access categories and/or WTRU addresses and optimizing the distribution of packets of multiple streams for multiple WTRUs across multiple RATs. (EX1005, [0351]-[0356].) For example, Chincholi discloses a MAC layer of a given transceiver may implement multiple transmission buffers, denoted Q_n, where "i" refers to the WTRU for which a group of packets is designated and "k" refers to the IP flow associated with the group of packets. (EX1005, [352].)</p> <p>Chincholi further discloses how utilization of the available transceiver bandwidth for one WTRU does not prevent other WTRUs from utilizing a range of frequencies corresponding to the remaining transceiver bandwidth at the same time. As discussed above, Chincholi's OMMA layer receives feedback metrics from each RAT. (EX1005, [0161].) Amongst the feedback metrics are the "MAC Type," for example "OFDMA." (EX1005, [0161] & Table 2.) OFDMA stands for "Orthogonal Frequency Division Multiple Access," which was a known wireless communication technique for dividing an available bandwidth into smaller subcarriers (<i>i.e.</i> frequency ranges) which are then allocated to different users. (EX1002, ¶130.) These subcarriers are described as orthogonal because they do not interfere with each other when simultaneously transmitted. A POSITA would have recognized that OFDMA techniques would allow multiple WTRUs to access different channels of the transceiver resources simultaneously and without interference. (<i>Id.</i>)</p> <p>Because Chincholi's RATs may provide feedback to the OMMA indicating that they are operating as an OFDMA MAC Type, a POSITA would have recognized that Chincholi discloses the capability to allow multiple WTRUs to simultaneously utilize different portions of the bandwidth availabilities of the selected and unselected transceivers. (<i>Id.</i>, ¶131.)</p>

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	EX1002 ¶¶ 128-131 (identical figure omitted).	Petition at 41-43 (identical figure omitted).