

EXHIBIT C

APPENDIX A (Amended)

Invalidity of U.S. Patent No. 11,627,631 (“’631 Patent”) Obvious Combinations

1. Claim 1

Invalidity of U.S. Patent 11,627,631 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
1[pre]	A method for transmitting and receiving data, the method comprising:	R3-173152 - Xn Based Mobility Across RA (“R3-173152”). <i>See</i> Exhibit A-1. U.S. Patent No. 10,966,222 (“Han 222”). <i>See</i> Exhibit A-2. U.S. Patent No. 11,765,635 (“Futaki 635”). <i>See</i> Exhibit A-3. 3GPP TR 38.801 V0.4.0 (2016-08) (“TR 38.801 V0.4.0”). <i>See</i> Exhibit A-4. U.S. Patent No. 11,356,854 (“Futaki 854”). <i>See</i> Exhibit A-5. U.S. Patent No. 10,893,455 (“Zee”). <i>See</i> Exhibit A-6. U.S. Patent No. 11,240,724 (“Han 724”). <i>See</i> Exhibit A-7. U.S. Patent Pub. No. 2011/0274087 (“Liang”). <i>See</i> Exhibit A-8. U.S. Patent Pub. No. 2019/0349803 (“Byun”). <i>See</i> Exhibit A-9. U.S. Patent Pub. No. 2014/0135007 (“Yu”). <i>See</i> Exhibit A-10. R3-171116 Connected Mode Mobility with Slicing (“R3-171116”). <i>See</i> Exhibit A-11. R3-171029 - NW Slice Availability Handling Approaches During Mobility (“R3-171029”). <i>See</i> Exhibit A-12.

Invalidity of U.S. Patent 11,627,631 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
		R3-170065 - Selection RAN Part Network Slice During UE Mobility (“R3-170065”). <i>See</i> Exhibit A-13. R3-173614 - Discussion on Slice Mobility Issue (“R3-173614”). <i>See</i> Exhibit A-14. 3GPP TS 36.300 V13.4.0 (2016-06) (“TS 36.300 V13.4.0”). <i>See</i> Exhibit A-15. U.S. Patent No. 9,681,355 (“Cho”) at Fig. 8, Fig. 11, Fig. 14, 6:62-7:3, 7:4-8, 10:31-40. U.S. Patent No. 10,952,275 (“Zhang”) at Fig. 1, Fig. 3, 3:14-29, 3:49-55, 7:3-19, 7:40-53. U.S. Patent No. 11,076,434 (“Sivavakeesar”) at Fig. 11, Fig. 12, 25:22-48, 25:49-63. U.S. Patent Pub. No. 2007/0293254 (“Jiang”) at Fig. 1, Fig. 2, Fig. 3, [0022]-[0023], [0027]-[0028]. U.S. Patent Pub. No. 2009/0252070 (“Connors”) at Fig. 2, Fig. 9, [0172]-0175]. U.S. Patent Pub. No. 2014/0086177 (“Adjakple”) at Fig. 1B, [0072], [0160], [0188], [0209], [0311].
1[a]	deciding, by a source base station (BS), whether to perform a handover;	R3-173152 - Xn Based Mobility Across RA (“R3-173152”). <i>See</i> Exhibit A-1. U.S. Patent No. 10,966,222 (“Han 222”). <i>See</i> Exhibit A-2. U.S. Patent No. 11,765,635 (“Futaki 635”). <i>See</i> Exhibit A-3. 3GPP TR 38.801 V0.4.0 (2016-08) (“TR 38.801 V0.4.0”). <i>See</i> Exhibit A-4. U.S. Patent No. 11,356,854 (“Futaki 854”). <i>See</i> Exhibit A-5.

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		U.S. Patent No. 10,893,455 (“Zee”). <i>See</i> Exhibit A-6. U.S. Patent No. 11,240,724 (“Han 724”). <i>See</i> Exhibit A-7. U.S. Patent Pub. No. 2011/0274087 (“Liang”). <i>See</i> Exhibit A-8. U.S. Patent Pub. No. 2019/0349803 (“Byun”). <i>See</i> Exhibit A-9. U.S. Patent Pub. No. 2014/0135007 (“Yu”). <i>See</i> Exhibit A-10. R3-171116 Connected Mode Mobility with Slicing (“R3-171116”). <i>See</i> Exhibit A-11. R3-171029 - NW Slice Availability Handling Approaches During Mobility (“R3-171029”). <i>See</i> Exhibit A-12. R3-170065 - Selection RAN Part Network Slice During UE Mobility (“R3-170065”). <i>See</i> Exhibit A-13. R3-173614 - Discussion on Slice Mobility Issue (“R3-173614”). <i>See</i> Exhibit A-14. 3GPP TS 36.300 V13.4.0 (2016-06) (“TS 36.300 V13.4.0”). <i>See</i> Exhibit A-15. U.S. Patent No. 9,681,355 (“Cho”) at Fig. 8, Fig. 11, Fig. 14, 6:62-7:3, 7:4-8, 10:31-40. U.S. Patent No. 10,952,275 (“Zhang”) at Fig. 1, Fig. 3, 3:14-29, 3:49-55, 7:3-19, 7:40-53. U.S. Patent No. 11,076,434 (“Sivavakeesar”) at Fig. 11, Fig. 12, 25:22-48, 25:49-63.

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		U.S. Patent Pub. No. 2007/0293254 (“Jiang”) at Fig. 1, Fig. 2, Fig. 3, [0022]-[0023], [0027]-[0028]. U.S. Patent Pub. No. 2009/0252070 (“Connors”) at Fig. 2, Fig. 9, [0172]-0175]. U.S. Patent Pub. No. 2014/0086177 (“Adjakple”) at Fig. 1B, [0072], [0160], [0188], [0209], [0311].
1[b]	transmitting, from the source BS to a target BS, a handover request message when it is decided to perform the handover,	R3-173152 - Xn Based Mobility Across RA (“R3-173152”). <i>See</i> Exhibit A-1. U.S. Patent No. 10,966,222 (“Han 222”). <i>See</i> Exhibit A-2. U.S. Patent No. 11,765,635 (“Futaki 635”). <i>See</i> Exhibit A-3. 3GPP TR 38.801 V0.4.0 (2016-08) (“TR 38.801 V0.4.0”). <i>See</i> Exhibit A-4. U.S. Patent No. 11,356,854 (“Futaki 854”). <i>See</i> Exhibit A-5. U.S. Patent No. 10,893,455 (“Zee”). <i>See</i> Exhibit A-6. U.S. Patent No. 11,240,724 (“Han 724”). <i>See</i> Exhibit A-7. U.S. Patent Pub. No. 2011/0274087 (“Liang”). <i>See</i> Exhibit A-8. U.S. Patent Pub. No. 2019/0349803 (“Byun”). <i>See</i> Exhibit A-9. U.S. Patent Pub. No. 2014/0135007 (“Yu”). <i>See</i> Exhibit A-10. R3-171116 Connected Mode Mobility with Slicing (“R3-171116”). <i>See</i> Exhibit A-11. R3-171029 - NW Slice Availability Handling Approaches During Mobility (“R3-171029”). <i>See</i> Exhibit A-12.

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		R3-170065 - Selection RAN Part Network Slice During UE Mobility (“R3-170065”). <i>See</i> Exhibit A-13. R3-173614 - Discussion on Slice Mobility Issue (“R3-173614”). <i>See</i> Exhibit A-14. 3GPP TS 36.300 V13.4.0 (2016-06) (“TS 36.300 V13.4.0”). <i>See</i> Exhibit A-15. U.S. Patent No. 9,681,355 (“Cho”) at Fig. 8, Fig. 11, Fig. 14, 6:62-7:3, 7:4-8, 10:31-40. U.S. Patent No. 10,952,275 (“Zhang”) at Fig. 1, Fig. 3, 3:14-29, 3:49-55, 7:3-19, 7:40-53. U.S. Patent No. 11,076,434 (“Sivavakeesar”) at Fig. 11, Fig. 12, 25:22-48, 25:49-63. U.S. Patent Pub. No. 2007/0293254 (“Jiang”) at Fig. 1, Fig. 2, Fig. 3, [0022]-[0023], [0027]-[0028]. U.S. Patent Pub. No. 2009/0252070 (“Connors”) at Fig. 2, Fig. 9, [0172]-[0175]. U.S. Patent Pub. No. 2014/0086177 (“Adjakple”) at Fig. 1B, [0072], [0160], [0188], [0209], [0311].
1[c]	wherein the handover request message includes network slice information; and	R3-173152 - Xn Based Mobility Across RA (“R3-173152”). <i>See</i> Exhibit A-1. U.S. Patent No. 10,966,222 (“Han 222”). <i>See</i> Exhibit A-2. U.S. Patent No. 11,765,635 (“Futaki 635”). <i>See</i> Exhibit A-3. 3GPP TR 38.801 V0.4.0 (2016-08) (“TR 38.801 V0.4.0”). <i>See</i> Exhibit A-4.

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		U.S. Patent No. 11,356,854 (“Futaki 854”). <i>See</i> Exhibit A-5. U.S. Patent No. 10,893,455 (“Zee”). <i>See</i> Exhibit A-6. U.S. Patent No. 11,240,724 (“Han 724”). <i>See</i> Exhibit A-7. U.S. Patent Pub. No. 2011/0274087 (“Liang”). <i>See</i> Exhibit A-8. U.S. Patent Pub. No. 2019/0349803 (“Byun”). <i>See</i> Exhibit A-9. U.S. Patent Pub. No. 2014/0135007 (“Yu”). <i>See</i> Exhibit A-10. R3-171116 Connected Mode Mobility with Slicing (“R3-171116”). <i>See</i> Exhibit A-11. R3-171029 - NW Slice Availability Handling Approaches During Mobility (“R3-171029”). <i>See</i> Exhibit A-12. R3-170065 - Selection RAN Part Network Slice During UE Mobility (“R3-170065”). <i>See</i> Exhibit A-13. R3-173614 - Discussion on Slice Mobility Issue (“R3-173614”). <i>See</i> Exhibit A-14. 3GPP TS 36.300 V13.4.0 (2016-06) (“TS 36.300 V13.4.0”). <i>See</i> Exhibit A-15. U.S. Patent No. 9,681,355 (“Cho”) at Fig. 8, Fig. 11, Fig. 14, 6:62-7:3, 7:4-8, 10:31-40. U.S. Patent No. 10,952,275 (“Zhang”) at Fig. 1, Fig. 3, 3:14-29, 3:49-55, 7:3-19, 7:40-53. U.S. Patent No. 11,076,434 (“Sivavakeesar”) at Fig. 11, Fig. 12, 25:22-48, 25:49-63.

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		U.S. Patent Pub. No. 2007/0293254 (“Jiang”) at Fig. 1, Fig. 2, Fig. 3, [0022]-[0023], [0027]-[0028]. U.S. Patent Pub. No. 2009/0252070 (“Connors”) at Fig. 2, Fig. 9, [0172]-0175]. U.S. Patent Pub. No. 2014/0086177 (“Adjakple”) at Fig. 1B, [0072], [0160], [0188], [0209], [0311].
1[d]	receiving, by the source BS from the target BS, a handover request confirmation message in response to the handover request message,	R3-173152 - Xn Based Mobility Across RA (“R3-173152”). <i>See</i> Exhibit A-1. U.S. Patent No. 10,966,222 (“Han 222”). <i>See</i> Exhibit A-2. U.S. Patent No. 11,765,635 (“Futaki 635”). <i>See</i> Exhibit A-3. 3GPP TR 38.801 V0.4.0 (2016-08) (“TR 38.801 V0.4.0”). <i>See</i> Exhibit A-4. U.S. Patent No. 11,356,854 (“Futaki 854”). <i>See</i> Exhibit A-5. U.S. Patent No. 10,893,455 (“Zee”). <i>See</i> Exhibit A-6. U.S. Patent No. 11,240,724 (“Han 724”). <i>See</i> Exhibit A-7. U.S. Patent Pub. No. 2011/0274087 (“Liang”). <i>See</i> Exhibit A-8. U.S. Patent Pub. No. 2019/0349803 (“Byun”). <i>See</i> Exhibit A-9. U.S. Patent Pub. No. 2014/0135007 (“Yu”). <i>See</i> Exhibit A-10. R3-171116 Connected Mode Mobility with Slicing (“R3-171116”). <i>See</i> Exhibit A-11.

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		R3-171029 - NW Slice Availability Handling Approaches During Mobility (“R3-171029”). <i>See</i> Exhibit A-12. R3-170065 - Selection RAN Part Network Slice During UE Mobility (“R3-170065”). <i>See</i> Exhibit A-13. R3-173614 - Discussion on Slice Mobility Issue (“R3-173614”). <i>See</i> Exhibit A-14. 3GPP TS 36.300 V13.4.0 (2016-06) (“TS 36.300 V13.4.0”). <i>See</i> Exhibit A-15. U.S. Patent No. 9,681,355 (“Cho”) at Fig. 8, Fig. 11, Fig. 14, 6:62-7:3, 7:4-8, 10:31-40. U.S. Patent No. 10,952,275 (“Zhang”) at Fig. 1, Fig. 3, 3:14-29, 3:49-55, 7:3-19, 7:40-53. U.S. Patent No. 11,076,434 (“Sivavakeesar”) at Fig. 11, Fig. 12, 25:22-48, 25:49-63. U.S. Patent Pub. No. 2007/0293254 (“Jiang”) at Fig. 1, Fig. 2, Fig. 3, [0022]-[0023], [0027]-[0028]. U.S. Patent Pub. No. 2009/0252070 (“Connors”) at Fig. 2, Fig. 9, [0172]-0175]. U.S. Patent Pub. No. 2014/0086177 (“Adjakple”) at Fig. 1B, [0072], [0160], [0188], [0209], [0311].
1[e]	wherein, if one or more protocol data unit (PDU) sessions are associated with one or more network slices that are not supported by the target BS, the handover	R3-173152 - Xn Based Mobility Across RA (“R3-173152”). <i>See</i> Exhibit A-1. U.S. Patent No. 10,966,222 (“Han 222”). <i>See</i> Exhibit A-2. U.S. Patent No. 11,765,635 (“Futaki 635”). <i>See</i> Exhibit A-3.

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	request confirmation message includes information for indicating a rejection of the one or more PDU sessions by the target BS.	3GPP TR 38.801 V0.4.0 (2016-08) (“TR 38.801 V0.4.0”). <i>See</i> Exhibit A-4. U.S. Patent No. 11,356,854 (“Futaki 854”). <i>See</i> Exhibit A-5. U.S. Patent No. 10,893,455 (“Zee”). <i>See</i> Exhibit A-6. U.S. Patent No. 11,240,724 (“Han 724”). <i>See</i> Exhibit A-7. U.S. Patent Pub. No. 2011/0274087 (“Liang”). <i>See</i> Exhibit A-8. U.S. Patent Pub. No. 2019/0349803 (“Byun”). <i>See</i> Exhibit A-9. U.S. Patent Pub. No. 2014/0135007 (“Yu”). <i>See</i> Exhibit A-10. R3-171116 Connected Mode Mobility with Slicing (“R3-171116”). <i>See</i> Exhibit A-11. R3-171029 - NW Slice Availability Handling Approaches During Mobility (“R3-171029”). <i>See</i> Exhibit A-12. R3-170065 - Selection RAN Part Network Slice During UE Mobility (“R3-170065”). <i>See</i> Exhibit A-13. R3-173614 - Discussion on Slice Mobility Issue (“R3-173614”). <i>See</i> Exhibit A-14. 3GPP TS 36.300 V13.4.0 (2016-06) (“TS 36.300 V13.4.0”). <i>See</i> Exhibit A-15. U.S. Patent No. 9,681,355 (“Cho”) at Fig. 8, Fig. 11, Fig. 14, 6:62-7:3, 7:4-8, 10:31-40. U.S. Patent No. 10,952,275 (“Zhang”) at Fig. 1, Fig. 3, 3:14-29, 3:49-55, 7:3-19, 7:40-53.

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Claim Language		Exemplary Citations to Disclosed Art
		U.S. Patent No. 11,076,434 (“Sivavakeesar”) at Fig. 11, Fig. 12, 25:22-48, 25:49-63. U.S. Patent Pub. No. 2007/0293254 (“Jiang”) at Fig. 1, Fig. 2, Fig. 3, [0022]-[0023], [0027]-[0028]. U.S. Patent Pub. No. 2009/0252070 (“Connors”) at Fig. 2, Fig. 9, [0172]-0175]. U.S. Patent Pub. No. 2014/0086177 (“Adjakple”) at Fig. 1B, [0072], [0160], [0188], [0209], [0311].

2. Claim 2

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Claim Language		Exemplary Citations to Disclosed Art
2	The method according to claim 1, further comprising: receiving, by the source BS from a user equipment (UE), a non-access stratum (NAS) message including network slice request information.	R3-173152 - Xn Based Mobility Across RA (“R3-173152”). <i>See</i> Exhibit A-1. U.S. Patent No. 10,966,222 (“Han 222”). <i>See</i> Exhibit A-2. U.S. Patent No. 11,765,635 (“Futaki 635”). <i>See</i> Exhibit A-3. 3GPP TR 38.801 V0.4.0 (2016-08) (“TR 38.801 V0.4.0”). <i>See</i> Exhibit A-4. U.S. Patent No. 11,356,854 (“Futaki 854”). <i>See</i> Exhibit A-5. U.S. Patent No. 10,893,455 (“Zee”). <i>See</i> Exhibit A-6. U.S. Patent No. 11,240,724 (“Han 724”). <i>See</i> Exhibit A-7. U.S. Patent Pub. No. 2011/0274087 (“Liang”). <i>See</i> Exhibit A-8.

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Claim Language		Exemplary Citations to Disclosed Art
		U.S. Patent Pub. No. 2019/0349803 (“Byun”). <i>See</i> Exhibit A-9. U.S. Patent Pub. No. 2014/0135007 (“Yu”). <i>See</i> Exhibit A-10. R3-171116 Connected Mode Mobility with Slicing (“R3-171116”). <i>See</i> Exhibit A-11. R3-171029 - NW Slice Availability Handling Approaches During Mobility (“R3-171029”). <i>See</i> Exhibit A-12. R3-170065 - Selection RAN Part Network Slice During UE Mobility (“R3-170065”). <i>See</i> Exhibit A-13. R3-173614 - Discussion on Slice Mobility Issue (“R3-173614”). <i>See</i> Exhibit A-14. 3GPP TS 36.300 V13.4.0 (2016-06) (“TS 36.300 V13.4.0”). <i>See</i> Exhibit A-15. U.S. Patent No. 9,681,355 (“Cho”) at Fig. 8, Fig. 11, Fig. 14, 6:62-7:3, 7:4-8, 10:31-40. U.S. Patent No. 10,952,275 (“Zhang”) at Fig. 1, Fig. 3, 3:14-29, 3:49-55, 7:3-19, 7:40-53. U.S. Patent No. 11,076,434 (“Sivavakeesar”) at Fig. 11, Fig. 12, 25:22-48, 25:49-63. U.S. Patent Pub. No. 2007/0293254 (“Jiang”) at Fig. 1, Fig. 2, Fig. 3, [0022]-[0023], [0027]-[0028]. U.S. Patent Pub. No. 2009/0252070 (“Connors”) at Fig. 2, Fig. 9, [0172]-0175].

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		U.S. Patent Pub. No. 2014/0086177 (“Adjakple”) at Fig. 1B, [0072], [0160], [0188], [0209], [0311].

3. Claim 3

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Claim Language		Exemplary Citations to Disclosed Art
3	The method according to claim 2, further comprising: receiving, by the source BS from a core network entity, the network slice information, wherein the network slice information is configured by the network slice request information.	R3-173152 - Xn Based Mobility Across RA (“R3-173152”). <i>See</i> Exhibit A-1. U.S. Patent No. 10,966,222 (“Han 222”). <i>See</i> Exhibit A-2. U.S. Patent No. 11,765,635 (“Futaki 635”). <i>See</i> Exhibit A-3. 3GPP TR 38.801 V0.4.0 (2016-08) (“TR 38.801 V0.4.0”). <i>See</i> Exhibit A-4. U.S. Patent No. 11,356,854 (“Futaki 854”). <i>See</i> Exhibit A-5. U.S. Patent No. 10,893,455 (“Zee”). <i>See</i> Exhibit A-6. U.S. Patent No. 11,240,724 (“Han 724”). <i>See</i> Exhibit A-7. U.S. Patent Pub. No. 2011/0274087 (“Liang”). <i>See</i> Exhibit A-8. U.S. Patent Pub. No. 2019/0349803 (“Byun”). <i>See</i> Exhibit A-9. U.S. Patent Pub. No. 2014/0135007 (“Yu”). <i>See</i> Exhibit A-10. R3-171116 Connected Mode Mobility with Slicing (“R3-171116”). <i>See</i> Exhibit A-11.

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Claim Language		Exemplary Citations to Disclosed Art
		R3-171029 - NW Slice Availability Handling Approaches During Mobility (“R3-171029”). <i>See</i> Exhibit A-12. R3-170065 - Selection RAN Part Network Slice During UE Mobility (“R3-170065”). <i>See</i> Exhibit A-13. R3-173614 - Discussion on Slice Mobility Issue (“R3-173614”). <i>See</i> Exhibit A-14. 3GPP TS 36.300 V13.4.0 (2016-06) (“TS 36.300 V13.4.0”). <i>See</i> Exhibit A-15. U.S. Patent No. 9,681,355 (“Cho”) at Fig. 8, Fig. 11, Fig. 14, 6:62-7:3, 7:4-8, 10:31-40. U.S. Patent No. 10,952,275 (“Zhang”) at Fig. 1, Fig. 3, 3:14-29, 3:49-55, 7:3-19, 7:40-53. U.S. Patent No. 11,076,434 (“Sivavakeesar”) at Fig. 11, Fig. 12, 25:22-48, 25:49-63. U.S. Patent Pub. No. 2007/0293254 (“Jiang”) at Fig. 1, Fig. 2, Fig. 3, [0022]-[0023], [0027]-[0028]. U.S. Patent Pub. No. 2009/0252070 (“Connors”) at Fig. 2, Fig. 9, [0172]-0175]. U.S. Patent Pub. No. 2014/0086177 (“Adjakple”) at Fig. 1B, [0072], [0160], [0188], [0209], [0311].

4. Claim 4

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Claim Language		Exemplary Citations to Disclosed Art
4	The method according to claim 2, wherein the NAS message including the network slice request information is included in a radio resource control (RRC) connection setup completion message.	R3-173152 - Xn Based Mobility Across RA (“R3-173152”). <i>See</i> Exhibit A-1. U.S. Patent No. 10,966,222 (“Han 222”). <i>See</i> Exhibit A-2. U.S. Patent No. 11,765,635 (“Futaki 635”). <i>See</i> Exhibit A-3. 3GPP TR 38.801 V0.4.0 (2016-08) (“TR 38.801 V0.4.0”). <i>See</i> Exhibit A-4. U.S. Patent No. 11,356,854 (“Futaki 854”). <i>See</i> Exhibit A-5. U.S. Patent No. 10,893,455 (“Zee”). <i>See</i> Exhibit A-6. U.S. Patent No. 11,240,724 (“Han 724”). <i>See</i> Exhibit A-7. U.S. Patent Pub. No. 2011/0274087 (“Liang”). <i>See</i> Exhibit A-8. U.S. Patent Pub. No. 2019/0349803 (“Byun”). <i>See</i> Exhibit A-9. U.S. Patent Pub. No. 2014/0135007 (“Yu”). <i>See</i> Exhibit A-10. R3-171116 Connected Mode Mobility with Slicing (“R3-171116”). <i>See</i> Exhibit A-11. R3-171029 - NW Slice Availability Handling Approaches During Mobility (“R3-171029”). <i>See</i> Exhibit A-12. R3-170065 - Selection RAN Part Network Slice During UE Mobility (“R3-170065”). <i>See</i> Exhibit A-13. R3-173614 - Discussion on Slice Mobility Issue (“R3-173614”). <i>See</i> Exhibit A-14.

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		3GPP TS 36.300 V13.4.0 (2016-06) (“TS 36.300 V13.4.0”). <i>See</i> Exhibit A-15. U.S. Patent No. 9,681,355 (“Cho”) at Fig. 8, Fig. 11, Fig. 14, 6:62-7:3, 7:4-8, 10:31-40. U.S. Patent No. 10,952,275 (“Zhang”) at Fig. 1, Fig. 3, 3:14-29, 3:49-55, 7:3-19, 7:40-53. U.S. Patent No. 11,076,434 (“Sivavakeesar”) at Fig. 11, Fig. 12, 25:22-48, 25:49-63. U.S. Patent Pub. No. 2007/0293254 (“Jiang”) at Fig. 1, Fig. 2, Fig. 3, [0022]-[0023], [0027]-[0028]. U.S. Patent Pub. No. 2009/0252070 (“Connors”) at Fig. 2, Fig. 9, [0172]-[0175]. U.S. Patent Pub. No. 2014/0086177 (“Adjakple”) at Fig. 1B, [0072], [0160], [0188], [0209], [0311].

5. Claim 5

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Claim Language		Exemplary Citations to Disclosed Art
5	The method according to claim 3, wherein the network slice information is configured by the core network entity based on the network slice request information.	R3-173152 - Xn Based Mobility Across RA (“R3-173152”). <i>See</i> Exhibit A-1. U.S. Patent No. 10,966,222 (“Han 222”). <i>See</i> Exhibit A-2. U.S. Patent No. 11,765,635 (“Futaki 635”). <i>See</i> Exhibit A-3. 3GPP TR 38.801 V0.4.0 (2016-08) (“TR 38.801 V0.4.0”). <i>See</i> Exhibit A-4.

Invalidity of U.S. Patent 11,627,631 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
		U.S. Patent No. 11,356,854 (“Futaki 854”). <i>See</i> Exhibit A-5. U.S. Patent No. 10,893,455 (“Zee”). <i>See</i> Exhibit A-6. U.S. Patent No. 11,240,724 (“Han 724”). <i>See</i> Exhibit A-7. U.S. Patent Pub. No. 2011/0274087 (“Liang”). <i>See</i> Exhibit A-8. U.S. Patent Pub. No. 2019/0349803 (“Byun”). <i>See</i> Exhibit A-9. U.S. Patent Pub. No. 2014/0135007 (“Yu”). <i>See</i> Exhibit A-10. R3-171116 Connected Mode Mobility with Slicing (“R3-171116”). <i>See</i> Exhibit A-11. R3-171029 - NW Slice Availability Handling Approaches During Mobility (“R3-171029”). <i>See</i> Exhibit A-12. R3-170065 - Selection RAN Part Network Slice During UE Mobility (“R3-170065”). <i>See</i> Exhibit A-13. R3-173614 - Discussion on Slice Mobility Issue (“R3-173614”). <i>See</i> Exhibit A-14. 3GPP TS 36.300 V13.4.0 (2016-06) (“TS 36.300 V13.4.0”). <i>See</i> Exhibit A-15. U.S. Patent No. 9,681,355 (“Cho”) at Fig. 8, Fig. 11, Fig. 14, 6:62-7:3, 7:4-8, 10:31-40. U.S. Patent No. 10,952,275 (“Zhang”) at Fig. 1, Fig. 3, 3:14-29, 3:49-55, 7:3-19, 7:40-53. U.S. Patent No. 11,076,434 (“Sivavakeesar”) at Fig. 11, Fig. 12, 25:22-48, 25:49-63.

Invalidity of U.S. Patent 11,627,631 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
		U.S. Patent Pub. No. 2007/0293254 (“Jiang”) at Fig. 1, Fig. 2, Fig. 3, [0022]-[0023], [0027]-[0028]. U.S. Patent Pub. No. 2009/0252070 (“Connors”) at Fig. 2, Fig. 9, [0172]-0175]. U.S. Patent Pub. No. 2014/0086177 (“Adjakple”) at Fig. 1B, [0072], [0160], [0188], [0209], [0311].

6. Claim 6

Invalidity of U.S. Patent 11,627,631 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
6	The method according to claim 5, wherein the transmission of the handover request message is performed through a direct interface associated with the target base station.	R3-173152 - Xn Based Mobility Across RA (“R3-173152”). <i>See</i> Exhibit A-1. U.S. Patent No. 10,966,222 (“Han 222”). <i>See</i> Exhibit A-2. U.S. Patent No. 11,765,635 (“Futaki 635”). <i>See</i> Exhibit A-3. 3GPP TR 38.801 V0.4.0 (2016-08) (“TR 38.801 V0.4.0”). <i>See</i> Exhibit A-4. U.S. Patent No. 11,356,854 (“Futaki 854”). <i>See</i> Exhibit A-5. U.S. Patent No. 10,893,455 (“Zee”). <i>See</i> Exhibit A-6. U.S. Patent No. 11,240,724 (“Han 724”). <i>See</i> Exhibit A-7. U.S. Patent Pub. No. 2011/0274087 (“Liang”). <i>See</i> Exhibit A-8. U.S. Patent Pub. No. 2019/0349803 (“Byun”). <i>See</i> Exhibit A-9.

Invalidity of U.S. Patent 11,627,631 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
		U.S. Patent Pub. No. 2014/0135007 (“Yu”). <i>See</i> Exhibit A-10. R3-171116 Connected Mode Mobility with Slicing (“R3-171116”). <i>See</i> Exhibit A-11. R3-171029 - NW Slice Availability Handling Approaches During Mobility (“R3-171029”). <i>See</i> Exhibit A-12. R3-170065 - Selection RAN Part Network Slice During UE Mobility (“R3-170065”). <i>See</i> Exhibit A-13. R3-173614 - Discussion on Slice Mobility Issue (“R3-173614”). <i>See</i> Exhibit A-14. 3GPP TS 36.300 V13.4.0 (2016-06) (“TS 36.300 V13.4.0”). <i>See</i> Exhibit A-15. U.S. Patent No. 9,681,355 (“Cho”) at Fig. 8, Fig. 11, Fig. 14, 6:62-7:3, 7:4-8, 10:31-40. U.S. Patent No. 10,952,275 (“Zhang”) at Fig. 1, Fig. 3, 3:14-29, 3:49-55, 7:3-19, 7:40-53. U.S. Patent No. 11,076,434 (“Sivavakeesar”) at Fig. 11, Fig. 12, 25:22-48, 25:49-63. U.S. Patent Pub. No. 2007/0293254 (“Jiang”) at Fig. 1, Fig. 2, Fig. 3, [0022]-[0023], [0027]-[0028]. U.S. Patent Pub. No. 2009/0252070 (“Connors”) at Fig. 2, Fig. 9, [0172]-[0175]. U.S. Patent Pub. No. 2014/0086177 (“Adjakple”) at Fig. 1B, [0072], [0160], [0188], [0209], [0311].

7. Claim 7

Invalidity of U.S. Patent 11,627,631 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
7[pre]	A controller for transmitting and receiving data, the controller comprising:	<i>See</i> limitation 1[pre].
7[a]	a processor performs:	R3-173152 - Xn Based Mobility Across RA (“R3-173152”). <i>See</i> Exhibit A-1. U.S. Patent No. 10,966,222 (“Han 222”). <i>See</i> Exhibit A-2. U.S. Patent No. 11,765,635 (“Futaki 635”). <i>See</i> Exhibit A-3. 3GPP TR 38.801 V0.4.0 (2016-08) (“TR 38.801 V0.4.0”). <i>See</i> Exhibit A-4. U.S. Patent No. 11,356,854 (“Futaki 854”). <i>See</i> Exhibit A-5. U.S. Patent No. 10,893,455 (“Zee”). <i>See</i> Exhibit A-6. U.S. Patent No. 11,240,724 (“Han 724”). <i>See</i> Exhibit A-7. U.S. Patent Pub. No. 2011/0274087 (“Liang”). <i>See</i> Exhibit A-8. U.S. Patent Pub. No. 2019/0349803 (“Byun”). <i>See</i> Exhibit A-9. U.S. Patent Pub. No. 2014/0135007 (“Yu”). <i>See</i> Exhibit A-10. R3-171116 Connected Mode Mobility with Slicing (“R3-171116”). <i>See</i> Exhibit A-11. R3-171029 - NW Slice Availability Handling Approaches During Mobility (“R3-171029”). <i>See</i> Exhibit A-12.

Invalidity of U.S. Patent 11,627,631 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
		R3-170065 - Selection RAN Part Network Slice During UE Mobility (“R3-170065”). <i>See</i> Exhibit A-13. R3-173614 - Discussion on Slice Mobility Issue (“R3-173614”). <i>See</i> Exhibit A-14. 3GPP TS 36.300 V13.4.0 (2016-06) (“TS 36.300 V13.4.0”). <i>See</i> Exhibit A-15. U.S. Patent No. 9,681,355 (“Cho”) at Fig. 8, Fig. 11, Fig. 14, 6:62-7:3, 7:4-8, 10:31-40. U.S. Patent No. 10,952,275 (“Zhang”) at Fig. 1, Fig. 3, 3:14-29, 3:49-55, 7:3-19, 7:40-53. U.S. Patent No. 11,076,434 (“Sivavakeesar”) at Fig. 11, Fig. 12, 25:22-48, 25:49-63. U.S. Patent Pub. No. 2007/0293254 (“Jiang”) at Fig. 1, Fig. 2, Fig. 3, [0022]-[0023], [0027]-[0028]. U.S. Patent Pub. No. 2009/0252070 (“Connors”) at Fig. 2, Fig. 9, [0172]-0175]. U.S. Patent Pub. No. 2014/0086177 (“Adjakple”) at Fig. 1B, [0072], [0160], [0188], [0209], [0311].
7[b]	to decide whether to perform a handover,	<i>See</i> limitation 1[a].
7[c]	to transmit a handover request message when it is decided to perform the handover,	<i>See</i> limitation 1[b].
7[d]	wherein the handover request message includes network slice information; and	<i>See</i> limitation 1[c].

Invalidity of U.S. Patent 11,627,631 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
7[e]	to receive a handover request confirmation message in response to the handover request message,	<i>See</i> limitation 1[d].
7[f]	wherein, if one or more protocol data unit (PDU) sessions are associated with one or more network slices that are not supported by a target BS, the handover request confirmation message includes information for indicating a rejection of the one or more PDU sessions by the target BS.	<i>See</i> limitation 1[e].

8. Claim 8

Invalidity of U.S. Patent 11,627,631 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
8	The controller according to claim 7, wherein the processor further performs to receive a non-access stratum (NAS) message including network slice request information.	<i>See</i> claim 2.

9. Claim 9

Invalidity of U.S. Patent 11,627,631 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
9	The controller according to claim 8, wherein the processor further performs to receive the network slice information from a core network, wherein the network slice information is configured by the network slice request information.	<i>See claim 3.</i>

10. Claim 10

Invalidity of U.S. Patent 11,627,631 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
10	The controller according to claim 8, wherein the NAS message including the network slice request information is included in a radio resource control (RRC) connection setup completion message.	<i>See claim 4.</i>

11. Claim 11

Invalidity of U.S. Patent 11,627,631 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
11	The controller according to claim 9, wherein the network slice information is configured by the core network entity based on the network slice request information.	<i>See claim 5.</i>

12. Claim 12

Invalidity of U.S. Patent 11,627,631 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
12	The controller according to claim 11, wherein the transmission of the handover request message is performed through a direct interface associated with the target base station.	<i>See claim 6.</i>

13. Claim 13

Invalidity of U.S. Patent 11,627,631 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
13[pre]	An apparatus for transmitting and receiving data, the apparatus comprising:	<i>See limitation 1[pre].</i>

Invalidity of U.S. Patent 11,627,631 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
13[a]	a controller configured to decide whether to perform a handover,	<i>See</i> limitation 1[a].
13[b]	a transmitter configured to transmit a handover request message when it is decided to perform the handover,	<i>See</i> limitation 1[b].
13[c]	wherein the handover request message includes network slice information; and	<i>See</i> limitation 1[c].
13[d]	a receiver configured to receive a handover request confirmation message in response to the handover request message,	<i>See</i> limitation 1[d].
13[e]	wherein, if one or more protocol data unit (PDU) sessions are associated with one or more network slices that are not supported by a target BS, the handover request confirmation message includes information for indicating a rejection of the one or more PDU sessions by the target BS.	<i>See</i> limitation 1[e].

14. Claim 14

Invalidity of U.S. Patent 11,627,631 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
14	The apparatus according to claim 13, wherein the processor further performs to receive a non-access stratum (NAS) message including network slice request information.	<i>See claim 2.</i>

15. Claim 15

Invalidity of U.S. Patent 11,627,631 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
15	The apparatus according to claim 14, wherein the processor further performs to receive the network slice information from a core network, wherein the network slice information is configured by the network slice request information.	<i>See claim 3.</i>

16. Claim 16

Invalidity of U.S. Patent 11,627,631 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
16	The apparatus according to claim 14, wherein the NAS message including the network slice request information is included in a radio resource control (RRC) connection setup completion message.	<i>See claim 4.</i>

17. Claim 17

Invalidity of U.S. Patent 11,627,631 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
17	The apparatus according to claim 15, wherein the network slice information is configured by the core network entity based on the network slice request information.	<i>See claim 5.</i>

18. Claim 18

Invalidity of U.S. Patent 11,627,631 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
18	The apparatus according to claim 17, wherein the transmission of the handover	<i>See claim 6.</i>

Invalidity of U.S. Patent 11,627,631 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
	request message is performed through a direct interface associated with the target base station.	

EXHIBIT E-4 (Amended)

Invalidity Analysis of U.S. Patent No. 10,594,460 (“460 Patent) Obvious Combinations

1. Claim 1

Invalidity of U.S. Patent No. 10,594,460 in Obviousness Combinations		
Claim Language		Disclosed Art
1[pre]	A method for a user equipment (UE) to transmit an uplink (UL) control channel and a UL data channel to a base station (BS), the method comprising	3GPP TS 38.213 v15.1.0 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Physical layer procedures for control (Release 15) (“TS 38.213 V15.1.0”). <i>See</i> Exhibit E-1. 3GPP TS 38.214 v15.1.0 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Physical layer procedures for data (Release 15) (“TS 38.214 v15.1.0”). <i>See</i> Exhibit E-2. “3G Evolution HSPA and LTE for Mobile Broadband” (Second Edition), E. Dahlman, S. Parkvall, J. Skold, P. Beming, Academic Press (“Dahlman”). <i>See</i> Exhibit E-3. “Frequency Hopping in LTE Uplink,” Tariku Mehari, Blekinge Institute of Technology (“Mehari”). <i>See</i> Exhibit E-4. 3GPP TS 36.213 v14.2.0 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures (Release 14) (“TS 36.213”). <i>See</i> Exhibit E-5. U.S. Patent Pub. 2020/0136778 to Takeda et. al. (“Takeda”). <i>See</i> Exhibit E-6. U.S. Patent No. 10,548,123 to Ouchi et. al. (“Ouchi”). <i>See</i> Exhibit E-7. U.S. Patent Pub. US2020/0336269A1 (“Shen”). <i>See</i> Exhibit E-8.

Invalidity of U.S. Patent No. 10,594,460 in Obviousness Combinations		
Claim Language		Disclosed Art
		U.S. Patent Pub. US2020/0389204 (“Matsumura”). <i>See</i> Exhibit E-9. WO 2018/203727 A1 (“Zhang”). <i>See</i> Exhibit E-10.
1[a]	receiving, from a BS, bandwidth part (BWP) configuration information of a BWP set composed of one or more BWPs configured for a UE;	3GPP TS 38.213 v15.1.0 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Physical layer procedures for control (Release 15) (“TS 38.213 V15.1.0”). <i>See</i> Exhibit E-1. 3GPP TS 38.214 v15.1.0 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Physical layer procedures for data (Release 15) (“TS 38.214 v15.1.0”). <i>See</i> Exhibit E-2. “3G Evolution HSPA and LTE for Mobile Broadband” (Second Edition), E. Dahlman, S. Parkvall, J. Skold, P. Beming, Academic Press (“Dahlman”). <i>See</i> Exhibit E-3. “Frequency Hopping in LTE Uplink,” Tariku Mehari, Blekinge Institute of Technology (“Mehari”). <i>See</i> Exhibit E-4. 3GPP TS 36.213 v14.2.0 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures (Release 14) (“TS 36.213”). <i>See</i> Exhibit E-5. U.S. Patent Pub. 2020/0136778 to Takeda et. al. (“Takeda”). <i>See</i> Exhibit E-6. U.S. Patent No. 10,548,123 to Ouchi et. al. (“Ouchi”). <i>See</i> Exhibit E-7. U.S. Patent Pub. US2020/0336269A1 (“Shen”). <i>See</i> Exhibit E-8. U.S. Patent Pub. US2020/0389204 (“Matsumura”). <i>See</i> Exhibit E-9.

Invalidity of U.S. Patent No. 10,594,460 in Obviousness Combinations		
Claim Language		Disclosed Art
		WO 2018/203727 A1 (“Zhang”). <i>See</i> Exhibit E-10.
1[b]	receiving, from the BS, frequency hopping configuration information for a UL control channel and a UL data channel transmitted through one transmission BWP of the BWP set; and	3GPP TS 38.213 v15.1.0 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Physical layer procedures for control (Release 15) (“TS 38.213 V15.1.0”). <i>See</i> Exhibit E-1. 3GPP TS 38.214 v15.1.0 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Physical layer procedures for data (Release 15) (“TS 38.214 v15.1.0”). <i>See</i> Exhibit E-2. “3G Evolution HSPA and LTE for Mobile Broadband” (Second Edition), E. Dahlman, S. Parkvall, J. Skold, P. Beming, Academic Press (“Dahlman”). <i>See</i> Exhibit E-3. “Frequency Hopping in LTE Uplink,” Tariku Mehari, Blekinge Institute of Technology (“Mehari”). <i>See</i> Exhibit E-4. 3GPP TS 36.213 v14.2.0 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures (Release 14) (“TS 36.213”). <i>See</i> Exhibit E-5. U.S. Patent Pub. 2020/0136778 to Takeda et. al. (“Takeda”). <i>See</i> Exhibit E-6. U.S. Patent No. 10,548,123 to Ouchi et. al. (“Ouchi”). <i>See</i> Exhibit E-7. U.S. Patent Pub. US2020/0336269A1 (“Shen”). <i>See</i> Exhibit E-8. U.S. Patent Pub. US2020/0389204 (“Matsumura”). <i>See</i> Exhibit E-9. WO 2018/203727 A1 (“Zhang”). <i>See</i> Exhibit E-10.

Invalidity of U.S. Patent No. 10,594,460 in Obviousness Combinations		
Claim Language		Disclosed Art
1[c]	transmitting a UL control channel and a UL data channel to the BS through the transmission BWP based on the BWP configuration information and the frequency hopping configuration information,	3GPP TS 38.213 v15.1.0 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Physical layer procedures for control (Release 15) (“TS 38.213 V15.1.0”). <i>See</i> Exhibit E-1. 3GPP TS 38.214 v15.1.0 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Physical layer procedures for data (Release 15) (“TS 38.214 v15.1.0”). <i>See</i> Exhibit E-2. “3G Evolution HSPA and LTE for Mobile Broadband” (Second Edition), E. Dahlman, S. Parkvall, J. Skold, P. Beming, Academic Press (“Dahlman”). <i>See</i> Exhibit E-3. “Frequency Hopping in LTE Uplink,” Tariku Mehari, Blekinge Institute of Technology (“Mehari”). <i>See</i> Exhibit E-4. 3GPP TS 36.213 v14.2.0 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures (Release 14) (“TS 36.213”). <i>See</i> Exhibit E-5. U.S. Patent Pub. 2020/0136778 to Takeda et. al. (“Takeda”). <i>See</i> Exhibit E-6. U.S. Patent No. 10,548,123 to Ouchi et. al. (“Ouchi”). <i>See</i> Exhibit E-7. U.S. Patent Pub. US2020/0336269A1 (“Shen”). <i>See</i> Exhibit E-8. U.S. Patent Pub. US2020/0389204 (“Matsumura”). <i>See</i> Exhibit E-9. WO 2018/203727 A1 (“Zhang”). <i>See</i> Exhibit E-10.
1[d]	wherein the frequency hopping configuration information for a UL data channel includes a frequency hopping offset set	3GPP TS 38.213 v15.1.0 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Physical layer procedures for control (Release 15) (“TS 38.213 V15.1.0”). <i>See</i> Exhibit E-1.

Invalidity of U.S. Patent No. 10,594,460 in Obviousness Combinations		
Claim Language		Disclosed Art
	composed of one or more frequency hopping offset values, and	3GPP TS 38.214 v15.1.0 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Physical layer procedures for data (Release 15) (“TS 38.214 v15.1.0”). <i>See</i> Exhibit E-2. “3G Evolution HSPA and LTE for Mobile Broadband” (Second Edition), E. Dahlman, S. Parkvall, J. Skold, P. Beming, Academic Press (“Dahlman”). <i>See</i> Exhibit E-3. “Frequency Hopping in LTE Uplink,” Tariku Mehari, Blekinge Institute of Technology (“Mehari”). <i>See</i> Exhibit E-4. 3GPP TS 36.213 v14.2.0 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures (Release 14) (“TS 36.213”). <i>See</i> Exhibit E-5. U.S. Patent Pub. 2020/0136778 to Takeda et. al. (“Takeda”). <i>See</i> Exhibit E-6. U.S. Patent No. 10,548,123 to Ouchi et. al. (“Ouchi”). <i>See</i> Exhibit E-7. U.S. Patent Pub. US2020/0336269A1 (“Shen”). <i>See</i> Exhibit E-8. U.S. Patent Pub. US2020/0389204 (“Matsumura”). <i>See</i> Exhibit E-9. WO 2018/203727 A1 (“Zhang”). <i>See</i> Exhibit E-10.
1[e]	wherein a frequency hopping offset value used to transmit the UL data channel among the frequency hopping offset values included in the frequency hopping offset set is indicated by UL grant	3GPP TS 38.213 v15.1.0 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Physical layer procedures for control (Release 15) (“TS 38.213 V15.1.0”). <i>See</i> Exhibit E-1. 3GPP TS 38.214 v15.1.0 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Physical layer procedures for data (Release 15) (“TS 38.214 v15.1.0”). <i>See</i> Exhibit E-2.

Invalidity of U.S. Patent No. 10,594,460 in Obviousness Combinations		
Claim Language		Disclosed Art
	downlink control information (DCI).	“3G Evolution HSPA and LTE for Mobile Broadband” (Second Edition), E. Dahlman, S. Parkvall, J. Skold, P. Beming, Academic Press (“Dahlman”). <i>See</i> Exhibit E-3. “Frequency Hopping in LTE Uplink,” Tariku Mehari, Blekinge Institute of Technology (“Mehari”). <i>See</i> Exhibit E-4. 3GPP TS 36.213 v14.2.0 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures (Release 14) (“TS 36.213”). <i>See</i> Exhibit E-5. U.S. Patent Pub. 2020/0136778 to Takeda et. al. (“Takeda”). <i>See</i> Exhibit E-6. U.S. Patent No. 10,548,123 to Ouchi et. al. (“Ouchi”). <i>See</i> Exhibit E-7. U.S. Patent Pub. US2020/0336269A1 (“Shen”). <i>See</i> Exhibit E-8. U.S. Patent Pub. US2020/0389204 (“Matsumura”). <i>See</i> Exhibit E-9. WO 2018/203727 A1 (“Zhang”). <i>See</i> Exhibit E-10.

2. Claim 2

Invalidity of U.S. Patent 8,554,196 in Obviousness Combinations		
Claim Language		Disclosed Art
2	The method of claim 1, wherein the frequency hopping configuration information for a UL control channel includes at least one of information indicating whether to perform frequency hopping, physical	3GPP TS 38.213 v15.1.0 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Physical layer procedures for control (Release 15) (“TS 38.213 V15.1.0”). <i>See</i> Exhibit E-1.

Invalidity of U.S. Patent 8,554,196 in Obviousness Combinations		
Claim Language		Disclosed Art
	resource block (PRB) allocation information of a first frequency resource region of the UL control channel, and PRB allocation information of a second frequency resource region of the UL control channel.	3GPP TS 38.214 v15.1.0 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Physical layer procedures for data (Release 15) (“TS 38.214 v15.1.0”). <i>See</i> Exhibit E-2. “3G Evolution HSPA and LTE for Mobile Broadband” (Second Edition), E. Dahlman, S. Parkvall, J. Skold, P. Beming, Academic Press (“Dahlman”). <i>See</i> Exhibit E-3. “Frequency Hopping in LTE Uplink,” Tariku Mehari, Blekinge Institute of Technology (“Mehari”). <i>See</i> Exhibit E-4. 3GPP TS 36.213 v14.2.0 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures (Release 14) (“TS 36.213”). <i>See</i> Exhibit E-5. U.S. Patent Pub. 2020/0136778 to Takeda et. al. (“Takeda”). <i>See</i> Exhibit E-6. U.S. Patent No. 10,548,123 to Ouchi et. al. (“Ouchi”). <i>See</i> Exhibit E-7. U.S. Patent Pub. US2020/0336269A1 (“Shen”). <i>See</i> Exhibit E-8. U.S. Patent Pub. US2020/0389204 (“Matsumura”). <i>See</i> Exhibit E-9. WO 2018/203727 A1 (“Zhang”). <i>See</i> Exhibit E-10.

3. Claim 3

Invalidity of U.S. Patent 8,554,196 in Obviousness Combinations		
Claim Language		Disclosed Art
3	The method of claim 1, wherein a number of frequency hopping offset values included in the frequency hopping offset set is determined based on a number of physical resource blocks (PRBs) constituting the transmission BWP.	3GPP TS 38.213 v15.1.0 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Physical layer procedures for control (Release 15) (“TS 38.213 V15.1.0”). <i>See</i> Exhibit E-1. 3GPP TS 38.214 v15.1.0 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Physical layer procedures for data (Release 15) (“TS 38.214 v15.1.0”). <i>See</i> Exhibit E-2. “3G Evolution HSPA and LTE for Mobile Broadband” (Second Edition), E. Dahlman, S. Parkvall, J. Skold, P. Beming, Academic Press (“Dahlman”). <i>See</i> Exhibit E-3. “Frequency Hopping in LTE Uplink,” Tariku Mehari, Blekinge Institute of Technology (“Mehari”). <i>See</i> Exhibit E-4. 3GPP TS 36.213 v14.2.0 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures (Release 14) (“TS 36.213”). <i>See</i> Exhibit E-5. U.S. Patent Pub. 2020/0136778 to Takeda et. al. (“Takeda”). <i>See</i> Exhibit E-6. U.S. Patent No. 10,548,123 to Ouchi et. al. (“Ouchi”). <i>See</i> Exhibit E-7. U.S. Patent Pub. US2020/0336269A1 (“Shen”). <i>See</i> Exhibit E-8. U.S. Patent Pub. US2020/0389204 (“Matsumura”). <i>See</i> Exhibit E-9. WO 2018/203727 A1 (“Zhang”). <i>See</i> Exhibit E-10.

4. Claim 4

Invalidity of U.S. Patent 8,554,196 in Obviousness Combinations		
Claim Language		Disclosed Art
4	The method of claim 3, wherein the number of frequency hopping offset values included in the frequency hopping offset set is determined depending on whether the number of PRBs constituting the transmission BWP is a preset threshold value or less.	3GPP TS 38.213 v15.1.0 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Physical layer procedures for control (Release 15) (“TS 38.213 V15.1.0”). <i>See</i> Exhibit E-1. 3GPP TS 38.214 v15.1.0 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Physical layer procedures for data (Release 15) (“TS 38.214 v15.1.0”). <i>See</i> Exhibit E-2. “3G Evolution HSPA and LTE for Mobile Broadband” (Second Edition), E. Dahlman, S. Parkvall, J. Skold, P. Beming, Academic Press (“Dahlman”). <i>See</i> Exhibit E-3. “Frequency Hopping in LTE Uplink,” Tariku Mehari, Blekinge Institute of Technology (“Mehari”). <i>See</i> Exhibit E-4. 3GPP TS 36.213 v14.2.0 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures (Release 14) (“TS 36.213”). <i>See</i> Exhibit E-5. U.S. Patent Pub. 2020/0136778 to Takeda et. al. (“Takeda”). <i>See</i> Exhibit E-6. U.S. Patent No. 10,548,123 to Ouchi et. al. (“Ouchi”). <i>See</i> Exhibit E-7. U.S. Patent Pub. US2020/0336269A1 (“Shen”). <i>See</i> Exhibit E-8. U.S. Patent Pub. US2020/0389204 (“Matsumura”). <i>See</i> Exhibit E-9. WO 2018/203727 A1 (“Zhang”). <i>See</i> Exhibit E-10. 3GPP TSG RAN WG1 NR Ad Hoc Meeting R1-1801080 (“R1-1801080”). <i>See</i> Exhibit E-11.

5. Claim 5

Invalidity of U.S. Patent 8,554,196 in Obviousness Combinations		
Claim Language		Disclosed Art
5[pre]	A method for a base station (BS) to receive an uplink (UL) control channel and a UL data channel from a user equipment (UE), the method comprising:	<i>See limitation 1[pre].</i>
5[a]	transmitting bandwidth part (BWP) configuration information of a BWP set composed of one or more BWPs configured for a UE to the UE;	<i>See limitation 1[a].</i>
5[b]	transmitting frequency hopping configuration information for a UL control channel and a UL data channel transmitted through one reception BWP of the BWP set to the UE; and	<i>See limitation 1[b].</i>
5[c]	receiving the UL control channel and the UL data channel from the UE through the reception BWP based on the BWP configuration information and the frequency hopping configuration information,	<i>See limitation 1[c].</i>

Invalidity of U.S. Patent 8,554,196 in Obviousness Combinations		
Claim Language		Disclosed Art
5[d]	wherein the frequency hopping configuration information for a UL data channel includes a frequency hopping offset set composed of one or more frequency hopping offset values, and	<i>See</i> limitation 1[d].
5[e]	wherein a frequency hopping offset value used to transmit the UL data channel among the frequency hopping offset values included in the frequency hopping offset set is indicated by UL grant downlink control information (DCI).	<i>See</i> limitation 1[e].

6. Claim 6

Invalidity of U.S. Patent 8,554,196 in Obviousness Combinations		
Claim Language		Disclosed Art
6	The method of claim 5, wherein the frequency hopping configuration information for a UL control channel includes at least one of information indicating whether to perform frequency hopping, physical resource block (PRB) allocation information of a first	<i>See</i> claim 2.

Invalidity of U.S. Patent 8,554,196 in Obviousness Combinations		
Claim Language		Disclosed Art
	frequency resource region of the UL control channel, and PRB allocation information of a second frequency resource region of the UL control channel.	

7. Claim 7

Invalidity of U.S. Patent 8,554,196 in Obviousness Combinations		
Claim Language		Disclosed Art
7	The method of claim 5, wherein a number of frequency hopping offset values included in the frequency hopping offset set is determined based on a number of physical resource blocks (PRBs) constituting the reception BWP.	<i>See claim 3.</i>

8. Claim 8

Invalidity of U.S. Patent 8,554,196 in Obviousness Combinations		
Claim Language		Disclosed Art
8	The method of claim 7, wherein the number of frequency hopping offset values included in the frequency hopping offset set is determined depending on	<i>See claim 4.</i>

Invalidity of U.S. Patent 8,554,196 in Obviousness Combinations		
Claim Language		Disclosed Art
	whether the number of PRBs constituting the reception BWP is a preset threshold value or less.	

9. Claim 9

Invalidity of U.S. Patent 8,554,196 in Obviousness Combinations		
Claim Language		Disclosed Art
9[pre]	A user equipment (UE) for transmitting an uplink (UL) control channel and a UL data channel to a base station (BS), the UE comprising:	<i>See</i> limitation 1[pre].
9[a]	a receiver configured to receive, from a BS, bandwidth part (BWP) configuration information of a BWP set composed of one or more BWPs configured for the UE and receive, from the BS, frequency hopping configuration information for a UL control channel and a UL data channel transmitted through one transmission BWP of the BWP set; and	<i>See</i> limitation 1[a] and 1[b].
9[b]	a transmitter configured to transmit a UL control channel and a UL data channel to the	<i>See</i> limitation 1[c].

Invalidity of U.S. Patent 8,554,196 in Obviousness Combinations		
Claim Language		Disclosed Art
	BS through the transmission BWP based on the BWP configuration information and the frequency hopping configuration information,	
9[c]	wherein the frequency hopping configuration information for a UL data channel includes a frequency hopping offset set composed of one or more frequency hopping offset values, and	<i>See</i> limitation 1[d].
9[d]	wherein a frequency hopping offset value used to transmit the UL data channel among the frequency hopping offset values included in the frequency hopping offset set is indicated by UL grant downlink control information (DCI).	<i>See</i> limitation 1[e].

10. Claim 10

Invalidity of U.S. Patent 8,554,196 in Obviousness Combinations		
Claim Language		Disclosed Art
10	The UE of claim 9, wherein the frequency hopping configuration information for a UL control channel includes at	<i>See</i> claim 2.

Invalidity of U.S. Patent 8,554,196 in Obviousness Combinations		
Claim Language		Disclosed Art
	least one of information indicating whether to perform frequency hopping, physical resource block (PRB) allocation information of a first frequency resource region of the UL control channel, and PRB allocation information of a second frequency resource region of the UL control channel.	

11. Claim 11

Invalidity of U.S. Patent 8,554,196 in Obviousness Combinations		
Claim Language		Disclosed Art
11	The UE of claim 9, wherein a number of frequency hopping offset values included in the frequency hopping offset set is determined based on a number of physical resource blocks (PRBs) constituting the transmission BWP.	See claim 3.

12. Claim 12

Invalidity of U.S. Patent 8,554,196 in Obviousness Combinations		
Claim Language		Disclosed Art
12	The UE of claim 11, wherein the number of frequency hopping offset values included in the frequency hopping offset set is determined depending on whether the number of PRBs constituting the transmission BWP is a preset threshold value or less.	See claim 4.

APPENDIX F (Amended)

Invalidity of U.S. Patent No. 10,721,118 (“118 Patent”) Obvious Combinations

1. Claim 1

Invalidity of U.S. Patent 10,721,118 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
1[pre]	A method of a user equipment for configuring dual connectivity, the method comprising:	U.S. Patent Pub. No. 2015/0119048 (“Yang”). <i>See</i> Exhibit F-1. WO 2015/070445 (“Zhang”). <i>See</i> Exhibit F-2. U.S. Patent Pub. No. 2016/0249389 (“Takahashi”). <i>See</i> Exhibit F-3. R2-141109 - RRC Reconfiguration Failure in Dual Connectivity (“R2-141109”). <i>See</i> Exhibit F-4. U.S. Patent Pub. No. 2016/0212753 (“Wu”). <i>See</i> Exhibit F-5. U.S. Patent Pub. No. 2015/0117183 (“Heo”). <i>See</i> Exhibit F-6. U.S. Patent No. 11,038,859 (“Velde”). <i>See</i> Exhibit F-7. U.S. Patent Pub. No. 2016/0380779 (“Sharma”). <i>See</i> Exhibit F-8. U.S. Patent Pub. No. 2017/0331670 (“Parkvall”). <i>See</i> Exhibit F-9. R2-133392 - Discussion on SRB via SeNB for Dual Connectivity (“R2-133392”). <i>See</i> Exhibit F-10. R2-140059 - The Order and Direction of Messages for SeNB (“R2-140059”). <i>See</i> Exhibit F-11.

Invalidity of U.S. Patent 10,721,118 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
		R2-144867 - Remaining Details for SCG Failure Reporting (“R2-144867”). <i>See</i> Exhibit F-12. U.S. Patent No. 10,952,099 (“Futaki”). <i>See</i> Exhibit F-13. U.S. Patent No. 9,961,606 (“Wu 606”) at Fig. 1, Fig. 3, Fig. 4, Fig. 5, 3:12-59, 4:64-21, 4:24-7:24. U.S. Patent Pub. No. 2015/0131578 (“Baek”) at Fig. 1, Fig. 2, Fig. 5, Fig. 6, Fig. 12, [0074], [0077], [0079], [0081], [0083]-[0084], [0118]-[0120]. U.S. Patent Pub. No. 2015/0208235 (“Ingale”) at Fig. 5, Fig. 6, [0074]-[0081], [0082]-[0084]. U.S. Patent Pub. No. 2015/0264562 (“Wu 562”) at Fig. 2B, Fig. 3, Fig. 4, Fig. 9B, Fig. 10, [0074]-[0076], [0077]-[0081]. U.S. Patent Pub. No. 2016/0029362 (“Kim”) at Fig. 1, Fig. 3, Fig. 4, [0027]-[0032], [0037]-[0074], [0075]-[0086]. U.S. Patent Pub. No. 2016/0044639 (“Yi”) at Fig. 14a, Fig. 14b, Fig. 15a, Fig. 15b, [0135]-[0159], [0160]-[0168]. WO 2016/005002 A1 (“Hwang”) at Fig. 2, Fig. 4, 12:1-29, 15:1-22. WO 2016/047904 A1 (“Lee”) at Fig. 2a, Fig. 12f, Fig. 13, [40]-[42], [220]-[223], [226]-[238]. WO 2016/006936 A1 (“Xu”) at Fig. 1, Fig. 11, Fig. 14, Fig. 15, Fig. 16, [34]-[40], [64]-[71], [103]-[113].

Invalidity of U.S. Patent 10,721,118 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
		3GPP TSG RAN WG2 #94; R2-163764 MediaTek “Architecture for Standalone NR and LTE-NR Tight Interworking” (“R2-163764”) 3GPP TSG RAN WG2 #87bis; R2-144363 Nokia “Remaining Details for SeNB Failure Reporting” (“R2-144363”) Dual Connectivity for LTE-advanced Heterogeneous Networks, Want et al., Wireless Networks at §§ 2-4. 3GPP TSG RAN WG2 #85; R2-140199 MediaTek Inc. “System Information Delivery for SCG” (“R2-140199”) 3GPP TSG RAN WG2 #93bis; R2-162413 MediaTek Inc. “Tight Interaction Between NR and LTE” (“R2-162413”) 3GPP TSG RAN WG2 #93bis; NEC “Tight Interworking Between NR and LTE” (“R2-162889”) 3GPP TS 36.300 version 12.8.0 Release 12 at 46-48, 68-74, 87-103, 204-222
1[a]	adding and configuring a secondary base station signaling radio bearer (SRB);	U.S. Patent Pub. No. 2015/0119048 (“Yang”). <i>See</i> Exhibit F-1. WO 2015/070445 (“Zhang”). <i>See</i> Exhibit F-2. U.S. Patent Pub. No. 2016/0249389 (“Takahashi”). <i>See</i> Exhibit F-3. R2-141109 - RRC Reconfiguration Failure in Dual Connectivity (“R2-141109”). <i>See</i> Exhibit F-4. U.S. Patent Pub. No. 2016/0212753 (“Wu”). <i>See</i> Exhibit F-5. U.S. Patent Pub. No. 2015/0117183 (“Heo”). <i>See</i> Exhibit F-6.

Invalidity of U.S. Patent 10,721,118 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
		U.S. Patent No. 11,038,859 (“Velde”). <i>See</i> Exhibit F-7. U.S. Patent Pub. No. 2016/0380779 (“Sharma”). <i>See</i> Exhibit F-8. U.S. Patent Pub. No. 2017/0331670 (“Parkvall”). <i>See</i> Exhibit F-9. R2-133392 - Discussion on SRB via SeNB for Dual Connectivity (“R2-133392”). <i>See</i> Exhibit F-10. R2-140059 - The Order and Direction of Messages for SeNB (“R2-140059”). <i>See</i> Exhibit F-11. R2-144867 - Remaining Details for SCG Failure Reporting (“R2-144867”). <i>See</i> Exhibit F-12. U.S. Patent No. 10,952,099 (“Futaki”). <i>See</i> Exhibit F-13. U.S. Patent No. 9,961,606 (“Wu 606”) at Fig. 1, Fig. 3, Fig. 4, Fig. 5, 3:12-59, 4:64-21, 4:24-7:24. U.S. Patent Pub. No. 2015/0131578 (“Baek”) at Fig. 1, Fig. 2, Fig. 5, Fig. 6, Fig. 12, [0074], [0077], [0079], [0081], [0083]-[0084], [0118]-[0120]. U.S. Patent Pub. No. 2015/0208235 (“Ingale”) at Fig. 5, Fig. 6, [0074]-[0081], [0082]-[0084]. U.S. Patent Pub. No. 2015/0264562 (“Wu 562”) at Fig. 2B, Fig. 3, Fig. 4, Fig. 9B, Fig. 10, [0074]-[0076], [0077]-[0081].

Invalidity of U.S. Patent 10,721,118 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
		U.S. Patent Pub. No. 2016/0029362 (“Kim”) at Fig. 1, Fig. 3, Fig. 4, [0027]-[0032], [0037]-[0074], [0075]-[0086]. U.S. Patent Pub. No. 2016/0044639 (“Yi”) at Fig. 14a, Fig. 14b, Fig. 15a, Fig. 15b, [0135]-[0159], [0160]-[0168]. WO 2016/005002 A1 (“Hwang”) at Fig. 2, Fig. 4, 12:1-29, 15:1-22. WO 2016/047904 A1 (“Lee”) at Fig. 2a, Fig. 12f, Fig. 13, [40]-[42], [220]-[223], [226]-[238]. WO 2016/006936 A1 (“Xu”) at Fig. 1, Fig. 11, Fig. 14, Fig. 15, Fig. 16, [34]-[40], [64]-[71], [103]-[113]. 3GPP TSG RAN WG2 #94; R2-163764 MediaTek “Architecture for Standalone NR and LTE-NR Tight Interworking” (“R2-163764”) 3GPP TSG RAN WG2 #87bis; R2-144363 Nokia “Remaining Details for SeNB Failure Reporting” (“R2-144363”) Dual Connectivity for LTE-advanced Heterogeneous Networks, Want et al., Wireless Networks at §§ 2-4. 3GPP TSG RAN WG2 #85; R2-140199 MediaTek Inc. “System Information Delivery for SCG” (“R2-140199”) 3GPP TSG RAN WG2 #93bis; R2-162413 MediaTek Inc. “Tight Interaction Between NR and LTE” (“R2-162413”) 3GPP TSG RAN WG2 #93bis; NEC “Tight Interworking Between NR and LTE” (“R2-162889”)

Invalidity of U.S. Patent 10,721,118 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
		3GPP TS 36.300 version 12.8.0 Release 12 at 46-48, 68-74, 87-103, 204-222
1[b]	receiving from a secondary base station, a radio resource control (RRC) message including radio resource configuration information on the secondary base station or a secondary cell group through the secondary base station SRB; and	U.S. Patent Pub. No. 2015/0119048 (“Yang”). <i>See</i> Exhibit F-1. WO 2015/070445 (“Zhang”). <i>See</i> Exhibit F-2. U.S. Patent Pub. No. 2016/0249389 (“Takahashi”). <i>See</i> Exhibit F-3. R2-141109 - RRC Reconfiguration Failure in Dual Connectivity (“R2-141109”). <i>See</i> Exhibit F-4. U.S. Patent Pub. No. 2016/0212753 (“Wu”). <i>See</i> Exhibit F-5. U.S. Patent Pub. No. 2015/0117183 (“Heo”). <i>See</i> Exhibit F-6. U.S. Patent No. 11,038,859 (“Velde”). <i>See</i> Exhibit F-7. U.S. Patent Pub. No. 2016/0380779 (“Sharma”). <i>See</i> Exhibit F-8. U.S. Patent Pub. No. 2017/0331670 (“Parkvall”). <i>See</i> Exhibit F-9. R2-133392 - Discussion on SRB via SeNB for Dual Connectivity (“R2-133392”). <i>See</i> Exhibit F-10. R2-140059 - The Order and Direction of Messages for SeNB (“R2-140059”). <i>See</i> Exhibit F-11. R2-144867 - Remaining Details for SCG Failure Reporting (“R2-144867”). <i>See</i> Exhibit F-12. U.S. Patent No. 10,952,099 (“Futaki”). <i>See</i> Exhibit F-13.

Invalidity of U.S. Patent 10,721,118 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
		U.S. Patent No. 9,961,606 (“Wu 606”) at Fig. 1, Fig. 3, Fig. 4, Fig. 5, 3:12-59, 4:64-21, 4:24-7:24. U.S. Patent Pub. No. 2015/0131578 (“Baek”) at Fig. 1, Fig. 2, Fig. 5, Fig. 6, Fig. 12, [0074], [0077], [0079], [0081], [0083]-[0084], [0118]-[0120]. U.S. Patent Pub. No. 2015/0208235 (“Ingale”) at Fig. 5, Fig. 6, [0074]-[0081], [0082]-[0084]. U.S. Patent Pub. No. 2015/0264562 (“Wu 562”) at Fig. 2B, Fig. 3, Fig. 4, Fig. 9B, Fig. 10, [0074]-[0076], [0077]-[0081]. U.S. Patent Pub. No. 2016/0029362 (“Kim”) at Fig. 1, Fig. 3, Fig. 4, [0027]-[0032], [0037]-[0074], [0075]-[0086]. U.S. Patent Pub. No. 2016/0044639 (“Yi”) at Fig. 14a, Fig. 14b, Fig. 15a, Fig. 15b, [0135]-[0159], [0160]-[0168]. WO 2016/005002 A1 (“Hwang”) at Fig. 2, Fig. 4, 12:1-29, 15:1-22. WO 2016/047904 A1 (“Lee”) at Fig. 2a, Fig. 12f, Fig. 13, [40]-[42], [220]-[223], [226]-[238]. WO 2016/006936 A1 (“Xu”) at Fig. 1, Fig. 11, Fig. 14, Fig. 15, Fig. 16, [34]-[40], [64]-[71], [103]-[113]. 3GPP TSG RAN WG2 #94; R2-163764 MediaTek “Architecture for Standalone NR and LTE-NR Tight Interworking” (“R2-163764”)

Invalidity of U.S. Patent 10,721,118 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
		3GPP TSG RAN WG2 #87bis; R2-144363 Nokia “Remaining Details for SeNB Failure Reporting” (“R2-144363”) Dual Connectivity for LTE-advanced Heterogeneous Networks, Want et al., Wireless Networks at §§ 2-4. 3GPP TSG RAN WG2 #85; R2-140199 MediaTek Inc. “System Information Delivery for SCG” (“R2-140199”) 3GPP TSG RAN WG2 #93bis; R2-162413 MediaTek Inc. “Tight Interaction Between NR and LTE” (“R2-162413”) 3GPP TSG RAN WG2 #93bis; NEC “Tight Interworking Between NR and LTE” (“R2-162889”) 3GPP TS 36.300 version 12.8.0 Release 12 at 46-48, 68-74, 87-103, 204-222
1[c]	transmitting a failure information message to a master base station in case the user equipment is unable to comply with the radio resource configuration information included in the RRC message,	U.S. Patent Pub. No. 2015/0119048 (“Yang”). <i>See</i> Exhibit F-1. WO 2015/070445 (“Zhang”). <i>See</i> Exhibit F-2. U.S. Patent Pub. No. 2016/0249389 (“Takahashi”). <i>See</i> Exhibit F-3. R2-141109 - RRC Reconfiguration Failure in Dual Connectivity (“R2-141109”). <i>See</i> Exhibit F-4. U.S. Patent Pub. No. 2016/0212753 (“Wu”). <i>See</i> Exhibit F-5. U.S. Patent Pub. No. 2015/0117183 (“Heo”). <i>See</i> Exhibit F-6. U.S. Patent No. 11,038,859 (“Velde”). <i>See</i> Exhibit F-7.

Invalidity of U.S. Patent 10,721,118 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
		U.S. Patent Pub. No. 2016/0380779 (“Sharma”). <i>See</i> Exhibit F-8. U.S. Patent Pub. No. 2017/0331670 (“Parkvall”). <i>See</i> Exhibit F-9. R2-133392 - Discussion on SRB via SeNB for Dual Connectivity (“R2-133392”). <i>See</i> Exhibit F-10. R2-140059 - The Order and Direction of Messages for SeNB (“R2-140059”). <i>See</i> Exhibit F-11. R2-144867 - Remaining Details for SCG Failure Reporting (“R2-144867”). <i>See</i> Exhibit F-12. U.S. Patent No. 10,952,099 (“Futaki”). <i>See</i> Exhibit F-13. U.S. Patent No. 9,961,606 (“Wu 606”) at Fig. 1, Fig. 3, Fig. 4, Fig. 5, 3:12-59, 4:64-21, 4:24-7:24. U.S. Patent Pub. No. 2015/0131578 (“Baek”) at Fig. 1, Fig. 2, Fig. 5, Fig. 6, Fig. 12, [0074], [0077], [0079], [0081], [0083]-[0084], [0118]-[0120]. U.S. Patent Pub. No. 2015/0208235 (“Ingale”) at Fig. 5, Fig. 6, [0074]-[0081], [0082]-[0084]. U.S. Patent Pub. No. 2015/0264562 (“Wu 562”) at Fig. 2B, Fig. 3, Fig. 4, Fig. 9B, Fig. 10, [0074]-[0076], [0077]-[0081]. U.S. Patent Pub. No. 2016/0029362 (“Kim”) at Fig. 1, Fig. 3, Fig. 4, [0027]-[0032], [0037]-[0074], [0075]-[0086].

Invalidity of U.S. Patent 10,721,118 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
		U.S. Patent Pub. No. 2016/0044639 (“Yi”) at Fig. 14a, Fig. 14b, Fig. 15a, Fig. 15b, [0135]-[0159], [0160]-[0168]. WO 2016/005002 A1 (“Hwang”) at Fig. 2, Fig. 4, 12:1-29, 15:1-22. WO 2016/047904 A1 (“Lee”) at Fig. 2a, Fig. 12f, Fig. 13, [40]-[42], [220]-[223], [226]-[238]. WO 2016/006936 A1 (“Xu”) at Fig. 1, Fig. 11, Fig. 14, Fig. 15, Fig. 16, [34]-[40], [64]-[71], [103]-[113]. 3GPP TSG RAN WG2 #94; R2-163764 MediaTek “Architecture for Standalone NR and LTE-NR Tight Interworking” (“R2-163764”) 3GPP TSG RAN WG2 #87bis; R2-144363 Nokia “Remaining Details for SeNB Failure Reporting” (“R2-144363”) Dual Connectivity for LTE-advanced Heterogeneous Networks, Want et al., Wireless Networks at §§ 2-4. 3GPP TSG RAN WG2 #85; R2-140199 MediaTek Inc. “System Information Delivery for SCG” (“R2-140199”) 3GPP TSG RAN WG2 #93bis; R2-162413 MediaTek Inc. “Tight Interaction Between NR and LTE” (“R2-162413”) 3GPP TSG RAN WG2 #93bis; NEC “Tight Interworking Between NR and LTE” (“R2-162889”) 3GPP TS 36.300 version 12.8.0 Release 12 at 46-48, 68-74, 87-103, 204-222

Invalidity of U.S. Patent 10,721,118 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
1[d]	wherein the addition of the secondary base station SRB is determined by the secondary base station.	U.S. Patent Pub. No. 2015/0119048 (“Yang”). <i>See</i> Exhibit F-1. WO 2015/070445 (“Zhang”). <i>See</i> Exhibit F-2. U.S. Patent Pub. No. 2016/0249389 (“Takahashi”). <i>See</i> Exhibit F-3. R2-141109 - RRC Reconfiguration Failure in Dual Connectivity (“R2-141109”). <i>See</i> Exhibit F-4. U.S. Patent Pub. No. 2016/0212753 (“Wu”). <i>See</i> Exhibit F-5. U.S. Patent Pub. No. 2015/0117183 (“Heo”). <i>See</i> Exhibit F-6. U.S. Patent No. 11,038,859 (“Velde”). <i>See</i> Exhibit F-7. U.S. Patent Pub. No. 2016/0380779 (“Sharma”). <i>See</i> Exhibit F-8. U.S. Patent Pub. No. 2017/0331670 (“Parkvall”). <i>See</i> Exhibit F-9. R2-133392 - Discussion on SRB via SeNB for Dual Connectivity (“R2-133392”). <i>See</i> Exhibit F-10. R2-140059 - The Order and Direction of Messages for SeNB (“R2-140059”). <i>See</i> Exhibit F-11. R2-144867 - Remaining Details for SCG Failure Reporting (“R2-144867”). <i>See</i> Exhibit F-12. U.S. Patent No. 10,952,099 (“Futaki”). <i>See</i> Exhibit F-13.

Invalidity of U.S. Patent 10,721,118 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
		U.S. Patent No. 9,961,606 (“Wu 606”) at Fig. 1, Fig. 3, Fig. 4, Fig. 5, 3:12-59, 4:64-21, 4:24-7:24. U.S. Patent Pub. No. 2015/0131578 (“Baek”) at Fig. 1, Fig. 2, Fig. 5, Fig. 6, Fig. 12, [0074], [0077], [0079], [0081], [0083]-[0084], [0118]-[0120]. U.S. Patent Pub. No. 2015/0208235 (“Ingale”) at Fig. 5, Fig. 6, [0074]-[0081], [0082]-[0084]. U.S. Patent Pub. No. 2015/0264562 (“Wu 562”) at Fig. 2B, Fig. 3, Fig. 4, Fig. 9B, Fig. 10, [0074]-[0076], [0077]-[0081]. U.S. Patent Pub. No. 2016/0029362 (“Kim”) at Fig. 1, Fig. 3, Fig. 4, [0027]-[0032], [0037]-[0074], [0075]-[0086]. U.S. Patent Pub. No. 2016/0044639 (“Yi”) at Fig. 14a, Fig. 14b, Fig. 15a, Fig. 15b, [0135]-[0159], [0160]-[0168]. WO 2016/005002 A1 (“Hwang”) at Fig. 2, Fig. 4, 12:1-29, 15:1-22. WO 2016/047904 A1 (“Lee”) at Fig. 2a, Fig. 12f, Fig. 13, [40]-[42], [220]-[223], [226]-[238]. WO 2016/006936 A1 (“Xu”) at Fig. 1, Fig. 11, Fig. 14, Fig. 15, Fig. 16, [34]-[40], [64]-[71], [103]-[113]. 3GPP TSG RAN WG2 #94; R2-163764 MediaTek “Architecture for Standalone NR and LTE-NR Tight Interworking” (“R2-163764”) 3GPP TSG RAN WG2 #87bis; R2-144363 Nokia “Remaining Details for SeNB Failure Reporting” (“R2-144363”)

Invalidity of U.S. Patent 10,721,118 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
		Dual Connectivity for LTE-advanced Heterogeneous Networks, Want et al., Wireless Networks at §§ 2-4. 3GPP TSG RAN WG2 #85; R2-140199 MediaTek Inc. “System Information Delivery for SCG” (“R2-140199”) 3GPP TSG RAN WG2 #93bis; R2-162413 MediaTek Inc. “Tight Interaction Between NR and LTE” (“R2-162413”) 3GPP TSG RAN WG2 #93bis; NEC “Tight Interworking Between NR and LTE” (“R2-162889”) 3GPP TS 36.300 version 12.8.0 Release 12 at 46-48, 68-74, 87-103, 204-222

2. Claim 2

Invalidity of U.S. Patent 10,721,118 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
2[a]	The method according to claim 1, wherein the master base station and the second base station are base stations using radio access technologies different from each other.	U.S. Patent Pub. No. 2015/0119048 (“Yang”). <i>See</i> Exhibit F-1. WO 2015/070445 (“Zhang”). <i>See</i> Exhibit F-2. U.S. Patent Pub. No. 2016/0249389 (“Takahashi”). <i>See</i> Exhibit F-3. R2-141109 - RRC Reconfiguration Failure in Dual Connectivity (“R2-141109”). <i>See</i> Exhibit F-4. U.S. Patent Pub. No. 2016/0212753 (“Wu”). <i>See</i> Exhibit F-5.

Invalidity of U.S. Patent 10,721,118 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
		U.S. Patent Pub. No. 2015/0117183 (“Heo”). <i>See</i> Exhibit F-6. U.S. Patent No. 11,038,859 (“Velde”). <i>See</i> Exhibit F-7. U.S. Patent Pub. No. 2016/0380779 (“Sharma”). <i>See</i> Exhibit F-8. U.S. Patent Pub. No. 2017/0331670 (“Parkvall”). <i>See</i> Exhibit F-9. R2-133392 - Discussion on SRB via SeNB for Dual Connectivity (“R2-133392”). <i>See</i> Exhibit F-10. R2-140059 - The Order and Direction of Messages for SeNB (“R2-140059”). <i>See</i> Exhibit F-11. R2-144867 - Remaining Details for SCG Failure Reporting (“R2-144867”). <i>See</i> Exhibit F-12. U.S. Patent No. 10,952,099 (“Futaki”). <i>See</i> Exhibit F-13. U.S. Patent No. 9,961,606 (“Wu 606”) at Fig. 1, Fig. 3, Fig. 4, Fig. 5, 3:12-59, 4:64-21, 4:24-7:24. U.S. Patent Pub. No. 2015/0131578 (“Baek”) at Fig. 1, Fig. 2, Fig. 5, Fig. 6, Fig. 12, [0074], [0077], [0079], [0081], [0083]-[0084], [0118]-[0120]. U.S. Patent Pub. No. 2015/0208235 (“Ingale”) at Fig. 5, Fig. 6, [0074]-[0081], [0082]-[0084]. U.S. Patent Pub. No. 2015/0264562 (“Wu 562”) at Fig. 2B, Fig. 3, Fig. 4, Fig. 9B, Fig. 10, [0074]-[0076], [0077]-[0081].

Invalidity of U.S. Patent 10,721,118 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
		U.S. Patent Pub. No. 2016/0029362 (“Kim”) at Fig. 1, Fig. 3, Fig. 4, [0027]-[0032], [0037]-[0074], [0075]-[0086]. U.S. Patent Pub. No. 2016/0044639 (“Yi”) at Fig. 14a, Fig. 14b, Fig. 15a, Fig. 15b, [0135]-[0159], [0160]-[0168]. WO 2016/005002 A1 (“Hwang”) at Fig. 2, Fig. 4, 12:1-29, 15:1-22. WO 2016/047904 A1 (“Lee”) at Fig. 2a, Fig. 12f, Fig. 13, [40]-[42], [220]-[223], [226]-[238]. WO 2016/006936 A1 (“Xu”) at Fig. 1, Fig. 11, Fig. 14, Fig. 15, Fig. 16, [34]-[40], [64]-[71], [103]-[113]. 3GPP TSG RAN WG2 #94; R2-163764 MediaTek “Architecture for Standalone NR and LTE-NR Tight Interworking” (“R2-163764”) 3GPP TSG RAN WG2 #87bis; R2-144363 Nokia “Remaining Details for SeNB Failure Reporting” (“R2-144363”) Dual Connectivity for LTE-advanced Heterogeneous Networks, Want et al., Wireless Networks at §§ 2-4. 3GPP TSG RAN WG2 #85; R2-140199 MediaTek Inc. “System Information Delivery for SCG” (“R2-140199”) 3GPP TSG RAN WG2 #93bis; R2-162413 MediaTek Inc. “Tight Interaction Between NR and LTE” (“R2-162413”) 3GPP TSG RAN WG2 #93bis; NEC “Tight Interworking Between NR and LTE” (“R2-162889”)

Invalidity of U.S. Patent 10,721,118 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
		3GPP TS 36.300 version 12.8.0 Release 12 at 46-48, 68-74, 87-103, 204-222

3. Claim 3

Invalidity of U.S. Patent 10,721,118 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
3[a]	The method according to claim 1, wherein the addition of the secondary base station SRB is configured when the master base station performs a secondary base station addition procedure.	U.S. Patent Pub. No. 2015/0119048 (“Yang”). <i>See</i> Exhibit F-1. WO 2015/070445 (“Zhang”). <i>See</i> Exhibit F-2. U.S. Patent Pub. No. 2016/0249389 (“Takahashi”). <i>See</i> Exhibit F-3. R2-141109 - RRC Reconfiguration Failure in Dual Connectivity (“R2-141109”). <i>See</i> Exhibit F-4. U.S. Patent Pub. No. 2016/0212753 (“Wu”). <i>See</i> Exhibit F-5. U.S. Patent Pub. No. 2015/0117183 (“Heo”). <i>See</i> Exhibit F-6. U.S. Patent No. 11,038,859 (“Velde”). <i>See</i> Exhibit F-7. U.S. Patent Pub. No. 2016/0380779 (“Sharma”). <i>See</i> Exhibit F-8. U.S. Patent Pub. No. 2017/0331670 (“Parkvall”). <i>See</i> Exhibit F-9. R2-133392 - Discussion on SRB via SeNB for Dual Connectivity (“R2-133392”). <i>See</i> Exhibit F-10.

Invalidity of U.S. Patent 10,721,118 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
		R2-140059 - The Order and Direction of Messages for SeNB (“R2-140059”). <i>See</i> Exhibit F-11. R2-144867 - Remaining Details for SCG Failure Reporting (“R2-144867”). <i>See</i> Exhibit F-12. U.S. Patent No. 10,952,099 (“Futaki”). <i>See</i> Exhibit F-13. U.S. Patent No. 9,961,606 (“Wu 606”) at Fig. 1, Fig. 3, Fig. 4, Fig. 5, 3:12-59, 4:64-21, 4:24-7:24. U.S. Patent Pub. No. 2015/0131578 (“Baek”) at Fig. 1, Fig. 2, Fig. 5, Fig. 6, Fig. 12, [0074], [0077], [0079], [0081], [0083]-[0084], [0118]-[0120]. U.S. Patent Pub. No. 2015/0208235 (“Ingale”) at Fig. 5, Fig. 6, [0074]-[0081], [0082]-[0084]. U.S. Patent Pub. No. 2015/0264562 (“Wu 562”) at Fig. 2B, Fig. 3, Fig. 4, Fig. 9B, Fig. 10, [0074]-[0076], [0077]-[0081]. U.S. Patent Pub. No. 2016/0029362 (“Kim”) at Fig. 1, Fig. 3, Fig. 4, [0027]-[0032], [0037]-[0074], [0075]-[0086]. U.S. Patent Pub. No. 2016/0044639 (“Yi”) at Fig. 14a, Fig. 14b, Fig. 15a, Fig. 15b, [0135]-[0159], [0160]-[0168]. WO 2016/005002 A1 (“Hwang”) at Fig. 2, Fig. 4, 12:1-29, 15:1-22. WO 2016/047904 A1 (“Lee”) at Fig. 2a, Fig. 12f, Fig. 13, [40]-[42], [220]-[223], [226]-[238].

Invalidity of U.S. Patent 10,721,118 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
		WO 2016/006936 A1 (“Xu”) at Fig. 1, Fig. 11, Fig. 14, Fig. 15, Fig. 16, [34]-[40], [64]-[71], [103]-[113]. 3GPP TSG RAN WG2 #94; R2-163764 MediaTek “Architecture for Standalone NR and LTE-NR Tight Interworking” (“R2-163764”) 3GPP TSG RAN WG2 #87bis; R2-144363 Nokia “Remaining Details for SeNB Failure Reporting” (“R2-144363”) Dual Connectivity for LTE-advanced Heterogeneous Networks, Want et al., Wireless Networks at §§ 2-4. 3GPP TSG RAN WG2 #85; R2-140199 MediaTek Inc. “System Information Delivery for SCG” (“R2-140199”) 3GPP TSG RAN WG2 #93bis; R2-162413 MediaTek Inc. “Tight Interaction Between NR and LTE” (“R2-162413”) 3GPP TSG RAN WG2 #93bis; NEC “Tight Interworking Between NR and LTE” (“R2-162889”) 3GPP TS 36.300 version 12.8.0 Release 12 at 46-48, 68-74, 87-103, 204-222

4. Claim 6

Invalidity of U.S. Patent 10,721,118 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
6[a]	The method according to claim 1, wherein the failure information message includes	U.S. Patent Pub. No. 2015/0119048 (“Yang”). <i>See</i> Exhibit F-1.

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Claim Language		Exemplary Citations to Disclosed Art
	cause information on the secondary base station radio resource configuration failure.	WO 2015/070445 (“Zhang”). <i>See</i> Exhibit F-2. U.S. Patent Pub. No. 2016/0249389 (“Takahashi”). <i>See</i> Exhibit F-3. R2-141109 - RRC Reconfiguration Failure in Dual Connectivity (“R2-141109”). <i>See</i> Exhibit F-4. U.S. Patent Pub. No. 2016/0212753 (“Wu”). <i>See</i> Exhibit F-5. U.S. Patent Pub. No. 2015/0117183 (“Heo”). <i>See</i> Exhibit F-6. U.S. Patent No. 11,038,859 (“Velde”). <i>See</i> Exhibit F-7. U.S. Patent Pub. No. 2016/0380779 (“Sharma”). <i>See</i> Exhibit F-8. U.S. Patent Pub. No. 2017/0331670 (“Parkvall”). <i>See</i> Exhibit F-9. R2-133392 - Discussion on SRB via SeNB for Dual Connectivity (“R2-133392”). <i>See</i> Exhibit F-10. R2-140059 - The Order and Direction of Messages for SeNB (“R2-140059”). <i>See</i> Exhibit F-11. R2-144867 - Remaining Details for SCG Failure Reporting (“R2-144867”). <i>See</i> Exhibit F-12. U.S. Patent No. 10,952,099 (“Futaki”). <i>See</i> Exhibit F-13. U.S. Patent No. 9,961,606 (“Wu 606”) at Fig. 1, Fig. 3, Fig. 4, Fig. 5, 3:12-59, 4:64-21, 4:24-7:24.

Invalidity of U.S. Patent 10,721,118 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
		U.S. Patent Pub. No. 2015/0131578 (“Baek”) at Fig. 1, Fig. 2, Fig. 5, Fig. 6, Fig. 12, [0074], [0077], [0079], [0081], [0083]-[0084], [0118]-[0120]. U.S. Patent Pub. No. 2015/0208235 (“Ingale”) at Fig. 5, Fig. 6, [0074]-[0081], [0082]-[0084]. U.S. Patent Pub. No. 2015/0264562 (“Wu 562”) at Fig. 2B, Fig. 3, Fig. 4, Fig. 9B, Fig. 10, [0074]-[0076], [0077]-[0081]. U.S. Patent Pub. No. 2016/0029362 (“Kim”) at Fig. 1, Fig. 3, Fig. 4, [0027]-[0032], [0037]-[0074], [0075]-[0086]. U.S. Patent Pub. No. 2016/0044639 (“Yi”) at Fig. 14a, Fig. 14b, Fig. 15a, Fig. 15b, [0135]-[0159], [0160]-[0168]. WO 2016/005002 A1 (“Hwang”) at Fig. 2, Fig. 4, 12:1-29, 15:1-22. WO 2016/047904 A1 (“Lee”) at Fig. 2a, Fig. 12f, Fig. 13, [40]-[42], [220]-[223], [226]-[238]. WO 2016/006936 A1 (“Xu”) at Fig. 1, Fig. 11, Fig. 14, Fig. 15, Fig. 16, [34]-[40], [64]-[71], [103]-[113]. 3GPP TSG RAN WG2 #94; R2-163764 MediaTek “Architecture for Standalone NR and LTE-NR Tight Interworking” (“R2-163764”) 3GPP TSG RAN WG2 #87bis; R2-144363 Nokia “Remaining Details for SeNB Failure Reporting” (“R2-144363”) Dual Connectivity for LTE-advanced Heterogeneous Networks, Want et al., Wireless Networks at §§ 2-4.

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Claim Language		Exemplary Citations to Disclosed Art
		3GPP TSG RAN WG2 #85; R2-140199 MediaTek Inc. “System Information Delivery for SCG” (“R2-140199”) 3GPP TSG RAN WG2 #93bis; R2-162413 MediaTek Inc. “Tight Interaction Between NR and LTE” (“R2-162413”) 3GPP TSG RAN WG2 #93bis; NEC “Tight Interworking Between NR and LTE” (“R2-162889”) 3GPP TS 36.300 version 12.8.0 Release 12 at 46-48, 68-74, 87-103, 204-222

5. Claim 7

Invalidity of U.S. Patent 10,721,118 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
7[pre]	A method of a secondary base station for controlling dual connectivity of a user equipment, the method comprising:	U.S. Patent Pub. No. 2015/0119048 (“Yang”). <i>See</i> Exhibit F-1. WO 2015/070445 (“Zhang”). <i>See</i> Exhibit F-2. U.S. Patent Pub. No. 2016/0249389 (“Takahashi”). <i>See</i> Exhibit F-3. R2-141109 - RRC Reconfiguration Failure in Dual Connectivity (“R2-141109”). <i>See</i> Exhibit F-4. U.S. Patent Pub. No. 2016/0212753 (“Wu”). <i>See</i> Exhibit F-5. U.S. Patent Pub. No. 2015/0117183 (“Heo”). <i>See</i> Exhibit F-6. U.S. Patent No. 11,038,859 (“Velde”). <i>See</i> Exhibit F-7.

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Claim Language		Exemplary Citations to Disclosed Art
		U.S. Patent Pub. No. 2016/0380779 (“Sharma”). <i>See</i> Exhibit F-8. U.S. Patent Pub. No. 2017/0331670 (“Parkvall”). <i>See</i> Exhibit F-9. R2-133392 - Discussion on SRB via SeNB for Dual Connectivity (“R2-133392”). <i>See</i> Exhibit F-10. R2-140059 - The Order and Direction of Messages for SeNB (“R2-140059”). <i>See</i> Exhibit F-11. R2-144867 - Remaining Details for SCG Failure Reporting (“R2-144867”). <i>See</i> Exhibit F-12. U.S. Patent No. 10,952,099 (“Futaki”). <i>See</i> Exhibit F-13. U.S. Patent No. 9,961,606 (“Wu 606”) at Fig. 1, Fig. 3, Fig. 4, Fig. 5, 3:12-59, 4:64-21, 4:24-7:24. U.S. Patent Pub. No. 2015/0131578 (“Baek”) at Fig. 1, Fig. 2, Fig. 5, Fig. 6, Fig. 12, [0074], [0077], [0079], [0081], [0083]-[0084], [0118]-[0120]. U.S. Patent Pub. No. 2015/0208235 (“Ingale”) at Fig. 5, Fig. 6, [0074]-[0081], [0082]-[0084]. U.S. Patent Pub. No. 2015/0264562 (“Wu 562”) at Fig. 2B, Fig. 3, Fig. 4, Fig. 9B, Fig. 10, [0074]-[0076], [0077]-[0081]. U.S. Patent Pub. No. 2016/0029362 (“Kim”) at Fig. 1, Fig. 3, Fig. 4, [0027]-[0032], [0037]-[0074], [0075]-[0086].

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Claim Language		Exemplary Citations to Disclosed Art
		U.S. Patent Pub. No. 2016/0044639 (“Yi”) at Fig. 14a, Fig. 14b, Fig. 15a, Fig. 15b, [0135]-[0159], [0160]-[0168]. WO 2016/005002 A1 (“Hwang”) at Fig. 2, Fig. 4, 12:1-29, 15:1-22. WO 2016/047904 A1 (“Lee”) at Fig. 2a, Fig. 12f, Fig. 13, [40]-[42], [220]-[223], [226]-[238]. WO 2016/006936 A1 (“Xu”) at Fig. 1, Fig. 11, Fig. 14, Fig. 15, Fig. 16, [34]-[40], [64]-[71], [103]-[113]. 3GPP TSG RAN WG2 #94; R2-163764 MediaTek “Architecture for Standalone NR and LTE-NR Tight Interworking” (“R2-163764”) 3GPP TSG RAN WG2 #87bis; R2-144363 Nokia “Remaining Details for SeNB Failure Reporting” (“R2-144363”) Dual Connectivity for LTE-advanced Heterogeneous Networks, Want et al., Wireless Networks at §§ 2-4. 3GPP TSG RAN WG2 #85; R2-140199 MediaTek Inc. “System Information Delivery for SCG” (“R2-140199”) 3GPP TSG RAN WG2 #93bis; R2-162413 MediaTek Inc. “Tight Interaction Between NR and LTE” (“R2-162413”) 3GPP TSG RAN WG2 #93bis; NEC “Tight Interworking Between NR and LTE” (“R2-162889”) 3GPP TS 36.300 version 12.8.0 Release 12 at 46-48, 68-74, 87-103, 204-222

Invalidity of U.S. Patent 10,721,118 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
7[a]	determining, by the secondary base station, to add a secondary base station signaling radio bearer (SRB) to the user equipment;	U.S. Patent Pub. No. 2015/0119048 (“Yang”). <i>See</i> Exhibit F-1. WO 2015/070445 (“Zhang”). <i>See</i> Exhibit F-2. U.S. Patent Pub. No. 2016/0249389 (“Takahashi”). <i>See</i> Exhibit F-3. R2-141109 - RRC Reconfiguration Failure in Dual Connectivity (“R2-141109”). <i>See</i> Exhibit F-4. U.S. Patent Pub. No. 2016/0212753 (“Wu”). <i>See</i> Exhibit F-5. U.S. Patent Pub. No. 2015/0117183 (“Heo”). <i>See</i> Exhibit F-6. U.S. Patent No. 11,038,859 (“Velde”). <i>See</i> Exhibit F-7. U.S. Patent Pub. No. 2016/0380779 (“Sharma”). <i>See</i> Exhibit F-8. U.S. Patent Pub. No. 2017/0331670 (“Parkvall”). <i>See</i> Exhibit F-9. R2-133392 - Discussion on SRB via SeNB for Dual Connectivity (“R2-133392”). <i>See</i> Exhibit F-10. R2-140059 - The Order and Direction of Messages for SeNB (“R2-140059”). <i>See</i> Exhibit F-11. R2-144867 - Remaining Details for SCG Failure Reporting (“R2-144867”). <i>See</i> Exhibit F-12. U.S. Patent No. 10,952,099 (“Futaki”). <i>See</i> Exhibit F-13.

Invalidity of U.S. Patent 10,721,118 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
		U.S. Patent No. 9,961,606 (“Wu 606”) at Fig. 1, Fig. 3, Fig. 4, Fig. 5, 3:12-59, 4:64-21, 4:24-7:24. U.S. Patent Pub. No. 2015/0131578 (“Baek”) at Fig. 1, Fig. 2, Fig. 5, Fig. 6, Fig. 12, [0074], [0077], [0079], [0081], [0083]-[0084], [0118]-[0120]. U.S. Patent Pub. No. 2015/0208235 (“Ingale”) at Fig. 5, Fig. 6, [0074]-[0081], [0082]-[0084]. U.S. Patent Pub. No. 2015/0264562 (“Wu 562”) at Fig. 2B, Fig. 3, Fig. 4, Fig. 9B, Fig. 10, [0074]-[0076], [0077]-[0081]. U.S. Patent Pub. No. 2016/0029362 (“Kim”) at Fig. 1, Fig. 3, Fig. 4, [0027]-[0032], [0037]-[0074], [0075]-[0086]. U.S. Patent Pub. No. 2016/0044639 (“Yi”) at Fig. 14a, Fig. 14b, Fig. 15a, Fig. 15b, [0135]-[0159], [0160]-[0168]. WO 2016/005002 A1 (“Hwang”) at Fig. 2, Fig. 4, 12:1-29, 15:1-22. WO 2016/047904 A1 (“Lee”) at Fig. 2a, Fig. 12f, Fig. 13, [40]-[42], [220]-[223], [226]-[238]. WO 2016/006936 A1 (“Xu”) at Fig. 1, Fig. 11, Fig. 14, Fig. 15, Fig. 16, [34]-[40], [64]-[71], [103]-[113]. 3GPP TSG RAN WG2 #94; R2-163764 MediaTek “Architecture for Standalone NR and LTE-NR Tight Interworking” (“R2-163764”) 3GPP TSG RAN WG2 #87bis; R2-144363 Nokia “Remaining Details for SeNB Failure Reporting” (“R2-144363”)

Invalidity of U.S. Patent 10,721,118 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
		Dual Connectivity for LTE-advanced Heterogeneous Networks, Want et al., Wireless Networks at §§ 2-4. 3GPP TSG RAN WG2 #85; R2-140199 MediaTek Inc. “System Information Delivery for SCG” (“R2-140199”) 3GPP TSG RAN WG2 #93bis; R2-162413 MediaTek Inc. “Tight Interaction Between NR and LTE” (“R2-162413”) 3GPP TSG RAN WG2 #93bis; NEC “Tight Interworking Between NR and LTE” (“R2-162889”) 3GPP TS 36.300 version 12.8.0 Release 12 at 46-48, 68-74, 87-103, 204-222
7[b]	transmitting a radio resource control (RRC) message including radio resource configuration information on the secondary base station or a secondary cell group to the user equipment through the secondary base station SRB; and	U.S. Patent Pub. No. 2015/0119048 (“Yang”). <i>See</i> Exhibit F-1. WO 2015/070445 (“Zhang”). <i>See</i> Exhibit F-2. U.S. Patent Pub. No. 2016/0249389 (“Takahashi”). <i>See</i> Exhibit F-3. R2-141109 - RRC Reconfiguration Failure in Dual Connectivity (“R2-141109”). <i>See</i> Exhibit F-4. U.S. Patent Pub. No. 2016/0212753 (“Wu”). <i>See</i> Exhibit F-5. U.S. Patent Pub. No. 2015/0117183 (“Heo”). <i>See</i> Exhibit F-6. U.S. Patent No. 11,038,859 (“Velde”). <i>See</i> Exhibit F-7. U.S. Patent Pub. No. 2016/0380779 (“Sharma”). <i>See</i> Exhibit F-8.

Invalidity of U.S. Patent 10,721,118 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
		U.S. Patent Pub. No. 2017/0331670 (“Parkvall”). <i>See</i> Exhibit F-9. R2-133392 - Discussion on SRB via SeNB for Dual Connectivity (“R2-133392”). <i>See</i> Exhibit F-10. R2-140059 - The Order and Direction of Messages for SeNB (“R2-140059”). <i>See</i> Exhibit F-11. R2-144867 - Remaining Details for SCG Failure Reporting (“R2-144867”). <i>See</i> Exhibit F-12. U.S. Patent No. 10,952,099 (“Futaki”). <i>See</i> Exhibit F-13. U.S. Patent No. 9,961,606 (“Wu 606”) at Fig. 1, Fig. 3, Fig. 4, Fig. 5, 3:12-59, 4:64-21, 4:24-7:24. U.S. Patent Pub. No. 2015/0131578 (“Baek”) at Fig. 1, Fig. 2, Fig. 5, Fig. 6, Fig. 12, [0074], [0077], [0079], [0081], [0083]-[0084], [0118]-[0120]. U.S. Patent Pub. No. 2015/0208235 (“Ingale”) at Fig. 5, Fig. 6, [0074]-[0081], [0082]-[0084]. U.S. Patent Pub. No. 2015/0264562 (“Wu 562”) at Fig. 2B, Fig. 3, Fig. 4, Fig. 9B, Fig. 10, [0074]-[0076], [0077]-[0081]. U.S. Patent Pub. No. 2016/0029362 (“Kim”) at Fig. 1, Fig. 3, Fig. 4, [0027]-[0032], [0037]-[0074], [0075]-[0086]. U.S. Patent Pub. No. 2016/0044639 (“Yi”) at Fig. 14a, Fig. 14b, Fig. 15a, Fig. 15b, [0135]-[0159], [0160]-[0168].

Invalidity of U.S. Patent 10,721,118 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
		WO 2016/005002 A1 (“Hwang”) at Fig. 2, Fig. 4, 12:1-29, 15:1-22. WO 2016/047904 A1 (“Lee”) at Fig. 2a, Fig. 12f, Fig. 13, [40]-[42], [220]-[223], [226]-[238]. WO 2016/006936 A1 (“Xu”) at Fig. 1, Fig. 11, Fig. 14, Fig. 15, Fig. 16, [34]-[40], [64]-[71], [103]-[113]. 3GPP TSG RAN WG2 #94; R2-163764 MediaTek “Architecture for Standalone NR and LTE-NR Tight Interworking” (“R2-163764”) 3GPP TSG RAN WG2 #87bis; R2-144363 Nokia “Remaining Details for SeNB Failure Reporting” (“R2-144363”) Dual Connectivity for LTE-advanced Heterogeneous Networks, Want et al., Wireless Networks at §§ 2-4. 3GPP TSG RAN WG2 #85; R2-140199 MediaTek Inc. “System Information Delivery for SCG” (“R2-140199”) 3GPP TSG RAN WG2 #93bis; R2-162413 MediaTek Inc. “Tight Interaction Between NR and LTE” (“R2-162413”) 3GPP TSG RAN WG2 #93bis; NEC “Tight Interworking Between NR and LTE” (“R2-162889”) 3GPP TS 36.300 version 12.8.0 Release 12 at 46-48, 68-74, 87-103, 204-222
7[c]	receiving a response message for a radio resource configuration from the user equipment through the	U.S. Patent Pub. No. 2015/0119048 (“Yang”). <i>See</i> Exhibit F-1. WO 2015/070445 (“Zhang”). <i>See</i> Exhibit F-2.

Invalidity of U.S. Patent 10,721,118 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
	secondary BS SRB if the UE successfully complies with a radio resource on the secondary base station,	U.S. Patent Pub. No. 2016/0249389 (“Takahashi”). <i>See</i> Exhibit F-3. R2-141109 - RRC Reconfiguration Failure in Dual Connectivity (“R2-141109”). <i>See</i> Exhibit F-4. U.S. Patent Pub. No. 2016/0212753 (“Wu”). <i>See</i> Exhibit F-5. U.S. Patent Pub. No. 2015/0117183 (“Heo”). <i>See</i> Exhibit F-6. U.S. Patent No. 11,038,859 (“Velde”). <i>See</i> Exhibit F-7. U.S. Patent Pub. No. 2016/0380779 (“Sharma”). <i>See</i> Exhibit F-8. U.S. Patent Pub. No. 2017/0331670 (“Parkvall”). <i>See</i> Exhibit F-9. R2-133392 - Discussion on SRB via SeNB for Dual Connectivity (“R2-133392”). <i>See</i> Exhibit F-10. R2-140059 - The Order and Direction of Messages for SeNB (“R2-140059”). <i>See</i> Exhibit F-11. R2-144867 - Remaining Details for SCG Failure Reporting (“R2-144867”). <i>See</i> Exhibit F-12. U.S. Patent No. 10,952,099 (“Futaki”). <i>See</i> Exhibit F-13. U.S. Patent No. 9,961,606 (“Wu 606”) at Fig. 1, Fig. 3, Fig. 4, Fig. 5, 3:12-59, 4:64-21, 4:24-7:24. U.S. Patent Pub. No. 2015/0131578 (“Baek”) at Fig. 1, Fig. 2, Fig. 5, Fig. 6, Fig. 12, [0074], [0077], [0079], [0081], [0083]-[0084], [0118]-[0120].

Invalidity of U.S. Patent 10,721,118 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
		U.S. Patent Pub. No. 2015/0208235 (“Ingale”) at Fig. 5, Fig. 6, [0074]-[0081], [0082]-[0084]. U.S. Patent Pub. No. 2015/0264562 (“Wu 562”) at Fig. 2B, Fig. 3, Fig. 4, Fig. 9B, Fig. 10, [0074]-[0076], [0077]-[0081]. U.S. Patent Pub. No. 2016/0029362 (“Kim”) at Fig. 1, Fig. 3, Fig. 4, [0027]-[0032], [0037]-[0074], [0075]-[0086]. U.S. Patent Pub. No. 2016/0044639 (“Yi”) at Fig. 14a, Fig. 14b, Fig. 15a, Fig. 15b, [0135]-[0159], [0160]-[0168]. WO 2016/005002 A1 (“Hwang”) at Fig. 2, Fig. 4, 12:1-29, 15:1-22. WO 2016/047904 A1 (“Lee”) at Fig. 2a, Fig. 12f, Fig. 13, [40]-[42], [220]-[223], [226]-[238]. WO 2016/006936 A1 (“Xu”) at Fig. 1, Fig. 11, Fig. 14, Fig. 15, Fig. 16, [34]-[40], [64]-[71], [103]-[113]. 3GPP TSG RAN WG2 #94; R2-163764 MediaTek “Architecture for Standalone NR and LTE-NR Tight Interworking” (“R2-163764”) 3GPP TSG RAN WG2 #87bis; R2-144363 Nokia “Remaining Details for SeNB Failure Reporting” (“R2-144363”) Dual Connectivity for LTE-advanced Heterogeneous Networks, Want et al., Wireless Networks at §§ 2-4.

Invalidity of U.S. Patent 10,721,118 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
		3GPP TSG RAN WG2 #85; R2-140199 MediaTek Inc. “System Information Delivery for SCG” (“R2-140199”) 3GPP TSG RAN WG2 #93bis; R2-162413 MediaTek Inc. “Tight Interaction Between NR and LTE” (“R2-162413”) 3GPP TSG RAN WG2 #93bis; NEC “Tight Interworking Between NR and LTE” (“R2-162889”) 3GPP TS 36.300 version 12.8.0 Release 12 at 46-48, 68-74, 87-103, 204-222
7[d]	wherein the user equipment configures dual connectivity by using a master base station and the secondary base station.	U.S. Patent Pub. No. 2015/0119048 (“Yang”). <i>See</i> Exhibit F-1. WO 2015/070445 (“Zhang”). <i>See</i> Exhibit F-2. U.S. Patent Pub. No. 2016/0249389 (“Takahashi”). <i>See</i> Exhibit F-3. R2-141109 - RRC Reconfiguration Failure in Dual Connectivity (“R2-141109”). <i>See</i> Exhibit F-4. U.S. Patent Pub. No. 2016/0212753 (“Wu”). <i>See</i> Exhibit F-5. U.S. Patent Pub. No. 2015/0117183 (“Heo”). <i>See</i> Exhibit F-6. U.S. Patent No. 11,038,859 (“Velde”). <i>See</i> Exhibit F-7. U.S. Patent Pub. No. 2016/0380779 (“Sharma”). <i>See</i> Exhibit F-8. U.S. Patent Pub. No. 2017/0331670 (“Parkvall”). <i>See</i> Exhibit F-9. R2-133392 - Discussion on SRB via SeNB for Dual Connectivity (“R2-133392”). <i>See</i> Exhibit F-10.

Invalidity of U.S. Patent 10,721,118 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
		R2-140059 - The Order and Direction of Messages for SeNB (“R2-140059”). <i>See</i> Exhibit F-11. R2-144867 - Remaining Details for SCG Failure Reporting (“R2-144867”). <i>See</i> Exhibit F-12. U.S. Patent No. 10,952,099 (“Futaki”). <i>See</i> Exhibit F-13. U.S. Patent No. 9,961,606 (“Wu 606”) at Fig. 1, Fig. 3, Fig. 4, Fig. 5, 3:12-59, 4:64-21, 4:24-7:24. U.S. Patent Pub. No. 2015/0131578 (“Baek”) at Fig. 1, Fig. 2, Fig. 5, Fig. 6, Fig. 12, [0074], [0077], [0079], [0081], [0083]-[0084], [0118]-[0120]. U.S. Patent Pub. No. 2015/0208235 (“Ingale”) at Fig. 5, Fig. 6, [0074]-[0081], [0082]-[0084]. U.S. Patent Pub. No. 2015/0264562 (“Wu 562”) at Fig. 2B, Fig. 3, Fig. 4, Fig. 9B, Fig. 10, [0074]-[0076], [0077]-[0081]. U.S. Patent Pub. No. 2016/0029362 (“Kim”) at Fig. 1, Fig. 3, Fig. 4, [0027]-[0032], [0037]-[0074], [0075]-[0086]. U.S. Patent Pub. No. 2016/0044639 (“Yi”) at Fig. 14a, Fig. 14b, Fig. 15a, Fig. 15b, [0135]-[0159], [0160]-[0168]. WO 2016/005002 A1 (“Hwang”) at Fig. 2, Fig. 4, 12:1-29, 15:1-22. WO 2016/047904 A1 (“Lee”) at Fig. 2a, Fig. 12f, Fig. 13, [40]-[42], [220]-[223], [226]-[238].

Invalidity of U.S. Patent 10,721,118 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
		WO 2016/006936 A1 (“Xu”) at Fig. 1, Fig. 11, Fig. 14, Fig. 15, Fig. 16, [34]-[40], [64]-[71], [103]-[113]. 3GPP TSG RAN WG2 #94; R2-163764 MediaTek “Architecture for Standalone NR and LTE-NR Tight Interworking” (“R2-163764”) 3GPP TSG RAN WG2 #87bis; R2-144363 Nokia “Remaining Details for SeNB Failure Reporting” (“R2-144363”) Dual Connectivity for LTE-advanced Heterogeneous Networks, Want et al., Wireless Networks at §§ 2-4. 3GPP TSG RAN WG2 #85; R2-140199 MediaTek Inc. “System Information Delivery for SCG” (“R2-140199”) 3GPP TSG RAN WG2 #93bis; R2-162413 MediaTek Inc. “Tight Interaction Between NR and LTE” (“R2-162413”) 3GPP TSG RAN WG2 #93bis; NEC “Tight Interworking Between NR and LTE” (“R2-162889”) 3GPP TS 36.300 version 12.8.0 Release 12 at 46-48, 68-74, 87-103, 204-222

6. Claim 8

Invalidity of U.S. Patent 10,721,118 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
8[a]	The method according to claim 7, wherein the master base	See 2[a]

Invalidity of U.S. Patent 10,721,118 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
	station and the secondary base station are base stations using radio access technologies different from each other.	

7. Claim 9

Invalidity of U.S. Patent 10,721,118 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
9[a]	The method according to claim 7, wherein, in case the user equipment is unable to comply with the radio resource configuration information included in the RRC message, the user equipment is configured to transmit a failure information message to the master base station.	U.S. Patent Pub. No. 2015/0119048 (“Yang”). <i>See</i> Exhibit F-1. WO 2015/070445 (“Zhang”). <i>See</i> Exhibit F-2. U.S. Patent Pub. No. 2016/0249389 (“Takahashi”). <i>See</i> Exhibit F-3. R2-141109 - RRC Reconfiguration Failure in Dual Connectivity (“R2-141109”). <i>See</i> Exhibit F-4. U.S. Patent Pub. No. 2016/0212753 (“Wu”). <i>See</i> Exhibit F-5. U.S. Patent Pub. No. 2015/0117183 (“Heo”). <i>See</i> Exhibit F-6. U.S. Patent No. 11,038,859 (“Velde”). <i>See</i> Exhibit F-7. U.S. Patent Pub. No. 2016/0380779 (“Sharma”). <i>See</i> Exhibit F-8. U.S. Patent Pub. No. 2017/0331670 (“Parkvall”). <i>See</i> Exhibit F-9. R2-133392 - Discussion on SRB via SeNB for Dual Connectivity (“R2-133392”). <i>See</i> Exhibit F-10.

Invalidity of U.S. Patent 10,721,118 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
		R2-140059 - The Order and Direction of Messages for SeNB (“R2-140059”). <i>See</i> Exhibit F-11. R2-144867 - Remaining Details for SCG Failure Reporting (“R2-144867”). <i>See</i> Exhibit F-12. U.S. Patent No. 10,952,099 (“Futaki”). <i>See</i> Exhibit F-13. U.S. Patent No. 9,961,606 (“Wu 606”) at Fig. 1, Fig. 3, Fig. 4, Fig. 5, 3:12-59, 4:64-21, 4:24-7:24. U.S. Patent Pub. No. 2015/0131578 (“Baek”) at Fig. 1, Fig. 2, Fig. 5, Fig. 6, Fig. 12, [0074], [0077], [0079], [0081], [0083]-[0084], [0118]-[0120]. U.S. Patent Pub. No. 2015/0208235 (“Ingale”) at Fig. 5, Fig. 6, [0074]-[0081], [0082]-[0084]. U.S. Patent Pub. No. 2015/0264562 (“Wu 562”) at Fig. 2B, Fig. 3, Fig. 4, Fig. 9B, Fig. 10, [0074]-[0076], [0077]-[0081]. U.S. Patent Pub. No. 2016/0029362 (“Kim”) at Fig. 1, Fig. 3, Fig. 4, [0027]-[0032], [0037]-[0074], [0075]-[0086]. U.S. Patent Pub. No. 2016/0044639 (“Yi”) at Fig. 14a, Fig. 14b, Fig. 15a, Fig. 15b, [0135]-[0159], [0160]-[0168]. WO 2016/005002 A1 (“Hwang”) at Fig. 2, Fig. 4, 12:1-29, 15:1-22. WO 2016/047904 A1 (“Lee”) at Fig. 2a, Fig. 12f, Fig. 13, [40]-[42], [220]-[223], [226]-[238].

Invalidity of U.S. Patent 10,721,118 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
		WO 2016/006936 A1 (“Xu”) at Fig. 1, Fig. 11, Fig. 14, Fig. 15, Fig. 16, [34]-[40], [64]-[71], [103]-[113]. 3GPP TSG RAN WG2 #94; R2-163764 MediaTek “Architecture for Standalone NR and LTE-NR Tight Interworking” (“R2-163764”) 3GPP TSG RAN WG2 #87bis; R2-144363 Nokia “Remaining Details for SeNB Failure Reporting” (“R2-144363”) Dual Connectivity for LTE-advanced Heterogeneous Networks, Want et al., Wireless Networks at §§ 2-4. 3GPP TSG RAN WG2 #85; R2-140199 MediaTek Inc. “System Information Delivery for SCG” (“R2-140199”) 3GPP TSG RAN WG2 #93bis; R2-162413 MediaTek Inc. “Tight Interaction Between NR and LTE” (“R2-162413”) 3GPP TSG RAN WG2 #93bis; NEC “Tight Interworking Between NR and LTE” (“R2-162889”) 3GPP TS 36.300 version 12.8.0 Release 12 at 46-48, 68-74, 87-103, 204-222

8. Claim 10

Invalidity of U.S. Patent 10,721,118 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
10[pre]	A user equipment for configuring dual connectivity,	See 1[pre]

Invalidity of U.S. Patent 10,721,118 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
	the user equipment comprising:	
10[a]	a controller configured to add and configure a secondary base station signaling radio bearer (SRB);	<i>See</i> 1[a]
10[b]	a receiver configured to receive from a secondary base station, a radio resource control (RRC) message including radio resource configuration information on the secondary base station or a secondary cell group through the secondary base station SRB; and	<i>See</i> 1[b]
10[c]	a transmitter configured to transmit a failure information message to a master base station in case the user equipment is unable to comply with the radio resource configuration information included in the RRC message,	<i>See</i> 1[c]
10[d]	wherein the addition of the secondary base station SRB is determined by the secondary base station.	<i>See</i> 1[d]

9. Claim 11

Invalidity of U.S. Patent 10,721,118 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
11[a]	The user equipment according to claim 10, wherein the master base station and the secondary base station are base stations using radio access technologies different from each other.	See 2[a]

10. Claim 12

Invalidity of U.S. Patent 10,721,118 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
12[a]	The user equipment according to claim 10, wherein the addition of the secondary base station SRB is configured when the master base station performs a secondary base station addition procedure.	See 3[a]

11. Claim 15

Invalidity of U.S. Patent 10,721,118 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
15[a]	The user equipment according to claim 10, wherein the failure	See 6[a]

Invalidity of U.S. Patent 10,721,118 in view of Disclosed Art		
Claim Language		Exemplary Citations to Disclosed Art
	information message includes cause information on the secondary base station radio resource configuration failure.	

APPENDIX G (Amended)

Invalidity of U.S. Patent No. 11,219,000 (“’000 Patent”) Obvious Combinations

1. Claim 1

Invalidity of U.S. Patent No. 11,219,000		
Claim Language		Disclosed Art
1[pre]	A method of transmitting uplink (UL) control information by a user equipment (UE), the method comprising:	U.S. Patent No. 10,305,664 to Ahn et al. (“Ahn”). <i>See</i> Exhibit G-1. U.S. Patent Publication No. 2016/0338041 to LI et al. (“LI”). <i>See</i> Exhibit G-2. U.S. Patent Publication No. 2017/0265176 to Marinier et al. (“Marinier”). <i>See</i> Exhibit G-3. U.S. Patent No. 9,485,060 to Nayeb Nazar et al. (“Nayeb Nazar”). <i>See</i> Exhibit G-4. U.S. Patent No. 10,805,941 to Shaheen et al. (“Shaheen”). <i>See</i> Exhibit G-5. U.S. Patent Publication No. 2020/0374866 (“Takeda I”). <i>See</i> Exhibit G-6. U.S. Patent Publication No. 2020/0163085 to Takeda et al. (“Takeda II”). <i>See</i> Exhibit G-7. U.S. Patent Publication No. 2020/0252180 to Takeda et al. (“Takeda III”). <i>See</i> Exhibit G-8. U.S. Patent No. 10,736,085 to Yan et al. (“Yan”). <i>See</i> Exhibit G-9. U.S. Patent Publication No. 2019/0239214 to Yang et al. (“Yang”). <i>See</i> Exhibit G-10. International Patent Publication No. WO 2018/227538 to Zhang et al. (“Zhang”). <i>See</i> Exhibit G-11. 3GPP TSG-RAN WG1 #89, R1-1709802, Ericsson et al., “Way Forward on bandwidth part for efficient wideband operation in NR” (“R1-1709802”). <i>See</i> Exhibit G-12.

Invalidity of U.S. Patent No. 11,219,000		
Claim Language		Disclosed Art
		3GPP TSG RAN WG1 #90, R1-1713181, LG Electronics, “Consideration on resource allocation for NR-PUCCH” (“R1-1713181”). <i>See</i> Exhibit G-13. 3GPP TSG RAN WG1 #90, R1-1714079, Nokia, Nokia Shanghai Bell, “PUCCH resource allocation” (“R1-1714079”). <i>See</i> Exhibit G-14. U.S. Patent Publication No. 2017/0086219 to Lee et al. (“Lee”). <i>See, e.g.</i>, Lee at Abstract, [0007]-[0023]. U.S. Patent No. 11,133,971 to Ko et al. (“Ko”). <i>See, e.g.</i>, Ko at Abstract, 1:65-3:11. U.S. Patent No. 10,980,007 to Oh et al. (“Oh”). <i>See</i> Exhibit G-16.
1[a]	receiving, from a base station, UL control channel resource set configuration information for UL control information transmission;	U.S. Patent No. 10,305,664 to Ahn et al. (“Ahn”). <i>See</i> Exhibit G-1. U.S. Patent Publication No. 2016/0338041 to LI et al. (“LI”). <i>See</i> Exhibit G-2. U.S. Patent Publication No. 2017/0265176 to Marinier et al. (“Marinier”). <i>See</i> Exhibit G-3. U.S. Patent No. 9,485,060 to Nayeb Nazar et al. (“Nayeb Nazar”). <i>See</i> Exhibit G-4. U.S. Patent No. 10,805,941 to Shaheen et al. (“Shaheen”). <i>See</i> Exhibit G-5. U.S. Patent Publication No. 2020/0374866 (“Takeda I”). <i>See</i> Exhibit G-6. U.S. Patent Publication No. 2020/0163085 to Takeda et al. (“Takeda II”). <i>See</i> Exhibit G-7. U.S. Patent Publication No. 2020/0252180 to Takeda et al. (“Takeda III”). <i>See</i> Exhibit G-8. U.S. Patent No. 10,736,085 to Yan et al. (“Yan”). <i>See</i> Exhibit G-9.

Invalidity of U.S. Patent No. 11,219,000		
Claim Language		Disclosed Art
		U.S. Patent Publication No. 2019/0239214 to Yang et al. (“Yang”). <i>See</i> Exhibit G-10. International Patent Publication No. WO 2018/227538 to Zhang et al. (“Zhang”). <i>See</i> Exhibit G-11. 3GPP TSG-RAN WG1 #89, R1-1709802, Ericsson et al., “Way Forward on bandwidth part for efficient wideband operation in NR” (“R1-1709802”). <i>See</i> Exhibit G-12. 3GPP TSG RAN WG1 #90, R1-1713181, LG Electronics, “Consideration on resource allocation for NR-PUCCH” (“R1-1713181”). <i>See</i> Exhibit G-13. 3GPP TSG RAN WG1 #90, R1-1714079, Nokia, Nokia Shanghai Bell, “PUCCH resource allocation” (“R1-1714079”). <i>See</i> Exhibit G-14. U.S. Patent Publication No. 2017/0086219 to Lee et al. (“Lee”). <i>See, e.g.</i>, Lee at [0007]-[0008], [0020], [0192], [0239], [0265]-[0268], Fig. 2. U.S. Patent No. 11,133,971 to Ko et al. (“Ko”). <i>See, e.g.</i>, Ko at 10:56-67, 17:47-54, 34:7-19. U.S. Patent No. 10,980,007 to Oh et al. (“Oh”). <i>See</i> Exhibit G-16.
1[b]	determining one of UL control channel resource sets contained in the received UL control channel resource set configuration information;	U.S. Patent No. 10,305,664 to Ahn et al. (“Ahn”). <i>See</i> Exhibit G-1. U.S. Patent Publication No. 2016/0338041 to LI et al. (“LI”). <i>See</i> Exhibit G-2. U.S. Patent Publication No. 2017/0265176 to Marinier et al. (“Marinier”). <i>See</i> Exhibit G-3. U.S. Patent No. 9,485,060 to Nayeb Nazar et al. (“Nayeb Nazar”). <i>See</i> Exhibit G-4. U.S. Patent No. 10,805,941 to Shaheen et al. (“Shaheen”). <i>See</i> Exhibit G-5. U.S. Patent Publication No. 2020/0374866 (“Takeda I”). <i>See</i> Exhibit G-6.

Invalidity of U.S. Patent No. 11,219,000		
Claim Language		Disclosed Art
		U.S. Patent Publication No. 2020/0163085 to Takeda et al. (“Takeda II”). <i>See</i> Exhibit G-7. U.S. Patent Publication No. 2020/0252180 to Takeda et al. (“Takeda III”). <i>See</i> Exhibit G-8. U.S. Patent No. 10,736,085 to Yan et al. (“Yan”). <i>See</i> Exhibit G-9. U.S. Patent Publication No. 2019/0239214 to Yang et al. (“Yang”). <i>See</i> Exhibit G-10. International Patent Publication No. WO 2018/227538 to Zhang et al. (“Zhang”). <i>See</i> Exhibit G-11. 3GPP TSG-RAN WG1 #89, R1-1709802, Ericsson et al., “Way Forward on bandwidth part for efficient wideband operation in NR” (“R1-1709802”). <i>See</i> Exhibit G-12. 3GPP TSG RAN WG1 #90, R1-1713181, LG Electronics, “Consideration on resource allocation for NR-PUCCH” (“R1-1713181”). <i>See</i> Exhibit G-13. 3GPP TSG RAN WG1 #90, R1-1714079, Nokia, Nokia Shanghai Bell, “PUCCH resource allocation” (“R1-1714079”). <i>See</i> Exhibit G-14. U.S. Patent Publication No. 2017/0086219 to Lee et al. (“Lee”). <i>See, e.g.</i>, Lee at Abstract, [0007], [0085], [0092], [0098], [0105]. U.S. Patent No. 11,133,971 to Ko et al. (“Ko”). <i>See, e.g.</i>, Ko at 4:54-5:8. U.S. Patent No. 10,980,007 to Oh et al. (“Oh”). <i>See</i> Exhibit G-16.
1[c]	determining one of UL control channel resources contained in the determined UL	U.S. Patent No. 10,305,664 to Ahn et al. (“Ahn”). <i>See</i> Exhibit G-1. U.S. Patent Publication No. 2016/0338041 to LI et al. (“LI”). <i>See</i> Exhibit G-2.

Invalidity of U.S. Patent No. 11,219,000		
Claim Language		Disclosed Art
	control channel resource set; and	U.S. Patent Publication No. 2017/0265176 to Marinier et al. (“Marinier”). <i>See</i> Exhibit G-3. U.S. Patent No. 9,485,060 to Nayeb Nazar et al. (“Nayeb Nazar”). <i>See</i> Exhibit G-4. U.S. Patent No. 10,805,941 to Shaheen et al. (“Shaheen”). <i>See</i> Exhibit G-5. U.S. Patent Publication No. 2020/0374866 (“Takeda I”). <i>See</i> Exhibit G-6. U.S. Patent Publication No. 2020/0163085 to Takeda et al. (“Takeda II”). <i>See</i> Exhibit G-7. U.S. Patent Publication No. 2020/0252180 to Takeda et al. (“Takeda III”). <i>See</i> Exhibit G-8. U.S. Patent No. 10,736,085 to Yan et al. (“Yan”). <i>See</i> Exhibit G-9. U.S. Patent Publication No. 2019/0239214 to Yang et al. (“Yang”). <i>See</i> Exhibit G-10. International Patent Publication No. WO 2018/227538 to Zhang et al. (“Zhang”). <i>See</i> Exhibit G-11. 3GPP TSG-RAN WG1 #89, R1-1709802, Ericsson et al., “Way Forward on bandwidth part for efficient wideband operation in NR” (“R1-1709802”). <i>See</i> Exhibit G-12. 3GPP TSG RAN WG1 #90, R1-1713181, LG Electronics, “Consideration on resource allocation for NR-PUCCH” (“R1-1713181”). <i>See</i> Exhibit G-13. 3GPP TSG RAN WG1 #90, R1-1714079, Nokia, Nokia Shanghai Bell, “PUCCH resource allocation” (“R1-1714079”). <i>See</i> Exhibit G-14. U.S. Patent Publication No. 2017/0086219 to Lee et al. (“Lee”). <i>See, e.g.,</i> Lee at [0092], [0095]-[0096], [0098], [0100], [0126]-[0127].

Invalidity of U.S. Patent No. 11,219,000		
Claim Language		Disclosed Art
		U.S. Patent No. 11,133,971 to Ko et al. (“Ko”). <i>See, e.g.</i>, Ko at 4:54-5:8, 7:5-15, 10:56-67. U.S. Patent No. 10,980,007 to Oh et al. (“Oh”). <i>See</i> Exhibit G-16.
1[d]	transmitting UL control information through the determined UL control channel resource,	U.S. Patent No. 10,305,664 to Ahn et al. (“Ahn”). <i>See</i> Exhibit G-1. U.S. Patent Publication No. 2016/0338041 to LI et al. (“LI”). <i>See</i> Exhibit G-2. U.S. Patent Publication No. 2017/0265176 to Marinier et al. (“Marinier”). <i>See</i> Exhibit G-3. U.S. Patent No. 9,485,060 to Nayebe Nazar et al. (“Nayebe Nazar”). <i>See</i> Exhibit G-4. U.S. Patent No. 10,805,941 to Shaheen et al. (“Shaheen”). <i>See</i> Exhibit G-5. U.S. Patent Publication No. 2020/0374866 (“Takeda I”). <i>See</i> Exhibit G-6. U.S. Patent Publication No. 2020/0163085 to Takeda et al. (“Takeda II”). <i>See</i> Exhibit G-7. U.S. Patent Publication No. 2020/0252180 to Takeda et al. (“Takeda III”). <i>See</i> Exhibit G-8. U.S. Patent No. 10,736,085 to Yan et al. (“Yan”). <i>See</i> Exhibit G-9. U.S. Patent Publication No. 2019/0239214 to Yang et al. (“Yang”). <i>See</i> Exhibit G-10. International Patent Publication No. WO 2018/227538 to Zhang et al. (“Zhang”). <i>See</i> Exhibit G-11. 3GPP TSG-RAN WG1 #89, R1-1709802, Ericsson et al., “Way Forward on bandwidth part for efficient wideband operation in NR” (“R1-1709802”). <i>See</i> Exhibit G-12. 3GPP TSG RAN WG1 #90, R1-1713181, LG Electronics, “Consideration on resource allocation for NR-PUCCH” (“R1-1713181”). <i>See</i> Exhibit G-13.

Invalidity of U.S. Patent No. 11,219,000		
Claim Language		Disclosed Art
		3GPP TSG RAN WG1 #90, R1-1714079, Nokia, Nokia Shanghai Bell, “PUCCH resource allocation” (“R1-1714079”). <i>See</i> Exhibit G-14. U.S. Patent Publication No. 2017/0086219 to Lee et al. (“Lee”). <i>See, e.g.,</i> Lee at Abstract, [0126]-[0127]. U.S. Patent No. 11,133,971 to Ko et al. (“Ko”). <i>See, e.g.,</i> Ko at 4:54-5:8, 7:5-15, 10:56-67. 11:1-12. U.S. Patent No. 10,980,007 to Oh et al. (“Oh”). <i>See</i> Exhibit G-16.
1[e]	wherein the determining of the one of the UL control channel resource sets is performed based on a size of the UL control information, and	U.S. Patent No. 10,305,664 to Ahn et al. (“Ahn”). <i>See</i> Exhibit G-1. U.S. Patent Publication No. 2016/0338041 to LI et al. (“LI”). <i>See</i> Exhibit G-2. U.S. Patent Publication No. 2017/0265176 to Marinier et al. (“Marinier”). <i>See</i> Exhibit G-3. U.S. Patent No. 9,485,060 to Nayeb Nazar et al. (“Nayeb Nazar”). <i>See</i> Exhibit G-4. U.S. Patent No. 10,805,941 to Shaheen et al. (“Shaheen”). <i>See</i> Exhibit G-5. U.S. Patent Publication No. 2020/0374866 (“Takeda I”). <i>See</i> Exhibit G-6. U.S. Patent Publication No. 2020/0163085 to Takeda et al. (“Takeda II”). <i>See</i> Exhibit G-7. U.S. Patent Publication No. 2020/0252180 to Takeda et al. (“Takeda III”). <i>See</i> Exhibit G-8. U.S. Patent No. 10,736,085 to Yan et al. (“Yan”). <i>See</i> Exhibit G-9. U.S. Patent Publication No. 2019/0239214 to Yang et al. (“Yang”). <i>See</i> Exhibit G-10.

Invalidity of U.S. Patent No. 11,219,000		
Claim Language		Disclosed Art
		International Patent Publication No. WO 2018/227538 to Zhang et al. (“Zhang”). <i>See</i> Exhibit G-11. 3GPP TSG RAN WG1 #90, R1-1713181, LG Electronics, “Consideration on resource allocation for NR-PUCCH” (“R1-1713181”). <i>See</i> Exhibit G-13. 3GPP TSG RAN WG1 #90, R1-1714079, Nokia, Nokia Shanghai Bell, “PUCCH resource allocation” (“R1-1714079”). <i>See</i> Exhibit G-14. U.S. Patent Publication No. 2017/0086219 to Lee et al. (“Lee”). <i>See, e.g.</i>, Lee at [0098]-[0100], [0125]. U.S. Patent No. 11,133,971 to Ko et al. (“Ko”). <i>See, e.g.</i>, Ko at 34:24-55, 36:38-65. U.S. Patent No. 10,980,007 to Oh et al. (“Oh”). <i>See</i> Exhibit G-16.
1[f]	wherein the UL control channel resource set configuration information is received through UE specific radio resource control (RRC) signaling.	U.S. Patent No. 10,305,664 to Ahn et al. (“Ahn”). <i>See</i> Exhibit G-1. U.S. Patent Publication No. 2016/0338041 to LI et al. (“LI”). <i>See</i> Exhibit G-2. U.S. Patent Publication No. 2017/0265176 to Marinier et al. (“Marinier”). <i>See</i> Exhibit G-3. U.S. Patent No. 9,485,060 to Nayeb Nazar et al. (“Nayeb Nazar”). <i>See</i> Exhibit G-4. U.S. Patent No. 10,805,941 to Shaheen et al. (“Shaheen”). <i>See</i> Exhibit G-5. U.S. Patent Publication No. 2020/0374866 (“Takeda I”). <i>See</i> Exhibit G-6. U.S. Patent Publication No. 2020/0163085 to Takeda et al. (“Takeda II”). <i>See</i> Exhibit G-7. U.S. Patent Publication No. 2020/0252180 to Takeda et al. (“Takeda III”). <i>See</i> Exhibit G-8.

Invalidity of U.S. Patent No. 11,219,000		
Claim Language		Disclosed Art
		U.S. Patent No. 10,736,085 to Yan et al. (“Yan”). <i>See</i> Exhibit G-9. U.S. Patent Publication No. 2019/0239214 to Yang et al. (“Yang”). <i>See</i> Exhibit G-10. International Patent Publication No. WO 2018/227538 to Zhang et al. (“Zhang”). <i>See</i> Exhibit G-11. 3GPP TSG-RAN WG1 #89, R1-1709802, Ericsson et al., “Way Forward on bandwidth part for efficient wideband operation in NR” (“R1-1709802”). <i>See</i> Exhibit G-12. 3GPP TSG RAN WG1 #90, R1-1713181, LG Electronics, “Consideration on resource allocation for NR-PUCCH” (“R1-1713181”). <i>See</i> Exhibit G-13. 3GPP TSG RAN WG1 #90, R1-1714079, Nokia, Nokia Shanghai Bell, “PUCCH resource allocation” (“R1-1714079”). <i>See</i> Exhibit G-14. U.S. Patent Publication No. 2017/0086219 to Lee et al. (“Lee”). <i>See, e.g.</i>, Lee at [0187], [0189], [0232], [0239], [0265]-[0268]. U.S. Patent No. 11,133,971 to Ko et al. (“Ko”). <i>See, e.g.</i>, Ko at 6:11-24, Fig. 1. U.S. Patent No. 10,980,007 to Oh et al. (“Oh”). <i>See</i> Exhibit G-16.
2	The method according to claim 1, wherein the UL control channel resource sets are configured for each UL bandwidth part (BWP) configured for the UE.	U.S. Patent No. 10,305,664 to Ahn et al. (“Ahn”). <i>See</i> Exhibit G-1. U.S. Patent Publication No. 2016/0338041 to LI et al. (“LI”). <i>See</i> Exhibit G-2. U.S. Patent Publication No. 2017/0265176 to Marinier et al. (“Marinier”). <i>See</i> Exhibit G-3. U.S. Patent No. 9,485,060 to Nayeb Nazar et al. (“Nayeb Nazar”). <i>See</i> Exhibit G-4. U.S. Patent No. 10,805,941 to Shaheen et al. (“Shaheen”). <i>See</i> Exhibit G-5.

Invalidity of U.S. Patent No. 11,219,000		
Claim Language		Disclosed Art
		U.S. Patent Publication No. 2020/0374866 (“Takeda I”). <i>See</i> Exhibit G-6. U.S. Patent Publication No. 2020/0163085 to Takeda et al. (“Takeda II”). <i>See</i> Exhibit G-7. U.S. Patent Publication No. 2020/0252180 to Takeda et al. (“Takeda III”). <i>See</i> Exhibit G-8. U.S. Patent No. 10,736,085 to Yan et al. (“Yan”). <i>See</i> Exhibit G-9. U.S. Patent Publication No. 2019/0239214 to Yang et al. (“Yang”). <i>See</i> Exhibit G-10. International Patent Publication No. WO 2018/227538 to Zhang et al. (“Zhang”). <i>See</i> Exhibit G-11. 3GPP TSG-RAN WG1 #89, R1-1709802, Ericsson et al., “Way Forward on bandwidth part for efficient wideband operation in NR” (“R1-1709802”). <i>See</i> Exhibit G-12. 3GPP TSG RAN WG1 #90, R1-1713181, LG Electronics, “Consideration on resource allocation for NR-PUCCH” (“R1-1713181”). <i>See</i> Exhibit G-13. U.S. Patent Publication No. 2017/0086219 to Lee et al. (“Lee”). <i>See, e.g.,</i> Lee at [0068], [0218]-[0219]. U.S. Patent No. 11,133,971 to Ko et al. (“Ko”). <i>See, e.g.,</i> Ko at 31:46-32:29, 33:3-22. 3GPP TSG RAN WG1 Ad-Hoc#1, R1-1711853, Ericsson et al., “Activation/deactivation of bandwidth part” (“R1-1711853”). <i>See</i> Exhibit G-15. U.S. Patent No. 10,980,007 to Oh et al. (“Oh”). <i>See</i> Exhibit G-16.
3	The method according to claim 2, wherein the	U.S. Patent No. 10,305,664 to Ahn et al. (“Ahn”). <i>See</i> Exhibit G-1.

Invalidity of U.S. Patent No. 11,219,000		
Claim Language		Disclosed Art
	each UL BWP is activated through downlink (DL) control information.	U.S. Patent Publication No. 2016/0338041 to LI et al. (“LI”). <i>See</i> Exhibit G-2. U.S. Patent Publication No. 2017/0265176 to Marinier et al. (“Marinier”). <i>See</i> Exhibit G-3. U.S. Patent No. 9,485,060 to Nayeb Nazar et al. (“Nayeb Nazar”). <i>See</i> Exhibit G-4. U.S. Patent No. 10,805,941 to Shaheen et al. (“Shaheen”). <i>See</i> Exhibit G-5. U.S. Patent Publication No. 2020/0374866 (“Takeda I”). <i>See</i> Exhibit G-6. U.S. Patent Publication No. 2020/0163085 to Takeda et al. (“Takeda II”). <i>See</i> Exhibit G-7. U.S. Patent Publication No. 2020/0252180 to Takeda et al. (“Takeda III”). <i>See</i> Exhibit G-8. U.S. Patent No. 10,736,085 to Yan et al. (“Yan”). <i>See</i> Exhibit G-9. U.S. Patent Publication No. 2019/0239214 to Yang et al. (“Yang”). <i>See</i> Exhibit G-10. International Patent Publication No. WO 2018/227538 to Zhang et al. (“Zhang”). <i>See</i> Exhibit G-11. 3GPP TSG-RAN WG1 #89, R1-1709802, Ericsson et al., “Way Forward on bandwidth part for efficient wideband operation in NR” (“R1-1709802”). <i>See</i> Exhibit G-12. 3GPP TSG RAN WG1 #90, R1-1713181, LG Electronics, “Consideration on resource allocation for NR-PUCCH” (“R1-1713181”). <i>See</i> Exhibit G-13. U.S. Patent Publication No. 2017/0086219 to Lee et al. (“Lee”). <i>See, e.g.</i>, Lee at [0095]-[0096], [0101]-[0112]. U.S. Patent No. 11,133,971 to Ko et al. (“Ko”). <i>See, e.g.</i>, Ko at 4:54-5:8, 10:56-67.

Invalidity of U.S. Patent No. 11,219,000		
Claim Language		Disclosed Art
		3GPP TSG RAN WG1 Ad-Hoc#1, R1-1711853, Ericsson et al., “Activation/deactivation of bandwidth part” (“R1-1711853”). <i>See</i> Exhibit G-15. U.S. Patent No. 10,980,007 to Oh et al. (“Oh”). <i>See</i> Exhibit G-16.
4[a]	The method according to claim 1, further comprising: receiving, from the base station, downlink (DL) control information containing information indicating the one of the UL control channel resources for the UL control information transmission,	U.S. Patent No. 10,305,664 to Ahn et al. (“Ahn”). <i>See</i> Exhibit G-1. U.S. Patent Publication No. 2016/0338041 to LI et al. (“LI”). <i>See</i> Exhibit G-2. U.S. Patent Publication No. 2017/0265176 to Marinier et al. (“Marinier”). <i>See</i> Exhibit G-3. U.S. Patent No. 9,485,060 to Nayeb Nazar et al. (“Nayeb Nazar”). <i>See</i> Exhibit G-4. U.S. Patent No. 10,805,941 to Shaheen et al. (“Shaheen”). <i>See</i> Exhibit G-5. U.S. Patent Publication No. 2020/0374866 (“Takeda I”). <i>See</i> Exhibit G-6. U.S. Patent Publication No. 2020/0163085 to Takeda et al. (“Takeda II”). <i>See</i> Exhibit G-7. U.S. Patent Publication No. 2020/0252180 to Takeda et al. (“Takeda III”). <i>See</i> Exhibit G-8. U.S. Patent No. 10,736,085 to Yan et al. (“Yan”). <i>See</i> Exhibit G-9. U.S. Patent Publication No. 2019/0239214 to Yang et al. (“Yang”). <i>See</i> Exhibit G-10. International Patent Publication No. WO 2018/227538 to Zhang et al. (“Zhang”). <i>See</i> Exhibit G-11. 3GPP TSG-RAN WG1 #89, R1-1709802, Ericsson et al., “Way Forward on bandwidth part for efficient wideband operation in NR” (“R1-1709802”). <i>See</i> Exhibit G-12.

Invalidity of U.S. Patent No. 11,219,000		
Claim Language		Disclosed Art
		3GPP TSG RAN WG1 #90, R1-1713181, LG Electronics, “Consideration on resource allocation for NR-PUCCH” (“R1-1713181”). <i>See</i> Exhibit G-13. 3GPP TSG RAN WG1 #90, R1-1714079, Nokia, Nokia Shanghai Bell, “PUCCH resource allocation” (“R1-1714079”). <i>See</i> Exhibit G-14. U.S. Patent Publication No. 2017/0086219 to Lee et al. (“Lee”). <i>See, e.g.</i>, Lee at [0092], [0095]-[0096], [0098], [0100], [0126]-[0127]. U.S. Patent No. 11,133,971 to Ko et al. (“Ko”). <i>See, e.g.</i>, Ko at 4:54-5:8, 10:56-67. 3GPP TSG RAN WG1 Ad-Hoc#1, R1-1711853, Ericsson et al., “Activation/deactivation of bandwidth part” (“R1-1711853”). <i>See</i> Exhibit G-15. U.S. Patent No. 10,980,007 to Oh et al. (“Oh”). <i>See</i> Exhibit G-16.
4[b]	wherein the one of the UL control channel resources is indicated from the base station through the DL control information.	U.S. Patent No. 10,305,664 to Ahn et al. (“Ahn”). <i>See</i> Exhibit G-1. U.S. Patent Publication No. 2016/0338041 to LI et al. (“LI”). <i>See</i> Exhibit G-2. U.S. Patent Publication No. 2017/0265176 to Marinier et al. (“Marinier”). <i>See</i> Exhibit G-3. U.S. Patent No. 9,485,060 to Nayeb Nazar et al. (“Nayeb Nazar”). <i>See</i> Exhibit G-4. U.S. Patent No. 10,805,941 to Shaheen et al. (“Shaheen”). <i>See</i> Exhibit G-5. U.S. Patent Publication No. 2020/0374866 (“Takeda I”). <i>See</i> Exhibit G-6. U.S. Patent Publication No. 2020/0163085 to Takeda et al. (“Takeda II”). <i>See</i> Exhibit G-7. U.S. Patent Publication No. 2020/0252180 to Takeda et al. (“Takeda III”). <i>See</i> Exhibit G-8.

Invalidity of U.S. Patent No. 11,219,000		
Claim Language		Disclosed Art
		U.S. Patent No. 10,736,085 to Yan et al. (“Yan”). <i>See</i> Exhibit G-9. U.S. Patent Publication No. 2019/0239214 to Yang et al. (“Yang”). <i>See</i> Exhibit G-10. International Patent Publication No. WO 2018/227538 to Zhang et al. (“Zhang”). <i>See</i> Exhibit G-11. 3GPP TSG-RAN WG1 #89, R1-1709802, Ericsson et al., “Way Forward on bandwidth part for efficient wideband operation in NR” (“R1-1709802”). <i>See</i> Exhibit G-12. 3GPP TSG RAN WG1 #90, R1-1713181, LG Electronics, “Consideration on resource allocation for NR-PUCCH” (“R1-1713181”). <i>See</i> Exhibit G-13. 3GPP TSG RAN WG1 #90, R1-1714079, Nokia, Nokia Shanghai Bell, “PUCCH resource allocation” (“R1-1714079”). <i>See</i> Exhibit G-14. U.S. Patent Publication No. 2017/0086219 to Lee et al. (“Lee”). <i>See, e.g.</i>, Lee at [0092], [0095]-[0096], [0098], [0100], [0126]-[0127]. U.S. Patent No. 11,133,971 to Ko et al. (“Ko”). <i>See, e.g.</i>, Ko at 4:54-5:8, 10:56-67. 3GPP TSG RAN WG1 Ad-Hoc#1, R1-1711853, Ericsson et al., “Activation/deactivation of bandwidth part” (“R1-1711853”). <i>See</i> Exhibit G-15. U.S. Patent No. 10,980,007 to Oh et al. (“Oh”). <i>See</i> Exhibit G-16.

2. Claim 5

Invalidity of U.S. Patent No. 11,219,000		
Claim Language		Disclosed Art
5[pre]	A method of receiving uplink (UL) control information by a base station, the method comprising:	<i>See</i> limitation 1[pre] above.
5[a]	transmitting, to a user equipment (UE), UL control channel resource set configuration information for UL control information; and	<i>See</i> limitation 1[a] above.
5[b]	receiving the UL control information through one of UL control channel resources in one of UL control channel resource sets contained in the transmitted UL control channel resource set configuration information,	<i>See</i> limitations 1[b], 1[c], and 1[d] above.
5[c]	wherein the one of the UL control channel resource sets for the	<i>See</i> limitation 1[e] above.

Invalidity of U.S. Patent No. 11,219,000		
Claim Language		Disclosed Art
	UL control information transmission is determined based on a size of the UL control information, and	
5[d]	wherein the UL control channel resource set configuration information is transmitted through UE specific radio resource control (RRC) signaling.	<i>See</i> limitation 1[f] above.
6	The method according to claim 5, wherein the UL control channel resource sets are configured for each UL bandwidth part (BWP) configured for the UE.	<i>See</i> limitation 2 above.
7	The method according to claim 6, wherein the each UL BWP is activated through downlink (DL) control information.	<i>See</i> limitation 3 above.
8[a]	The method according to claim 5, further comprising:	<i>See</i> limitation 4[a] above.

Invalidity of U.S. Patent No. 11,219,000		
Claim Language		Disclosed Art
	transmitting, to the user equipment, downlink (DL) control information containing information that indicates the one of the UL control channel resources for the UL control information transmission,	
8[b]	wherein the one of the UL control channel resources is indicated to the UE through the DL control information.	See limitation 4[b] above.

3. Claim 9

Invalidity of U.S. Patent No. 11,219,000		
Claim Language		Disclosed Art
9[pre]	A user equipment (UE) for transmitting uplink (UL) control information, comprising:	See limitation 1[pre] above.
9[a]	a receiver configured to receive, from a base station, UL control	See limitation 1[a] above.

Invalidity of U.S. Patent No. 11,219,000		
Claim Language		Disclosed Art
	channel resource set configuration information for UL control information transmission;	
9[b]	a controller configured to determine one of UL control channel resource sets contained in the received UL control channel resource set configuration information, and determine one of UL control channel resources configuring the determined one UL control channel resource set; and	<i>See limitations 1[b] and 1[c] above.</i>
9[c]	a transmitter configured to transmit the UL control information through the determined UL control channel resource,	<i>See limitation 1[d] above.</i>
9[d]	wherein the determining of the one of the UL control channel resource sets is	<i>See limitation 1[e] above.</i>

Invalidity of U.S. Patent No. 11,219,000		
Claim Language		Disclosed Art
	performed based on a size of the UL control information, and	
9[e]	wherein the UL control channel resource set configuration information is received through UE specific radio resource control (RRC) signaling.	See limitation 1[f] above.
10	The UE according to claim 9, wherein the UL control channel resource sets are configured for each UL bandwidth part (BWP) configured for the UE.	See limitation 2 above.
11	The UE according to claim 10, wherein the each UL BWP is activated through downlink (DL) control information.	See limitation 3 above.
12[a]	The UE according to claim 9, wherein the receiver receives, from the base station, DL control information containing information	See limitation 4[a] above.

Invalidity of U.S. Patent No. 11,219,000		
Claim Language		Disclosed Art
	that indicates the one of the UL control channel resources for the UL control information transmission,	
12[b]	wherein the one of the UL control channel resources is indicated from the base station through the DL control information.	See limitation 4[b] above.

APPENDIX H (Amended)

Invalidity of U.S. Patent No. 10,638,463 (“’463 Patent”) Obvious Combinations

1. Claim 1

Invalidity of U.S. Patent No. 10,638,463		
Claim Language		Disclosed Art
1[pre]	A method of transmitting uplink (UL) control information by a user equipment, the method comprising:	U.S. Patent No. 10,305,664 to Ahn et al. (“Ahn”). <i>See</i> Exhibit H-1. U.S. Patent Publication No. 2016/0338041 to LI et al. (“LI”). <i>See</i> Exhibit H-2. U.S. Patent Publication No. 2017/0265176 to Marinier et al. (“Marinier”). <i>See</i> Exhibit H-3. U.S. Patent No. 9,485,060 to Nayeb Nazar et al. (“Nayeb Nazar”). <i>See</i> Exhibit H-4. U.S. Patent No. 10,805,941 to Shaheen et al. (“Shaheen”). <i>See</i> Exhibit H-5. U.S. Patent Publication No. 2020/0374866 (“Takeda I”). <i>See</i> Exhibit H-6. U.S. Patent Publication No. 2020/0163085 to Takeda et al. (“Takeda II”). <i>See</i> Exhibit H-7. U.S. Patent Publication No. 2020/0252180 to Takeda et al. (“Takeda III”). <i>See</i> Exhibit H-8. U.S. Patent No. 10,736,085 to Yan et al. (“Yan”). <i>See</i> Exhibit H-9. U.S. Patent Publication No. 2019/0239214 to Yang et al. (“Yang”). <i>See</i> Exhibit H-10. International Patent Publication No. WO 2018/227538 to Zhang et al. (“Zhang”). <i>See</i> Exhibit H-11. 3GPP TSG-RAN WG1 #89, R1-1709802, Ericsson et al., “Way Forward on bandwidth part for efficient wideband operation in NR” (“R1-1709802”). <i>See</i> Exhibit H-12.

Invalidity of U.S. Patent No. 10,638,463		
Claim Language		Disclosed Art
		3GPP TSG RAN WG1 #90, R1-1713181, LG Electronics, “Consideration on resource allocation for NR-PUCCH” (“R1-1713181”). <i>See</i> Exhibit H-13. 3GPP TSG RAN WG1 #90, R1-1714079, Nokia, Nokia Shanghai Bell, “PUCCH resource allocation” (“R1-1714079”). <i>See</i> Exhibit H-14. U.S. Patent Publication No. 2017/0086219 to Lee et al. (“Lee”). <i>See, e.g.</i>, Lee at Abstract, [0007]-[0023]. U.S. Patent No. 11,133,971 to Ko et al. (“Ko”). <i>See, e.g.</i>, Ko at Abstract, 1:65-3:11. U.S. Patent No. 10,980,007 to Oh et al. (“Oh”). <i>See</i> Exhibit H-16.
1[a]	receiving, from a base station, UL control channel resource set configuration information for UL control information transmission;	U.S. Patent No. 10,305,664 to Ahn et al. (“Ahn”). <i>See</i> Exhibit H-1. U.S. Patent Publication No. 2016/0338041 to LI et al. (“LI”). <i>See</i> Exhibit H-2. U.S. Patent Publication No. 2017/0265176 to Marinier et al. (“Marinier”). <i>See</i> Exhibit H-3. U.S. Patent No. 9,485,060 to Nayeb Nazar et al. (“Nayeb Nazar”). <i>See</i> Exhibit H-4. U.S. Patent No. 10,805,941 to Shaheen et al. (“Shaheen”). <i>See</i> Exhibit H-5. U.S. Patent Publication No. 2020/0374866 (“Takeda I”). <i>See</i> Exhibit H-6. U.S. Patent Publication No. 2020/0163085 to Takeda et al. (“Takeda II”). <i>See</i> Exhibit H-7. U.S. Patent Publication No. 2020/0252180 to Takeda et al. (“Takeda III”). <i>See</i> Exhibit H-8. U.S. Patent No. 10,736,085 to Yan et al. (“Yan”). <i>See</i> Exhibit H-9.

Invalidity of U.S. Patent No. 10,638,463		
Claim Language		Disclosed Art
		U.S. Patent Publication No. 2019/0239214 to Yang et al. (“Yang”). <i>See</i> Exhibit H-10. International Patent Publication No. WO 2018/227538 to Zhang et al. (“Zhang”). <i>See</i> Exhibit H-11. 3GPP TSG-RAN WG1 #89, R1-1709802, Ericsson et al., “Way Forward on bandwidth part for efficient wideband operation in NR” (“R1-1709802”). <i>See</i> Exhibit H-12. 3GPP TSG RAN WG1 #90, R1-1713181, LG Electronics, “Consideration on resource allocation for NR-PUCCH” (“R1-1713181”). <i>See</i> Exhibit H-13. 3GPP TSG RAN WG1 #90, R1-1714079, Nokia, Nokia Shanghai Bell, “PUCCH resource allocation” (“R1-1714079”). <i>See</i> Exhibit H-14. U.S. Patent Publication No. 2017/0086219 to Lee et al. (“Lee”). <i>See, e.g.</i>, Lee at [0007]-[0008], [0020], [0192], [0239], [0265]-[0268], Fig. 2. U.S. Patent No. 11,133,971 to Ko et al. (“Ko”). <i>See, e.g.</i>, Ko at 10:56-67, 17:47-54, 34:7-19. U.S. Patent No. 10,980,007 to Oh et al. (“Oh”). <i>See</i> Exhibit H-16.
1[b]	determining one of UL control channel resource sets contained in the UL control channel resource set configuration information;	U.S. Patent No. 10,305,664 to Ahn et al. (“Ahn”). <i>See</i> Exhibit H-1. U.S. Patent Publication No. 2016/0338041 to LI et al. (“LI”). <i>See</i> Exhibit H-2. U.S. Patent Publication No. 2017/0265176 to Marinier et al. (“Marinier”). <i>See</i> Exhibit H-3. U.S. Patent No. 9,485,060 to Nayeb Nazar et al. (“Nayeb Nazar”). <i>See</i> Exhibit H-4. U.S. Patent No. 10,805,941 to Shaheen et al. (“Shaheen”). <i>See</i> Exhibit H-5. U.S. Patent Publication No. 2020/0374866 (“Takeda I”). <i>See</i> Exhibit H-6.

Invalidity of U.S. Patent No. 10,638,463		
Claim Language		Disclosed Art
		U.S. Patent Publication No. 2020/0163085 to Takeda et al. (“Takeda II”). <i>See</i> Exhibit H-7. U.S. Patent Publication No. 2020/0252180 to Takeda et al. (“Takeda III”). <i>See</i> Exhibit H-8. U.S. Patent No. 10,736,085 to Yan et al. (“Yan”). <i>See</i> Exhibit H-9. U.S. Patent Publication No. 2019/0239214 to Yang et al. (“Yang”). <i>See</i> Exhibit H-10. International Patent Publication No. WO 2018/227538 to Zhang et al. (“Zhang”). <i>See</i> Exhibit H-11. 3GPP TSG-RAN WG1 #89, R1-1709802, Ericsson et al., “Way Forward on bandwidth part for efficient wideband operation in NR” (“R1-1709802”). <i>See</i> Exhibit H-12. 3GPP TSG RAN WG1 #90, R1-1713181, LG Electronics, “Consideration on resource allocation for NR-PUCCH” (“R1-1713181”). <i>See</i> Exhibit H-13. 3GPP TSG RAN WG1 #90, R1-1714079, Nokia, Nokia Shanghai Bell, “PUCCH resource allocation” (“R1-1714079”). <i>See</i> Exhibit H-14. U.S. Patent Publication No. 2017/0086219 to Lee et al. (“Lee”). <i>See, e.g.</i>, Lee at Abstract, [0007], [0085], [0092], [0098], [0105]. U.S. Patent No. 11,133,971 to Ko et al. (“Ko”). <i>See, e.g.</i>, Ko at 4:54-5:8. U.S. Patent No. 10,980,007 to Oh et al. (“Oh”). <i>See</i> Exhibit H-16.
1[c]	determining one of UL control channel resources contained in the determined UL	U.S. Patent No. 10,305,664 to Ahn et al. (“Ahn”). <i>See</i> Exhibit H-1. U.S. Patent Publication No. 2016/0338041 to LI et al. (“LI”). <i>See</i> Exhibit H-2.

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Claim Language		Disclosed Art
	control channel resource set; and	U.S. Patent Publication No. 2017/0265176 to Marinier et al. (“Marinier”). <i>See</i> Exhibit H-3. U.S. Patent No. 9,485,060 to Nayeb Nazar et al. (“Nayeb Nazar”). <i>See</i> Exhibit H-4. U.S. Patent No. 10,805,941 to Shaheen et al. (“Shaheen”). <i>See</i> Exhibit H-5. U.S. Patent Publication No. 2020/0374866 (“Takeda I”). <i>See</i> Exhibit H-6. U.S. Patent Publication No. 2020/0163085 to Takeda et al. (“Takeda II”). <i>See</i> Exhibit H-7. U.S. Patent Publication No. 2020/0252180 to Takeda et al. (“Takeda III”). <i>See</i> Exhibit H-8. U.S. Patent No. 10,736,085 to Yan et al. (“Yan”). <i>See</i> Exhibit H-9. U.S. Patent Publication No. 2019/0239214 to Yang et al. (“Yang”). <i>See</i> Exhibit H-10. International Patent Publication No. WO 2018/227538 to Zhang et al. (“Zhang”). <i>See</i> Exhibit H-11. 3GPP TSG-RAN WG1 #89, R1-1709802, Ericsson et al., “Way Forward on bandwidth part for efficient wideband operation in NR” (“R1-1709802”). <i>See</i> Exhibit H-12. 3GPP TSG RAN WG1 #90, R1-1713181, LG Electronics, “Consideration on resource allocation for NR-PUCCH” (“R1-1713181”). <i>See</i> Exhibit H-13. 3GPP TSG RAN WG1 #90, R1-1714079, Nokia, Nokia Shanghai Bell, “PUCCH resource allocation” (“R1-1714079”). <i>See</i> Exhibit H-14. U.S. Patent Publication No. 2017/0086219 to Lee et al. (“Lee”). <i>See, e.g.,</i> Lee at [0092], [0095]-[0096], [0098], [0100], [0126]-[0127].

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Claim Language		Disclosed Art
		U.S. Patent No. 11,133,971 to Ko et al. (“Ko”). <i>See, e.g.</i>, Ko at 4:54-5:8, 7:5-15, 10:56-67. U.S. Patent No. 10,980,007 to Oh et al. (“Oh”). <i>See</i> Exhibit H-16.
1[d]	transmitting UL control information through the determined UL control channel resource,	U.S. Patent No. 10,305,664 to Ahn et al. (“Ahn”). <i>See</i> Exhibit H-1. U.S. Patent Publication No. 2016/0338041 to LI et al. (“LI”). <i>See</i> Exhibit H-2. U.S. Patent Publication No. 2017/0265176 to Marinier et al. (“Marinier”). <i>See</i> Exhibit H-3. U.S. Patent No. 9,485,060 to Nayeb Nazar et al. (“Nayeb Nazar”). <i>See</i> Exhibit H-4. U.S. Patent No. 10,805,941 to Shaheen et al. (“Shaheen”). <i>See</i> Exhibit H-5. U.S. Patent Publication No. 2020/0374866 (“Takeda I”). <i>See</i> Exhibit H-6. U.S. Patent Publication No. 2020/0163085 to Takeda et al. (“Takeda II”). <i>See</i> Exhibit H-7. U.S. Patent Publication No. 2020/0252180 to Takeda et al. (“Takeda III”). <i>See</i> Exhibit H-8. U.S. Patent No. 10,736,085 to Yan et al. (“Yan”). <i>See</i> Exhibit H-9. U.S. Patent Publication No. 2019/0239214 to Yang et al. (“Yang”). <i>See</i> Exhibit H-10. International Patent Publication No. WO 2018/227538 to Zhang et al. (“Zhang”). <i>See</i> Exhibit H-11. 3GPP TSG-RAN WG1 #89, R1-1709802, Ericsson et al., “Way Forward on bandwidth part for efficient wideband operation in NR” (“R1-1709802”). <i>See</i> Exhibit H-12. 3GPP TSG RAN WG1 #90, R1-1713181, LG Electronics, “Consideration on resource allocation for NR-PUCCH” (“R1-1713181”). <i>See</i> Exhibit H-13.

Invalidity of U.S. Patent No. 10,638,463		
Claim Language		Disclosed Art
		3GPP TSG RAN WG1 #90, R1-1714079, Nokia, Nokia Shanghai Bell, “PUCCH resource allocation” (“R1-1714079”). <i>See</i> Exhibit H-14. U.S. Patent Publication No. 2017/0086219 to Lee et al. (“Lee”). <i>See, e.g.</i>, Lee at Abstract, [0126]-[0127]. U.S. Patent No. 11,133,971 to Ko et al. (“Ko”). <i>See, e.g.</i>, Ko at 4:54-5:8, 7:5-15, 10:56-67. 11:1-12. U.S. Patent No. 10,980,007 to Oh et al. (“Oh”). <i>See</i> Exhibit H-16.
1[e]	wherein the UL control channel resource sets are configured for each UL bandwidth part (BWP) configured for the user equipment, and	U.S. Patent No. 10,305,664 to Ahn et al. (“Ahn”). <i>See</i> Exhibit H-1. U.S. Patent Publication No. 2016/0338041 to LI et al. (“LI”). <i>See</i> Exhibit H-2. U.S. Patent Publication No. 2017/0265176 to Marinier et al. (“Marinier”). <i>See</i> Exhibit H-3. U.S. Patent No. 9,485,060 to Nayeb Nazar et al. (“Nayeb Nazar”). <i>See</i> Exhibit H-4. U.S. Patent No. 10,805,941 to Shaheen et al. (“Shaheen”). <i>See</i> Exhibit H-5. U.S. Patent Publication No. 2020/0374866 (“Takeda I”). <i>See</i> Exhibit H-6. U.S. Patent Publication No. 2020/0163085 to Takeda et al. (“Takeda II”). <i>See</i> Exhibit H-7. U.S. Patent Publication No. 2020/0252180 to Takeda et al. (“Takeda III”). <i>See</i> Exhibit H-8. U.S. Patent No. 10,736,085 to Yan et al. (“Yan”). <i>See</i> Exhibit H-9. U.S. Patent Publication No. 2019/0239214 to Yang et al. (“Yang”). <i>See</i> Exhibit H-10.

Invalidity of U.S. Patent No. 10,638,463		
Claim Language		Disclosed Art
		International Patent Publication No. WO 2018/227538 to Zhang et al. (“Zhang”). <i>See</i> Exhibit H-11. 3GPP TSG-RAN WG1 #89, R1-1709802, Ericsson et al., “Way Forward on bandwidth part for efficient wideband operation in NR” (“R1-1709802”). <i>See</i> Exhibit H-12. 3GPP TSG RAN WG1 #90, R1-1713181, LG Electronics, “Consideration on resource allocation for NR-PUCCH” (“R1-1713181”). <i>See</i> Exhibit H-13. U.S. Patent Publication No. 2017/0086219 to Lee et al. (“Lee”). <i>See, e.g.</i>, Lee at [0068], [0218]-[0219]. U.S. Patent No. 11,133,971 to Ko et al. (“Ko”). <i>See, e.g.</i>, Ko at 31:46-32:29, 33:3-22. 3GPP TSG RAN WG1 Ad-Hoc#1, R1-1711853, Ericsson et al., “Activation/deactivation of bandwidth part” (“R1-1711853”). <i>See</i> Exhibit H-15. U.S. Patent No. 10,980,007 to Oh et al. (“Oh”). <i>See</i> Exhibit H-16.
1[f]	wherein the each UL BWP is activated through downlink (DL) control information.	U.S. Patent No. 10,305,664 to Ahn et al. (“Ahn”). <i>See</i> Exhibit H-1. U.S. Patent Publication No. 2016/0338041 to LI et al. (“LI”). <i>See</i> Exhibit H-2. U.S. Patent Publication No. 2017/0265176 to Marinier et al. (“Marinier”). <i>See</i> Exhibit H-3. U.S. Patent No. 9,485,060 to Nayeb Nazar et al. (“Nayeb Nazar”). <i>See</i> Exhibit H-4. U.S. Patent No. 10,805,941 to Shaheen et al. (“Shaheen”). <i>See</i> Exhibit H-5. U.S. Patent Publication No. 2020/0374866 (“Takeda I”). <i>See</i> Exhibit H-6. U.S. Patent Publication No. 2020/0163085 to Takeda et al. (“Takeda II”). <i>See</i> Exhibit H-7.

Invalidity of U.S. Patent No. 10,638,463		
Claim Language		Disclosed Art
		U.S. Patent Publication No. 2020/0252180 to Takeda et al. (“Takeda III”). <i>See</i> Exhibit H-8. U.S. Patent No. 10,736,085 to Yan et al. (“Yan”). <i>See</i> Exhibit H-9. U.S. Patent Publication No. 2019/0239214 to Yang et al. (“Yang”). <i>See</i> Exhibit H-10. International Patent Publication No. WO 2018/227538 to Zhang et al. (“Zhang”). <i>See</i> Exhibit H-11. 3GPP TSG-RAN WG1 #89, R1-1709802, Ericsson et al., “Way Forward on bandwidth part for efficient wideband operation in NR” (“R1-1709802”). <i>See</i> Exhibit H-12. 3GPP TSG RAN WG1 #90, R1-1713181, LG Electronics, “Consideration on resource allocation for NR-PUCCH” (“R1-1713181”). <i>See</i> Exhibit H-13. U.S. Patent Publication No. 2017/0086219 to Lee et al. (“Lee”). <i>See, e.g.</i>, Lee at [0095]-[0096], [0101]-[0112]. U.S. Patent No. 11,133,971 to Ko et al. (“Ko”). <i>See, e.g.</i>, Ko at 4:54-5:8, 10:56-67. 3GPP TSG RAN WG1 Ad-Hoc#1, R1-1711853, Ericsson et al., “Activation/deactivation of bandwidth part” (“R1-1711853”). <i>See</i> Exhibit H-15. U.S. Patent No. 10,980,007 to Oh et al. (“Oh”). <i>See</i> Exhibit H-16.
2	The method according to claim 1, wherein the determining of the one of the UL control channel resource sets is performed based on a	U.S. Patent No. 10,305,664 to Ahn et al. (“Ahn”). <i>See</i> Exhibit H-1. U.S. Patent Publication No. 2016/0338041 to LI et al. (“LI”). <i>See</i> Exhibit H-2. U.S. Patent Publication No. 2017/0265176 to Marinier et al. (“Marinier”). <i>See</i> Exhibit H-3.

Invalidity of U.S. Patent No. 10,638,463		
Claim Language		Disclosed Art
	size of the UL control information.	U.S. Patent No. 9,485,060 to Nayeb Nazar et al. (“Nayeb Nazar”). <i>See</i> Exhibit H-4. U.S. Patent No. 10,805,941 to Shaheen et al. (“Shaheen”). <i>See</i> Exhibit H-5. U.S. Patent Publication No. 2020/0374866 (“Takeda I”). <i>See</i> Exhibit H-6. U.S. Patent Publication No. 2020/0163085 to Takeda et al. (“Takeda II”). <i>See</i> Exhibit H-7. U.S. Patent Publication No. 2020/0252180 to Takeda et al. (“Takeda III”). <i>See</i> Exhibit H-8. U.S. Patent No. 10,736,085 to Yan et al. (“Yan”). <i>See</i> Exhibit H-9. U.S. Patent Publication No. 2019/0239214 to Yang et al. (“Yang”). <i>See</i> Exhibit H-10. International Patent Publication No. WO 2018/227538 to Zhang et al. (“Zhang”). <i>See</i> Exhibit H-11. 3GPP TSG RAN WG1 #90, R1-1713181, LG Electronics, “Consideration on resource allocation for NR-PUCCH” (“R1-1713181”). <i>See</i> Exhibit H-13. 3GPP TSG RAN WG1 #90, R1-1714079, Nokia, Nokia Shanghai Bell, “PUCCH resource allocation” (“R1-1714079”). <i>See</i> Exhibit H-14. U.S. Patent Publication No. 2017/0086219 to Lee et al. (“Lee”). <i>See, e.g.</i>, Lee at [0098]-[0100], [0125]. U.S. Patent No. 11,133,971 to Ko et al. (“Ko”). <i>See, e.g.</i>, Ko at 34:24-55, 36:38-65. U.S. Patent No. 10,980,007 to Oh et al. (“Oh”). <i>See</i> Exhibit H-16.
3[a]	The method according to claim 1, further	U.S. Patent No. 10,305,664 to Ahn et al. (“Ahn”). <i>See</i> Exhibit H-1.

Invalidity of U.S. Patent No. 10,638,463		
Claim Language		Disclosed Art
	comprising receiving, from the base station, downlink (DL) control information containing information indicating the one of the UL control channel resources for the UL control information transmission,	U.S. Patent Publication No. 2016/0338041 to LI et al. (“LI”). <i>See</i> Exhibit H-2. U.S. Patent Publication No. 2017/0265176 to Marinier et al. (“Marinier”). <i>See</i> Exhibit H-3. U.S. Patent No. 9,485,060 to Nayeb Nazar et al. (“Nayeb Nazar”). <i>See</i> Exhibit H-4. U.S. Patent No. 10,805,941 to Shaheen et al. (“Shaheen”). <i>See</i> Exhibit H-5. U.S. Patent Publication No. 2020/0374866 (“Takeda I”). <i>See</i> Exhibit H-6. U.S. Patent Publication No. 2020/0163085 to Takeda et al. (“Takeda II”). <i>See</i> Exhibit H-7. U.S. Patent Publication No. 2020/0252180 to Takeda et al. (“Takeda III”). <i>See</i> Exhibit H-8. U.S. Patent No. 10,736,085 to Yan et al. (“Yan”). <i>See</i> Exhibit H-9. U.S. Patent Publication No. 2019/0239214 to Yang et al. (“Yang”). <i>See</i> Exhibit H-10. International Patent Publication No. WO 2018/227538 to Zhang et al. (“Zhang”). <i>See</i> Exhibit H-11. 3GPP TSG-RAN WG1 #89, R1-1709802, Ericsson et al., “Way Forward on bandwidth part for efficient wideband operation in NR” (“R1-1709802”). <i>See</i> Exhibit H-12. 3GPP TSG RAN WG1 #90, R1-1713181, LG Electronics, “Consideration on resource allocation for NR-PUCCH” (“R1-1713181”). <i>See</i> Exhibit H-13. 3GPP TSG RAN WG1 #90, R1-1714079, Nokia, Nokia Shanghai Bell, “PUCCH resource allocation” (“R1-1714079”). <i>See</i> Exhibit H-14.

Invalidity of U.S. Patent No. 10,638,463		
Claim Language		Disclosed Art
		U.S. Patent Publication No. 2017/0086219 to Lee et al. (“Lee”). <i>See, e.g.</i>, Lee at [0092], [0095]-[0096], [0098], [0100], [0126]-[0127]. U.S. Patent No. 11,133,971 to Ko et al. (“Ko”). <i>See, e.g.</i>, Ko at 4:54-5:8, 10:56-67. 3GPP TSG RAN WG1 Ad-Hoc#1, R1-1711853, Ericsson et al., “Activation/deactivation of bandwidth part” (“R1-1711853”). <i>See</i> Exhibit H-15. U.S. Patent No. 10,980,007 to Oh et al. (“Oh”). <i>See</i> Exhibit H-16.
3[b]	wherein the one of the UL control channel resources is indicated from the base station through the DL control information.	U.S. Patent No. 10,305,664 to Ahn et al. (“Ahn”). <i>See</i> Exhibit H-1. U.S. Patent Publication No. 2016/0338041 to LI et al. (“LI”). <i>See</i> Exhibit H-2. U.S. Patent Publication No. 2017/0265176 to Marinier et al. (“Marinier”). <i>See</i> Exhibit H-3. U.S. Patent No. 9,485,060 to Nayeb Nazar et al. (“Nayeb Nazar”). <i>See</i> Exhibit H-4. U.S. Patent No. 10,805,941 to Shaheen et al. (“Shaheen”). <i>See</i> Exhibit H-5. U.S. Patent Publication No. 2020/0374866 (“Takeda I”). <i>See</i> Exhibit H-6. U.S. Patent Publication No. 2020/0163085 to Takeda et al. (“Takeda II”). <i>See</i> Exhibit H-7. U.S. Patent Publication No. 2020/0252180 to Takeda et al. (“Takeda III”). <i>See</i> Exhibit H-8. U.S. Patent No. 10,736,085 to Yan et al. (“Yan”). <i>See</i> Exhibit H-9. U.S. Patent Publication No. 2019/0239214 to Yang et al. (“Yang”). <i>See</i> Exhibit H-10. International Patent Publication No. WO 2018/227538 to Zhang et al. (“Zhang”). <i>See</i> Exhibit H-11.

Invalidity of U.S. Patent No. 10,638,463		
Claim Language		Disclosed Art
		3GPP TSG-RAN WG1 #89, R1-1709802, Ericsson et al., “Way Forward on bandwidth part for efficient wideband operation in NR” (“R1-1709802”). <i>See</i> Exhibit H-12. 3GPP TSG RAN WG1 #90, R1-1713181, LG Electronics, “Consideration on resource allocation for NR-PUCCH” (“R1-1713181”). <i>See</i> Exhibit H-13. 3GPP TSG RAN WG1 #90, R1-1714079, Nokia, Nokia Shanghai Bell, “PUCCH resource allocation” (“R1-1714079”). <i>See</i> Exhibit H-14. U.S. Patent Publication No. 2017/0086219 to Lee et al. (“Lee”). <i>See, e.g.</i>, Lee at [0092], [0095]-[0096], [0098], [0100], [0126]-[0127]. U.S. Patent No. 11,133,971 to Ko et al. (“Ko”). <i>See, e.g.</i>, Ko at 4:54-5:8, 10:56-67. 3GPP TSG RAN WG1 Ad-Hoc#1, R1-1711853, Ericsson et al., “Activation/deactivation of bandwidth part” (“R1-1711853”). <i>See</i> Exhibit H-15. U.S. Patent No. 10,980,007 to Oh et al. (“Oh”). <i>See</i> Exhibit H-16.

2. Claim 4

Invalidity of U.S. Patent No. 10,638,463		
Claim Language		Disclosed Art
4[pre]	A method of receiving uplink (UL) control information by a base station, the method comprising:	<i>See</i> limitation 1[pre] above.

Invalidity of U.S. Patent No. 10,638,463		
Claim Language		Disclosed Art
4[a]	transmitting UL control channel resource set configuration information for transmitting UL control information to a user equipment; and	<i>See</i> limitation 1[a] above.
4[b]	receiving the UL control information through one of UL control channel resources configuring one of UL control channel resource sets contained in UL control channel resource set configuration information,	<i>See</i> limitations 1[b], 1[c], and 1[d] above.
4[c]	wherein the UL control channel resource sets are configured for each UL bandwidth part (BWP) configured for the user equipment, and	<i>See</i> limitation 1[e] above.
4[d]	wherein the each UL BWP is activated through downlink (DL) control information.	<i>See</i> limitation 1[f] above.

Invalidity of U.S. Patent No. 10,638,463		
Claim Language		Disclosed Art
5	The method according to claim 4, wherein the one of the UL control channel resource sets for the UL control information transmission is determined based on a size of the UL control information.	<i>See</i> limitation 2 above.
6[a]	The method according to claim 4, further comprising transmitting, to the user equipment, DL control information containing information that indicates the one of the UL control channel resources for the UL control information transmission,	<i>See</i> limitation 3[a] above.
6[b]	wherein the one of the UL control channel resources is indicated to the user equipment through the DL control information.	<i>See</i> limitation 3[a] above.

3. Claim 7

Invalidity of U.S. Patent No. 10,638,463		
Claim Language		Disclosed Art
7[pre]	A user equipment for transmitting uplink (UL) control information, comprising:	See limitation 1[pre] above.
7[a]	a receiver configured to receive, from a base station, UL control channel resource set configuration information for UL control information transmission;	See limitation 1[a] above.
7[b]	a controller configured to determine one of UL control channel resource sets contained in the UL control channel resource set configuration information, and determine one of UL control channel resources configuring the determined one UL control channel resource set; and	See limitations 1[b] and 1[c] above.

Invalidity of U.S. Patent No. 10,638,463		
Claim Language		Disclosed Art
7[c]	a transmitter configured to transmit the UL control information through the determined UL control channel resource,	<i>See</i> limitation 1[d] above.
7[d]	wherein the UL control channel resource sets are configured for each UL bandwidth part (BWP) configured for the user equipment, and	<i>See</i> limitation 1[e] above.
7[e]	wherein the each UL BWP is activated through downlink (DL) control information.	<i>See</i> limitation 1[f] above.
8	The user equipment according to claim 7, wherein the determining of the one of the UL control channel resource sets is performed based on a size of the UL control information.	<i>See</i> limitation 2 above.
9[a]	The user equipment according to claim 7, wherein the receiver receives, from the base	<i>See</i> limitation 3[a] above.

Invalidity of U.S. Patent No. 10,638,463		
Claim Language		Disclosed Art
	station, DL control information containing information that indicates the one of the UL control channel resources for the UL control information transmission,	
9[b]	wherein the one of the UL control channel resources is indicated from the base station through the DL control information.	See limitation 3[b] above.

APPENDIX I (Amended)

Invalidity of U.S. Patent No. 11,540,272 (“272 Patent”) Obviousness Combinations

1. Claim 1

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language	Disclosed Art	
1[pre] A base station, comprising: a transceiver; a receiver; and a controller which controls the transceiver and receiver thereby performing operations including:	U.S. Patent Publication No. US20180041325A1 to Lee et. al. ("Lee 325"). See Exhibit I-1. U.S. Patent Publication No. US20180376497A1 to You et. al. ("You"). See Exhibit I-2. U.S. Patent Publication No. US2018192434A1 to Lee et. al. ("Lee 434"). See Exhibit I-3. U.S. Patent Publication No. US20170041948A1 to Cheng et. al. ("Cheng"). See Exhibit I-4. U.S. Patent Publication No. US20140328260A1 to Papasakelleriou et. al. ("Papasakelleriou"). See Exhibit I-5. U.S. Patent Publication No. US20150215906A1 to Park et. al. ("Park"). See Exhibit I-6. U.S. Patent Publication No. US20200187169A1 to Gao et al. (“Gao”). See Exhibit I-7. 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Multiplexing and	

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
		channel coding (3GPP TS 36.212 version 13.1.0 Release 13), at Sections 5.3.3 (“Downlink control information”), 5.3.3.1, 5.3.3.1.2, 5.3.3.1.11. 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures (3GPP TS 36.213 V13.1.0 Release 13), at Sections 7.1.6 (“Resource allocation”), 8.1 (“Resource allocation for PDCCH/EPDCCH with uplink DCI format”), Tables 7.1.6-1, 7.1.7.1-1, 7.1.7.1-1A, 7.1.7.1-2, 7.1.7.2.1-1, 8.1.3-1. 3GPP T-Doc R1-1610129: Summary of [86-19] Discussion on Slot Structure Use Cases (Qualcomm Incorporated). U.S. Patent Publication No. US 20170170940A1 to Lee et. al. U.S. Patent Publication No. US20160330721A1 to Park et. al. U.S. Patent Publication No. US20160295584A1 to Chen et. al. U.S. Patent Publication No. US20190165882A1 to You et. al. U.S. Patent Publication No. US20190123883A1 to Islam et. al. U.S. Patent Publication No. US20200260526A1 to Xiong et. al. U.S. Patent Publication No. US20210282157A1 to Wang et. al. U.S. Patent Publication No. US20120207082A1 to Liu et. al. U.S. Patent Publication No. US20130094442A1 to Kim et. al. U.S. Patent Publication No. US2014056244A1 to Frenne et. al.

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
		U.S. Patent Publication No. US2011051654A1 to Blankenship et. al. U.S. Patent Publication No. US20120218952A1 to Kwon et. al. U.S. Patent Publication No. US20130336197A1 to Park et. al. U.S. Patent Publication No. US20140334430A1 to Moon et. al. U.S. Patent Publication No. US20150208394A1 to Seo et. al. U.S. Patent Publication No. US20150304995A1 to Yi et. al. U.S. Patent Publication No. US20130272261A1 to Seo et. al. U.S. Patent Publication No. US20150358111A1 to Marinier et. al. Korean Patent Publication No. KR102169958B1 to Park et. al. PCT Patent Publication No. WO2016039681A1 to Frenne et. al. PCT Patent Publication No. WO2016163854A1 to Novlan et. al. PCT Patent Publication No. WO2017196059A1 to Yeo et. al. 3GPP T-Doc R1-165652: WF on NPDCCH ordered PRACH (Ericsson). 3GPP T-Doc R1-1609509: NR frame structure for forward compatibility (Intel). 3GPP T-Doc R1-1609050: Numerology for URLLC (Samsung). 3GPP T-Doc R1-162345: Discussion on non-precoded CSI-RS design for eFD-MIMO (ZTE).

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
		3GPP T-Doc R1-161028: Discussion on Resource Allocation and Scheduling of NB-PDSCH (ITL). LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation (3GPP TS 36.211 version 12.9.0 Release 12) LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation (3GPP TS 36.212 version 12.5.0 Release 12) 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation (Release 13) The LTE Standard, Signals Research Group, April 2014. A Low Computational Complexity Realization Algorithm for DVRB Mapping to DPRB in TD-LTE System, Luo et. al., 2013 Ninth International Conference on Natural Computation (ICNC). Efficient Control Signaling for Resource Allocation in OFDMA Networks, Gwanmo Ku, Drexel University, 2014. Resource Allocation and Link Adaptation in LTE and LTE Advanced: A Tutorial, Ku et. al., IEEE COMMUNICATION SURVEYS & TUTORIALS, VOL. 17, NO. 3, THIRD QUARTER 2015.
1[a]	transmitting, to a wireless device, a radio resource control (RRC) signal including information on one or more allocations of a time-domain resource, wherein the time-	U.S. Patent Publication No. US20180041325A1 to Lee et. al. ("Lee 325"). See Exhibit I-1. U.S. Patent Publication No. US20180376497A1 to You et. al. ("You"). See Exhibit I-2.

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
	domain resource includes at least one or more orthogonal frequency-division multiplexing (OFDM) symbols,	U.S. Patent Publication No. US2018192434A1 to Lee et. al. ("Lee 434"). See Exhibit I-3. U.S. Patent Publication No. US20170041948A1 to Cheng et. al. ("Cheng"). See Exhibit I-4. U.S. Patent Publication No. US20140328260A1 to Papasakelleriou et. al. ("Papasakelleriou"). See Exhibit I-5. U.S. Patent Publication No. US20150215906A1 to Park et. al. ("Park"). See Exhibit I-6. U.S. Patent Publication No. US20200187169A1 to Gao et al. ("Gao"). See Exhibit I-7. 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Multiplexing and channel coding (3GPP TS 36.212 version 13.1.0 Release 13), at Sections 5.3.3 ("Downlink control information"), 5.3.3.1, 5.3.3.1.2, 5.3.3.1.11. 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures (3GPP TS 36.213 V13.1.0 Release 13), at Sections 7.1.6 ("Resource allocation"), 8.1 ("Resource allocation for PDCCH/EPDCCH with uplink DCI format"), Tables 7.1.6-1, 7.1.7.1-1, 7.1.7.1-1A, 7.1.7.1-2, 7.1.7.2.1-1, 8.1.3-1. 3GPP T-Doc R1-1610129: Summary of [86-19] Discussion on Slot Structure Use Cases (Qualcomm Incorporated). U.S. Patent Publication No. US 20170170940A1 to Lee et. al. U.S. Patent Publication No. US20160330721A1 to Park et. al.

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
		U.S. Patent Publication No. US20160295584A1 to Chen et. al. U.S. Patent Publication No. US20190165882A1 to You et. al. U.S. Patent Publication No. US20190123883A1 to Islam et. al. U.S. Patent Publication No. US20200260526A1 to Xiong et. al. U.S. Patent Publication No. US20210282157A1 to Wang et. al. U.S. Patent Publication No. US20120207082A1 to Liu et. al. U.S. Patent Publication No. US20130094442A1 to Kim et. al. U.S. Patent Publication No. US2014056244A1 to Frenne et. al. U.S. Patent Publication No. US2011051654A1 to Blankenship et. al. U.S. Patent Publication No. US20120218952A1 to Kwon et. al. U.S. Patent Publication No. US20130336197A1 to Park et. al. U.S. Patent Publication No. US20140334430A1 to Moon et. al. U.S. Patent Publication No. US20150208394A1 to Seo et. al. U.S. Patent Publication No. US20150304995A1 to Yi et. al. U.S. Patent Publication No. US20130272261A1 to Seo et. al. U.S. Patent Publication No. US20150358111A1 to Marinier et. al. Korean Patent Publication No. KR102169958B1 to Park et. al.

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
		PCT Patent Publication No. WO2016039681A1 to Frenne et. al. PCT Patent Publication No. WO2016163854A1 to Novlan et. al. PCT Patent Publication No. WO2017196059A1 to Yeo et. al. 3GPP T-Doc R1-165652: WF on NPDCCH ordered PRACH (Ericsson). 3GPP T-Doc R1-1609509: NR frame structure for forward compatibility (Intel). 3GPP T-Doc R1-1609050: Numerology for URLLC (Samsung). 3GPP T-Doc R1-162345: Discussion on non-precoded CSI-RS design for eFD-MIMO (ZTE). 3GPP T-Doc R1-161028: Discussion on Resource Allocation and Scheduling of NB-PDSCH (ITL). LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation (3GPP TS 36.211 version 12.9.0 Release 12) LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation (3GPP TS 36.212 version 12.5.0 Release 12) 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation (Release 13) The LTE Standard, Signals Research Group, April 2014.

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
		A Low Computational Complexity Realization Algorithm for DVRB Mapping to DPRB in TD-LTE System, Luo et. al., 2013 Ninth International Conference on Natural Computation (ICNC). Efficient Control Signaling for Resource Allocation in OFDMA Networks, Gwanmo Ku, Drexel University, 2014. Resource Allocation and Link Adaptation in LTE and LTE Advanced: A Tutorial, Ku et. al., IEEE COMMUNICATION SURVEYS & TUTORIALS, VOL. 17, NO. 3, THIRD QUARTER 2015.
1[b]	wherein, based on the information, a number of OFDM symbols are determined for a physical downlink shared channel (PDSCH) or a physical uplink shared channel (PUSCH), and	U.S. Patent Publication No. US20180041325A1 to Lee et. al. ("Lee 325"). See Exhibit I-1. U.S. Patent Publication No. US20180376497A1 to You et. al. ("You"). See Exhibit I-2. U.S. Patent Publication No. US2018192434A1 to Lee et. al. ("Lee 434"). See Exhibit I-3. U.S. Patent Publication No. US20170041948A1 to Cheng et. al. ("Cheng"). See Exhibit I-4. U.S. Patent Publication No. US20140328260A1 to Papasakelleriou et. al. ("Papasakelleriou"). See Exhibit I-5. U.S. Patent Publication No. US20150215906A1 to Park et. al. ("Park"). See Exhibit I-6. U.S. Patent Publication No. US20200187169A1 to Gao et al. ("Gao"). See Exhibit I-7.

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
		3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Multiplexing and channel coding (3GPP TS 36.212 version 13.1.0 Release 13), at Sections 5.3.3 (“Downlink control information”), 5.3.3.1, 5.3.3.1.2, 5.3.3.1.11. 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures (3GPP TS 36.213 V13.1.0 Release 13), at Sections 7.1.6 (“Resource allocation”), 8.1 (“Resource allocation for PDCCH/EPDCCH with uplink DCI format”), Tables 7.1.6-1, 7.1.7.1-1, 7.1.7.1-1A, 7.1.7.1-2, 7.1.7.2.1-1, 8.1.3-1. 3GPP T-Doc R1-1610129: Summary of [86-19] Discussion on Slot Structure Use Cases (Qualcomm Incorporated). U.S. Patent Publication No. US 20170170940A1 to Lee et. al. U.S. Patent Publication No. US20160330721A1 to Park et. al. U.S. Patent Publication No. US20160295584A1 to Chen et. al. U.S. Patent Publication No. US20190165882A1 to You et. al. U.S. Patent Publication No. US20190123883A1 to Islam et. al. U.S. Patent Publication No. US20200260526A1 to Xiong et. al. U.S. Patent Publication No. US20210282157A1 to Wang et. al. U.S. Patent Publication No. US20120207082A1 to Liu et. al. U.S. Patent Publication No. US20130094442A1 to Kim et. al.

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
		U.S. Patent Publication No. US2014056244A1 to Frenne et. al. U.S. Patent Publication No. US2011051654A1 to Blankenship et. al. U.S. Patent Publication No. US20120218952A1 to Kwon et. al. U.S. Patent Publication No. US20130336197A1 to Park et. al. U.S. Patent Publication No. US20140334430A1 to Moon et. al. U.S. Patent Publication No. US20150208394A1 to Seo et. al. U.S. Patent Publication No. US20150304995A1 to Yi et. al. U.S. Patent Publication No. US20130272261A1 to Seo et. al. U.S. Patent Publication No. US20150358111A1 to Marinier et. al. Korean Patent Publication No. KR102169958B1 to Park et. al. PCT Patent Publication No. WO2016039681A1 to Frenne et. al. PCT Patent Publication No. WO2016163854A1 to Novlan et. al. PCT Patent Publication No. WO2017196059A1 to Yeo et. al. 3GPP T-Doc R1-165652: WF on NPDCCH ordered PRACH (Ericsson). 3GPP T-Doc R1-1609509: NR frame structure for forward compatibility (Intel). 3GPP T-Doc R1-1609050: Numerology for URLLC (Samsung).

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
		3GPP T-Doc R1-162345: Discussion on non-precoded CSI-RS design for eFD-MIMO (ZTE). 3GPP T-Doc R1-161028: Discussion on Resource Allocation and Scheduling of NB-PDSCH (ITL). LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation (3GPP TS 36.211 version 12.9.0 Release 12) LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation (3GPP TS 36.212 version 12.5.0 Release 12) 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation (Release 13) The LTE Standard, Signals Research Group, April 2014. A Low Computational Complexity Realization Algorithm for DVRB Mapping to DPRB in TD-LTE System, Luo et. al., 2013 Ninth International Conference on Natural Computation (ICNC). Efficient Control Signaling for Resource Allocation in OFDMA Networks, Gwanmo Ku, Drexel University, 2014. Resource Allocation and Link Adaptation in LTE and LTE Advanced: A Tutorial, Ku et. al., IEEE COMMUNICATION SURVEYS & TUTORIALS, VOL. 17, NO. 3, THIRD QUARTER 2015.
1[c]	wherein the determined number of OFDM symbols is smaller than or equal to a	U.S. Patent Publication No. US20180041325A1 to Lee et. al. ("Lee 325"). See Exhibit I-1.

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
	number of OFDM symbols included in a slot; and	U.S. Patent Publication No. US20180376497A1 to You et. al. ("You"). See Exhibit I-2. U.S. Patent Publication No. US2018192434A1 to Lee et. al. ("Lee 434"). See Exhibit I-3. U.S. Patent Publication No. US20170041948A1 to Cheng et. al. ("Cheng"). See Exhibit I-4. U.S. Patent Publication No. US20140328260A1 to Papasakelleriou et. al. ("Papasakelleriou"). See Exhibit I-5. U.S. Patent Publication No. US20150215906A1 to Park et. al. ("Park"). See Exhibit I-6. U.S. Patent Publication No. US20200187169A1 to Gao et al. ("Gao"). See Exhibit I-7. 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Multiplexing and channel coding (3GPP TS 36.212 version 13.1.0 Release 13), at Sections 5.3.3 ("Downlink control information"), 5.3.3.1, 5.3.3.1.2, 5.3.3.1.11. 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures (3GPP TS 36.213 V13.1.0 Release 13), at Sections 7.1.6 ("Resource allocation"), 8.1 ("Resource allocation for PDCCH/EPDCCH with uplink DCI format"), Tables 7.1.6-1, 7.1.7.1-1, 7.1.7.1-1A, 7.1.7.1-2, 7.1.7.2.1-1, 8.1.3-1. 3GPP T-Doc R1-1610129: Summary of [86-19] Discussion on Slot Structure Use Cases (Qualcomm Incorporated).

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
		U.S. Patent Publication No. US 20170170940A1 to Lee et. al. U.S. Patent Publication No. US20160330721A1 to Park et. al. U.S. Patent Publication No. US20160295584A1 to Chen et. al. U.S. Patent Publication No. US20190165882A1 to You et. al. U.S. Patent Publication No. US20190123883A1 to Islam et. al. U.S. Patent Publication No. US20200260526A1 to Xiong et. al. U.S. Patent Publication No. US20210282157A1 to Wang et. al. U.S. Patent Publication No. US20120207082A1 to Liu et. al. U.S. Patent Publication No. US20130094442A1 to Kim et. al. U.S. Patent Publication No. US2014056244A1 to Frenne et. al. U.S. Patent Publication No. US2011051654A1 to Blankenship et. al. U.S. Patent Publication No. US20120218952A1 to Kwon et. al. U.S. Patent Publication No. US20130336197A1 to Park et. al. U.S. Patent Publication No. US20140334430A1 to Moon et. al. U.S. Patent Publication No. US20150208394A1 to Seo et. al. U.S. Patent Publication No. US20150304995A1 to Yi et. al. U.S. Patent Publication No. US20130272261A1 to Seo et. al.

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
		U.S. Patent Publication No. US20150358111A1 to Marinier et. al. Korean Patent Publication No. KR102169958B1 to Park et. al. PCT Patent Publication No. WO2016039681A1 to Frenne et. al. PCT Patent Publication No. WO2016163854A1 to Novlan et. al. PCT Patent Publication No. WO2017196059A1 to Yeo et. al. 3GPP T-Doc R1-165652: WF on NPDCCH ordered PRACH (Ericsson). 3GPP T-Doc R1-1609509: NR frame structure for forward compatibility (Intel). 3GPP T-Doc R1-1609050: Numerology for URLLC (Samsung). 3GPP T-Doc R1-162345: Discussion on non-coded CSI-RS design for eFD-MIMO (ZTE). 3GPP T-Doc R1-161028: Discussion on Resource Allocation and Scheduling of NB-PDSCH (ITL). LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation (3GPP TS 36.211 version 12.9.0 Release 12) LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation (3GPP TS 36.212 version 12.5.0 Release 12) 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation (Release 13)

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
		The LTE Standard, Signals Research Group, April 2014. A Low Computational Complexity Realization Algorithm for DVRB Mapping to DPRB in TD-LTE System, Luo et. al., 2013 Ninth International Conference on Natural Computation (ICNC). Efficient Control Signaling for Resource Allocation in OFDMA Networks, Gwanmo Ku, Drexel University, 2014. Resource Allocation and Link Adaptation in LTE and LTE Advanced: A Tutorial, Ku et. al., IEEE COMMUNICATION SURVEYS & TUTORIALS, VOL. 17, NO. 3, THIRD QUARTER 2015.
1[d]	transmitting, to the wireless device, downlink control information (DCI), including a field including a bit string,	U.S. Patent Publication No. US20180041325A1 to Lee et. al. ("Lee 325"). See Exhibit I-1. U.S. Patent Publication No. US20180376497A1 to You et. al. ("You"). See Exhibit I-2. U.S. Patent Publication No. US2018192434A1 to Lee et. al. ("Lee 434"). See Exhibit I-3. U.S. Patent Publication No. US20170041948A1 to Cheng et. al. ("Cheng"). See Exhibit I-4. U.S. Patent Publication No. US20140328260A1 to Papasakelleriou et. al. ("Papasakelleriou"). See Exhibit I-5. U.S. Patent Publication No. US20150215906A1 to Park et. al. ("Park"). See Exhibit I-6.

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
		U.S. Patent Publication No. US20200187169A1 to Gao et al. (“Gao”). See Exhibit I-7. 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Multiplexing and channel coding (3GPP TS 36.212 version 13.1.0 Release 13), at Sections 5.3.3 (“Downlink control information”), 5.3.3.1, 5.3.3.1.2, 5.3.3.1.11. 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures (3GPP TS 36.213 V13.1.0 Release 13), at Sections 7.1.6 (“Resource allocation”), 8.1 (“Resource allocation for PDCCH/EPDCCH with uplink DCI format”), Tables 7.1.6-1, 7.1.7.1-1, 7.1.7.1-1A, 7.1.7.1-2, 7.1.7.2.1-1, 8.1.3-1. 3GPP T-Doc R1-1610129: Summary of [86-19] Discussion on Slot Structure Use Cases (Qualcomm Incorporated). U.S. Patent Publication No. US 20170170940A1 to Lee et. al. U.S. Patent Publication No. US20160330721A1 to Park et. al. U.S. Patent Publication No. US20160295584A1 to Chen et. al. U.S. Patent Publication No. US20190165882A1 to You et. al. U.S. Patent Publication No. US20190123883A1 to Islam et. al. U.S. Patent Publication No. US20200260526A1 to Xiong et. al. U.S. Patent Publication No. US20210282157A1 to Wang et. al. U.S. Patent Publication No. US20120207082A1 to Liu et. al.

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
		U.S. Patent Publication No. US20130094442A1 to Kim et. al. U.S. Patent Publication No. US2014056244A1 to Frenne et. al. U.S. Patent Publication No. US2011051654A1 to Blankenship et. al. U.S. Patent Publication No. US20120218952A1 to Kwon et. al. U.S. Patent Publication No. US20130336197A1 to Park et. al. U.S. Patent Publication No. US20140334430A1 to Moon et. al. U.S. Patent Publication No. US20150208394A1 to Seo et. al. U.S. Patent Publication No. US20150304995A1 to Yi et. al. U.S. Patent Publication No. US20130272261A1 to Seo et. al. U.S. Patent Publication No. US20150358111A1 to Marinier et. al. Korean Patent Publication No. KR102169958B1 to Park et. al. PCT Patent Publication No. WO2016039681A1 to Frenne et. al. PCT Patent Publication No. WO2016163854A1 to Novlan et. al. PCT Patent Publication No. WO2017196059A1 to Yeo et. al. 3GPP T-Doc R1-165652: WF on NPDCCH ordered PRACH (Ericsson). 3GPP T-Doc R1-1609509: NR frame structure for forward compatibility (Intel). 3GPP T-Doc R1-1609050: Numerology for URLLC (Samsung).

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
		3GPP T-Doc R1-162345: Discussion on non-precoded CSI-RS design for eFD-MIMO (ZTE). 3GPP T-Doc R1-161028: Discussion on Resource Allocation and Scheduling of NB-PDSCH (ITL). LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation (3GPP TS 36.211 version 12.9.0 Release 12) LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation (3GPP TS 36.212 version 12.5.0 Release 12) 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation (Release 13) The LTE Standard, Signals Research Group, April 2014. A Low Computational Complexity Realization Algorithm for DVRB Mapping to DPRB in TD-LTE System, Luo et. al., 2013 Ninth International Conference on Natural Computation (ICNC). Efficient Control Signaling for Resource Allocation in OFDMA Networks, Gwanmo Ku, Drexel University, 2014. Resource Allocation and Link Adaptation in LTE and LTE Advanced: A Tutorial, Ku et. al., IEEE COMMUNICATION SURVEYS & TUTORIALS, VOL. 17, NO. 3, THIRD QUARTER 2015.
1[e]	wherein the bit string in the field relates to a row index of an allocation table, and	U.S. Patent Publication No. US20180041325A1 to Lee et. al. ("Lee 325"). See Exhibit I-1.

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
		U.S. Patent Publication No. US20180376497A1 to You et. al. ("You"). See Exhibit I-2. U.S. Patent Publication No. US2018192434A1 to Lee et. al. ("Lee 434"). See Exhibit I-3. U.S. Patent Publication No. US20170041948A1 to Cheng et. al. ("Cheng"). See Exhibit I-4. U.S. Patent Publication No. US20140328260A1 to Papasakelleriou et. al. ("Papasakelleriou"). See Exhibit I-5. U.S. Patent Publication No. US20150215906A1 to Park et. al. ("Park"). See Exhibit I-6. U.S. Patent Publication No. US20200187169A1 to Gao et al. ("Gao"). See Exhibit I-7. 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Multiplexing and channel coding (3GPP TS 36.212 version 13.1.0 Release 13), at Sections 5.3.3 ("Downlink control information"), 5.3.3.1, 5.3.3.1.2, 5.3.3.1.11. 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures (3GPP TS 36.213 V13.1.0 Release 13), at Sections 7.1.6 ("Resource allocation"), 8.1 ("Resource allocation for PDCCH/EPDCCH with uplink DCI format"), Tables 7.1.6-1, 7.1.7.1-1, 7.1.7.1-1A, 7.1.7.1-2, 7.1.7.2.1-1, 8.1.3-1. 3GPP T-Doc R1-1610129: Summary of [86-19] Discussion on Slot Structure Use Cases (Qualcomm Incorporated).

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
		U.S. Patent Publication No. US 20170170940A1 to Lee et. al. U.S. Patent Publication No. US20160330721A1 to Park et. al. U.S. Patent Publication No. US20160295584A1 to Chen et. al. U.S. Patent Publication No. US20190165882A1 to You et. al. U.S. Patent Publication No. US20190123883A1 to Islam et. al. U.S. Patent Publication No. US20200260526A1 to Xiong et. al. U.S. Patent Publication No. US20210282157A1 to Wang et. al. U.S. Patent Publication No. US20120207082A1 to Liu et. al. U.S. Patent Publication No. US20130094442A1 to Kim et. al. U.S. Patent Publication No. US2014056244A1 to Frenne et. al. U.S. Patent Publication No. US2011051654A1 to Blankenship et. al. U.S. Patent Publication No. US20120218952A1 to Kwon et. al. U.S. Patent Publication No. US20130336197A1 to Park et. al. U.S. Patent Publication No. US20140334430A1 to Moon et. al. U.S. Patent Publication No. US20150208394A1 to Seo et. al. U.S. Patent Publication No. US20150304995A1 to Yi et. al. U.S. Patent Publication No. US20130272261A1 to Seo et. al.

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
		U.S. Patent Publication No. US20150358111A1 to Marinier et. al. Korean Patent Publication No. KR102169958B1 to Park et. al. PCT Patent Publication No. WO2016039681A1 to Frenne et. al. PCT Patent Publication No. WO2016163854A1 to Novlan et. al. PCT Patent Publication No. WO2017196059A1 to Yeo et. al. 3GPP T-Doc R1-165652: WF on NPDCCH ordered PRACH (Ericsson). 3GPP T-Doc R1-1609509: NR frame structure for forward compatibility (Intel). 3GPP T-Doc R1-1609050: Numerology for URLLC (Samsung). 3GPP T-Doc R1-162345: Discussion on non-precoded CSI-RS design for eFD-MIMO (ZTE). 3GPP T-Doc R1-161028: Discussion on Resource Allocation and Scheduling of NB-PDSCH (ITL). LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation (3GPP TS 36.211 version 12.9.0 Release 12) LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation (3GPP TS 36.212 version 12.5.0 Release 12) 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation (Release 13)

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
		The LTE Standard, Signals Research Group, April 2014. A Low Computational Complexity Realization Algorithm for DVRB Mapping to DPRB in TD-LTE System, Luo et. al., 2013 Ninth International Conference on Natural Computation (ICNC). Efficient Control Signaling for Resource Allocation in OFDMA Networks, Gwanmo Ku, Drexel University, 2014. Resource Allocation and Link Adaptation in LTE and LTE Advanced: A Tutorial, Ku et. al., IEEE COMMUNICATION SURVEYS & TUTORIALS, VOL. 17, NO. 3, THIRD QUARTER 2015.
1[f]	wherein the allocation table includes information on a starting OFDM symbol and the number of the OFDM symbols which is smaller than or equal to the number of OFDM symbols included in the slot.	U.S. Patent Publication No. US20180041325A1 to Lee et. al. ("Lee 325"). See Exhibit I-1. U.S. Patent Publication No. US20180376497A1 to You et. al. ("You"). See Exhibit I-2. U.S. Patent Publication No. US2018192434A1 to Lee et. al. ("Lee 434"). See Exhibit I-3. U.S. Patent Publication No. US20170041948A1 to Cheng et. al. ("Cheng"). See Exhibit I-4. U.S. Patent Publication No. US20140328260A1 to Papasakelleriou et. al. ("Papasakelleriou"). See Exhibit I-5. U.S. Patent Publication No. US20150215906A1 to Park et. al. ("Park"). See Exhibit I-6.

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
		U.S. Patent Publication No. US20200187169A1 to Gao et al. (“Gao”). See Exhibit I-7. 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Multiplexing and channel coding (3GPP TS 36.212 version 13.1.0 Release 13), at Sections 5.3.3 (“Downlink control information”), 5.3.3.1, 5.3.3.1.2, 5.3.3.1.11. 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures (3GPP TS 36.213 V13.1.0 Release 13), at Sections 7.1.6 (“Resource allocation”), 8.1 (“Resource allocation for PDCCH/EPDCCH with uplink DCI format”), Tables 7.1.6-1, 7.1.7.1-1, 7.1.7.1-1A, 7.1.7.1-2, 7.1.7.2.1-1, 8.1.3-1. 3GPP T-Doc R1-1610129: Summary of [86-19] Discussion on Slot Structure Use Cases (Qualcomm Incorporated). U.S. Patent Publication No. US 20170170940A1 to Lee et. al. U.S. Patent Publication No. US20160330721A1 to Park et. al. U.S. Patent Publication No. US20160295584A1 to Chen et. al. U.S. Patent Publication No. US20190165882A1 to You et. al. U.S. Patent Publication No. US20190123883A1 to Islam et. al. U.S. Patent Publication No. US20200260526A1 to Xiong et. al. U.S. Patent Publication No. US20210282157A1 to Wang et. al. U.S. Patent Publication No. US20120207082A1 to Liu et. al.

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
		U.S. Patent Publication No. US20130094442A1 to Kim et. al. U.S. Patent Publication No. US2014056244A1 to Frenne et. al. U.S. Patent Publication No. US2011051654A1 to Blankenship et. al. U.S. Patent Publication No. US20120218952A1 to Kwon et. al. U.S. Patent Publication No. US20130336197A1 to Park et. al. U.S. Patent Publication No. US20140334430A1 to Moon et. al. U.S. Patent Publication No. US20150208394A1 to Seo et. al. U.S. Patent Publication No. US20150304995A1 to Yi et. al. U.S. Patent Publication No. US20130272261A1 to Seo et. al. U.S. Patent Publication No. US20150358111A1 to Marinier et. al. Korean Patent Publication No. KR102169958B1 to Park et. al. PCT Patent Publication No. WO2016039681A1 to Frenne et. al. PCT Patent Publication No. WO2016163854A1 to Novlan et. al. PCT Patent Publication No. WO2017196059A1 to Yeo et. al. 3GPP T-Doc R1-165652: WF on NPDCCH ordered PRACH (Ericsson). 3GPP T-Doc R1-1609509: NR frame structure for forward compatibility (Intel). 3GPP T-Doc R1-1609050: Numerology for URLLC (Samsung).

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
		3GPP T-Doc R1-162345: Discussion on non-precoded CSI-RS design for eFD-MIMO (ZTE). 3GPP T-Doc R1-161028: Discussion on Resource Allocation and Scheduling of NB-PDSCH (ITL). LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation (3GPP TS 36.211 version 12.9.0 Release 12) LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation (3GPP TS 36.212 version 12.5.0 Release 12) 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation (Release 13) The LTE Standard, Signals Research Group, April 2014. A Low Computational Complexity Realization Algorithm for DVRB Mapping to DPRB in TD-LTE System, Luo et. al., 2013 Ninth International Conference on Natural Computation (ICNC). Efficient Control Signaling for Resource Allocation in OFDMA Networks, Gwanmo Ku, Drexel University, 2014. Resource Allocation and Link Adaptation in LTE and LTE Advanced: A Tutorial, Ku et. al., IEEE COMMUNICATION SURVEYS & TUTORIALS, VOL. 17, NO. 3, THIRD QUARTER 2015.

2. Claim 2

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
2[a]	The base station of claim 1, wherein the bit string is 3 bits in length.	U.S. Patent Publication No. US20180041325A1 to Lee et. al. ("Lee 325"). See Exhibit I-1. U.S. Patent Publication No. US20180376497A1 to You et. al. ("You"). See Exhibit I-2. U.S. Patent Publication No. US2018192434A1 to Lee et. al. ("Lee 434"). See Exhibit I-3. U.S. Patent Publication No. US20170041948A1 to Cheng et. al. ("Cheng"). See Exhibit I-4. U.S. Patent Publication No. US20140328260A1 to Papasakelleriou et. al. ("Papasakelleriou"). See Exhibit I-5. U.S. Patent Publication No. US20150215906A1 to Park et. al. ("Park"). See Exhibit I-6. U.S. Patent Publication No. US20200187169A1 to Gao et al. ("Gao"). See Exhibit I-7. 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Multiplexing and channel coding (3GPP TS 36.212 version 13.1.0 Release 13), at Sections 5.3.3 ("Downlink control information"), 5.3.3.1, 5.3.3.1.2, 5.3.3.1.11. 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures (3GPP TS 36.213 V13.1.0 Release 13), at Sections 7.1.6 ("Resource

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
		allocation”), 8.1 (“Resource allocation for PDCCH/EPDCCH with uplink DCI format”), Tables 7.1.6-1, 7.1.7.1-1, 7.1.7.1-1A, 7.1.7.1-2, 7.1.7.2.1-1, 8.1.3-1. 3GPP T-Doc R1-1610129: Summary of [86-19] Discussion on Slot Structure Use Cases (Qualcomm Incorporated). U.S. Patent Publication No. US 20170170940A1 to Lee et. al. U.S. Patent Publication No. US20160330721A1 to Park et. al. U.S. Patent Publication No. US20160295584A1 to Chen et. al. U.S. Patent Publication No. US20190165882A1 to You et. al. U.S. Patent Publication No. US20190123883A1 to Islam et. al. U.S. Patent Publication No. US20200260526A1 to Xiong et. al. U.S. Patent Publication No. US20210282157A1 to Wang et. al. U.S. Patent Publication No. US20120207082A1 to Liu et. al. U.S. Patent Publication No. US20130094442A1 to Kim et. al. U.S. Patent Publication No. US2014056244A1 to Frenne et. al. U.S. Patent Publication No. US2011051654A1 to Blankenship et. al. U.S. Patent Publication No. US20120218952A1 to Kwon et. al. U.S. Patent Publication No. US20130336197A1 to Park et. al. U.S. Patent Publication No. US20140334430A1 to Moon et. al.

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
		U.S. Patent Publication No. US20150208394A1 to Seo et. al. U.S. Patent Publication No. US20150304995A1 to Yi et. al. U.S. Patent Publication No. US20130272261A1 to Seo et. al. U.S. Patent Publication No. US20150358111A1 to Marinier et. al. Korean Patent Publication No. KR102169958B1 to Park et. al. PCT Patent Publication No. WO2016039681A1 to Frenne et. al. PCT Patent Publication No. WO2016163854A1 to Novlan et. al. PCT Patent Publication No. WO2017196059A1 to Yeo et. al. 3GPP T-Doc R1-165652: WF on NPDCCH ordered PRACH (Ericsson). 3GPP T-Doc R1-1609509: NR frame structure for forward compatibility (Intel). 3GPP T-Doc R1-1609050: Numerology for URLLC (Samsung). 3GPP T-Doc R1-162345: Discussion on non-precoded CSI-RS design for eFD-MIMO (ZTE). 3GPP T-Doc R1-161028: Discussion on Resource Allocation and Scheduling of NB-PDSCH (ITL). LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation (3GPP TS 36.211 version 12.9.0 Release 12)

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
		LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation (3GPP TS 36.212 version 12.5.0 Release 12) 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation (Release 13) The LTE Standard, Signals Research Group, April 2014. A Low Computational Complexity Realization Algorithm for DVRB Mapping to DPRB in TD-LTE System, Luo et. al., 2013 Ninth International Conference on Natural Computation (ICNC). Efficient Control Signaling for Resource Allocation in OFDMA Networks, Gwanmo Ku, Drexel University, 2014. Resource Allocation and Link Adaptation in LTE and LTE Advanced: A Tutorial, Ku et. al., IEEE COMMUNICATION SURVEYS & TUTORIALS, VOL. 17, NO. 3, THIRD QUARTER 2015.

3. Claim 3

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
3[a]	The base station of claim 1, wherein the DCI further includes information on one or more allocations of a frequency-domain resource.	U.S. Patent Publication No. US20180041325A1 to Lee et. al. ("Lee 325"). See Exhibit I-1. U.S. Patent Publication No. US20180376497A1 to You et. al. ("You"). See Exhibit I-2.

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
		U.S. Patent Publication No. US2018192434A1 to Lee et. al. ("Lee 434"). See Exhibit I-3. U.S. Patent Publication No. US20170041948A1 to Cheng et. al. ("Cheng"). See Exhibit I-4. U.S. Patent Publication No. US20140328260A1 to Papasakelleriou et. al. ("Papasakelleriou"). See Exhibit I-5. U.S. Patent Publication No. US20150215906A1 to Park et. al. ("Park"). See Exhibit I-6. U.S. Patent Publication No. US20200187169A1 to Gao et al. ("Gao"). See Exhibit I-7. 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Multiplexing and channel coding (3GPP TS 36.212 version 13.1.0 Release 13), at Sections 5.3.3 ("Downlink control information"), 5.3.3.1, 5.3.3.1.2, 5.3.3.1.11. 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures (3GPP TS 36.213 V13.1.0 Release 13), at Sections 7.1.6 ("Resource allocation"), 8.1 ("Resource allocation for PDCCH/EPDCCH with uplink DCI format"), Tables 7.1.6-1, 7.1.7.1-1, 7.1.7.1-1A, 7.1.7.1-2, 7.1.7.2.1-1, 8.1.3-1. 3GPP T-Doc R1-1610129: Summary of [86-19] Discussion on Slot Structure Use Cases (Qualcomm Incorporated). U.S. Patent Publication No. US 20170170940A1 to Lee et. al. U.S. Patent Publication No. US20160330721A1 to Park et. al.

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
		U.S. Patent Publication No. US20160295584A1 to Chen et. al. U.S. Patent Publication No. US20190165882A1 to You et. al. U.S. Patent Publication No. US20190123883A1 to Islam et. al. U.S. Patent Publication No. US20200260526A1 to Xiong et. al. U.S. Patent Publication No. US20210282157A1 to Wang et. al. U.S. Patent Publication No. US20120207082A1 to Liu et. al. U.S. Patent Publication No. US20130094442A1 to Kim et. al. U.S. Patent Publication No. US2014056244A1 to Frenne et. al. U.S. Patent Publication No. US2011051654A1 to Blankenship et. al. U.S. Patent Publication No. US20120218952A1 to Kwon et. al. U.S. Patent Publication No. US20130336197A1 to Park et. al. U.S. Patent Publication No. US20140334430A1 to Moon et. al. U.S. Patent Publication No. US20150208394A1 to Seo et. al. U.S. Patent Publication No. US20150304995A1 to Yi et. al. U.S. Patent Publication No. US20130272261A1 to Seo et. al. U.S. Patent Publication No. US20150358111A1 to Marinier et. al. Korean Patent Publication No. KR102169958B1 to Park et. al.

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
		PCT Patent Publication No. WO2016039681A1 to Frenne et. al. PCT Patent Publication No. WO2016163854A1 to Novlan et. al. PCT Patent Publication No. WO2017196059A1 to Yeo et. al. 3GPP T-Doc R1-165652: WF on NPDCCH ordered PRACH (Ericsson). 3GPP T-Doc R1-1609509: NR frame structure for forward compatibility (Intel). 3GPP T-Doc R1-1609050: Numerology for URLLC (Samsung). 3GPP T-Doc R1-162345: Discussion on non-precoded CSI-RS design for eFD-MIMO (ZTE). 3GPP T-Doc R1-161028: Discussion on Resource Allocation and Scheduling of NB-PDSCH (ITL). LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation (3GPP TS 36.211 version 12.9.0 Release 12) LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation (3GPP TS 36.212 version 12.5.0 Release 12) 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation (Release 13) The LTE Standard, Signals Research Group, April 2014.

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
		A Low Computational Complexity Realization Algorithm for DVRB Mapping to DPRB in TD-LTE System, Luo et. al., 2013 Ninth International Conference on Natural Computation (ICNC). Efficient Control Signaling for Resource Allocation in OFDMA Networks, Gwanmo Ku, Drexel University, 2014. Resource Allocation and Link Adaptation in LTE and LTE Advanced: A Tutorial, Ku et. al., IEEE COMMUNICATION SURVEYS & TUTORIALS, VOL. 17, NO. 3, THIRD QUARTER 2015.

4. Claim 4

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
4[a]	The base station of claim 1, wherein the base station supports a new radio access technology (NR).	U.S. Patent Publication No. US20180041325A1 to Lee et. al. ("Lee 325"). See Exhibit I-1. U.S. Patent Publication No. US20180376497A1 to You et. al. ("You"). See Exhibit I-2. U.S. Patent Publication No. US2018192434A1 to Lee et. al. ("Lee 434"). See Exhibit I-3. U.S. Patent Publication No. US20170041948A1 to Cheng et. al. ("Cheng"). See Exhibit I-4. U.S. Patent Publication No. US20140328260A1 to Papasakelleriou et. al. ("Papasakelleriou"). See Exhibit I-5.

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
		U.S. Patent Publication No. US20150215906A1 to Park et. al. ("Park"). See Exhibit I-6. U.S. Patent Publication No. US20200187169A1 to Gao et al. ("Gao"). See Exhibit I-7. 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Multiplexing and channel coding (3GPP TS 36.212 version 13.1.0 Release 13), at Sections 5.3.3 ("Downlink control information"), 5.3.3.1, 5.3.3.1.2, 5.3.3.1.11. 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures (3GPP TS 36.213 V13.1.0 Release 13), at Sections 7.1.6 ("Resource allocation"), 8.1 ("Resource allocation for PDCCH/EPDCCH with uplink DCI format"), Tables 7.1.6-1, 7.1.7.1-1, 7.1.7.1-1A, 7.1.7.1-2, 7.1.7.2.1-1, 8.1.3-1. 3GPP T-Doc R1-1610129: Summary of [86-19] Discussion on Slot Structure Use Cases (Qualcomm Incorporated). U.S. Patent Publication No. US 20170170940A1 to Lee et. al. U.S. Patent Publication No. US20160330721A1 to Park et. al. U.S. Patent Publication No. US20160295584A1 to Chen et. al. U.S. Patent Publication No. US20190165882A1 to You et. al. U.S. Patent Publication No. US20190123883A1 to Islam et. al. U.S. Patent Publication No. US20200260526A1 to Xiong et. al.

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
		U.S. Patent Publication No. US20210282157A1 to Wang et. al. U.S. Patent Publication No. US20120207082A1 to Liu et. al. U.S. Patent Publication No. US20130094442A1 to Kim et. al. U.S. Patent Publication No. US2014056244A1 to Frenne et. al. U.S. Patent Publication No. US2011051654A1 to Blankenship et. al. U.S. Patent Publication No. US20120218952A1 to Kwon et. al. U.S. Patent Publication No. US20130336197A1 to Park et. al. U.S. Patent Publication No. US20140334430A1 to Moon et. al. U.S. Patent Publication No. US20150208394A1 to Seo et. al. U.S. Patent Publication No. US20150304995A1 to Yi et. al. U.S. Patent Publication No. US20130272261A1 to Seo et. al. U.S. Patent Publication No. US20150358111A1 to Marinier et. al. Korean Patent Publication No. KR102169958B1 to Park et. al. PCT Patent Publication No. WO2016039681A1 to Frenne et. al. PCT Patent Publication No. WO2016163854A1 to Novlan et. al. PCT Patent Publication No. WO2017196059A1 to Yeo et. al. 3GPP T-Doc R1-165652: WF on NPDCCH ordered PRACH (Ericsson).

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
		3GPP T-Doc R1-1609509: NR frame structure for forward compatibility (Intel). 3GPP T-Doc R1-1609050: Numerology for URLLC (Samsung). 3GPP T-Doc R1-162345: Discussion on non-precoded CSI-RS design for eFD-MIMO (ZTE). 3GPP T-Doc R1-161028: Discussion on Resource Allocation and Scheduling of NB-PDSCH (ITL). LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation (3GPP TS 36.211 version 12.9.0 Release 12) LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation (3GPP TS 36.212 version 12.5.0 Release 12) 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation (Release 13) The LTE Standard, Signals Research Group, April 2014. A Low Computational Complexity Realization Algorithm for DVRB Mapping to DPRB in TD-LTE System, Luo et. al., 2013 Ninth International Conference on Natural Computation (ICNC). Efficient Control Signaling for Resource Allocation in OFDMA Networks, Gwanmo Ku, Drexel University, 2014. Resource Allocation and Link Adaptation in LTE and LTE Advanced: A Tutorial, Ku et. al., IEEE COMMUNICATION SURVEYS & TUTORIALS, VOL. 17, NO. 3, THIRD QUARTER 2015.

5. Claim 5

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
5[a]	The base station of claim 1, wherein the base station supports different numerologies which are defined by a subcarrier spacing (SCS).	U.S. Patent Publication No. US20180041325A1 to Lee et. al. ("Lee 325"). See Exhibit I-1. U.S. Patent Publication No. US20180376497A1 to You et. al. ("You"). See Exhibit I-2. U.S. Patent Publication No. US2018192434A1 to Lee et. al. ("Lee 434"). See Exhibit I-3. U.S. Patent Publication No. US20170041948A1 to Cheng et. al. ("Cheng"). See Exhibit I-4. U.S. Patent Publication No. US20140328260A1 to Papasakelleriou et. al. ("Papasakelleriou"). See Exhibit I-5. U.S. Patent Publication No. US20150215906A1 to Park et. al. ("Park"). See Exhibit I-6. U.S. Patent Publication No. US20200187169A1 to Gao et al. ("Gao"). See Exhibit I-7. 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Multiplexing and channel coding (3GPP TS 36.212 version 13.1.0 Release 13), at Sections 5.3.3 ("Downlink control information"), 5.3.3.1, 5.3.3.1.2, 5.3.3.1.11. 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures (3GPP TS 36.213 V13.1.0 Release 13), at Sections 7.1.6 ("Resource

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
		allocation”), 8.1 (“Resource allocation for PDCCH/EPDCCH with uplink DCI format”), Tables 7.1.6-1, 7.1.7.1-1, 7.1.7.1-1A, 7.1.7.1-2, 7.1.7.2.1-1, 8.1.3-1. 3GPP T-Doc R1-1610129: Summary of [86-19] Discussion on Slot Structure Use Cases (Qualcomm Incorporated). U.S. Patent Publication No. US 20170170940A1 to Lee et. al. U.S. Patent Publication No. US20160330721A1 to Park et. al. U.S. Patent Publication No. US20160295584A1 to Chen et. al. U.S. Patent Publication No. US20190165882A1 to You et. al. U.S. Patent Publication No. US20190123883A1 to Islam et. al. U.S. Patent Publication No. US20200260526A1 to Xiong et. al. U.S. Patent Publication No. US20210282157A1 to Wang et. al. U.S. Patent Publication No. US20120207082A1 to Liu et. al. U.S. Patent Publication No. US20130094442A1 to Kim et. al. U.S. Patent Publication No. US2014056244A1 to Frenne et. al. U.S. Patent Publication No. US2011051654A1 to Blankenship et. al. U.S. Patent Publication No. US20120218952A1 to Kwon et. al. U.S. Patent Publication No. US20130336197A1 to Park et. al. U.S. Patent Publication No. US20140334430A1 to Moon et. al.

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
		U.S. Patent Publication No. US20150208394A1 to Seo et. al. U.S. Patent Publication No. US20150304995A1 to Yi et. al. U.S. Patent Publication No. US20130272261A1 to Seo et. al. U.S. Patent Publication No. US20150358111A1 to Marinier et. al. Korean Patent Publication No. KR102169958B1 to Park et. al. PCT Patent Publication No. WO2016039681A1 to Frenne et. al. PCT Patent Publication No. WO2016163854A1 to Novlan et. al. PCT Patent Publication No. WO2017196059A1 to Yeo et. al. 3GPP T-Doc R1-165652: WF on NPDCCH ordered PRACH (Ericsson). 3GPP T-Doc R1-1609509: NR frame structure for forward compatibility (Intel). 3GPP T-Doc R1-1609050: Numerology for URLLC (Samsung). 3GPP T-Doc R1-162345: Discussion on non-precoded CSI-RS design for eFD-MIMO (ZTE). 3GPP T-Doc R1-161028: Discussion on Resource Allocation and Scheduling of NB-PDSCH (ITL). LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation (3GPP TS 36.211 version 12.9.0 Release 12)

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
		LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation (3GPP TS 36.212 version 12.5.0 Release 12) 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation (Release 13) The LTE Standard, Signals Research Group, April 2014. A Low Computational Complexity Realization Algorithm for DVRB Mapping to DPRB in TD-LTE System, Luo et. al., 2013 Ninth International Conference on Natural Computation (ICNC). Efficient Control Signaling for Resource Allocation in OFDMA Networks, Gwanmo Ku, Drexel University, 2014. Resource Allocation and Link Adaptation in LTE and LTE Advanced: A Tutorial, Ku et. al., IEEE COMMUNICATION SURVEYS & TUTORIALS, VOL. 17, NO. 3, THIRD QUARTER 2015.

6. Claim 6

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
6[pre]	The base station of claim 1, wherein the operations further include:	U.S. Patent Publication No. US20180041325A1 to Lee et. al. ("Lee 325"). See Exhibit I-1. U.S. Patent Publication No. US20180376497A1 to You et. al. ("You"). See Exhibit I-2.

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
		U.S. Patent Publication No. US2018192434A1 to Lee et. al. ("Lee 434"). See Exhibit I-3. U.S. Patent Publication No. US20170041948A1 to Cheng et. al. ("Cheng"). See Exhibit I-4. U.S. Patent Publication No. US20140328260A1 to Papasakelleriou et. al. ("Papasakelleriou"). See Exhibit I-5. U.S. Patent Publication No. US20150215906A1 to Park et. al. ("Park"). See Exhibit I-6. U.S. Patent Publication No. US20200187169A1 to Gao et al. ("Gao"). See Exhibit I-7. 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Multiplexing and channel coding (3GPP TS 36.212 version 13.1.0 Release 13), at Sections 5.3.3 ("Downlink control information"), 5.3.3.1, 5.3.3.1.2, 5.3.3.1.11. 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures (3GPP TS 36.213 V13.1.0 Release 13), at Sections 7.1.6 ("Resource allocation"), 8.1 ("Resource allocation for PDCCH/EPDCCH with uplink DCI format"), Tables 7.1.6-1, 7.1.7.1-1, 7.1.7.1-1A, 7.1.7.1-2, 7.1.7.2.1-1, 8.1.3-1. 3GPP T-Doc R1-1610129: Summary of [86-19] Discussion on Slot Structure Use Cases (Qualcomm Incorporated). U.S. Patent Publication No. US 20170170940A1 to Lee et. al. U.S. Patent Publication No. US20160330721A1 to Park et. al.

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
		U.S. Patent Publication No. US20160295584A1 to Chen et. al. U.S. Patent Publication No. US20190165882A1 to You et. al. U.S. Patent Publication No. US20190123883A1 to Islam et. al. U.S. Patent Publication No. US20200260526A1 to Xiong et. al. U.S. Patent Publication No. US20210282157A1 to Wang et. al. U.S. Patent Publication No. US20120207082A1 to Liu et. al. U.S. Patent Publication No. US20130094442A1 to Kim et. al. U.S. Patent Publication No. US2014056244A1 to Frenne et. al. U.S. Patent Publication No. US2011051654A1 to Blankenship et. al. U.S. Patent Publication No. US20120218952A1 to Kwon et. al. U.S. Patent Publication No. US20130336197A1 to Park et. al. U.S. Patent Publication No. US20140334430A1 to Moon et. al. U.S. Patent Publication No. US20150208394A1 to Seo et. al. U.S. Patent Publication No. US20150304995A1 to Yi et. al. U.S. Patent Publication No. US20130272261A1 to Seo et. al. U.S. Patent Publication No. US20150358111A1 to Marinier et. al. Korean Patent Publication No. KR102169958B1 to Park et. al.

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
		PCT Patent Publication No. WO2016039681A1 to Frenne et. al. PCT Patent Publication No. WO2016163854A1 to Novlan et. al. PCT Patent Publication No. WO2017196059A1 to Yeo et. al. 3GPP T-Doc R1-165652: WF on NPDCCH ordered PRACH (Ericsson). 3GPP T-Doc R1-1609509: NR frame structure for forward compatibility (Intel). 3GPP T-Doc R1-1609050: Numerology for URLLC (Samsung). 3GPP T-Doc R1-162345: Discussion on non-precoded CSI-RS design for eFD-MIMO (ZTE). 3GPP T-Doc R1-161028: Discussion on Resource Allocation and Scheduling of NB-PDSCH (ITL). LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation (3GPP TS 36.211 version 12.9.0 Release 12) LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation (3GPP TS 36.212 version 12.5.0 Release 12) 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation (Release 13) The LTE Standard, Signals Research Group, April 2014.

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
		A Low Computational Complexity Realization Algorithm for DVRB Mapping to DPRB in TD-LTE System, Luo et. al., 2013 Ninth International Conference on Natural Computation (ICNC). Efficient Control Signaling for Resource Allocation in OFDMA Networks, Gwanmo Ku, Drexel University, 2014. Resource Allocation and Link Adaptation in LTE and LTE Advanced: A Tutorial, Ku et. al., IEEE COMMUNICATION SURVEYS & TUTORIALS, VOL. 17, NO. 3, THIRD QUARTER 2015.
6[a]	transmitting, to the wireless device, downlink data via the PDSCH; and	U.S. Patent Publication No. US20180041325A1 to Lee et. al. ("Lee 325"). See Exhibit I-1. U.S. Patent Publication No. US20180376497A1 to You et. al. ("You"). See Exhibit I-2. U.S. Patent Publication No. US2018192434A1 to Lee et. al. ("Lee 434"). See Exhibit I-3. U.S. Patent Publication No. US20170041948A1 to Cheng et. al. ("Cheng"). See Exhibit I-4. U.S. Patent Publication No. US20140328260A1 to Papasakelleriou et. al. ("Papasakelleriou"). See Exhibit I-5. U.S. Patent Publication No. US20150215906A1 to Park et. al. ("Park"). See Exhibit I-6. U.S. Patent Publication No. US20200187169A1 to Gao et al. ("Gao"). See Exhibit I-7.

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
		3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Multiplexing and channel coding (3GPP TS 36.212 version 13.1.0 Release 13), at Sections 5.3.3 (“Downlink control information”), 5.3.3.1, 5.3.3.1.2, 5.3.3.1.11. 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures (3GPP TS 36.213 V13.1.0 Release 13), at Sections 7.1.6 (“Resource allocation”), 8.1 (“Resource allocation for PDCCH/EPDCCH with uplink DCI format”), Tables 7.1.6-1, 7.1.7.1-1, 7.1.7.1-1A, 7.1.7.1-2, 7.1.7.2.1-1, 8.1.3-1. 3GPP T-Doc R1-1610129: Summary of [86-19] Discussion on Slot Structure Use Cases (Qualcomm Incorporated). U.S. Patent Publication No. US 20170170940A1 to Lee et. al. U.S. Patent Publication No. US20160330721A1 to Park et. al. U.S. Patent Publication No. US20160295584A1 to Chen et. al. U.S. Patent Publication No. US20190165882A1 to You et. al. U.S. Patent Publication No. US20190123883A1 to Islam et. al. U.S. Patent Publication No. US20200260526A1 to Xiong et. al. U.S. Patent Publication No. US20210282157A1 to Wang et. al. U.S. Patent Publication No. US20120207082A1 to Liu et. al. U.S. Patent Publication No. US20130094442A1 to Kim et. al.

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
		U.S. Patent Publication No. US2014056244A1 to Frenne et. al. U.S. Patent Publication No. US2011051654A1 to Blankenship et. al. U.S. Patent Publication No. US20120218952A1 to Kwon et. al. U.S. Patent Publication No. US20130336197A1 to Park et. al. U.S. Patent Publication No. US20140334430A1 to Moon et. al. U.S. Patent Publication No. US20150208394A1 to Seo et. al. U.S. Patent Publication No. US20150304995A1 to Yi et. al. U.S. Patent Publication No. US20130272261A1 to Seo et. al. U.S. Patent Publication No. US20150358111A1 to Marinier et. al. Korean Patent Publication No. KR102169958B1 to Park et. al. PCT Patent Publication No. WO2016039681A1 to Frenne et. al. PCT Patent Publication No. WO2016163854A1 to Novlan et. al. PCT Patent Publication No. WO2017196059A1 to Yeo et. al. 3GPP T-Doc R1-165652: WF on NPDCCH ordered PRACH (Ericsson). 3GPP T-Doc R1-1609509: NR frame structure for forward compatibility (Intel). 3GPP T-Doc R1-1609050: Numerology for URLLC (Samsung).

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
		3GPP T-Doc R1-162345: Discussion on non-precoded CSI-RS design for eFD-MIMO (ZTE). 3GPP T-Doc R1-161028: Discussion on Resource Allocation and Scheduling of NB-PDSCH (ITL). LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation (3GPP TS 36.211 version 12.9.0 Release 12) LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation (3GPP TS 36.212 version 12.5.0 Release 12) 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation (Release 13) The LTE Standard, Signals Research Group, April 2014. A Low Computational Complexity Realization Algorithm for DVRB Mapping to DPRB in TD-LTE System, Luo et. al., 2013 Ninth International Conference on Natural Computation (ICNC). Efficient Control Signaling for Resource Allocation in OFDMA Networks, Gwanmo Ku, Drexel University, 2014. Resource Allocation and Link Adaptation in LTE and LTE Advanced: A Tutorial, Ku et. al., IEEE COMMUNICATION SURVEYS & TUTORIALS, VOL. 17, NO. 3, THIRD QUARTER 2015.
6[b]	receiving, from the wireless device, uplink data via the PUSCH.	U.S. Patent Publication No. US20180041325A1 to Lee et. al. ("Lee 325"). See Exhibit I-1.

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
		U.S. Patent Publication No. US20180376497A1 to You et. al. ("You"). See Exhibit I-2. U.S. Patent Publication No. US2018192434A1 to Lee et. al. ("Lee 434"). See Exhibit I-3. U.S. Patent Publication No. US20170041948A1 to Cheng et. al. ("Cheng"). See Exhibit I-4. U.S. Patent Publication No. US20140328260A1 to Papasakelleriou et. al. ("Papasakelleriou"). See Exhibit I-5. U.S. Patent Publication No. US20150215906A1 to Park et. al. ("Park"). See Exhibit I-6. U.S. Patent Publication No. US20200187169A1 to Gao et al. ("Gao"). See Exhibit I-7. 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Multiplexing and channel coding (3GPP TS 36.212 version 13.1.0 Release 13), at Sections 5.3.3 ("Downlink control information"), 5.3.3.1, 5.3.3.1.2, 5.3.3.1.11. 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures (3GPP TS 36.213 V13.1.0 Release 13), at Sections 7.1.6 ("Resource allocation"), 8.1 ("Resource allocation for PDCCH/EPDCCH with uplink DCI format"), Tables 7.1.6-1, 7.1.7.1-1, 7.1.7.1-1A, 7.1.7.1-2, 7.1.7.2.1-1, 8.1.3-1. 3GPP T-Doc R1-1610129: Summary of [86-19] Discussion on Slot Structure Use Cases (Qualcomm Incorporated).

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
		U.S. Patent Publication No. US 20170170940A1 to Lee et. al. U.S. Patent Publication No. US20160330721A1 to Park et. al. U.S. Patent Publication No. US20160295584A1 to Chen et. al. U.S. Patent Publication No. US20190165882A1 to You et. al. U.S. Patent Publication No. US20190123883A1 to Islam et. al. U.S. Patent Publication No. US20200260526A1 to Xiong et. al. U.S. Patent Publication No. US20210282157A1 to Wang et. al. U.S. Patent Publication No. US20120207082A1 to Liu et. al. U.S. Patent Publication No. US20130094442A1 to Kim et. al. U.S. Patent Publication No. US2014056244A1 to Frenne et. al. U.S. Patent Publication No. US2011051654A1 to Blankenship et. al. U.S. Patent Publication No. US20120218952A1 to Kwon et. al. U.S. Patent Publication No. US20130336197A1 to Park et. al. U.S. Patent Publication No. US20140334430A1 to Moon et. al. U.S. Patent Publication No. US20150208394A1 to Seo et. al. U.S. Patent Publication No. US20150304995A1 to Yi et. al. U.S. Patent Publication No. US20130272261A1 to Seo et. al.

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
		U.S. Patent Publication No. US20150358111A1 to Marinier et. al. Korean Patent Publication No. KR102169958B1 to Park et. al. PCT Patent Publication No. WO2016039681A1 to Frenne et. al. PCT Patent Publication No. WO2016163854A1 to Novlan et. al. PCT Patent Publication No. WO2017196059A1 to Yeo et. al. 3GPP T-Doc R1-165652: WF on NPDCCH ordered PRACH (Ericsson). 3GPP T-Doc R1-1609509: NR frame structure for forward compatibility (Intel). 3GPP T-Doc R1-1609050: Numerology for URLLC (Samsung). 3GPP T-Doc R1-162345: Discussion on non-coded CSI-RS design for eFD-MIMO (ZTE). 3GPP T-Doc R1-161028: Discussion on Resource Allocation and Scheduling of NB-PDSCH (ITL). LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation (3GPP TS 36.211 version 12.9.0 Release 12) LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation (3GPP TS 36.212 version 12.5.0 Release 12) 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation (Release 13)

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
		The LTE Standard, Signals Research Group, April 2014. A Low Computational Complexity Realization Algorithm for DVRB Mapping to DPRB in TD-LTE System, Luo et. al., 2013 Ninth International Conference on Natural Computation (ICNC). Efficient Control Signaling for Resource Allocation in OFDMA Networks, Gwanmo Ku, Drexel University, 2014. Resource Allocation and Link Adaptation in LTE and LTE Advanced: A Tutorial, Ku et. al., IEEE COMMUNICATION SURVEYS & TUTORIALS, VOL. 17, NO. 3, THIRD QUARTER 2015.

7. Claim 7

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
7[a]	The base station of claim 1, wherein the number of the OFDM symbols is a maximum of 14.	U.S. Patent Publication No. US20180041325A1 to Lee et. al. ("Lee 325"). See Exhibit I-1. U.S. Patent Publication No. US20180376497A1 to You et. al. ("You"). See Exhibit I-2. U.S. Patent Publication No. US2018192434A1 to Lee et. al. ("Lee 434"). See Exhibit I-3. U.S. Patent Publication No. US20170041948A1 to Cheng et. al. ("Cheng"). See Exhibit I-4. U.S. Patent Publication No. US20140328260A1 to Papasakelleriou et. al. ("Papasakelleriou"). See Exhibit I-5.

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
		U.S. Patent Publication No. US20150215906A1 to Park et. al. ("Park"). See Exhibit I-6. U.S. Patent Publication No. US20200187169A1 to Gao et al. ("Gao"). See Exhibit I-7. 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Multiplexing and channel coding (3GPP TS 36.212 version 13.1.0 Release 13), at Sections 5.3.3 ("Downlink control information"), 5.3.3.1, 5.3.3.1.2, 5.3.3.1.11. 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures (3GPP TS 36.213 V13.1.0 Release 13), at Sections 7.1.6 ("Resource allocation"), 8.1 ("Resource allocation for PDCCH/EPDCCH with uplink DCI format"), Tables 7.1.6-1, 7.1.7.1-1, 7.1.7.1-1A, 7.1.7.1-2, 7.1.7.2.1-1, 8.1.3-1. 3GPP T-Doc R1-1610129: Summary of [86-19] Discussion on Slot Structure Use Cases (Qualcomm Incorporated). U.S. Patent Publication No. US 20170170940A1 to Lee et. al. U.S. Patent Publication No. US20160330721A1 to Park et. al. U.S. Patent Publication No. US20160295584A1 to Chen et. al. U.S. Patent Publication No. US20190165882A1 to You et. al. U.S. Patent Publication No. US20190123883A1 to Islam et. al. U.S. Patent Publication No. US20200260526A1 to Xiong et. al.

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
		U.S. Patent Publication No. US20210282157A1 to Wang et. al. U.S. Patent Publication No. US20120207082A1 to Liu et. al. U.S. Patent Publication No. US20130094442A1 to Kim et. al. U.S. Patent Publication No. US2014056244A1 to Frenne et. al. U.S. Patent Publication No. US2011051654A1 to Blankenship et. al. U.S. Patent Publication No. US20120218952A1 to Kwon et. al. U.S. Patent Publication No. US20130336197A1 to Park et. al. U.S. Patent Publication No. US20140334430A1 to Moon et. al. U.S. Patent Publication No. US20150208394A1 to Seo et. al. U.S. Patent Publication No. US20150304995A1 to Yi et. al. U.S. Patent Publication No. US20130272261A1 to Seo et. al. U.S. Patent Publication No. US20150358111A1 to Marinier et. al. Korean Patent Publication No. KR102169958B1 to Park et. al. PCT Patent Publication No. WO2016039681A1 to Frenne et. al. PCT Patent Publication No. WO2016163854A1 to Novlan et. al. PCT Patent Publication No. WO2017196059A1 to Yeo et. al. 3GPP T-Doc R1-165652: WF on NPDCCH ordered PRACH (Ericsson).

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
		3GPP T-Doc R1-1609509: NR frame structure for forward compatibility (Intel). 3GPP T-Doc R1-1609050: Numerology for URLLC (Samsung). 3GPP T-Doc R1-162345: Discussion on non-precoded CSI-RS design for eFD-MIMO (ZTE). 3GPP T-Doc R1-161028: Discussion on Resource Allocation and Scheduling of NB-PDSCH (ITL). LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation (3GPP TS 36.211 version 12.9.0 Release 12) LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation (3GPP TS 36.212 version 12.5.0 Release 12) 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation (Release 13) The LTE Standard, Signals Research Group, April 2014. A Low Computational Complexity Realization Algorithm for DVRB Mapping to DPRB in TD-LTE System, Luo et. al., 2013 Ninth International Conference on Natural Computation (ICNC). Efficient Control Signaling for Resource Allocation in OFDMA Networks, Gwanmo Ku, Drexel University, 2014. Resource Allocation and Link Adaptation in LTE and LTE Advanced: A Tutorial, Ku et. al., IEEE COMMUNICATION SURVEYS & TUTORIALS, VOL. 17, NO. 3, THIRD QUARTER 2015.

8. Claim 8

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
8[pre - c]	A wireless device, comprising: a transceiver; a receiver; and a controller which controls the transceiver and receiver thereby performing operations including:	<i>See 1[pre], supra.</i>
8[d]	receiving, from a base station, a radio resource control (RRC) signal including information on one or more allocations of a time-domain resource,	<i>See 1[a], supra.</i>
8[e]	wherein the time-domain resource includes at least one or more orthogonal frequency-division multiplexing (OFDM) symbols,	<i>See 1[a], supra.</i>
8[f]	wherein, based on the information, a number of OFDM symbols are determined for a physical downlink shared channel (PDSCH) or a physical uplink shared channel (PUSCH), and	<i>See 1[b], supra.</i>
8[g]	wherein the determined number of OFDM symbols is smaller than or equal to a	<i>See 1[c], supra.</i>

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
	number of OFDM symbols included in a slot; and	
8[i]	receiving, from the base station, downlink control information (DCI), including a field including a bit string,	<i>See 1[d], supra.</i>
8[j]	wherein the bit string in the field relates to a row index of an allocation table, and	<i>See 1[e], supra.</i>
8[k]	wherein the allocation table includes information on a starting OFDM symbol and the number of the OFDM symbols which is smaller than or equal to the number of OFDM symbols included in the slot.	<i>See 1[f], supra.</i>

9. Claim 9

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
9[a]	The wireless device of claim 8, wherein the bit string is 3 bits in length.	<i>See 2[a], supra.</i>

10. Claim 10

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
10[a]	The wireless device of claim 8, wherein the DCI further includes information on one or more allocations of a frequency-domain resource.	See 3[a], <i>supra</i> .

11. Claim 11

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
11[a]	The wireless device of claim 8, wherein the wireless device supports a new radio access technology (NR).	See 4[a], <i>supra</i> .

12. Claim 12

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
12[a]	The wireless device of claim 8, wherein the wireless device supports different numerologies which are defined by a subcarrier spacing (SCS).	See 5[a], <i>supra</i> .

13. Claim 13

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
13[pre]	The wireless device of claim 8, wherein the operations further include:	<i>See, e.g., 6[pre], supra.</i> <i>See 13[a]–[b], infra.</i>
13[a]	receiving, from the base station, downlink data via the PDSCH; and	<i>See, e.g., 6[b], supra.</i>
13[b]	transmitting, to the base station, uplink data via the PUSCH.	<i>See, e.g., 6[a], supra.</i>

14. Claim 14

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
14[a]	The wireless device of claim 8, wherein the number of the OFDM symbols is a maximum of 14.	<i>See, e.g., 7[a], supra.</i>

15. Claim 15

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
15[pre]	An operation method of wireless device, comprising:	<i>See 1[pre], supra.</i>

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
15[a]	receiving, from a base station, a radio resource control (RRC) signal including information on one or more allocations of a time-domain resource,	<i>See 1[a]–[b], supra.</i>
15[b]	wherein the time-domain resource includes at least one or more orthogonal frequency-division multiplexing (OFDM) symbols,	<i>See 1[a], supra.</i>
15[c]	wherein, based on the information, a number of OFDM symbols are determined for a physical downlink shared channel (PDSCH) or a physical uplink shared channel (PUSCH), and	<i>See 1[b], supra.</i>
15[d]	wherein the determined number of OFDM symbols is smaller than or equal to a number of OFDM symbols included in a slot; and	<i>See 1[c], supra.</i>
15[e]	receiving, from the base station, downlink control information (DCI), including a field including a bit string,	<i>See 1[d], supra.</i>
15[f]	wherein the bit string in the field relates to a row index of an allocation table, and	<i>See 1[e], supra.</i>

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
15[g]	wherein the allocation table includes information on a starting OFDM symbol and the number of the OFDM symbols which is smaller than or equal to the number of OFDM symbols included in the slot.	<i>See 1[f], supra.</i>

16. Claim 16

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
16[a]	The method of claim 15, wherein the bit string is 3 bits in length.	<i>See, e.g., 2[a], supra.</i>

17. Claim 17

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
17[a]	The method of claim 15, wherein the DCI further includes information on one or more allocations of a frequency-domain resource.	<i>See, e.g., 3[a], supra.</i>

18. Claim 18

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
18[a]	The method of claim 15, wherein the wireless device supports a new radio access technology (NR).	<i>See, e.g., 4[a], supra.</i>

19. Claim 19

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
19[a]	The method of claim 18, wherein the wireless device supports different numerologies which are defined by a subcarrier spacing (SCS).	<i>See, e.g., 5[a], supra.</i>

20. Claim 20

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
20[pre]	The method of claim 18, further comprising:	<i>See, e.g., 6[pre], supra.</i> <i>See 13[a]–[b], infra.</i>
20[a]	receiving, from the base station, downlink data via the PDSCH; and	<i>See, e.g., 6[b], supra.</i>

Invalidity of U.S. Patent 11,540,272 in view of Obviousness Combinations		
Claim Language		Disclosed Art
20[b]	transmitting, to the base station, uplink data via the PUSCH.	<i>See, e.g., 6[a], supra.</i>

APPENDIX J (Amended)

Invalidity of U.S. Patent No. 9,894,644 (“644 Patent”) Obvious Combinations

1. Claim 1

Invalidity of U.S. Patent 9,894,644		
Claim Language		Disclosed Art
1[pre]	A method for receiving, by a terminal, downlink control information through downlink control channels repeatedly allocated in a plurality of subframes, the method comprising:	International Publication No. WO 2015/018075 to Zhuang et al. (“Zhuang”). <i>See</i> Exhibit J-01. U.S. Patent Application Publication No. 2014/0161084 to Yang et al. (“Yang-084”). <i>See</i> Exhibit J-02. European Patent Application Publication No. EP 2,835,990 to Baker et al. (“Baker”). <i>See</i> Exhibit J-03. U.S. Patent Application Publication No. 2011/0222491 to Vajapeyam et al. (“Vajapeyam”). <i>See</i> Exhibit J-04. U.S. Patent Application Publication No. 2012/0028668 to Lee et al. (“Lee-668”). <i>See</i> Exhibit J-05. U.S. Patent Application Publication No. 2012/0122825 to Lee et al. (“Lee-825”). <i>See</i> Exhibit J-06. U.S. Patent Application Publication No. 2014/0071915 to Papasakellariou et al. (“Papasakellariou-915”). <i>See</i> Exhibit J-07. U.S. Patent Application Publication No. 2012/0320782 to Seo et al. (“Seo-782”) at Abstract, [0001], [0002], [0003], [0004], [0005], [0007], [0045], [0046], [0051], [0053], [0157], [0255], [0257], [0259], [0260], Fig. 1, Fig. 2, Fig. 4, Fig. 5, Fig. 6, Fig. 7, Fig. 8, Fig. 10, Fig. 11, Fig. 16, Fig. 17, Fig. 28, Fig. 29.

Invalidity of U.S. Patent 9,894,644	
Claim Language	Disclosed Art
	U.S. Patent Application Publication No. 2013/0114570 to Park et al. (“Park-570”) at Abstract, [0079], [0081], [0082], [0083], [0084], [0086], [0180], [0181], Table 1, Fig. 1, Fig. 2, Fig. 3, Fig. 6, Fig. 7, Fig. 8, Fig. 9. U.S. Patent Application Publication No. 2013/0301542 to Krishnamurthy et al. (“Krishnamurthy”) at [0043], [0053], [0055], [0057]. U.S. Patent Application Publication No. 2016/0353420 to You et al. (“You”) at Abstract, [0001], [0002], [0003], [0005], [0007], [0008], [0009], [0010], [0011], [0012], [0013], [0014], [0015], [0043], [0044], [0045], [0046], [0047], [0048], [0049], [0052], [0053], [0054], [0057], [0058], [0059], [0080], [0081], [0082], [0083], [0084], [0085], [0086], [0087], [0114], [0115], [0117], [0124], [0125], [0127], [0128], [0129], [0130], [0131], [0144], [0145], [0146], [0147], [0148], [0149], [0150], [0151], [0152], [0153], [0154], [0155], [0156], [0157], [0158], [0159], [0160], [0161], [0162], [0173], [0174], [0175], [0176], [0223], [0224], [0225], [0226], [0227], [0228], [0229], [0230], [0235], [0236], [0237], [0238], [0239], Fig. 1, Fig. 2, Fig. 3, Fig. 4, Fig. 5, Fig. 6, Fig. 7, Fig. 8, Fig. 9, Fig. 10, Fig. 11, Fig. 12, Fig. 13, Fig. 14, Fig. 15, Fig. 16, Fig. 17, Fig. 18, Fig. 19, Fig. 20. European Patent Application Publication No. 2,337,260 to Kim et al. (“Kim-260”) at Abstract, [0001], [0002], [0013], [0014], [0016], [0017], [0021], [0025], [0028], [0032], [0044], [0045], [0048], Fig. 1, Fig. 2. International Application Publication No. WO2012/173432 to Kim et al. (“Kim-432”) at Abstract, [0002], [0004], [0005], [0007], [0008], [0009], [0011], [0012], [0062], [0073], [0074], [0075], [0076], [0077], [0078]-[0085], [0087], [0089], [0090], [0091], [0092], [0093], [0098], [0099], [0271], [0272], [0275], [0276], [0152], Fig. 2, Fig. 5, Fig. 6, Fig. 7, Fig. 8, Fig. 9. International Application Publication No. WO2012/169800 to Seo et al. (“Seo-800”) at [0046], [0058], [0065], [0078], [0090], [0093], [0106], [0107], [0110], [0113], Fig. 1, Fig. 2, Fig. 3, Fig. 4, Fig. 5, Fig. 6.

Invalidity of U.S. Patent 9,894,644		
Claim Language		Disclosed Art
		3GPP TS 22.368 V12.2.0: Service Requirements for Machine-Type Communications §§ 1-7. 3GPP R1-132973: Coverage enhancement for (E)PDCCH at 1-2. 3GPP R1-130938: PBCH coverage extension for MTC devices at 1-4. 3GPP TS 36.213 V9.1.0 at § 9.
1[a]	receiving configuration information relating to the plurality of subframes through higher layer signaling;	International Publication No. WO 2015/018075 to Zhuang et al. (“Zhuang”). <i>See</i> Exhibit J-01. U.S. Patent Application Publication No. 2014/0161084 to Yang et al. (“Yang-084”). <i>See</i> Exhibit J-02. European Patent Application Publication No. EP 2,835,990 to Baker et al. (“Baker”). <i>See</i> Exhibit J-03. U.S. Patent Application Publication No. 2011/0222491 to Vajapeyam et al. (“Vajapeyam”). <i>See</i> Exhibit J-04. U.S. Patent Application Publication No. 2012/0028668 to Lee et al. (“Lee-668”). <i>See</i> Exhibit J-05. U.S. Patent Application Publication No. 2012/0122825 to Lee et al. (“Lee-825”). <i>See</i> Exhibit J-06. U.S. Patent Application Publication No. 2014/0071915 to Papasakellariou et al. (“Papasakellariou-915”). <i>See</i> Exhibit J-07.

Invalidity of U.S. Patent 9,894,644	
Claim Language	Disclosed Art
	U.S. Patent Application Publication No. 2012/0320782 to Seo et al. (“Seo-782”) at [0053], [0083], [0185], [0186], [0189], [0234], [0238], [0251], [0253], [0254]. U.S. Patent Application Publication No. 2013/0114570 to Park et al. (“Park-570”) at [0017], [0021], [0026], [0039], [0118], [0120], [0132], [0133], [0139], [0140], [0143], [0144], [0152], [0154], [0159], [0176], [0179], [0183], [0190], Fig. 6, Fig. 7, Fig. 8. U.S. Patent Application Publication No. 2013/0301542 to Krishnamurthy et al. (“Krishnamurthy”) at [0023], [0046], [0048], [0050], [0052], [0061], [0062], [0063], [0087], [0113], Fig. 1, Fig. 2, Fig. 3, Fig. 4, Fig. 5, Fig. 6. U.S. Patent Application Publication No. 2016/0353420 to You et al. (“You”) at Abstract, [0001], [0002], [0003], [0005], [0007], [0008], [0009], [0010], [0011], [0012], [0013], [0014], [0015], [0043], [0044], [0045], [0046], [0047], [0048], [0049], [0052], [0053], [0054], [0057], [0058], [0059], [0080], [0081], [0082], [0083], [0084], [0085], [0086], [0087], [0114], [0115], [0117], [0124], [0125], [0127], [0128], [0129], [0130], [0131], [0144], [0145], [0146], [0147], [0148], [0149], [0150], [0151], [0152], [0153], [0154], [0155], [0156], [0157], [0158], [0159], [0160], [0161], [0162], [0173], [0174], [0175], [0176], [0223], [0224], [0225], [0226], [0227], [0228], [0229], [0230], [0235], [0236], [0237], [0238], [0239], Fig. 1, Fig. 2, Fig. 3, Fig. 4, Fig. 5, Fig. 6, Fig. 7, Fig. 8, Fig. 9, Fig. 10, Fig. 11, Fig. 12, Fig. 13, Fig. 14, Fig. 15, Fig. 16, Fig. 17, Fig. 18, Fig. 19, Fig. 20. European Patent Application Publication No. 2,337,260 to Kim et al. (“Kim-260”) at [0031]. International Application Publication No. WO2012/169800 to Seo et al. (“Seo-800”) at [0058], [0077], [0085], [0086], [0087], [0088], [0096], [0097], [0110], [0113], [0115]. 3GPP R4-132283: EPDCCH impact on UE demodulation performance – EPDCCH test scenarios at 3-6. 3GPP R1-125404: Change Request – 36.213 at 34-35, 119.

Invalidity of U.S. Patent 9,894,644		
Claim Language		Disclosed Art
1[b]	receiving downlink control channels repeatedly allocated in the plurality of subframes and combining the received downlink control channels on the basis of the configuration information; and	International Publication No. WO 2015/018075 to Zhuang et al. (“Zhuang”). <i>See</i> Exhibit J-01. U.S. Patent Application Publication No. 2014/0161084 to Yang et al. (“Yang-084”). <i>See</i> Exhibit J-02. European Patent Application Publication No. EP 2,835,990 to Baker et al. (“Baker”). <i>See</i> Exhibit J-03. U.S. Patent Application Publication No. 2011/0222491 to Vajapeyam et al. (“Vajapeyam”). <i>See</i> Exhibit J-04. U.S. Patent Application Publication No. 2012/0028668 to Lee et al. (“Lee-668”). <i>See</i> Exhibit J-05. U.S. Patent Application Publication No. 2012/0122825 to Lee et al. (“Lee-825”). <i>See</i> Exhibit J-06. U.S. Patent Application Publication No. 2014/0071915 to Papasakellariou et al. (“Papasakellariou-915”). <i>See</i> Exhibit J-07. U.S. Patent Application Publication No. 2012/0320782 to Seo et al. (“Seo-782”) at Abstract, [0001], [0002], [0003], [0004], [0005], [0007], [0045], [0046], [0051], [0053], [0157], [0255], [0257], [0259], [0260], Fig. 1, Fig. 2, Fig. 4, Fig. 5, Fig. 6, Fig. 7, Fig. 8, Fig. 10, Fig. 11, Fig. 16, Fig. 17, Fig. 28, Fig. 29. U.S. Patent Application Publication No. 2013/0114570 to Park et al. (“Park-570”) at Abstract, [0079], [0081], [0082], [0083], [0084], [0086], [0180], [0181], Table 1, Fig. 1, Fig. 2, Fig. 3, Fig. 6, Fig. 7, Fig. 8, Fig. 9.

Invalidity of U.S. Patent 9,894,644	
Claim Language	Disclosed Art
	U.S. Patent Application Publication No. 2013/0301542 to Krishnamurthy et al. (“Krishnamurthy”) at [0043], [0053], [0055], [0057]. U.S. Patent Application Publication No. 2016/0353420 to You et al. (“You”) at Abstract, [0001], [0002], [0003], [0005], [0007], [0008], [0009], [0010], [0011], [0012], [0013], [0014], [0015], [0043], [0044], [0045], [0046], [0047], [0048], [0049], [0052], [0053], [0054], [0057], [0058], [0059], [0080], [0081], [0082], [0083], [0084], [0085], [0086], [0087], [0114], [0115], [0117], [0124], [0125], [0127], [0128], [0129], [0130], [0131], [0144], [0145], [0146], [0147], [0148], [0149], [0150], [0151], [0152], [0153], [0154], [0155], [0156], [0157], [0158], [0159], [0160], [0161], [0162], [0173], [0174], [0175], [0176], [0223], [0224], [0225], [0226], [0227], [0228], [0229], [0230], [0235], [0236], [0237], [0238], [0239], Fig. 1, Fig. 2, Fig. 3, Fig. 4, Fig. 5, Fig. 6, Fig. 7, Fig. 8, Fig. 9, Fig. 10, Fig. 11, Fig. 12, Fig. 13, Fig. 14, Fig. 15, Fig. 16, Fig. 17, Fig. 18, Fig. 19, Fig. 20. European Patent Application Publication No. 2,337,260 to Kim et al. (“Kim-260”) at Abstract, [0001], [0002], [0013], [0014], [0016], [0017], [0021], [0025], [0028], [0032], [0044], [0045], [0048], Fig. 1, Fig. 2. International Application Publication No. WO2012/173432 to Kim et al. (“Kim-432”) at Abstract, [0002], [0004], [0005], [0007], [0008], [0009], [0011], [0012], [0062], [0073], [0074], [0075], [0076], [0077], [0078]-[0085], [0087], [0089], [0090], [0091], [0092], [0093], [0098], [0099], [0271], [0272], [0275], [0276], [0152], Fig. 2, Fig. 5, Fig. 6, Fig. 7, Fig. 8, Fig. 9. International Application Publication No. WO2012/169800 to Seo et al. (“Seo-800”) at [0046], [0058], [0065], [0078], [0090], [0093], [0106], [0107], [0110], [0113], Fig. 1, Fig. 2, Fig. 3, Fig. 4, Fig. 5, Fig. 6. 3GPP R1-132973: Coverage enhancement for (E)PDCCH at 1-2.

Invalidity of U.S. Patent 9,894,644		
Claim Language		Disclosed Art
		3GPP R1-130938: PBCH coverage extension for MTC devices at 1-4. 3GPP TS 36.213 V9.1.0 at § 9.
1[c]	extracting the downlink control information from the combined downlink control channels, wherein:	International Publication No. WO 2015/018075 to Zhuang et al. (“Zhuang”). <i>See</i> Exhibit J-01. U.S. Patent Application Publication No. 2014/0161084 to Yang et al. (“Yang-084”). <i>See</i> Exhibit J-02. European Patent Application Publication No. EP 2,835,990 to Baker et al. (“Baker”). <i>See</i> Exhibit J-03. U.S. Patent Application Publication No. 2011/0222491 to Vajapeyam et al. (“Vajapeyam”). <i>See</i> Exhibit J-04. U.S. Patent Application Publication No. 2012/0028668 to Lee et al. (“Lee-668”). <i>See</i> Exhibit J-05. U.S. Patent Application Publication No. 2012/0122825 to Lee et al. (“Lee-825”). <i>See</i> Exhibit J-06. U.S. Patent Application Publication No. 2014/0071915 to Papasakellariou et al. (“Papasakellariou-915”). <i>See</i> Exhibit J-07. U.S. Patent Application Publication No. 2012/0320782 to Seo et al. (“Seo-782”) at Abstract, [0001], [0002], [0003], [0004], [0005], [0007], [0045], [0046], [0051], [0053], [0157], [0255], [0257], [0259], [0260], Fig. 1, Fig. 2, Fig. 4, Fig. 5, Fig. 6, Fig. 7, Fig. 8, Fig. 10, Fig. 11, Fig. 16, Fig. 17, Fig. 28, Fig. 29.

Invalidity of U.S. Patent 9,894,644		
Claim Language		Disclosed Art
		U.S. Patent Application Publication No. 2013/0114570 to Park et al. (“Park-570”) at Abstract, [0079], [0081], [0082], [0083], [0084], [0086], [0180], [0181], Table 1, Fig. 1, Fig. 2, Fig. 3, Fig. 6, Fig. 7, Fig. 8, Fig. 9. U.S. Patent Application Publication No. 2013/0301542 to Krishnamurthy et al. (“Krishnamurthy”) at [0043], [0053], [0055], [0057]. U.S. Patent Application Publication No. 2016/0353420 to You et al. (“You”) at Abstract, [0001], [0002], [0003], [0005], [0007], [0008], [0009], [0010], [0011], [0012], [0013], [0014], [0015], [0043], [0044], [0045], [0046], [0047], [0048], [0049], [0052], [0053], [0054], [0057], [0058], [0059], [0080], [0081], [0082], [0083], [0084], [0085], [0086], [0087], [0114], [0115], [0117], [0124], [0125], [0127], [0128], [0129], [0130], [0131], [0144], [0145], [0146], [0147], [0148], [0149], [0150], [0151], [0152], [0153], [0154], [0155], [0156], [0157], [0158], [0159], [0160], [0161], [0162], [0173], [0174], [0175], [0176], [0223], [0224], [0225], [0226], [0227], [0228], [0229], [0230], [0235], [0236], [0237], [0238], [0239], Fig. 1, Fig. 2, Fig. 3, Fig. 4, Fig. 5, Fig. 6, Fig. 7, Fig. 8, Fig. 9, Fig. 10, Fig. 11, Fig. 12, Fig. 13, Fig. 14, Fig. 15, Fig. 16, Fig. 17, Fig. 18, Fig. 19, Fig. 20. European Patent Application Publication No. 2,337,260 to Kim et al. (“Kim-260”) at Abstract, [0001], [0002], [0013], [0014], [0016], [0017], [0021], [0025], [0028], [0032], [0044], [0045], [0048], Fig. 1, Fig. 2. International Application Publication No. WO2012/173432 to Kim et al. (“Kim-432”) at Abstract, [0002], [0004], [0005], [0007], [0008], [0009], [0011], [0012], [0062], [0073], [0074], [0075], [0076], [0077], [0078]-[0085], [0087], [0089], [0090], [0091], [0092], [0093], [0098], [0099], [0271], [0272], [0275], [0276], [0152], Fig. 2, Fig. 5, Fig. 6, Fig. 7, Fig. 8, Fig. 9. International Application Publication No. WO2012/169800 to Seo et al. (“Seo-800”) at [0046], [0058], [0065], [0078], [0090], [0093], [0106], [0107], [0110], [0113], Fig. 1, Fig. 2, Fig. 3, Fig. 4, Fig. 5, Fig. 6.

Invalidity of U.S. Patent 9,894,644		
Claim Language		Disclosed Art
		3GPP R1-132973: Coverage enhancement for (E)PDCCH at 1-2. 3GPP R1-130938: PBCH coverage extension for MTC devices at 1-4. 3GPP TS 36.213 V9.1.0 at § 9.
1[d]	the configuration information comprises information on a start subframe of the plurality of subframes; and	International Publication No. WO 2015/018075 to Zhuang et al. (“Zhuang”). <i>See</i> Exhibit J-01. U.S. Patent Application Publication No. 2014/0161084 to Yang et al. (“Yang-084”). <i>See</i> Exhibit J-02. European Patent Application Publication No. EP 2,835,990 to Baker et al. (“Baker”). <i>See</i> Exhibit J-03. U.S. Patent Application Publication No. 2011/0222491 to Vajapeyam et al. (“Vajapeyam”). <i>See</i> Exhibit J-04. U.S. Patent Application Publication No. 2012/0028668 to Lee et al. (“Lee-668”). <i>See</i> Exhibit J-05. U.S. Patent Application Publication No. 2012/0122825 to Lee et al. (“Lee-825”). <i>See</i> Exhibit J-06. U.S. Patent Application Publication No. 2014/0071915 to Papasakellariou et al. (“Papasakellariou-915”). <i>See</i> Exhibit J-07. U.S. Patent Application Publication No. 2012/0320782 to Seo et al. (“Seo-782”) at [0053], [0083], [0185], [0186], [0189], [0234], [0238], [0251], [0253], [0254].

Invalidity of U.S. Patent 9,894,644		
Claim Language		Disclosed Art
		U.S. Patent Application Publication No. 2013/0114570 to Park et al. (“Park-570”) at [0017], [0021], [0026], [0039], [0118], [0120], [0132], [0133], [0139], [0140], [0143], [0144], [0152], [0154], [0159], [0176], [0179], [0183], [0190], Fig. 6, Fig. 7, Fig. 8. U.S. Patent Application Publication No. 2013/0301542 to Krishnamurthy et al. (“Krishnamurthy”) at [0023], [0046], [0048], [0050], [0052], [0061], [0062], [0063], [0087], [0113], Fig. 1, Fig. 2, Fig. 3, Fig. 4, Fig. 5, Fig. 6. U.S. Patent Application Publication No. 2016/0353420 to You et al. (“You”) at Abstract, [0001], [0002], [0003], [0005], [0007], [0008], [0009], [0010], [0011], [0012], [0013], [0014], [0015], [0043], [0044], [0045], [0046], [0047], [0048], [0049], [0052], [0053], [0054], [0057], [0058], [0059], [0080], [0081], [0082], [0083], [0084], [0085], [0086], [0087], [0114], [0115], [0117], [0124], [0125], [0127], [0128], [0129], [0130], [0131], [0144], [0145], [0146], [0147], [0148], [0149], [0150], [0151], [0152], [0153], [0154], [0155], [0156], [0157], [0158], [0159], [0160], [0161], [0162], [0173], [0174], [0175], [0176], [0223], [0224], [0225], [0226], [0227], [0228], [0229], [0230], [0235], [0236], [0237], [0238], [0239], Fig. 1, Fig. 2, Fig. 3, Fig. 4, Fig. 5, Fig. 6, Fig. 7, Fig. 8, Fig. 9, Fig. 10, Fig. 11, Fig. 12, Fig. 13, Fig. 14, Fig. 15, Fig. 16, Fig. 17, Fig. 18, Fig. 19, Fig. 20. European Patent Application Publication No. 2,337,260 to Kim et al. (“Kim-260”) at [0031]. International Application Publication No. WO2012/169800 to Seo et al. (“Seo-800”) at [0058], [0077], [0085], [0086], [0087], [0088], [0096], [0097], [0110], [0113], [0115]. 3GPP R4-132283: EPDCCH impact on UE demodulation performance – EPDCCH test scenarios at 3-6. 3GPP R1-125404: Change Request – 36.213 at 34-35, 119.
1[e]	the downlink control information comprises information on the	International Publication No. WO 2015/018075 to Zhuang et al. (“Zhuang”). <i>See</i> Exhibit J-01.

Invalidity of U.S. Patent 9,894,644		
Claim Language		Disclosed Art
	number of the plurality of subframes.	U.S. Patent Application Publication No. 2014/0161084 to Yang et al. (“Yang-084”). <i>See</i> Exhibit J-02. European Patent Application Publication No. EP 2,835,990 to Baker et al. (“Baker”). <i>See</i> Exhibit J-03. U.S. Patent Application Publication No. 2011/0222491 to Vajapeyam et al. (“Vajapeyam”). <i>See</i> Exhibit J-04. U.S. Patent Application Publication No. 2012/0028668 to Lee et al. (“Lee-668”). <i>See</i> Exhibit J-05. U.S. Patent Application Publication No. 2012/0122825 to Lee et al. (“Lee-825”). <i>See</i> Exhibit J-06. U.S. Patent Application Publication No. 2014/0071915 to Papasakellariou et al. (“Papasakellariou-915”). <i>See</i> Exhibit J-07. U.S. Patent Application Publication No. 2012/0320782 to Seo et al. (“Seo-782”) at Abstract, [0001], [0002], [0003], [0004], [0005], [0007], [0045], [0046], [0051], [0053], [0157], [0255], [0257], [0259], [0260], Fig. 1, Fig. 2, Fig. 4, Fig. 5, Fig. 6, Fig. 7, Fig. 8, Fig. 10, Fig. 11, Fig. 16, Fig. 17, Fig. 28, Fig. 29. U.S. Patent Application Publication No. 2013/0114570 to Park et al. (“Park-570”) at Abstract, [0079], [0081], [0082], [0083], [0084], [0086], [0180], [0181], Table 1, Fig. 1, Fig. 2, Fig. 3, Fig. 6, Fig. 7, Fig. 8, Fig. 9. U.S. Patent Application Publication No. 2013/0301542 to Krishnamurthy et al. (“Krishnamurthy”) at [0043], [0053], [0055], [0057].

Invalidity of U.S. Patent 9,894,644	
Claim Language	Disclosed Art
	U.S. Patent Application Publication No. 2016/0353420 to You et al. (“You”) at Abstract, [0001], [0002], [0003], [0005], [0007], [0008], [0009], [0010], [0011], [0012], [0013], [0014], [0015], [0043], [0044], [0045], [0046], [0047], [0048], [0049], [0052], [0053], [0054], [0057], [0058], [0059], [0080], [0081], [0082], [0083], [0084], [0085], [0086], [0087], [0114], [0115], [0117], [0124], [0125], [0127], [0128], [0129], [0130], [0131], [0144], [0145], [0146], [0147], [0148], [0149], [0150], [0151], [0152], [0153], [0154], [0155], [0156], [0157], [0158], [0159], [0160], [0161], [0162], [0173], [0174], [0175], [0176], [0223], [0224], [0225], [0226], [0227], [0228], [0229], [0230], [0235], [0236], [0237], [0238], [0239], Fig. 1, Fig. 2, Fig. 3, Fig. 4, Fig. 5, Fig. 6, Fig. 7, Fig. 8, Fig. 9, Fig. 10, Fig. 11, Fig. 12, Fig. 13, Fig. 14, Fig. 15, Fig. 16, Fig. 17, Fig. 18, Fig. 19, Fig. 20. European Patent Application Publication No. 2,337,260 to Kim et al. (“Kim-260”) at Abstract, [0001], [0002], [0013], [0014], [0016], [0017], [0021], [0025], [0028], [0032], [0044], [0045], [0048], Fig. 1, Fig. 2. International Application Publication No. WO2012/173432 to Kim et al. (“Kim-432”) at Abstract, [0002], [0004], [0005], [0007], [0008], [0009], [0011], [0012], [0062], [0073], [0074], [0075], [0076], [0077], [0078]-[0085], [0087], [0089], [0090], [0091], [0092], [0093], [0098], [0099], [0271], [0272], [0275], [0276], [0152], Fig. 2, Fig. 5, Fig. 6, Fig. 7, Fig. 8, Fig. 9. International Application Publication No. WO2012/169800 to Seo et al. (“Seo-800”) at [0046], [0058], [0065], [0078], [0090], [0093], [0106], [0107], [0110], [0113], Fig. 1, Fig. 2, Fig. 3, Fig. 4, Fig. 5, Fig. 6. 3GPP R1-132973: Coverage enhancement for (E)PDCCH at 1-2. 3GPP R1-130938: PBCH coverage extension for MTC devices at 1-4.

2. Claim 2

Invalidity of U.S. Patent 9,894,644		
Claim Language		Disclosed Art
2[pre]	A method of transmitting, by a base station, downlink control information through downlink control channels repeatedly allocated in a plurality of subframes, the method comprising:	International Publication No. WO 2015/018075 to Zhuang et al. (“Zhuang”). <i>See</i> Exhibit J-01. U.S. Patent Application Publication No. 2014/0161084 to Yang et al. (“Yang-084”). <i>See</i> Exhibit J-02. European Patent Application Publication No. EP 2,835,990 to Baker et al. (“Baker”). <i>See</i> Exhibit J-03. U.S. Patent Application Publication No. 2011/0222491 to Vajapeyam et al. (“Vajapeyam”). <i>See</i> Exhibit J-04. U.S. Patent Application Publication No. 2012/0028668 to Lee et al. (“Lee-668”). <i>See</i> Exhibit J-05. U.S. Patent Application Publication No. 2012/0122825 to Lee et al. (“Lee-825”). <i>See</i> Exhibit J-06. U.S. Patent Application Publication No. 2014/0071915 to Papasakellariou et al. (“Papasakellariou-915”). <i>See</i> Exhibit J-07. U.S. Patent Application Publication No. 2012/0320782 to Seo et al. (“Seo-782”) at Abstract, [0001], [0002], [0003], [0004], [0005], [0007], [0045], [0046], [0051], [0053], [0157], [0255], [0257], [0259], [0260], Fig. 1, Fig. 2, Fig. 4, Fig. 5, Fig. 6, Fig. 7, Fig. 8, Fig. 10, Fig. 11, Fig. 16, Fig. 17, Fig. 28, Fig. 29. U.S. Patent Application Publication No. 2013/0114570 to Park et al. (“Park-570”) at Abstract, [0079], [0081], [0082], [0083], [0084], [0086], [0180], [0181], Table 1, Fig. 1, Fig. 2, Fig. 3, Fig. 6, Fig. 7, Fig. 8, Fig. 9.

Invalidity of U.S. Patent 9,894,644	
Claim Language	Disclosed Art
	U.S. Patent Application Publication No. 2013/0301542 to Krishnamurthy et al. (“Krishnamurthy”) at [0043], [0053], [0055], [0057]. U.S. Patent Application Publication No. 2016/0353420 to You et al. (“You”) at Abstract, [0001], [0002], [0003], [0005], [0007], [0008], [0009], [0010], [0011], [0012], [0013], [0014], [0015], [0043], [0044], [0045], [0046], [0047], [0048], [0049], [0052], [0053], [0054], [0057], [0058], [0059], [0080], [0081], [0082], [0083], [0084], [0085], [0086], [0087], [0114], [0115], [0117], [0124], [0125], [0127], [0128], [0129], [0130], [0131], [0144], [0145], [0146], [0147], [0148], [0149], [0150], [0151], [0152], [0153], [0154], [0155], [0156], [0157], [0158], [0159], [0160], [0161], [0162], [0173], [0174], [0175], [0176], [0223], [0224], [0225], [0226], [0227], [0228], [0229], [0230], [0235], [0236], [0237], [0238], [0239], Fig. 1, Fig. 2, Fig. 3, Fig. 4, Fig. 5, Fig. 6, Fig. 7, Fig. 8, Fig. 9, Fig. 10, Fig. 11, Fig. 12, Fig. 13, Fig. 14, Fig. 15, Fig. 16, Fig. 17, Fig. 18, Fig. 19, Fig. 20. European Patent Application Publication No. 2,337,260 to Kim et al. (“Kim-260”) at Abstract, [0001], [0002], [0013], [0014], [0016], [0017], [0021], [0025], [0028], [0032], [0044], [0045], [0048], Fig. 1, Fig. 2. International Application Publication No. WO2012/173432 to Kim et al. (“Kim-432”) at Abstract, [0002], [0004], [0005], [0007], [0008], [0009], [0011], [0012], [0062], [0073], [0074], [0075], [0076], [0077], [0078]-[0085], [0087], [0089], [0090], [0091], [0092], [0093], [0098], [0099], [0271], [0272], [0275], [0276], [0152], Fig. 2, Fig. 5, Fig. 6, Fig. 7, Fig. 8, Fig. 9. International Application Publication No. WO2012/169800 to Seo et al. (“Seo-800”) at [0046], [0058], [0065], [0078], [0090], [0093], [0106], [0107], [0110], [0113], Fig. 1, Fig. 2, Fig. 3, Fig. 4, Fig. 5, Fig. 6. 3GPP TS 22.368 V12.2.0: Service Requirements for Machine-Type Communications §§ 1-7 (2013-03).

Invalidity of U.S. Patent 9,894,644		
Claim Language		Disclosed Art
		3GPP R1-132973: Coverage enhancement for (E)PDCCH at 1-2. 3GPP R1-130938: PBCH coverage extension for MTC devices at 1-4. 3GPP TS 36.213 V9.1.0 at § 9.
2[a]	transmitting configuration information relating to the plurality of subframes through higher layer signaling; and	International Publication No. WO 2015/018075 to Zhuang et al. (“Zhuang”). <i>See</i> Exhibit J-01. U.S. Patent Application Publication No. 2014/0161084 to Yang et al. (“Yang-084”). <i>See</i> Exhibit J-02. European Patent Application Publication No. EP 2,835,990 to Baker et al. (“Baker”). <i>See</i> Exhibit J-03. U.S. Patent Application Publication No. 2011/0222491 to Vajapeyam et al. (“Vajapeyam”). <i>See</i> Exhibit J-04. U.S. Patent Application Publication No. 2012/0028668 to Lee et al. (“Lee-668”). <i>See</i> Exhibit J-05. U.S. Patent Application Publication No. 2012/0122825 to Lee et al. (“Lee-825”). <i>See</i> Exhibit J-06. U.S. Patent Application Publication No. 2014/0071915 to Papasakellariou et al. (“Papasakellariou-915”). <i>See</i> Exhibit J-07. U.S. Patent Application Publication No. 2012/0320782 to Seo et al. (“Seo-782”) at [0053], [0083], [0185], [0186], [0189], [0234], [0238], [0251], [0253], [0254].

Invalidity of U.S. Patent 9,894,644		
Claim Language		Disclosed Art
		U.S. Patent Application Publication No. 2013/0114570 to Park et al. (“Park-570”) at [0017], [0021], [0026], [0039], [0118], [0120], [0132], [0133], [0139], [0140], [0143], [0144], [0152], [0154], [0159], [0176], [0179], [0183], [0190], Fig. 6, Fig. 7, Fig. 8. U.S. Patent Application Publication No. 2013/0301542 to Krishnamurthy et al. (“Krishnamurthy”) at [0023], [0046], [0048], [0050], [0052], [0061], [0062], [0063], [0087], [0113], Fig. 1, Fig. 2, Fig. 3, Fig. 4, Fig. 5, Fig. 6. U.S. Patent Application Publication No. 2016/0353420 to You et al. (“You”) at Abstract, [0001], [0002], [0003], [0005], [0007], [0008], [0009], [0010], [0011], [0012], [0013], [0014], [0015], [0043], [0044], [0045], [0046], [0047], [0048], [0049], [0052], [0053], [0054], [0057], [0058], [0059], [0080], [0081], [0082], [0083], [0084], [0085], [0086], [0087], [0114], [0115], [0117], [0124], [0125], [0127], [0128], [0129], [0130], [0131], [0144], [0145], [0146], [0147], [0148], [0149], [0150], [0151], [0152], [0153], [0154], [0155], [0156], [0157], [0158], [0159], [0160], [0161], [0162], [0173], [0174], [0175], [0176], [0223], [0224], [0225], [0226], [0227], [0228], [0229], [0230], [0235], [0236], [0237], [0238], [0239], Fig. 1, Fig. 2, Fig. 3, Fig. 4, Fig. 5, Fig. 6, Fig. 7, Fig. 8, Fig. 9, Fig. 10, Fig. 11, Fig. 12, Fig. 13, Fig. 14, Fig. 15, Fig. 16, Fig. 17, Fig. 18, Fig. 19, Fig. 20. European Patent Application Publication No. 2,337,260 to Kim et al. (“Kim-260”) at [0031]. International Application Publication No. WO2012/169800 to Seo et al. (“Seo-800”) at [0058], [0077], [0085], [0086], [0087], [0088], [0096], [0097], [0110], [0113], [0115]. 3GPP R4-132283: EPDCCH impact on UE demodulation performance – EPDCCH test scenarios at 3-6. 3GPP R1-125404: Change Request – 36.213 at 34-35, 119.
2[b]	transmitting the downlink control information through the	International Publication No. WO 2015/018075 to Zhuang et al. (“Zhuang”). <i>See</i> Exhibit J-01.

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Claim Language		Disclosed Art
	downlink control channels repeatedly allocated in the plurality of subframes, wherein	U.S. Patent Application Publication No. 2014/0161084 to Yang et al. (“Yang-084”). <i>See</i> Exhibit J-02. European Patent Application Publication No. EP 2,835,990 to Baker et al. (“Baker”). <i>See</i> Exhibit J-03. U.S. Patent Application Publication No. 2011/0222491 to Vajapeyam et al. (“Vajapeyam”). <i>See</i> Exhibit J-04. U.S. Patent Application Publication No. 2012/0028668 to Lee et al. (“Lee-668”). <i>See</i> Exhibit J-05. U.S. Patent Application Publication No. 2012/0122825 to Lee et al. (“Lee-825”). <i>See</i> Exhibit J-06. U.S. Patent Application Publication No. 2014/0071915 to Papasakellariou et al. (“Papasakellariou-915”). <i>See</i> Exhibit J-07. U.S. Patent Application Publication No. 2012/0320782 to Seo et al. (“Seo-782”) at Abstract, [0001], [0002], [0003], [0004], [0005], [0007], [0045], [0046], [0051], [0053], [0157], [0255], [0257], [0259], [0260], Fig. 1, Fig. 2, Fig. 4, Fig. 5, Fig. 6, Fig. 7, Fig. 8, Fig. 10, Fig. 11, Fig. 16, Fig. 17, Fig. 28, Fig. 29. U.S. Patent Application Publication No. 2013/0114570 to Park et al. (“Park-570”) at Abstract, [0079], [0081], [0082], [0083], [0084], [0086], [0180], [0181], Table 1, Fig. 1, Fig. 2, Fig. 3, Fig. 6, Fig. 7, Fig. 8, Fig. 9. U.S. Patent Application Publication No. 2013/0301542 to Krishnamurthy et al. (“Krishnamurthy”) at [0043], [0053], [0055], [0057].

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Claim Language	Disclosed Art
	U.S. Patent Application Publication No. 2016/0353420 to You et al. (“You”) at Abstract, [0001], [0002], [0003], [0005], [0007], [0008], [0009], [0010], [0011], [0012], [0013], [0014], [0015], [0043], [0044], [0045], [0046], [0047], [0048], [0049], [0052], [0053], [0054], [0057], [0058], [0059], [0080], [0081], [0082], [0083], [0084], [0085], [0086], [0087], [0114], [0115], [0117], [0124], [0125], [0127], [0128], [0129], [0130], [0131], [0144], [0145], [0146], [0147], [0148], [0149], [0150], [0151], [0152], [0153], [0154], [0155], [0156], [0157], [0158], [0159], [0160], [0161], [0162], [0173], [0174], [0175], [0176], [0223], [0224], [0225], [0226], [0227], [0228], [0229], [0230], [0235], [0236], [0237], [0238], [0239], Fig. 1, Fig. 2, Fig. 3, Fig. 4, Fig. 5, Fig. 6, Fig. 7, Fig. 8, Fig. 9, Fig. 10, Fig. 11, Fig. 12, Fig. 13, Fig. 14, Fig. 15, Fig. 16, Fig. 17, Fig. 18, Fig. 19, Fig. 20. International Application Publication No. WO2012/173432 to Kim et al. (“Kim-432”) at Abstract, [0002], [0004], [0005], [0007], [0008], [0009], [0011], [0012], [0062], [0073], [0074], [0075], [0076], [0077], [0078]-[0085], [0087], [0089], [0090], [0091], [0092], [0093], [0098], [0099], [0271], [0272], [0275], [0276], [0152], Fig. 2, Fig. 5, Fig. 6, Fig. 7, Fig. 8, Fig. 9. International Application Publication No. WO2012/169800 to Seo et al. (“Seo-800”) at [0046], [0058], [0065], [0078], [0090], [0093], [0106], [0107], [0110], [0113], Fig. 1, Fig. 2, Fig. 3, Fig. 4, Fig. 5, Fig. 6. European Patent Application Publication No. 2,337,260 to Kim et al. (“Kim-260”) at Abstract, [0001], [0002], [0013], [0014], [0016], [0017], [0021], [0025], [0028], [0032], [0044], [0045], [0048], Fig. 1, Fig. 2. 3GPP R1-132973: Coverage enhancement for (E)PDCCH at 1-2. 3GPP R1-130938: PBCH coverage extension for MTC devices at 1-4. 3GPP TS 36.213 V9.1.0 at § 9.

Invalidity of U.S. Patent 9,894,644		
Claim Language		Disclosed Art
2[c]	the configuration information comprises information on a start subframe of the plurality of subframes; and	International Publication No. WO 2015/018075 to Zhuang et al. (“Zhuang”). <i>See</i> Exhibit J-01. U.S. Patent Application Publication No. 2014/0161084 to Yang et al. (“Yang-084”). <i>See</i> Exhibit J-02. European Patent Application Publication No. EP 2,835,990 to Baker et al. (“Baker”). <i>See</i> Exhibit J-03. U.S. Patent Application Publication No. 2011/0222491 to Vajapeyam et al. (“Vajapeyam”). <i>See</i> Exhibit J-04. U.S. Patent Application Publication No. 2012/0028668 to Lee et al. (“Lee-668”). <i>See</i> Exhibit J-05. U.S. Patent Application Publication No. 2012/0122825 to Lee et al. (“Lee-825”). <i>See</i> Exhibit J-06. U.S. Patent Application Publication No. 2014/0071915 to Papasakellariou et al. (“Papasakellariou-915”). <i>See</i> Exhibit J-07. U.S. Patent Application Publication No. 2012/0320782 to Seo et al. (“Seo-782”) at [0053], [0083], [0185], [0186], [0189], [0234], [0238], [0251], [0253], [0254]. U.S. Patent Application Publication No. 2013/0114570 to Park et al. (“Park-570”) at [0017], [0021], [0026], [0039], [0118], [0120], [0132], [0133], [0139], [0140], [0143], [0144], [0152], [0154], [0159], [0176], [0179], [0183], [0190], Fig. 6, Fig. 7, Fig. 8. U.S. Patent Application Publication No. 2013/0301542 to Krishnamurthy et al. (“Krishnamurthy”) at [0023], [0046], [0048], [0050], [0052], [0061], [0062], [0063], [0087], [0113], Fig. 1, Fig. 2, Fig. 3, Fig. 4, Fig. 5, Fig. 6.

Invalidity of U.S. Patent 9,894,644		
Claim Language		Disclosed Art
		U.S. Patent Application Publication No. 2016/0353420 to You et al. (“You”) at Abstract, [0001], [0002], [0003], [0005], [0007], [0008], [0009], [0010], [0011], [0012], [0013], [0014], [0015], [0043], [0044], [0045], [0046], [0047], [0048], [0049], [0052], [0053], [0054], [0057], [0058], [0059], [0080], [0081], [0082], [0083], [0084], [0085], [0086], [0087], [0114], [0115], [0117], [0124], [0125], [0127], [0128], [0129], [0130], [0131], [0144], [0145], [0146], [0147], [0148], [0149], [0150], [0151], [0152], [0153], [0154], [0155], [0156], [0157], [0158], [0159], [0160], [0161], [0162], [0173], [0174], [0175], [0176], [0223], [0224], [0225], [0226], [0227], [0228], [0229], [0230], [0235], [0236], [0237], [0238], [0239], Fig. 1, Fig. 2, Fig. 3, Fig. 4, Fig. 5, Fig. 6, Fig. 7, Fig. 8, Fig. 9, Fig. 10, Fig. 11, Fig. 12, Fig. 13, Fig. 14, Fig. 15, Fig. 16, Fig. 17, Fig. 18, Fig. 19, Fig. 20. European Patent Application Publication No. 2,337,260 to Kim et al. (“Kim-260”) at [0031]. International Application Publication No. WO2012/169800 to Seo et al. (“Seo-800”) at [0058], [0077], [0085], [0086], [0087], [0088], [0096], [0097], [0110], [0113], [0115]. 3GPP R4-132283: EPDCCH impact on UE demodulation performance – EPDCCH test scenarios at 3-6. 3GPP R1-125404: Change Request – 36.213 at 34-35, 119.
2[d]	the downlink control information comprises information on the number of the plurality of subframes.	International Publication No. WO 2015/018075 to Zhuang et al. (“Zhuang”). <i>See</i> Exhibit J-01. U.S. Patent Application Publication No. 2014/0161084 to Yang et al. (“Yang-084”). <i>See</i> Exhibit J-02. European Patent Application Publication No. EP 2,835,990 to Baker et al. (“Baker”). <i>See</i> Exhibit J-03.

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Claim Language	Disclosed Art
	U.S. Patent Application Publication No. 2011/0222491 to Vajapeyam et al. (“Vajapeyam”). <i>See</i> Exhibit J-04. U.S. Patent Application Publication No. 2012/0028668 to Lee et al. (“Lee-668”). <i>See</i> Exhibit J-05. U.S. Patent Application Publication No. 2012/0122825 to Lee et al. (“Lee-825”). <i>See</i> Exhibit J-06. U.S. Patent Application Publication No. 2014/0071915 to Papasakellariou et al. (“Papasakellariou-915”). <i>See</i> Exhibit J-07. U.S. Patent Application Publication No. 2012/0320782 to Seo et al. (“Seo-782”) at Abstract, [0001], [0002], [0003], [0004], [0005], [0007], [0045], [0046], [0051], [0053], [0157], [0255], [0257], [0259], [0260], Fig. 1, Fig. 2, Fig. 4, Fig. 5, Fig. 6, Fig. 7, Fig. 8, Fig. 10, Fig. 11, Fig. 16, Fig. 17, Fig. 28, Fig. 29. U.S. Patent Application Publication No. 2013/0114570 to Park et al. (“Park-570”) at Abstract, [0079], [0081], [0082], [0083], [0084], [0086], [0180], [0181], Table 1, Fig. 1, Fig. 2, Fig. 3, Fig. 6, Fig. 7, Fig. 8, Fig. 9. U.S. Patent Application Publication No. 2013/0301542 to Krishnamurthy et al. (“Krishnamurthy”) at [0043], [0053], [0055], [0057]. U.S. Patent Application Publication No. 2016/0353420 to You et al. (“You”) at Abstract, [0001], [0002], [0003], [0005], [0007], [0008], [0009], [0010], [0011], [0012], [0013], [0014], [0015], [0043], [0044], [0045], [0046], [0047], [0048], [0049], [0052], [0053], [0054], [0057], [0058], [0059], [0080], [0081], [0082], [0083], [0084], [0085], [0086], [0087], [0114], [0115], [0117], [0124], [0125], [0127], [0128], [0129], [0130], [0131], [0144], [0145], [0146], [0147], [0148], [0149], [0150], [0151], [0152], [0153], [0154], [0155], [0156], [0157], [0158], [0159], [0160], [0161], [0162], [0173], [0174], [0175],

Invalidity of U.S. Patent 9,894,644		
Claim Language		Disclosed Art
		[0176], [0223], [0224], [0225], [0226], [0227], [0228], [0229], [0230], [0235], [0236], [0237], [0238], [0239], Fig. 1, Fig. 2, Fig. 3, Fig. 4, Fig. 5, Fig. 6, Fig. 7, Fig. 8, Fig. 9, Fig. 10, Fig. 11, Fig. 12, Fig. 13, Fig. 14, Fig. 15, Fig. 16, Fig. 17, Fig. 18, Fig. 19, Fig. 20. European Patent Application Publication No. 2,337,260 to Kim et al. (“Kim-260”) at Abstract, [0001], [0002], [0013], [0014], [0016], [0017], [0021], [0025], [0028], [0032], [0044], [0045], [0048], Fig. 1, Fig. 2. International Application Publication No. WO2012/173432 to Kim et al. (“Kim-432”) at Abstract, [0002], [0004], [0005], [0007], [0008], [0009], [0011], [0012], [0062], [0073], [0074], [0075], [0076], [0077], [0078]-[0085], [0087], [0089], [0090], [0091], [0092], [0093], [0098], [0099], [0271], [0272], [0275], [0276], [0152], Fig. 2, Fig. 5, Fig. 6, Fig. 7, Fig. 8, Fig. 9. International Application Publication No. WO2012/169800 to Seo et al. (“Seo-800”) at [0046], [0058], [0065], [0078], [0090], [0093], [0106], [0107], [0110], [0113], Fig. 1, Fig. 2, Fig. 3, Fig. 4, Fig. 5, Fig. 6. 3GPP R1-132973: Coverage enhancement for (E)PDCCH at 1-2. 3GPP R1-130938: PBCH coverage extension for MTC devices at 1-4.

3. Claim 3

Invalidity of U.S. Patent 9,894,644		
Claim Language		Disclosed Art
3[pre]	A terminal for receiving downlink control information through downlink control	International Publication No. WO 2015/018075 to Zhuang et al. (“Zhuang”). <i>See</i> Exhibit J-01.

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Claim Language	Disclosed Art
channels repeatedly allocated in plurality of subframes, the terminal comprising:	U.S. Patent Application Publication No. 2014/0161084 to Yang et al. (“Yang-084”). <i>See</i> Exhibit J-02. European Patent Application Publication No. EP 2,835,990 to Baker et al. (“Baker”). <i>See</i> Exhibit J-03. U.S. Patent Application Publication No. 2011/0222491 to Vajapeyam et al. (“Vajapeyam”). <i>See</i> Exhibit J-04. U.S. Patent Application Publication No. 2012/0028668 to Lee et al. (“Lee-668”). <i>See</i> Exhibit J-05. U.S. Patent Application Publication No. 2012/0122825 to Lee et al. (“Lee-825”). <i>See</i> Exhibit J-06. U.S. Patent Application Publication No. 2014/0071915 to Papasakellariou et al. (“Papasakellariou-915”). <i>See</i> Exhibit J-07. U.S. Patent Application Publication No. 2012/0320782 to Seo et al. (“Seo-782”) at Abstract, [0001], [0002], [0003], [0004], [0005], [0007], [0045], [0046], [0051], [0053], [0157], [0255], [0257], [0259], [0260], Fig. 1, Fig. 2, Fig. 4, Fig. 5, Fig. 6, Fig. 7, Fig. 8, Fig. 10, Fig. 11, Fig. 16, Fig. 17, Fig. 28, Fig. 29. U.S. Patent Application Publication No. 2013/0114570 to Park et al. (“Park-570”) at Abstract, [0079], [0081], [0082], [0083], [0084], [0086], [0180], [0181], Table 1, Fig. 1, Fig. 2, Fig. 3, Fig. 6, Fig. 7, Fig. 8, Fig. 9. U.S. Patent Application Publication No. 2013/0301542 to Krishnamurthy et al. (“Krishnamurthy”) at [0043], [0053], [0055], [0057].

Invalidity of U.S. Patent 9,894,644	
Claim Language	Disclosed Art
	U.S. Patent Application Publication No. 2016/0353420 to You et al. (“You”) at Abstract, [0001], [0002], [0003], [0005], [0007], [0008], [0009], [0010], [0011], [0012], [0013], [0014], [0015], [0043], [0044], [0045], [0046], [0047], [0048], [0049], [0052], [0053], [0054], [0057], [0058], [0059], [0080], [0081], [0082], [0083], [0084], [0085], [0086], [0087], [0114], [0115], [0117], [0124], [0125], [0127], [0128], [0129], [0130], [0131], [0144], [0145], [0146], [0147], [0148], [0149], [0150], [0151], [0152], [0153], [0154], [0155], [0156], [0157], [0158], [0159], [0160], [0161], [0162], [0173], [0174], [0175], [0176], [0223], [0224], [0225], [0226], [0227], [0228], [0229], [0230], [0235], [0236], [0237], [0238], [0239], Fig. 1, Fig. 2, Fig. 3, Fig. 4, Fig. 5, Fig. 6, Fig. 7, Fig. 8, Fig. 9, Fig. 10, Fig. 11, Fig. 12, Fig. 13, Fig. 14, Fig. 15, Fig. 16, Fig. 17, Fig. 18, Fig. 19, Fig. 20. European Patent Application Publication No. 2,337,260 to Kim et al. (“Kim-260”) at Abstract, [0001], [0002], [0013], [0014], [0016], [0017], [0021], [0025], [0028], [0032], [0044], [0045], [0048], Fig. 1, Fig. 2. International Application Publication No. WO2012/173432 to Kim et al. (“Kim-432”) at Abstract, [0002], [0004], [0005], [0007], [0008], [0009], [0011], [0012], [0062], [0073], [0074], [0075], [0076], [0077], [0078]-[0085], [0087], [0089], [0090], [0091], [0092], [0093], [0098], [0099], [0271], [0272], [0275], [0276], [0152], Fig. 2, Fig. 5, Fig. 6, Fig. 7, Fig. 8, Fig. 9. International Application Publication No. WO2012/169800 to Seo et al. (“Seo-800”) at [0046], [0058], [0065], [0078], [0090], [0093], [0106], [0107], [0110], [0113], Fig. 1, Fig. 2, Fig. 3, Fig. 4, Fig. 5, Fig. 6. 3GPP TS 22.368 V12.2.0: Service Requirements for Machine-Type Communications §§ 1-7 (2013-03). 3GPP R1-132973: Coverage enhancement for (E)PDCCH at 1-2. 3GPP R1-130938: PBCH coverage extension for MTC devices at 1-4.

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Claim Language		Disclosed Art
		3GPP TS 36.213 V9.1.0 at § 9.
3[a]	a receiver configured to receive configuration information comprising information on a start subframe of the plurality of subframes through higher layer signaling, to receive the downlink control channels repeatedly allocated in the plurality of subframes, and to combine the received downlink control channels based on the configuration information; and	International Publication No. WO 2015/018075 to Zhuang et al. (“Zhuang”). <i>See</i> Exhibit J-01. U.S. Patent Application Publication No. 2014/0161084 to Yang et al. (“Yang-084”). <i>See</i> Exhibit J-02. European Patent Application Publication No. EP 2,835,990 to Baker et al. (“Baker”). <i>See</i> Exhibit J-03. U.S. Patent Application Publication No. 2011/0222491 to Vajapeyam et al. (“Vajapeyam”). <i>See</i> Exhibit J-04. U.S. Patent Application Publication No. 2012/0028668 to Lee et al. (“Lee-668”). <i>See</i> Exhibit J-05. U.S. Patent Application Publication No. 2012/0122825 to Lee et al. (“Lee-825”). <i>See</i> Exhibit J-06. U.S. Patent Application Publication No. 2014/0071915 to Papasakellariou et al. (“Papasakellariou-915”). <i>See</i> Exhibit J-07. U.S. Patent Application Publication No. 2012/0320782 to Seo et al. (“Seo-782”) at Abstract, [0001], [0002], [0003], [0004], [0005], [0007], [0045], [0046], [0051], [0053], [0157], [0255], [0257], [0259], [0260], Fig. 1, Fig. 2, Fig. 4, Fig. 5, Fig. 6, Fig. 7, Fig. 8, Fig. 10, Fig. 11, Fig. 16, Fig. 17, Fig. 28, Fig. 29. U.S. Patent Application Publication No. 2013/0114570 to Park et al. (“Park-570”) at [0017], [0021], [0026], [0039], [0079], [0081], [0082], [0083], [0084], [0086], [0118],

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Claim Language	Disclosed Art
	[0120], [0132], [0133], [0139], [0140], [0143], [0144], [0152], [0154], [0159], [0176], [0179], [0180], [0181], [0183], [0190], Table 1, Fig. 1, Fig. 2, Fig. 3, Fig. 6, Fig. 7, Fig. 8, Fig. 9. U.S. Patent Application Publication No. 2013/0301542 to Krishnamurthy et al. (“Krishnamurthy”) at [0023], [0043], [0046], [0048], [0050], [0052], [0053], [0055], [0057], [0061], [0062], [0063], [0087], [0113], Fig. 1, Fig. 2, Fig. 3, Fig. 4, Fig. 5, Fig. 6. U.S. Patent Application Publication No. 2016/0353420 to You et al. (“You”) at Abstract, [0001], [0002], [0003], [0005], [0007], [0008], [0009], [0010], [0011], [0012], [0013], [0014], [0015], [0043], [0044], [0045], [0046], [0047], [0048], [0049], [0052], [0053], [0054], [0057], [0058], [0059], [0080], [0081], [0082], [0083], [0084], [0085], [0086], [0087], [0114], [0115], [0117], [0124], [0125], [0127], [0128], [0129], [0130], [0131], [0144], [0145], [0146], [0147], [0148], [0149], [0150], [0151], [0152], [0153], [0154], [0155], [0156], [0157], [0158], [0159], [0160], [0161], [0162], [0173], [0174], [0175], [0176], [0223], [0224], [0225], [0226], [0227], [0228], [0229], [0230], [0235], [0236], [0237], [0238], [0239], Fig. 1, Fig. 2, Fig. 3, Fig. 4, Fig. 5, Fig. 6, Fig. 7, Fig. 8, Fig. 9, Fig. 10, Fig. 11, Fig. 12, Fig. 13, Fig. 14, Fig. 15, Fig. 16, Fig. 17, Fig. 18, Fig. 19, Fig. 20. European Patent Application Publication No. 2,337,260 to Kim et al. (“Kim-260”) at Abstract, [0001], [0002], [0013], [0014], [0016], [0017], [0021], [0025], [0028], [0031], [0032], [0044], [0045], [0048], Fig. 1, Fig. 2. International Application Publication No. WO2012/173432 to Kim et al. (“Kim-432”) at Abstract, [0002], [0004], [0005], [0007], [0008], [0009], [0011], [0012], [0062], [0073], [0074], [0075], [0076], [0077], [0078]-[0085], [0087], [0089], [0090], [0091], [0092], [0093], [0098], [0099], [0271], [0272], [0275], [0276], [0152], Fig. 2, Fig. 5, Fig. 6, Fig. 7, Fig. 8, Fig. 9.

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Claim Language		Disclosed Art
		International Application Publication No. WO2012/169800 to Seo et al. (“Seo-800”) at [0046], [0058], [0077], [0065], [0078], [0085], [0086], [0087], [0088], [0096], [0097], [0090], [0093], [0106], [0107], [0110], [0113], [0115]. 3GPP R1-132973: Coverage enhancement for (E)PDCCH at 1-2. 3GPP R4-132283: EPDCCH impact on UE demodulation performance – EPDCCH test scenarios at 3-6. 3GPP R1-125404: Change Request – 36.213 at 34-35, 119. 3GPP R1-130938: PBCH coverage extension for MTC devices at 1-4. 3GPP TS 36.213 V9.1.0 at § 9.
3[b]	a controller configured to extract downlink control information from the combined downlink control channels,	International Publication No. WO 2015/018075 to Zhuang et al. (“Zhuang”). <i>See</i> Exhibit J-01. U.S. Patent Application Publication No. 2014/0161084 to Yang et al. (“Yang-084”). <i>See</i> Exhibit J-02. European Patent Application Publication No. EP 2,835,990 to Baker et al. (“Baker”). <i>See</i> Exhibit J-03. U.S. Patent Application Publication No. 2011/0222491 to Vajapeyam et al. (“Vajapeyam”). <i>See</i> Exhibit J-04. U.S. Patent Application Publication No. 2012/0028668 to Lee et al. (“Lee-668”). <i>See</i> Exhibit J-05.

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Claim Language		Disclosed Art
		U.S. Patent Application Publication No. 2012/0122825 to Lee et al. (“Lee-825”). <i>See</i> Exhibit J-06. U.S. Patent Application Publication No. 2014/0071915 to Papasakellariou et al. (“Papasakellariou-915”). <i>See</i> Exhibit J-07. U.S. Patent Application Publication No. 2012/0320782 to Seo et al. (“Seo-782”) at Abstract, [0001], [0002], [0003], [0004], [0005], [0007], [0045], [0046], [0051], [0053], [0083], [0157], [0185], [0186], [0189], [0234], [0238], [0251], [0253], [0254], [0255], [0257], [0259], [0260], Fig. 1, Fig. 2, Fig. 4, Fig. 5, Fig. 6, Fig. 7, Fig. 8, Fig. 10, Fig. 11, Fig. 16, Fig. 17, Fig. 28, Fig. 29. U.S. Patent Application Publication No. 2013/0114570 to Park et al. (“Park-570”) at Abstract, [0079], [0081], [0082], [0083], [0084], [0086], [0180], [0181], Table 1, Fig. 1, Fig. 2, Fig. 3, Fig. 6, Fig. 7, Fig. 8, Fig. 9. U.S. Patent Application Publication No. 2013/0301542 to Krishnamurthy et al. (“Krishnamurthy”) at [0043], [0053], [0055], [0057]. U.S. Patent Application Publication No. 2016/0353420 to You et al. (“You”) at Abstract, [0001], [0002], [0003], [0005], [0007], [0008], [0009], [0010], [0011], [0012], [0013], [0014], [0015], [0043], [0044], [0045], [0046], [0047], [0048], [0049], [0052], [0053], [0054], [0057], [0058], [0059], [0080], [0081], [0082], [0083], [0084], [0085], [0086], [0087], [0114], [0115], [0117], [0124], [0125], [0127], [0128], [0129], [0130], [0131], [0144], [0145], [0146], [0147], [0148], [0149], [0150], [0151], [0152], [0153], [0154], [0155], [0156], [0157], [0158], [0159], [0160], [0161], [0162], [0173], [0174], [0175], [0176], [0223], [0224], [0225], [0226], [0227], [0228], [0229], [0230], [0235], [0236], [0237], [0238], [0239], Fig. 1, Fig. 2, Fig. 3, Fig. 4, Fig. 5, Fig. 6, Fig. 7, Fig. 8, Fig. 9, Fig. 10, Fig. 11, Fig. 12, Fig. 13, Fig. 14, Fig. 15, Fig. 16, Fig. 17, Fig. 18, Fig. 19, Fig. 20.

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Claim Language		Disclosed Art
		European Patent Application Publication No. 2,337,260 to Kim et al. (“Kim-260”) at Abstract, [0001], [0002], [0013], [0014], [0016], [0017], [0021], [0025], [0028], [0032], [0044], [0045], [0048], Fig. 1, Fig. 2. International Application Publication No. WO2012/173432 to Kim et al. (“Kim-432”) at Abstract, [0002], [0004], [0005], [0007], [0008], [0009], [0011], [0012], [0062], [0073], [0074], [0075], [0076], [0077], [0078]-[0085], [0087], [0089], [0090], [0091], [0092], [0093], [0098], [0099], [0271], [0272], [0275], [0276], [0152], Fig. 2, Fig. 5, Fig. 6, Fig. 7, Fig. 8, Fig. 9. International Application Publication No. WO2012/169800 to Seo et al. (“Seo-800”) at [0046], [0058], [0065], [0078], [0090], [0093], [0106], [0107], [0110], [0113], Fig. 1, Fig. 2, Fig. 3, Fig. 4, Fig. 5, Fig. 6. 3GPP R1-132973: Coverage enhancement for (E)PDCCH at 1-2. 3GPP R1-130938: PBCH coverage extension for MTC devices at 1-4. 3GPP TS 36.213 V9.1.0 at § 9.
3[c]	wherein the downlink control information comprises information on the number of the plurality of subframes.	International Publication No. WO 2015/018075 to Zhuang et al. (“Zhuang”). <i>See Exhibit J-01.</i> U.S. Patent Application Publication No. 2014/0161084 to Yang et al. (“Yang-084”). <i>See Exhibit J-02.</i> European Patent Application Publication No. EP 2,835,990 to Baker et al. (“Baker”). <i>See Exhibit J-03.</i> U.S. Patent Application Publication No. 2011/0222491 to Vajapeyam et al. (“Vajapeyam”). <i>See Exhibit J-04.</i>

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Claim Language		Disclosed Art
		U.S. Patent Application Publication No. 2012/0028668 to Lee et al. (“Lee-668”). <i>See</i> Exhibit J-05. U.S. Patent Application Publication No. 2012/0122825 to Lee et al. (“Lee-825”). <i>See</i> Exhibit J-06. U.S. Patent Application Publication No. 2014/0071915 to Papasakellariou et al. (“Papasakellariou-915”). <i>See</i> Exhibit J-07. U.S. Patent Application Publication No. 2012/0320782 to Seo et al. (“Seo-782”) at Abstract, [0001], [0002], [0003], [0004], [0005], [0007], [0045], [0046], [0051], [0053], [0157], [0255], [0257], [0259], [0260], Fig. 1, Fig. 2, Fig. 4, Fig. 5, Fig. 6, Fig. 7, Fig. 8, Fig. 10, Fig. 11, Fig. 16, Fig. 17, Fig. 28, Fig. 29. U.S. Patent Application Publication No. 2013/0114570 to Park et al. (“Park-570”) at Abstract, [0079], [0081], [0082], [0083], [0084], [0086], [0180], [0181], Table 1, Fig. 1, Fig. 2, Fig. 3, Fig. 6, Fig. 7, Fig. 8, Fig. 9. U.S. Patent Application Publication No. 2013/0301542 to Krishnamurthy et al. (“Krishnamurthy”) at [0043], [0053], [0055], [0057]. U.S. Patent Application Publication No. 2016/0353420 to You et al. (“You”) at Abstract, [0001], [0002], [0003], [0005], [0007], [0008], [0009], [0010], [0011], [0012], [0013], [0014], [0015], [0043], [0044], [0045], [0046], [0047], [0048], [0049], [0052], [0053], [0054], [0057], [0058], [0059], [0080], [0081], [0082], [0083], [0084], [0085], [0086], [0087], [0114], [0115], [0117], [0124], [0125], [0127], [0128], [0129], [0130], [0131], [0144], [0145], [0146], [0147], [0148], [0149], [0150], [0151], [0152], [0153], [0154], [0155], [0156], [0157], [0158], [0159], [0160], [0161], [0162], [0173], [0174], [0175], [0176], [0223], [0224], [0225], [0226], [0227], [0228], [0229], [0230], [0235], [0236],

Invalidity of U.S. Patent 9,894,644	
Claim Language	Disclosed Art
	[0237], [0238], [0239], Fig. 1, Fig. 2, Fig. 3, Fig. 4, Fig. 5, Fig. 6, Fig. 7, Fig. 8, Fig. 9, Fig. 10, Fig. 11, Fig. 12, Fig. 13, Fig. 14, Fig. 15, Fig. 16, Fig. 17, Fig. 18, Fig. 19, Fig. 20. European Patent Application Publication No. 2,337,260 to Kim et al. (“Kim-260”) at Abstract, [0001], [0002], [0013], [0014], [0016], [0017], [0021], [0025], [0028], [0032], [0044], [0045], [0048], Fig. 1, Fig. 2. International Application Publication No. WO2012/173432 to Kim et al. (“Kim-432”) at Abstract, [0002], [0004], [0005], [0007], [0008], [0009], [0011], [0012], [0062], [0073], [0074], [0075], [0076], [0077], [0078]-[0085], [0087], [0089], [0090], [0091], [0092], [0093], [0098], [0099], [0271], [0272], [0275], [0276], [0152], Fig. 2, Fig. 5, Fig. 6, Fig. 7, Fig. 8, Fig. 9. International Application Publication No. WO2012/169800 to Seo et al. (“Seo-800”) at [0046], [0058], [0065], [0078], [0090], [0093], [0106], [0107], [0110], [0113], Fig. 1, Fig. 2, Fig. 3, Fig. 4, Fig. 5, Fig. 6. 3GPP R1-132973: Coverage enhancement for (E)PDCCH at 1-2. 3GPP R1-130938: PBCH coverage extension for MTC devices at 1-4.

APPENDIX K

Invalidity of U.S. Patent No. 10,009,161 (“’196 Patent”) Obvious Combinations

1. Claim 1

Invalidity of U.S. Patent 10,009,161		
Claim Language		Disclosed Art
1[pre]	A method for transmitting channel state information by a User Equipment (UE), the method comprising:	CQI/MCS Table Design for 256QAM (R1-140034) (“Huawei 034”); <i>See</i> Exhibit K-1. Further Details on CQI Table Design (R1-141529) (“Nokia 529”); <i>See</i> Exhibit K-2. WO2014/194681 to Xia et. al. (“Xia 681”); <i>See</i> Exhibit K-3. U.S. Patent Appl. Pub. No. 2014/0192732 to Chen et. al. (“Chen 732”); <i>See</i> Exhibit K-4. U.S. Patent No. 9,860,091 to Larson et. al. (“Larson 091”); <i>See</i> Exhibit K-5. WO2015/103630 to Kwon et. al. (“Kwon 630”); <i>See</i> Exhibit K-6. Further Discussion on CQI/MCS Table Design for 256QAM (R1-141120) (“Huawei 120”); <i>See</i> Exhibit K-7. 3GPP TS 36.213 V12.0.0 (2013-12) (“TS 36.213”); <i>See</i> Exhibit K-8. <i>See also, e.g.,</i> LTE Book at 652; Kim 201 at [0134];

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Claim Language		Disclosed Art
		Wang 773 at [0002]; Xu 784 at cl. 5; Li, N. et al., Extendable CQI Table Design for Higher Order Modulation in LTE Downlink Transmission, IEEE/CIC ICC 2015 Symposium on Communication and Control Theory (“Li”) at Fig. 2; Hammarwall at [0035].
1[a]	receiving a reference signal for measuring channel quality from a base station;	CQI/MCS Table Design for 256QAM (R1-140034) (“Huawei 034”); <i>See</i> Exhibit K-1. Further Details on CQI Table Design (R1-141529) (“Nokia 529”); <i>See</i> Exhibit K-2. WO2014/194681 to Xia et. al. (“Xia 681”); <i>See</i> Exhibit K-3. U.S. Patent Appl. Pub. No. 2014/0192732 to Chen et. al. (“Chen 732”); <i>See</i> Exhibit K-4. U.S. Patent No. 9,860,091 to Larson et. al. (“Larson 091”); <i>See</i> Exhibit K-5. WO2015/103630 to Kwon et. al. (“Kwon 630”); <i>See</i> Exhibit K-6. Further Discussion on CQI/MCS Table Design for 256QAM (R1-141120) (“Huawei 120”); <i>See</i> Exhibit K-7. 3GPP TS 36.213 V12.0.0 (2013-12) (“TS 36.213”); <i>See</i> Exhibit K-8.

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Claim Language		Disclosed Art
		<i>See also, e.g.,</i> LTE Book; Enescu 845 at 7:54-59; Kim 201 at FIG. 18, [0164]; Wang 773 at [0002]; Li at FIG. 2; Hammarwall at [0035].
1[b]	measuring the channel quality based on the reference signal, and selecting a channel quality indicator (CQI) index value from a predetermined CQI index table including CQI index values for 256 quadrature amplitude modulation (QAM) modulation, based on the measurement result of the channel quality; and	CQI/MCS Table Design for 256QAM (R1-140034) (“Huawei 034”); <i>See</i> Exhibit K-1. Further Details on CQI Table Design (R1-141529) (“Nokia 529”); <i>See</i> Exhibit K-2. WO2014/194681 to Xia et. al. (“Xia 681”); <i>See</i> Exhibit K-3. U.S. Patent Appl. Pub. No. 2014/0192732 to Chen et. al. (“Chen 732”); <i>See</i> Exhibit K-4. U.S. Patent No. 9,860,091 to Larson et. al. (“Larson 091”); <i>See</i> Exhibit K-5. WO2015/103630 to Kwon et. al. (“Kwon 630”); <i>See</i> Exhibit K-6. Further Discussion on CQI/MCS Table Design for 256QAM (R1-141120) (“Huawei 120”); <i>See</i> Exhibit K-7.

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Claim Language		Disclosed Art
		3GPP TS 36.213 V12.0.0 (2013-12) (“TS 36.213”); <i>See</i> Exhibit K-8. <i>See also, e.g.,</i> LTE Book; Enescu 845 at 7:54-59; Kim 201 at FIG. 18, [0164]; Hammarwall at [0035]; Mu at 3; Kwon 630 at [056]; Wang 773 at [0002]; Xia 244 at [0003]; Huawei 033 at 4 (Table 1); Alcatel 058 at 1-2 (Table 1); FiberHome 366 at 2 (Table 1); Qualcomm 451 at 2 (Table 2); ZTE 258 at 3 (Table 1); Alcatel 160 at 4 (Table 3);

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		Hitachi 521 at 2 (Table 2); Broadcom 609at 1-2 (Table 3(b)); Ericsson 753 at 102 (Table 1(b)); ZTE 136 at 3-4 (Table 2); Huawei 034 at 4 (Table 1); Xu 784 at Table 3; Olsson at Table 4; Intel 118 at 5; Li at FIG. 2; Nokia 555.
1[c]	transmitting channel state information including the selected CQI index value to the base station,	CQI/MCS Table Design for 256QAM (R1-140034) (“Huawei 034”); <i>See</i> Exhibit K-1. Further Details on CQI Table Design (R1-141529) (“Nokia 529”); <i>See</i> Exhibit K-2. WO2014/194681 to Xia et. al. (“Xia 681”); <i>See</i> Exhibit K-3. U.S. Patent Appl. Pub. No. 2014/0192732 to Chen et. al. (“Chen 732”); <i>See</i> Exhibit K-4.

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Claim Language		Disclosed Art
		U.S. Patent No. 9,860,091 to Larson et. al. (“Larson 091”); <i>See</i> Exhibit K-5. WO2015/103630 to Kwon et. al. (“Kwon 630”); <i>See</i> Exhibit K-6. Further Discussion on CQI/MCS Table Design for 256QAM (R1-141120) (“Huawei 120”); <i>See</i> Exhibit K-7. 3GPP TS 36.213 V12.0.0 (2013-12) (“TS 36.213”); <i>See</i> Exhibit K-8. <i>See also, e.g.,</i> LTE Book at 662-665; Enescu 845 at 7:54-59; Kim 201 at [0134]; Xu 784 at cl. 5; Li at FIG. 2; Xia 422 at [0003].
1[d]	wherein: the CQI index table includes three CQI index values for QPSK modulation, three CQI index values for 16QAM modulation, five CQI index values for 64QAM modulation, and four CQI	CQI/MCS Table Design for 256QAM (R1-140034) (“Huawei 034”); <i>See</i> Exhibit K-1. Further Details on CQI Table Design (R1-141529) (“Nokia 529”); <i>See</i> Exhibit K-2. WO2014/194681 to Xia et. al. (“Xia 681”); <i>See</i> Exhibit K-3. U.S. Patent Appl. Pub. No. 2014/0192732 to Chen et. al. (“Chen 732”); <i>See</i> Exhibit

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	index values for 256QAM modulation;	K-4. U.S. Patent No. 9,860,091 to Larson et. al. (“Larson 091”); <i>See</i> Exhibit K-5. WO2015/103630 to Kwon et. al. (“Kwon 630”); <i>See</i> Exhibit K-6. Further Discussion on CQI/MCS Table Design for 256QAM (R1-141120) (“Huawei 120”); <i>See</i> Exhibit K-7. 3GPP TS 36.213 V12.0.0 (2013-12) (“TS 36.213”); <i>See</i> Exhibit K-8. <i>See also, e.g.,</i> Huawei 033 at 4 (Table 1); FiberHome 366 at 2 (Table 1); Intel 118 at 5; Nokia 555; Li at 2; Xia 244 at Table 2.
1[e]	one of the four CQI index values for 256QAM modulation is configured to have one code rate value that supports a same transmission efficiency as a maximum	CQI/MCS Table Design for 256QAM (R1-140034) (“Huawei 034”); <i>See</i> Exhibit K-1. Further Details on CQI Table Design (R1-141529) (“Nokia 529”); <i>See</i> Exhibit K-2. WO2014/194681 to Xia et. al. (“Xia 681”); <i>See</i> Exhibit K-3.

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	transmission efficiency of a CQI index table that excludes CQI index values for 256QAM modulation; and	U.S. Patent Appl. Pub. No. 2014/0192732 to Chen et. al. (“Chen 732”); <i>See</i> Exhibit K-4. U.S. Patent No. 9,860,091 to Larson et. al. (“Larson 091”); <i>See</i> Exhibit K-5. WO2015/103630 to Kwon et. al. (“Kwon 630”); <i>See</i> Exhibit K-6. Further Discussion on CQI/MCS Table Design for 256QAM (R1-141120) (“Huawei 120”); <i>See</i> Exhibit K-7. 3GPP TS 36.213 V12.0.0 (2013-12) (“TS 36.213”); <i>See</i> Exhibit K-8. <i>See also, e.g.,</i> Huawei 033 at 4 (Table 1); FiberHome 366 at 2 (Table 1); Xia 244 at Table 2; LTE Book at 219 (Table 10.1); Mu at 2 (Table 1); FiberHome 366 at 2; FiberHome 366 at 2 (Table 1); Huawei 120 at 5;

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Claim Language		Disclosed Art
		Li at 2; Xia 244 at Table 2.
1[f]	another of the four CQI index values for 256QAM modulation is configured to have another code rate value same as the code rate value having a maximum transmission efficiency of a CQI index table that excludes CQI index values for 256QAM modulation; and	CQI/MCS Table Design for 256QAM (R1-140034) (“Huawei 034”); <i>See</i> Exhibit K-1. Further Details on CQI Table Design (R1-141529) (“Nokia 529”); <i>See</i> Exhibit K-2. WO2014/194681 to Xia et. al. (“Xia 681”); <i>See</i> Exhibit K-3. U.S. Patent Appl. Pub. No. 2014/0192732 to Chen et. al. (“Chen 732”); <i>See</i> Exhibit K-4. U.S. Patent No. 9,860,091 to Larson et. al. (“Larson 091”); <i>See</i> Exhibit K-5. WO2015/103630 to Kwon et. al. (“Kwon 630”); <i>See</i> Exhibit K-6. Further Discussion on CQI/MCS Table Design for 256QAM (R1-141120) (“Huawei 120”); <i>See</i> Exhibit K-7. 3GPP TS 36.213 V12.0.0 (2013-12) (“TS 36.213”); <i>See</i> Exhibit K-8. <i>See also, e.g.,</i> Mu at 4 (Table IV); FiberHome 366 at 2 (Table 1); Qualcomm 451 at 2 (Table 2);

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Claim Language		Disclosed Art
		Alcatel 160 at 4 (Table 3); Hitachi 521 at 2 (Table 2); Chen 732 at FIG. 4; Li at 2; Olsson at Table 4
1[g]	wherein: the one code rate value of the one of the four CQI index values for 256QAM modulation is calculated to be 711 using “code rate×1024,”	CQI/MCS Table Design for 256QAM (R1-140034) (“Huawei 034”); <i>See</i> Exhibit K-1. Further Details on CQI Table Design (R1-141529) (“Nokia 529”); <i>See</i> Exhibit K-2. WO2014/194681 to Xia et. al. (“Xia 681”); <i>See</i> Exhibit K-3. U.S. Patent Appl. Pub. No. 2014/0192732 to Chen et. al. (“Chen 732”); <i>See</i> Exhibit K-4. U.S. Patent No. 9,860,091 to Larson et. al. (“Larson 091”); <i>See</i> Exhibit K-5. WO2015/103630 to Kwon et. al. (“Kwon 630”); <i>See</i> Exhibit K-6. Further Discussion on CQI/MCS Table Design for 256QAM (R1-141120) (“Huawei 120”); <i>See</i> Exhibit K-7. 3GPP TS 36.213 V12.0.0 (2013-12) (“TS 36.213”); <i>See</i> Exhibit K-8. <i>See also, e.g.,</i>

Invalidity of U.S. Patent 10,009,161		
Claim Language		Disclosed Art
		Huawei 033 at 4 (Table 1); FiberHome 366 at 2 (Table 1); LTE Book at 219 (Table 10.1); Mu at 2 (Table 1); FiberHome 366 at 2; FiberHome 366 at 2 (Table 1); Huawei 120 at 5; Li at 2.
1[h]	the another code rate value of the another of the four CQI index values for 256QAM modulation is calculated to be 948 using “code rate×1024,” and	CQI/MCS Table Design for 256QAM (R1-140034) (“Huawei 034”); <i>See</i> Exhibit K-1. Further Details on CQI Table Design (R1-141529) (“Nokia 529”); <i>See</i> Exhibit K-2. WO2014/194681 to Xia et. al. (“Xia 681”); <i>See</i> Exhibit K-3. U.S. Patent Appl. Pub. No. 2014/0192732 to Chen et. al. (“Chen 732”); <i>See</i> Exhibit K-4. U.S. Patent No. 9,860,091 to Larson et. al. (“Larson 091”); <i>See</i> Exhibit K-5. WO2015/103630 to Kwon et. al. (“Kwon 630”); <i>See</i> Exhibit K-6.

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Claim Language		Disclosed Art
		Further Discussion on CQI/MCS Table Design for 256QAM (R1-141120) (“Huawei 120”); <i>See</i> Exhibit K-7. 3GPP TS 36.213 V12.0.0 (2013-12) (“TS 36.213”); <i>See</i> Exhibit K-8. <i>See also, e.g.,</i> Mu at 4 (Table IV); FiberHome 366 at 2 (Table 1); Qualcomm 451 at 2 (Table 2); Alcatel 160 at 4 (Table 3); Hitachi 521 at 2 (Table 2); Chen 732 at FIG. 4; Olsson at Table 4; Li at 2.
1[i]	a different another code rate value of a different another of the four CQI index values for 256QAM modulation is calculated to be 797 using “code rate×1024. ”	CQI/MCS Table Design for 256QAM (R1-140034) (“Huawei 034”); <i>See</i> Exhibit K-1. Further Details on CQI Table Design (R1-141529) (“Nokia 529”); <i>See</i> Exhibit K-2. WO2014/194681 to Xia et. al. (“Xia 681”); <i>See</i> Exhibit K-3. U.S. Patent Appl. Pub. No. 2014/0192732 to Chen et. al. (“Chen 732”); <i>See</i> Exhibit

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Claim Language		Disclosed Art
		K-4. U.S. Patent No. 9,860,091 to Larson et. al. (“Larson 091”); <i>See</i> Exhibit K-5. WO2015/103630 to Kwon et. al. (“Kwon 630”); <i>See</i> Exhibit K-6. Further Discussion on CQI/MCS Table Design for 256QAM (R1-141120) (“Huawei 120”); <i>See</i> Exhibit K-7. 3GPP TS 36.213 V12.0.0 (2013-12) (“TS 36.213”); <i>See</i> Exhibit K-8. <i>See also, e.g.,</i> Huawei 033 at 1; FiberHome 366 at 1, 2; ZTE 258 at 2, 8 (Appendix A); Broadcom 609 at 2; Ericsson 753 at 2, 3-4; R1-075069 at 2; Mu at 2, 4; Ding 2011 at 3; Alcatel 058 at 1, 2, 3-7;

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Claim Language		Disclosed Art
		Hitachi 521 at 3; ZTE 136 at 1-4; Huawei 120 at 7-9; Ikuno 2010; Mehlfuhrer 2009 at 1; Mehlfuhrer 2011 at 1; Li at 2; Kitanov (describing Vienna LTE Link Level Simulator).

2. Claim 2

Invalidity of U.S. Patent 10,009,161		
Claim Language		Disclosed Art
2	The method of claim 1, wherein the five CQI index values for 64QAM modulation, respectively, to have same difference within a predetermined error rate, as shown in a table below	CQI/MCS Table Design for 256QAM (R1-140034) (“Huawei 034”); <i>See</i> Exhibit K-1. Further Details on CQI Table Design (R1-141529) (“Nokia 529”); <i>See</i> Exhibit K-2. WO2014/194681 to Xia et. al. (“Xia 681”); <i>See</i> Exhibit K-3. U.S. Patent Appl. Pub. No. 2014/0192732 to Chen et. al. (“Chen 732”); <i>See</i> Exhibit

Invalidity of U.S. Patent 10,009,161																																																								
Claim Language		Disclosed Art																																																						
	<table><tr><th>CQI index</th><th>modulation</th><th>code rate × 1024</th><th>efficiency</th></tr><tr><td>0</td><td></td><td>out of range</td><td></td></tr><tr><td>1</td><td>QPSK</td><td>78</td><td>0.1523</td></tr><tr><td>2</td><td>QPSK</td><td>193</td><td>0.3770</td></tr><tr><td>3</td><td>QPSK</td><td>449</td><td>0.8770</td></tr><tr><td>4</td><td>16QAM</td><td>378</td><td>1.4766</td></tr><tr><td>5</td><td>16QAM</td><td>490</td><td>1.9141</td></tr><tr><td>6</td><td>16QAM</td><td>616</td><td>2.4063</td></tr><tr><td>7</td><td>64QAM</td><td>466</td><td>2.7305</td></tr><tr><td>8</td><td>64QAM</td><td>567</td><td>3.3223</td></tr><tr><td>9</td><td>64QAM</td><td>666</td><td>3.9023</td></tr><tr><td>10</td><td>64QAM</td><td>772</td><td>4.5234</td></tr><tr><td>11</td><td>64QAM</td><td>873</td><td>5.1152</td></tr></table>	CQI index	modulation	code rate × 1024	efficiency	0		out of range		1	QPSK	78	0.1523	2	QPSK	193	0.3770	3	QPSK	449	0.8770	4	16QAM	378	1.4766	5	16QAM	490	1.9141	6	16QAM	616	2.4063	7	64QAM	466	2.7305	8	64QAM	567	3.3223	9	64QAM	666	3.9023	10	64QAM	772	4.5234	11	64QAM	873	5.1152	K-4. U.S. Patent No. 9,860,091 to Larson et. al. (“Larson 091”); <i>See</i> Exhibit K-5. WO2015/103630 to Kwon et. al. (“Kwon 630”); <i>See</i> Exhibit K-6. Further Discussion on CQI/MCS Table Design for 256QAM (R1-141120) (“Huawei 120”); <i>See</i> Exhibit K-7. 3GPP TS 36.213 V12.0.0 (2013-12) (“TS 36.213”); <i>See</i> Exhibit K-8. <i>See also, e.g.,</i> Mu at 4 (Table IV); Huawei 033 at 4 (Table 1); Alcatel 058 at 1-2 (Table 1); FiberHome 366 at 2 (Table 1); Qualcomm 451 at 2 (Table 2); ZTE 258 at 3 (Table 1); Alcatel 160 at 4 (Table 3); Hitachi 521 at 2 (Table 2); Broadcom 609 at 1-2 (Table 3(b));		
CQI index	modulation	code rate × 1024	efficiency																																																					
0		out of range																																																						
1	QPSK	78	0.1523																																																					
2	QPSK	193	0.3770																																																					
3	QPSK	449	0.8770																																																					
4	16QAM	378	1.4766																																																					
5	16QAM	490	1.9141																																																					
6	16QAM	616	2.4063																																																					
7	64QAM	466	2.7305																																																					
8	64QAM	567	3.3223																																																					
9	64QAM	666	3.9023																																																					
10	64QAM	772	4.5234																																																					
11	64QAM	873	5.1152																																																					

Invalidity of U.S. Patent 10,009,161		
Claim Language		Disclosed Art
		Ericsson 753 at 102 (Table 1(b)); ZTE 136 at 3-4 (Table 2); Xu 784 at Table 3; Intel 118 at 5; Nokia 555; Li at 2; Olsson at Table 4

3. Claim 3

Invalidity of U.S. Patent 10,009,161		
Claim Language		Disclosed Art
3[pre]	A method for receiving channel state information by a base station, the method comprising:	CQI/MCS Table Design for 256QAM (R1-140034) (“Huawei 034”); <i>See</i> Exhibit K-1. Further Details on CQI Table Design (R1-141529) (“Nokia 529”); <i>See</i> Exhibit K-2. WO2014/194681 to Xia et. al. (“Xia 681”); <i>See</i> Exhibit K-3. U.S. Patent Appl. Pub. No. 2014/0192732 to Chen et. al. (“Chen 732”); <i>See</i> Exhibit K-4.

Invalidity of U.S. Patent 10,009,161		
Claim Language		Disclosed Art
		U.S. Patent No. 9,860,091 to Larson et. al. (“Larson 091”); <i>See</i> Exhibit K-5. WO2015/103630 to Kwon et. al. (“Kwon 630”); <i>See</i> Exhibit K-6. Further Discussion on CQI/MCS Table Design for 256QAM (R1-141120) (“Huawei 120”); <i>See</i> Exhibit K-7. 3GPP TS 36.213 V12.0.0 (2013-12) (“TS 36.213”); <i>See</i> Exhibit K-8. <i>See also, e.g.,</i> TS 36.213 at 55; LTE Book at 652; Xia 681 at 47; Kim 201 at [0134]; Wang 773 at [0002]; Xu 784 at cl.; Li at FIG. 2; Hammarwall at [0035].
3[a]	creating a reference signal for measuring channel quality;	CQI/MCS Table Design for 256QAM (R1-140034) (“Huawei 034”); <i>See</i> Exhibit K-1. Further Details on CQI Table Design (R1-141529) (“Nokia 529”); <i>See</i> Exhibit K-2.

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Claim Language		Disclosed Art
		WO2014/194681 to Xia et. al. (“Xia 681”); <i>See</i> Exhibit K-3. U.S. Patent Appl. Pub. No. 2014/0192732 to Chen et. al. (“Chen 732”); <i>See</i> Exhibit K-4. U.S. Patent No. 9,860,091 to Larson et. al. (“Larson 091”); <i>See</i> Exhibit K-5. WO2015/103630 to Kwon et. al. (“Kwon 630”); <i>See</i> Exhibit K-6. Further Discussion on CQI/MCS Table Design for 256QAM (R1-141120) (“Huawei 120”); <i>See</i> Exhibit K-7. 3GPP TS 36.213 V12.0.0 (2013-12) (“TS 36.213”); <i>See</i> Exhibit K-8. <i>See also, e.g.,</i> LTE Book; Enescu 845 at 7:54-59; Kim 201 at FIG. 18, [0164], cl. 6; Wang 773 at [0002]; Li at FIG. 2; Hammarwall at [0035].

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Claim Language		Disclosed Art
3[b]	transmitting the reference signal to a User Equipment (UE); and	CQI/MCS Table Design for 256QAM (R1-140034) (“Huawei 034”); <i>See</i> Exhibit K-1. Further Details on CQI Table Design (R1-141529) (“Nokia 529”); <i>See</i> Exhibit K-2. WO2014/194681 to Xia et. al. (“Xia 681”); <i>See</i> Exhibit K-3. U.S. Patent Appl. Pub. No. 2014/0192732 to Chen et. al. (“Chen 732”); <i>See</i> Exhibit K-4. U.S. Patent No. 9,860,091 to Larson et. al. (“Larson 091”); <i>See</i> Exhibit K-5. WO2015/103630 to Kwon et. al. (“Kwon 630”); <i>See</i> Exhibit K-6. Further Discussion on CQI/MCS Table Design for 256QAM (R1-141120) (“Huawei 120”); <i>See</i> Exhibit K-7. 3GPP TS 36.213 V12.0.0 (2013-12) (“TS 36.213”); <i>See</i> Exhibit K-8. <i>See also, e.g.,</i> LTE Book; Enescu 845 at 7:54-59; Kim 201 at FIG. 18, [0164]; Hammarwall at [0035]; Mu at 3;

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Claim Language		Disclosed Art
		Wang 773 at [0002]; Li at FIG. 2.
3[c]	receiving channel state information including a channel quality indicator (CQI) index selected from a predetermined CQI index table including CQI index values for 256 quadrature amplitude modulation (QAM) modulation, based on a measurement result of the channel quality, from the User Equipment,	CQI/MCS Table Design for 256QAM (R1-140034) (“Huawei 034”); <i>See</i> Exhibit K-1. Further Details on CQI Table Design (R1-141529) (“Nokia 529”); <i>See</i> Exhibit K-2. WO2014/194681 to Xia et. al. (“Xia 681”); <i>See</i> Exhibit K-3. U.S. Patent Appl. Pub. No. 2014/0192732 to Chen et. al. (“Chen 732”); <i>See</i> Exhibit K-4. U.S. Patent No. 9,860,091 to Larson et. al. (“Larson 091”); <i>See</i> Exhibit K-5. WO2015/103630 to Kwon et. al. (“Kwon 630”); <i>See</i> Exhibit K-6. Further Discussion on CQI/MCS Table Design for 256QAM (R1-141120) (“Huawei 120”); <i>See</i> Exhibit K-7. 3GPP TS 36.213 V12.0.0 (2013-12) (“TS 36.213”); <i>See</i> Exhibit K-8. <i>See also, e.g.,</i> TS 36.213 ; LTE Book at 662-665 (describing enhanced CSI feedback);

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Claim Language		Disclosed Art
		Enescu 845 at 7:54-59; Kim 201 at [0134], cl. 6; Xu 784 at cl. 5, Table 3; Xia 422 at [0003]; Mu at 4 (Table IV); Huawei 033 at 4 (Table 1); Alcatel 058 at 1-2 (Table 1); FiberHome 366 at 2 (Table 1); Qualcomm 451 at 2 (Table 2); ZTE 258 at 3 (Table 1); Alcatel 160 at 4 (Table 3); Hitachi 521 at 2 (Table 2); Broadcom 609 at 1-2 (Table 3(b)); Ericsson 753 at 102 (Table 1(b)); ZTE 136 at 3-4 (Table 2); Intel 118 at 5;

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Claim Language		Disclosed Art
		Nokia 555; Li at FIG. 2; Olsson at Table 4.
3[d]	wherein: the CQI index table includes three CQI index values for QPSK modulation, three CQI index values for 16QAM modulation, five CQI index values for 64QAM modulation, and four CQI index values for 256QAM modulation;	CQI/MCS Table Design for 256QAM (R1-140034) (“Huawei 034”); <i>See</i> Exhibit K-1. Further Details on CQI Table Design (R1-141529) (“Nokia 529”); <i>See</i> Exhibit K-2. WO2014/194681 to Xia et. al. (“Xia 681”); <i>See</i> Exhibit K-3. U.S. Patent Appl. Pub. No. 2014/0192732 to Chen et. al. (“Chen 732”); <i>See</i> Exhibit K-4. U.S. Patent No. 9,860,091 to Larson et. al. (“Larson 091”); <i>See</i> Exhibit K-5. WO2015/103630 to Kwon et. al. (“Kwon 630”); <i>See</i> Exhibit K-6. Further Discussion on CQI/MCS Table Design for 256QAM (R1-141120) (“Huawei 120”); <i>See</i> Exhibit K-7. 3GPP TS 36.213 V12.0.0 (2013-12) (“TS 36.213”); <i>See</i> Exhibit K-8. <i>See also, e.g.,</i> Huawei 033 at 4 (Table 1); FiberHome 366 at 2 (Table 1);

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Claim Language		Disclosed Art
		Intel 118 at 5; Nokia 555; Li at 2; Xia 244 at Table 2.
3[e]	one of the four CQI index values for 256QAM modulation is configured to have one code rate value that supports a same transmission efficiency as a maximum transmission efficiency of a CQI index table that excludes CQI index values for 256QAM modulation; and	CQI/MCS Table Design for 256QAM (R1-140034) (“Huawei 034”); <i>See</i> Exhibit K-1. Further Details on CQI Table Design (R1-141529) (“Nokia 529”); <i>See</i> Exhibit K-2. WO2014/194681 to Xia et. al. (“Xia 681”); <i>See</i> Exhibit K-3. U.S. Patent Appl. Pub. No. 2014/0192732 to Chen et. al. (“Chen 732”); <i>See</i> Exhibit K-4. U.S. Patent No. 9,860,091 to Larson et. al. (“Larson 091”); <i>See</i> Exhibit K-5. WO2015/103630 to Kwon et. al. (“Kwon 630”); <i>See</i> Exhibit K-6. Further Discussion on CQI/MCS Table Design for 256QAM (R1-141120) (“Huawei 120”); <i>See</i> Exhibit K-7. 3GPP TS 36.213 V12.0.0 (2013-12) (“TS 36.213”); <i>See</i> Exhibit K-8. <i>See also, e.g.,</i> Huawei 033 at 4 (Table 1);

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Claim Language		Disclosed Art
		FiberHome 366 at 2 (Table 1); Xia 244 at Table 2; LTE Book at 219 (Table 10.1); Mu at 2 (Table 1); FiberHome 366 at 2; Huawei 033 at 4 (Table 1); FiberHome 366 at 2 (Table 1); Huawei 120 at 5; Kwon 630 at [0041], Table 5; Li at 2; Xia 244 at Table 2.
3[f]	another of the four CQI index values for 256QAM modulation is configured to have another code rate value same as the code rate value having a maximum transmission efficiency of a CQI index table that excludes	CQI/MCS Table Design for 256QAM (R1-140034) (“Huawei 034”); <i>See</i> Exhibit K-1. Further Details on CQI Table Design (R1-141529) (“Nokia 529”); <i>See</i> Exhibit K-2. WO2014/194681 to Xia et. al. (“Xia 681”); <i>See</i> Exhibit K-3. U.S. Patent Appl. Pub. No. 2014/0192732 to Chen et. al. (“Chen 732”); <i>See</i> Exhibit

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Claim Language		Disclosed Art
	CQI index values for 256QAM modulation; and	K-4. U.S. Patent No. 9,860,091 to Larson et. al. (“Larson 091”); <i>See</i> Exhibit K-5. WO2015/103630 to Kwon et. al. (“Kwon 630”); <i>See</i> Exhibit K-6. Further Discussion on CQI/MCS Table Design for 256QAM (R1-141120) (“Huawei 120”); <i>See</i> Exhibit K-7. 3GPP TS 36.213 V12.0.0 (2013-12) (“TS 36.213”); <i>See</i> Exhibit K-8. <i>See also, e.g.,</i> Mu at 4 (Table IV); FiberHome 366 at 2 (Table 1); Qualcomm 451 at 2 (Table 2); Alcatel 160 at 4 (Table 3); Hitachi 521 at 2 (Table 2); Chen 732 at FIG. 4; Li at 2; Olsson at Table 4
3[g]	wherein: the one code rate value of the one of the four	CQI/MCS Table Design for 256QAM (R1-140034) (“Huawei 034”); <i>See</i> Exhibit K-1.

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Claim Language	Disclosed Art
CQI index values for 256QAM modulation is calculated to be 711 using “code rate $\times$ 1024,”	Further Details on CQI Table Design (R1-141529) (“Nokia 529”); <i>See</i> Exhibit K-2. WO2014/194681 to Xia et. al. (“Xia 681”); <i>See</i> Exhibit K-3. U.S. Patent Appl. Pub. No. 2014/0192732 to Chen et. al. (“Chen 732”); <i>See</i> Exhibit K-4. U.S. Patent No. 9,860,091 to Larson et. al. (“Larson 091”); <i>See</i> Exhibit K-5. WO2015/103630 to Kwon et. al. (“Kwon 630”); <i>See</i> Exhibit K-6. Further Discussion on CQI/MCS Table Design for 256QAM (R1-141120) (“Huawei 120”); <i>See</i> Exhibit K-7. 3GPP TS 36.213 V12.0.0 (2013-12) (“TS 36.213”); <i>See</i> Exhibit K-8. <i>See also, e.g.,</i> Huawei 033 at 4 (Table 1); FiberHome 366 at 2 (Table 1); Xia 244 at Table 2; LTE Book at 219 (Table 10.1); Mu at 2 (Table 1);

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Claim Language		Disclosed Art
		FiberHome 366 at 2 (“the maximum efficiency supported by current CQI table is 5.5547”); Huawei 033 at 4 (Table 1); FiberHome 366 at 2 (Table 1); Huawei 120 at 5; Li at 2; Xia 244 at Table 2.
3[h]	the another code rate value of the another of the four CQI index values for 256QAM modulation is calculated to be 948 using “code rate×1024,” and	CQI/MCS Table Design for 256QAM (R1-140034) (“Huawei 034”); <i>See</i> Exhibit K-1. Further Details on CQI Table Design (R1-141529) (“Nokia 529”); <i>See</i> Exhibit K-2. WO2014/194681 to Xia et. al. (“Xia 681”); <i>See</i> Exhibit K-3. U.S. Patent Appl. Pub. No. 2014/0192732 to Chen et. al. (“Chen 732”); <i>See</i> Exhibit K-4. U.S. Patent No. 9,860,091 to Larson et. al. (“Larson 091”); <i>See</i> Exhibit K-5. WO2015/103630 to Kwon et. al. (“Kwon 630”); <i>See</i> Exhibit K-6. Further Discussion on CQI/MCS Table Design for 256QAM (R1-141120) (“Huawei 120”); <i>See</i> Exhibit K-7.

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Claim Language		Disclosed Art
		3GPP TS 36.213 V12.0.0 (2013-12) (“TS 36.213”); <i>See</i> Exhibit K-8. <i>See also, e.g.,</i> Mu at 4 (Table IV); FiberHome 366 at 2 (Table 1); Qualcomm 451 at 2 (Table 2); Alcatel 160 at 4 (Table 3); Hitachi 521 at 2 (Table 2); Chen 732 at FIG. 4; Li at 2; Olsson at Table 4
3[i]	a different another code rate value of a different another of the four CQI index values for 256QAM modulation is calculated to be 797 using “code rate×1024.”	CQI/MCS Table Design for 256QAM (R1-140034) (“Huawei 034”); <i>See</i> Exhibit K-1. Further Details on CQI Table Design (R1-141529) (“Nokia 529”); <i>See</i> Exhibit K-2. WO2014/194681 to Xia et. al. (“Xia 681”); <i>See</i> Exhibit K-3. U.S. Patent Appl. Pub. No. 2014/0192732 to Chen et. al. (“Chen 732”); <i>See</i> Exhibit K-4. U.S. Patent No. 9,860,091 to Larson et. al. (“Larson 091”); <i>See</i> Exhibit K-5.

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Claim Language		Disclosed Art
		WO2015/103630 to Kwon et. al. (“Kwon 630”); <i>See</i> Exhibit K-6. Further Discussion on CQI/MCS Table Design for 256QAM (R1-141120) (“Huawei 120”); <i>See</i> Exhibit K-7. 3GPP TS 36.213 V12.0.0 (2013-12) (“TS 36.213”); <i>See</i> Exhibit K-8. <i>See also, e.g.,</i> Huawei 033 at 1 (“The sampling is based on equal SINR spacing principle”); FiberHome 366 at 1, 2; ZTE 258 at 2, 3, 8 (Appendix A); Broadcom 609 at 2; Ericsson 753 at 2, 3-4; Mu at 2 (plotting the SINR and spectral efficiency of several modulation orders), 4; Ding 2011 at 3; Alcatel 058 at 1, 2 (Figure 1), 3-7; Hitachi 521 at 3; ZTE 136 at 1-4 (describing system-level simulation evaluating gain after introduction of 256QAM based on certain simulation assumptions and mapping CQI against SNR);

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Claim Language		Disclosed Art
		Huawei 120 at 7-9 (describing simulation results); Ikuno 2010; Mehlfuhrer 2009 at 1; Mehlfuhrer 2011 at 1; Li at 2; Kitanov (describing Vienna LTE Link Level Simulator).

4. Claim 4

Invalidity of U.S. Patent 10,009,161		
Claim Language		Disclosed Art
4	The method of claim 2, wherein the five CQI index values for 64QAM modulation, respectively, to have same difference within a predetermined error rate, as shown in a table below	CQI/MCS Table Design for 256QAM (R1-140034) (“Huawei 034”); <i>See</i> Exhibit K-1. Further Details on CQI Table Design (R1-141529) (“Nokia 529”); <i>See</i> Exhibit K-2. WO2014/194681 to Xia et. al. (“Xia 681”); <i>See</i> Exhibit K-3. U.S. Patent Appl. Pub. No. 2014/0192732 to Chen et. al. (“Chen 732”); <i>See</i> Exhibit K-4. U.S. Patent No. 9,860,091 to Larson et. al. (“Larson 091”); <i>See</i> Exhibit K-5.

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Claim Language		Disclosed Art																																																						
	<table><tr><th>CQI index</th><th>modulation</th><th>code rate × 1024</th><th>efficiency</th></tr><tr><td>0</td><td></td><td>out of range</td><td></td></tr><tr><td>1</td><td>QPSK</td><td>78</td><td>0.1523</td></tr><tr><td>2</td><td>QPSK</td><td>193</td><td>0.3770</td></tr><tr><td>3</td><td>QPSK</td><td>449</td><td>0.8770</td></tr><tr><td>4</td><td>16QAM</td><td>378</td><td>1.4766</td></tr><tr><td>5</td><td>16QAM</td><td>490</td><td>1.9141</td></tr><tr><td>6</td><td>16QAM</td><td>616</td><td>2.4063</td></tr><tr><td>7</td><td>64QAM</td><td>466</td><td>2.7305</td></tr><tr><td>8</td><td>64QAM</td><td>567</td><td>3.3223</td></tr><tr><td>9</td><td>64QAM</td><td>666</td><td>3.9023</td></tr><tr><td>10</td><td>64QAM</td><td>772</td><td>4.5234</td></tr><tr><td>11</td><td>64QAM</td><td>873</td><td>5.1152</td></tr></table>	CQI index	modulation	code rate × 1024	efficiency	0		out of range		1	QPSK	78	0.1523	2	QPSK	193	0.3770	3	QPSK	449	0.8770	4	16QAM	378	1.4766	5	16QAM	490	1.9141	6	16QAM	616	2.4063	7	64QAM	466	2.7305	8	64QAM	567	3.3223	9	64QAM	666	3.9023	10	64QAM	772	4.5234	11	64QAM	873	5.1152	WO2015/103630 to Kwon et. al. (“Kwon 630”); <i>See</i> Exhibit K-6. Further Discussion on CQI/MCS Table Design for 256QAM (R1-141120) (“Huawei 120”); <i>See</i> Exhibit K-7. 3GPP TS 36.213 V12.0.0 (2013-12) (“TS 36.213”); <i>See</i> Exhibit K-8. <i>See also, e.g.,</i> Mu at 4 (Table IV); Huawei 033 at 4 (Table 1); Alcatel 058 at 1-2 (Table 1); FiberHome 366 at 2 (Table 1); Qualcomm 451 at 2 (Table 2); ZTE 258 at 3 (Table 1); Alcatel 160 at 4 (Table 3); Hitachi 521 at 2 (Table 2); Broadcom 609at 1-2 (Table 3(b)); Ericsson 753 at 102 (Table 1(b)); ZTE 136 at 3-4 (Table 2);		
CQI index	modulation	code rate × 1024	efficiency																																																					
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1	QPSK	78	0.1523																																																					
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Claim Language		Disclosed Art
		Huawei 034 at 4 (Table 1); Nokia 529 at 2 (Table 1); Larsson 091 at FIG. 4; Xu 784 at Table 3; Intel 118 at 5; Nokia 555; Li at 2; Olsson at Table 4

5. Claim 5

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Claim Language		Disclosed Art
5[pre]	A User Equipment (UE) for transmitting channel state information, comprising:	CQI/MCS Table Design for 256QAM (R1-140034) (“Huawei 034”); <i>See</i> Exhibit K-1. Further Details on CQI Table Design (R1-141529) (“Nokia 529”); <i>See</i> Exhibit K-2. WO2014/194681 to Xia et. al. (“Xia 681”); <i>See</i> Exhibit K-3. U.S. Patent Appl. Pub. No. 2014/0192732 to Chen et. al. (“Chen 732”); <i>See</i> Exhibit

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Claim Language		Disclosed Art
		K-4. U.S. Patent No. 9,860,091 to Larson et. al. (“Larson 091”); <i>See</i> Exhibit K-5. WO2015/103630 to Kwon et. al. (“Kwon 630”); <i>See</i> Exhibit K-6. Further Discussion on CQI/MCS Table Design for 256QAM (R1-141120) (“Huawei 120”); <i>See</i> Exhibit K-7. 3GPP TS 36.213 V12.0.0 (2013-12) (“TS 36.213”); <i>See</i> Exhibit K-8. <i>See also, e.g.,</i> LTE Book at 652; Kim 201 at [0134]; Wang 773 at [0002]; Xu 784 at cl. 5; Li at FIG. 2; Hammarwall at [0035].
5[a]	a receiver configured to receive a reference signal for measuring channel quality from a base station;	CQI/MCS Table Design for 256QAM (R1-140034) (“Huawei 034”); <i>See</i> Exhibit K-1. Further Details on CQI Table Design (R1-141529) (“Nokia 529”); <i>See</i> Exhibit K-2. WO2014/194681 to Xia et. al. (“Xia 681”); <i>See</i> Exhibit K-3.

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Claim Language		Disclosed Art
		U.S. Patent Appl. Pub. No. 2014/0192732 to Chen et. al. (“Chen 732”); <i>See</i> Exhibit K-4. U.S. Patent No. 9,860,091 to Larson et. al. (“Larson 091”); <i>See</i> Exhibit K-5. WO2015/103630 to Kwon et. al. (“Kwon 630”); <i>See</i> Exhibit K-6. Further Discussion on CQI/MCS Table Design for 256QAM (R1-141120) (“Huawei 120”); <i>See</i> Exhibit K-7. 3GPP TS 36.213 V12.0.0 (2013-12) (“TS 36.213”); <i>See</i> Exhibit K-8. <i>See also, e.g.,</i> LTE Book; Enescu 845 at 7:54-59; Kim 201 at FIG. 18, [0164], cl. 6; Wang 773 at [0002]; Li at FIG. 2; Hammarwall at [0035].
5[b]	a controller configured to measure the channel quality based on the reference signal, and select a channel quality	CQI/MCS Table Design for 256QAM (R1-140034) (“Huawei 034”); <i>See</i> Exhibit K-1. Further Details on CQI Table Design (R1-141529) (“Nokia 529”); <i>See</i> Exhibit K-2.

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	indicator (CQI) index value from a predetermined CQI index table including CQI index values for 256 quadrature amplitude modulation (QAM) modulation, based on the measurement result of the channel quality; and	WO2014/194681 to Xia et. al. (“Xia 681”); <i>See</i> Exhibit K-3. U.S. Patent Appl. Pub. No. 2014/0192732 to Chen et. al. (“Chen 732”); <i>See</i> Exhibit K-4. U.S. Patent No. 9,860,091 to Larson et. al. (“Larson 091”); <i>See</i> Exhibit K-5. WO2015/103630 to Kwon et. al. (“Kwon 630”); <i>See</i> Exhibit K-6. Further Discussion on CQI/MCS Table Design for 256QAM (R1-141120) (“Huawei 120”); <i>See</i> Exhibit K-7. 3GPP TS 36.213 V12.0.0 (2013-12) (“TS 36.213”); <i>See</i> Exhibit K-8. <i>See also, e.g.,</i> LTE Book; Enescu 845 at 7:54-59; Kim 201 at FIG. 18, [0164], cl. 6; Hammarwall at [0035]; Mu at 3, 4 (Table IV); Wang 773 at [0002]; Huawei 033 at 4 (Table 1);

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Claim Language		Disclosed Art
		Alcatel 058 at 1-2 (Table 1); FiberHome 366 at 2 (Table 1); Qualcomm 451 at 2 (Table 2); ZTE 258 at 3 (Table 1); Alcatel 160 at 4 (Table 3); Hitachi 521 at 2 (Table 2); Broadcom 609at 1-2 (Table 3(b)); Ericsson 753 at 102 (Table 1(b)); ZTE 136 at 3-4 (Table 2); Huawei 034 at 4 (Table 1); Nokia 529 at 2 (Table 1); Larsson 091 at FIG. 4; Xu 784 at Table 3; Intel 118 at 5; Nokia 555;

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Claim Language		Disclosed Art
		Li at FIG. 2; Olsson at Table 4.
5[c]	a transmitter configured to transmit channel state information including the selected CQI index value to the base station,	CQI/MCS Table Design for 256QAM (R1-140034) (“Huawei 034”); <i>See</i> Exhibit K-1. Further Details on CQI Table Design (R1-141529) (“Nokia 529”); <i>See</i> Exhibit K-2. WO2014/194681 to Xia et. al. (“Xia 681”); <i>See</i> Exhibit K-3. U.S. Patent Appl. Pub. No. 2014/0192732 to Chen et. al. (“Chen 732”); <i>See</i> Exhibit K-4. U.S. Patent No. 9,860,091 to Larson et. al. (“Larson 091”); <i>See</i> Exhibit K-5. WO2015/103630 to Kwon et. al. (“Kwon 630”); <i>See</i> Exhibit K-6. Further Discussion on CQI/MCS Table Design for 256QAM (R1-141120) (“Huawei 120”); <i>See</i> Exhibit K-7. 3GPP TS 36.213 V12.0.0 (2013-12) (“TS 36.213”); <i>See</i> Exhibit K-8. <i>See also, e.g.,</i> LTE Book at 662-665 (describing enhanced CSI feedback); Enescu 845 at 7:54-59; Kim 201 at [0134], cl. 6;

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Claim Language		Disclosed Art
		Xu 784 at cl. 5; Li at FIG. 2; Xia 422 at [0003].
5[d]	wherein: the CQI index table includes three CQI index values for QPSK modulation, three CQI index values for 16QAM modulation, five CQI index values for 64QAM modulation, and four CQI index values for 256QAM modulation;	CQI/MCS Table Design for 256QAM (R1-140034) (“Huawei 034”); <i>See</i> Exhibit K-1. Further Details on CQI Table Design (R1-141529) (“Nokia 529”); <i>See</i> Exhibit K-2. WO2014/194681 to Xia et. al. (“Xia 681”); <i>See</i> Exhibit K-3. U.S. Patent Appl. Pub. No. 2014/0192732 to Chen et. al. (“Chen 732”); <i>See</i> Exhibit K-4. U.S. Patent No. 9,860,091 to Larson et. al. (“Larson 091”); <i>See</i> Exhibit K-5. WO2015/103630 to Kwon et. al. (“Kwon 630”); <i>See</i> Exhibit K-6. Further Discussion on CQI/MCS Table Design for 256QAM (R1-141120) (“Huawei 120”); <i>See</i> Exhibit K-7. 3GPP TS 36.213 V12.0.0 (2013-12) (“TS 36.213”); <i>See</i> Exhibit K-8. <i>See also, e.g.,</i> Huawei 033 at 4 (Table 1); FiberHome 366 at 2 (Table 1);

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Claim Language		Disclosed Art
		Intel 118 at 5; Nokia 555; Li at 2; Xia 244 at Table 2.
5[e]	one of the four CQI index values for 256QAM modulation is configured to have one code rate value that supports a same transmission efficiency as a maximum transmission efficiency of a CQI index table that excludes CQI index values for 256QAM modulation; and	CQI/MCS Table Design for 256QAM (R1-140034) (“Huawei 034”); <i>See</i> Exhibit K-1. Further Details on CQI Table Design (R1-141529) (“Nokia 529”); <i>See</i> Exhibit K-2. WO2014/194681 to Xia et. al. (“Xia 681”); <i>See</i> Exhibit K-3. U.S. Patent Appl. Pub. No. 2014/0192732 to Chen et. al. (“Chen 732”); <i>See</i> Exhibit K-4. U.S. Patent No. 9,860,091 to Larson et. al. (“Larson 091”); <i>See</i> Exhibit K-5. WO2015/103630 to Kwon et. al. (“Kwon 630”); <i>See</i> Exhibit K-6. Further Discussion on CQI/MCS Table Design for 256QAM (R1-141120) (“Huawei 120”); <i>See</i> Exhibit K-7. 3GPP TS 36.213 V12.0.0 (2013-12) (“TS 36.213”); <i>See</i> Exhibit K-8. <i>See also, e.g.,</i> Huawei 033 at 4 (Table 1);

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Claim Language		Disclosed Art
		FiberHome 366 at 2 (Table 1); Xia 244 at Table 2; LTE Book at 219 (Table 10.1); Mu at 2 (Table 1); FiberHome 366 at 2 (“the maximum efficiency supported by current CQI table is 5.5547”); FiberHome 366 at 2 (Table 1); Huawei 120 at 5; Li at 2; Xia 244 at Table 2.
5[f]	another of the four CQI index values for 256QAM modulation is configured to have another code rate value same as the code rate value having a maximum transmission efficiency of a CQI index table that excludes CQI index values for 256QAM modulation; and wherein:	CQI/MCS Table Design for 256QAM (R1-140034) (“Huawei 034”); <i>See</i> Exhibit K-1. Further Details on CQI Table Design (R1-141529) (“Nokia 529”); <i>See</i> Exhibit K-2. WO2014/194681 to Xia et. al. (“Xia 681”); <i>See</i> Exhibit K-3. U.S. Patent Appl. Pub. No. 2014/0192732 to Chen et. al. (“Chen 732”); <i>See</i> Exhibit K-4. U.S. Patent No. 9,860,091 to Larson et. al. (“Larson 091”); <i>See</i> Exhibit K-5. WO2015/103630 to Kwon et. al. (“Kwon 630”); <i>See</i> Exhibit K-6.

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Claim Language		Disclosed Art
		Further Discussion on CQI/MCS Table Design for 256QAM (R1-141120) (“Huawei 120”); <i>See</i> Exhibit K-7. 3GPP TS 36.213 V12.0.0 (2013-12) (“TS 36.213”); <i>See</i> Exhibit K-8. <i>See also, e.g.,</i> Mu at 4 (Table IV); FiberHome 366 at 2 (Table 1); Qualcomm 451 at 2 (Table 2); Alcatel 160 at 4 (Table 3); Hitachi 521 at 2 (Table 2); Chen 732 at FIG. 4; Li at 2; Olsson at Table 4
5[g]	wherein: the one code rate value of the one of the four CQI index values for 256QAM modulation is calculated to be 711 using “code rate×1024,”	CQI/MCS Table Design for 256QAM (R1-140034) (“Huawei 034”); <i>See</i> Exhibit K-1. Further Details on CQI Table Design (R1-141529) (“Nokia 529”); <i>See</i> Exhibit K-2. WO2014/194681 to Xia et. al. (“Xia 681”); <i>See</i> Exhibit K-3. U.S. Patent Appl. Pub. No. 2014/0192732 to Chen et. al. (“Chen 732”); <i>See</i> Exhibit

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Claim Language		Disclosed Art
		K-4. U.S. Patent No. 9,860,091 to Larson et. al. (“Larson 091”); <i>See</i> Exhibit K-5. WO2015/103630 to Kwon et. al. (“Kwon 630”); <i>See</i> Exhibit K-6. Further Discussion on CQI/MCS Table Design for 256QAM (R1-141120) (“Huawei 120”); <i>See</i> Exhibit K-7. 3GPP TS 36.213 V12.0.0 (2013-12) (“TS 36.213”); <i>See</i> Exhibit K-8. <i>See also, e.g.,</i> Huawei 033 at 4 (Table 1); FiberHome 366 at 2 (Table 1); Xia 244 at Table 2; LTE Book at 219 (Table 10.1); Mu at 2 (Table 1); FiberHome 366 at 2 (“the maximum efficiency supported by current CQI table is 5.5547”); FiberHome 366 at 2 (Table 1);

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Claim Language		Disclosed Art
		Huawei 120 at 5 (“The SE (5.5547 should be maintained to reduce impact on Modulation and TBS index/TBS tables,” and “[t]he modulation order of existing CQI index 15 is changed to 256QAM.”); Li at 2; Xia 244 at Table 2.
5[h]	the another code rate value of the another of the four CQI index values for 256QAM modulation is calculated to be 948 using “code rate×1024,” and	CQI/MCS Table Design for 256QAM (R1-140034) (“Huawei 034”); <i>See</i> Exhibit K-1. Further Details on CQI Table Design (R1-141529) (“Nokia 529”); <i>See</i> Exhibit K-2. WO2014/194681 to Xia et. al. (“Xia 681”); <i>See</i> Exhibit K-3. U.S. Patent Appl. Pub. No. 2014/0192732 to Chen et. al. (“Chen 732”); <i>See</i> Exhibit K-4. U.S. Patent No. 9,860,091 to Larson et. al. (“Larson 091”); <i>See</i> Exhibit K-5. WO2015/103630 to Kwon et. al. (“Kwon 630”); <i>See</i> Exhibit K-6. Further Discussion on CQI/MCS Table Design for 256QAM (R1-141120) (“Huawei 120”); <i>See</i> Exhibit K-7. 3GPP TS 36.213 V12.0.0 (2013-12) (“TS 36.213”); <i>See</i> Exhibit K-8. <i>See also, e.g.,</i> Mu at 4 (Table IV);

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		FiberHome 366 at 2 (Table 1); Qualcomm 451 at 2 (Table 2); Alcatel 160 at 4 (Table 3); Hitachi 521 at 2 (Table 2); Chen 732 at FIG. 4; Olsson at Table 4; Li at 2;
5[i]	a different another code rate value of a different another of the four CQI index values for 256QAM modulation is calculated to be 797 using “code rate×1024.”	CQI/MCS Table Design for 256QAM (R1-140034) (“Huawei 034”); <i>See</i> Exhibit K-1. Further Details on CQI Table Design (R1-141529) (“Nokia 529”); <i>See</i> Exhibit K-2. WO2014/194681 to Xia et. al. (“Xia 681”); <i>See</i> Exhibit K-3. U.S. Patent Appl. Pub. No. 2014/0192732 to Chen et. al. (“Chen 732”); <i>See</i> Exhibit K-4. U.S. Patent No. 9,860,091 to Larson et. al. (“Larson 091”); <i>See</i> Exhibit K-5. WO2015/103630 to Kwon et. al. (“Kwon 630”); <i>See</i> Exhibit K-6. Further Discussion on CQI/MCS Table Design for 256QAM (R1-141120) (“Huawei 120”); <i>See</i> Exhibit K-7.

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Claim Language		Disclosed Art
		3GPP TS 36.213 V12.0.0 (2013-12) (“TS 36.213”); <i>See</i> Exhibit K-8. <i>See also, e.g.,</i> Huawei 033 at 1; FiberHome 366 at 1, 2; ZTE 258 at 2, 3, 8 (Appendix A); Broadcom 609 at 2; Ericsson 753 at 2; Mu at 2, 4; Ding 2011 at 3; Alcatel 058 at 1, 2 (Figure 1), 3-7; Hitachi 521 at 3; ZTE 136 at 1-4; Huawei 120 at 7-9; Ikuno 2010; Mehlfuhrer 2009 at 1; Mehlfuhrer 2011 at 1;

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		Li at 2; Kitanov.

6. Claim 6

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Claim Language		Disclosed Art																																																					
6	The User Equipment of claim 5, wherein and five CQI index values for 64QAM modulation, respectively, to have a same difference within a predetermined error rate, as shown in a table below <table><tr><th>CQI index</th><th>modulation</th><th>code rate × 1024</th><th>efficiency</th></tr><tr><td>0</td><td></td><td>out of range</td><td></td></tr><tr><td>1</td><td>QPSK</td><td>78</td><td>0.1523</td></tr><tr><td>2</td><td>QPSK</td><td>193</td><td>0.3770</td></tr><tr><td>3</td><td>QPSK</td><td>449</td><td>0.8770</td></tr><tr><td>4</td><td>16QAM</td><td>378</td><td>1.4766</td></tr><tr><td>5</td><td>16QAM</td><td>490</td><td>1.9141</td></tr><tr><td>6</td><td>16QAM</td><td>616</td><td>2.4063</td></tr><tr><td>7</td><td>64QAM</td><td>466</td><td>2.7305</td></tr><tr><td>8</td><td>64QAM</td><td>567</td><td>3.3223</td></tr><tr><td>9</td><td>64QAM</td><td>666</td><td>3.9023</td></tr><tr><td>10</td><td>64QAM</td><td>772</td><td>4.5234</td></tr><tr><td>11</td><td>64QAM</td><td>873</td><td>5.1152</td></tr></table>	CQI index	modulation	code rate × 1024	efficiency	0		out of range		1	QPSK	78	0.1523	2	QPSK	193	0.3770	3	QPSK	449	0.8770	4	16QAM	378	1.4766	5	16QAM	490	1.9141	6	16QAM	616	2.4063	7	64QAM	466	2.7305	8	64QAM	567	3.3223	9	64QAM	666	3.9023	10	64QAM	772	4.5234	11	64QAM	873	5.1152	CQI/MCS Table Design for 256QAM (R1-140034) (“Huawei 034”); <i>See</i> Exhibit K-1. Further Details on CQI Table Design (R1-141529) (“Nokia 529”); <i>See</i> Exhibit K-2. WO2014/194681 to Xia et. al. (“Xia 681”); <i>See</i> Exhibit K-3. U.S. Patent Appl. Pub. No. 2014/0192732 to Chen et. al. (“Chen 732”); <i>See</i> Exhibit K-4. U.S. Patent No. 9,860,091 to Larson et. al. (“Larson 091”); <i>See</i> Exhibit K-5. WO2015/103630 to Kwon et. al. (“Kwon 630”); <i>See</i> Exhibit K-6. Further Discussion on CQI/MCS Table Design for 256QAM (R1-141120) (“Huawei 120”); <i>See</i> Exhibit K-7. 3GPP TS 36.213 V12.0.0 (2013-12) (“TS 36.213”); <i>See</i> Exhibit K-8. <i>See also, e.g.,</i>	
CQI index	modulation	code rate × 1024	efficiency																																																				
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		Mu at 4 (Table IV); Huawei 033 at 4 (Table 1); Alcatel 058 at 1-2 (Table 1); FiberHome 366 at 2 (Table 1); Qualcomm 451 at 2 (Table 2); ZTE 258 at 3 (Table 1); Alcatel 160 at 4 (Table 3); Hitachi 521 at 2 (Table 2); Broadcom 609at 1-2 (Table 3(b)); Ericsson 753 at 102 (Table 1(b)); ZTE 136 at 3-4 (Table 2); Huawei 034 at 4 (Table 1); Nokia 529 at 2 (Table 1); Larsson 091 at FIG. 4; Xu 784 at Table 3;

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		Intel 118 at 5; Nokia 555; Li at 2; Olsson at Table 4.