

**IN THE UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF TEXAS
WACO DIVISION**

INTELLECTUAL VENTURES II LLC,	)	
	)	
Plaintiff,	)	C.A. No. 6:24-cv-188-ADA
	)	
v.	)	
	)	JURY TRIAL DEMANDED
TESLA, INC.,	)	
	)	
Defendant.	)	
	)	

**PLAINTIFF’S DISCLOSURE OF
PRELIMINARY INFRINGEMENT CONTENTIONS**

Pursuant to the Joint Notice Regarding Preliminary Contentions (Dkt. 19) and P.R. 3-1 and 3-2, Plaintiff Intellectual Ventures II LLC (“Plaintiff” or “IV”), hereby provides its Initial Infringement Contentions to Defendant Tesla, Inc. (hereinafter, “Defendant” or “Tesla”) for U.S. Patent Nos. 7,336,805 (“the ’805 Patent”), 9,706,500 (“the ’500 Patent”), 10,292,138 (“the ’138 Patent”), 10,952,153 (“the ’153 Patent”), 8,898,395 (“the ’395 Patent”), 10,136,416 (“the ’416 Patent”), 7,916,180 (“the ’180 Patent”), 9,232,158 (“the ’158 Patent”), and 7,181,743 (“the ’743 Patent”), 6,894,639 (“the ’639 Patent”), 11,206,670 (“the ’670 Patent”), 11,664,889 (“the ’889 Patent”) (collectively, the “Asserted Patents” or “Patents-in-Suit”).

IV makes this disclosure based on the information presently available to it. Discovery in this case has not started, and IV reserves its right to amend or supplement these disclosures as permitted by the Federal Rules of Civil Procedure, by the local rules of the Western District of Texas, and by order of the Court, including the Scheduling Conference Order.

For each Asserted Patent, Plaintiff identifies the following Accused Instrumentalities of which it is currently aware. The identification of Accused Instrumentalities is based on Plaintiff’s research and analysis to date, without the benefit of discovery from the Defendant. Plaintiff reserves the right to add, delete, substitute or otherwise amend this list of Accused

Instrumentalities based on discovery or other circumstances, in a manner consistent with the Federal Rules of Civil Procedures, local rules, and standing order.

The Accused Instrumentalities include, without limitation, the following:

- The '805 Patent. The Accused Instrumentalities include, without limitation, Tesla automotive vehicles that are equipped with Autopilot technology, and all past, current and future Tesla products that operate in the same or substantially similar manner as the specifically identified products and components, and all past, current and future Tesla products that have the same or substantially similar features as the specifically identified products and components. Exhibit 1.
- The '500 Patent. The Accused Instrumentalities include, without limitation, Tesla automotive vehicles that are equipped with Connectivity features, and all past, current and future Tesla products that operate in the same or substantially similar manner as the specifically identified products and components, and all past, current, and future Tesla products that have the same or substantially similar features as the specifically identified products and components. Exhibit 2.
- The '138 Patent. The Accused Instrumentalities include, without limitation, Tesla automotive vehicles that are equipped with Connectivity features and all past, current and future Tesla products that operate in the same or substantially similar manner as the specifically identified products and components, and all past, current and future Tesla products that have the same or substantially similar features as the specifically identified products and components. Exhibit 3.
- The '153 Patent. The Accused Instrumentalities include, without limitation, Tesla automotive vehicles that are equipped with Connectivity features, and all past, current, and future Tesla products that operate in the same or substantially similar manner as the specifically identified products and components, and all past, current and future Tesla products that have the same or substantially similar features as the specifically identified products and components. Exhibit 4.
- The '395 Patent. The Accused Instrumentalities include, without limitation, Tesla automotive vehicles that are equipped with a computer system that includes memory management features, and all past, current and future Tesla products that operate in the same or substantially similar manner as the specifically identified products and components, and all past, current and future Tesla products that have the same or substantially similar features as the specifically identified products and components. Exhibit 5.
- The '416 Patent. The Accused Instrumentalities include, without limitation, Tesla automotive vehicles that are equipped with Connectivity features, and all past, current and future Tesla products that operate in the same or substantially similar manner as the specifically identified products and components, and all past, current and future Tesla products that have the same or substantially similar features as the specifically identified products and components. Exhibit 6.

- The '180 Patent. The Accused Instrumentalities include, without limitation, Tesla automotive vehicles that are equipped with Autopilot technology, and all past, current and future Tesla products that operate in the same or substantially similar manner as the specifically identified products and components, and all past, current, and future Tesla products that have the same or substantially similar features as the specifically identified products and components. Exhibit 7.
- The '158 Patent. The Accused Instrumentalities include, without limitation, Tesla automotive vehicles that are equipped with Autopilot technology, and all past, current and future Tesla products that operate in the same or substantially similar manner as the specifically identified products and components, and all past, current and future Tesla products that have the same or substantially similar features as the specifically identified products and components. Exhibit 8.
- The '743 Patent. The Accused Instrumentalities include, without limitation, Tesla infrastructure for supporting Tesla automotive vehicles, and all past, current and future Tesla products that operate in the same or substantially similar manner as the specifically identified products and components, and all past, current and future Tesla products that have the same or substantially similar features as the specifically identified products and components. Exhibit 9.
- The '639 Patent. The Accused Instrumentalities include, without limitation, Tesla automotive vehicles that are equipped with Autopilot technology, and all past, current and future Tesla products that operate in the same or substantially similar manner as the specifically identified products and components, and all past, current, and future Tesla products that have the same or substantially similar features as the specifically identified products and components. Exhibit 10.
- The '670 Patent. The Accused Instrumentalities include, without limitation, Tesla automotive vehicles that are equipped with Connectivity features, and all past, current and future Tesla products that operate in the same or substantially similar manner as the specifically identified products and components, and all past, current, and future Tesla products that have the same or substantially similar features as the specifically identified products and components. Exhibit 11.
- The '889 Patent. The Accused Instrumentalities include, without limitation, Tesla automotive vehicles that are equipped with Connectivity features, and all past, current and future Tesla products that operate in the same or substantially similar manner as the specifically identified products and components, and all past, current and future Tesla products that have the same or substantially similar features as the specifically identified products and components. Exhibit 12.
- All past, current and future Tesla products and services that operate in the same or substantially similar manner as the specifically identified products and services above and described in

Exhibits 1-12 (claim charts identifying specifically where each element of each asserted claim is found within each Accused Instrumentality).

- All past, current and future Tesla products and services that have the same or substantially similar features as the specifically identified products and services above and described in Exhibits 1-12, (claim charts identifying specifically where each element of each asserted claim is found within each Accused Instrumentality).

Plaintiff's infringement contentions apply to the Accused Instrumentalities as well as all other past, current and future hardware and software products and services developed, made, used, offered for sale, sold, imported, and provided by Tesla that contain or make use of the Patented Technology.¹ This identification of Accused Instrumentalities is based upon Plaintiff's diligent investigation to date, and without the benefit of any discovery from the Defendant and without the benefit of the Court's claim construction. Plaintiff expressly reserves the right to add, delete, substitute or otherwise amend this list of Accused Instrumentalities based on discovery, the Court's claim construction, or other circumstances, in a manner consistent with the Federal Rules of Civil Procedure and the Court's rule, including the local Patent Rules.

These preliminary infringement contentions are based upon publicly-available information and Plaintiff's diligent investigation to date, and without the benefit of any substantial discovery from the Defendant and without the benefit of the Court's claim construction. Plaintiff anticipates that discovery may provide additional evidence of Defendant's infringement, may lead to the discovery of additional instances of infringement, and may also enable identification of additional claims that are infringed by Defendant.

¹ "Patented Technology" means all technologies described in the claims of the Patents-in-Suit.

Based upon currently available information, IV asserts that Tesla has infringed and/or continues to infringe the patents and claims identified in the attached claim charts (the “Asserted Claims” of the Patents-in-Suit). Infringement claim charts evidencing the correspondence between (i) the elements of the Asserted Claims, and (ii) the corresponding items of the accused products are attached hereto. Further, Exhibits 1-12, which are attached hereto and incorporated by reference, are exemplary infringement claim charts identifying specifically where each limitation of each Asserted Claim is found within each Accused Instrumentality or practiced by each Accused Instrumentality.

Plaintiff asserts that Defendant has directly infringed and continues to directly infringe the Asserted Claims literally through the Accused Instrumentalities by making, using, offering for sale, selling, and/or importing into the United States the Accused Instrumentalities. To the extent that Defendant alleges that one or more limitations of the Asserted Claims are not literally found in the Accused Instrumentalities, Plaintiff alleges that such limitations are found in or practiced by the Accused Instrumentalities under the doctrine of equivalents. Any differences alleged to exist between any of the Asserted Claims and any of the Accused Instrumentalities are insubstantial and that each Accused Instrumentality also meets each limitation under the doctrine of equivalents as the identified features of the Accused Instrumentality performs substantially the same function in substantially the same way to achieve substantially the same result as the corresponding claim limitation. IV reserves the right to assert infringement solely under the doctrine of equivalents with respect to any particular claim element(s), if warranted by discovery, further analysis, and/or claim constructions in this case.

These assertions are based upon Plaintiff’s diligent investigation to date, and without the benefit of any substantial discovery from the Defendant and without the benefit of the Court’s claim construction. Plaintiff reserves the right to add, delete, substitute or otherwise amend these

infringement allegations based on discovery, the Court's claim construction, or other circumstances, in a manner consistent with the Federal Rules of Civil Procedure and the Court's rules, including the local Patent Rules.

Plaintiff further asserts that Defendant has indirectly infringed and continues to indirectly infringe by actively inducing infringement of one or more of the claims of the Asserted Patents through the Accused Instrumentalities. Plaintiff further asserts that Defendant has indirectly infringed and continues to indirectly infringe by contributory infringement by (at least) providing replacement parts to Tesla vehicles and repair facilities by least making components that suitable for direct infringement that do not have any substantial non-infringing use.

Plaintiff also asserts that these third-parties directly infringe at least one or more of the claims of the Asserted Patents through the manufacture, use, sale, offer to sell, or importation of the Accused Instrumentalities.

For example, Defendant has actively induced infringement by encouraging the use of the Accused Instrumentalities in ways that infringe each Asserted Claim. Defendant knew or should have known that such encouragement would induce infringement. Defendant has taken active steps with the specific intent to encourage and cause others to use each Accused Instrumentality in ways that infringes each Asserted Claim. Such active steps by Defendant with specific intent to induce infringement have included, among other things, advertising, promoting, marketing, making available for use, offering to sell, and/or selling the Accused Instrumentalities to others; encouraging and influencing others to import, offer to sell, and/or sell the Accused Instrumentalities; directing and instructing others to use the Accused Instrumentalities in infringing ways, including providing and promoting the described hardware and/or software components and features that when used in their normal and customary ways as intended and design infringe; and by providing the Accused Instrumentalities to others. Tesla has performed the

aforementioned active steps with the knowledge of the Asserted Patents through receipt of a letter dated April 11, 2024 and received by Defendant on the same date, and also as of the date when the complaint in this case was filed. Tesla has known or should have known that the acts it has induced constitute infringement because, for instance, it has been aware that end users and resellers will purchase the Accused Instrumentalities and use them, resulting in direct infringement.

IV further reserves the right to supplement or revise its infringement contentions and/or charts. Such supplement may be based upon, for example, further discovery. Further, IV reserves the right to supplement or revise its infringement contentions and/or chart, including identification of additional asserted claims, based on, for example, new versions or variations of one or more of the accused products that are later discovered.

Each of the Asserted Claims of the '805 Patent is entitled to a priority date of no later than June 16, 2004. Each of the Asserted Claims of the '500 Patent is entitled to a priority date of no later than August 12, 2004. Each of the Asserted Claims of the '138 Patent is entitled to a priority date of no later than May 8, 2006. Each of the Asserted Claims of the '153 Patent is entitled to a priority date of no later than Aug. 12, 2004. Each of the Asserted Claims of the '395 Patent is entitled to a priority date of no later than Apr. 7, 2005. Each of the Asserted Claims of the '416 Patent is entitled to a priority date of no later than September 27, 2007. Each of the Asserted Claims of the '180 Patent is entitled to a priority date of no later than August 25, 2005. Each of the Asserted Claims of the '158 Patent is entitled to a priority date of no later than August 25, 2005. Each of the Asserted Claims of the '743 Patent is entitled to a priority date of no later than May 24, 2001. Each of the Asserted Claims of the '639 Patent is entitled to a priority date of no later than December 18, 1991. Each of the Asserted Claims of the '670 Patent is entitled to a priority date of no later than January 20, 2012. Each of the Asserted Claims of the '889 Patent is entitled to a priority date of no later than December 27, 2006. The subject matter described by the Asserted

Claims, however, may have been conceived and reduced to practice prior to these dates. Plaintiff's research and analysis is ongoing and Plaintiff reserves the right to assert that the claims are entitled to a priority date that is earlier than the above dates.

Dated: August 1, 2024

Respectfully submitted,

By: /s/ Jonathan K. Waldrop

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INTELLECTUAL VENTURES II LLC

CERTIFICATE OF SERVICE

I hereby certify that a true and correct copy of the foregoing instrument was served or delivered electronically, via email, to all counsel of record, on this 1st day of August 2024.

/s/ Jonathan K. Waldrop
Jonathan K. Waldrop

**Exhibit 4 to
Intellectual Ventures II LLC's
Preliminary Infringement Contentions**

Infringement Claim Chart of U.S. Patent No. 10,952,153 (the “’153 Patent”)

The Accused Instrumentalities include, without limitation, Tesla automotive vehicles (*e.g.*, Tesla Model X, S, 3, Y, Semi, Roadster Second Generation, and Cybertruck) that are equipped with Connectivity features,¹ and all past, current, and future Tesla products that operate in the same or substantially similar manner as the specifically identified products and components, and all past, current and future Tesla products that have the same or substantially similar features as the specifically identified products and components (“Count VI Automotive Vehicles” or “Tesla Automotive Vehicles”).

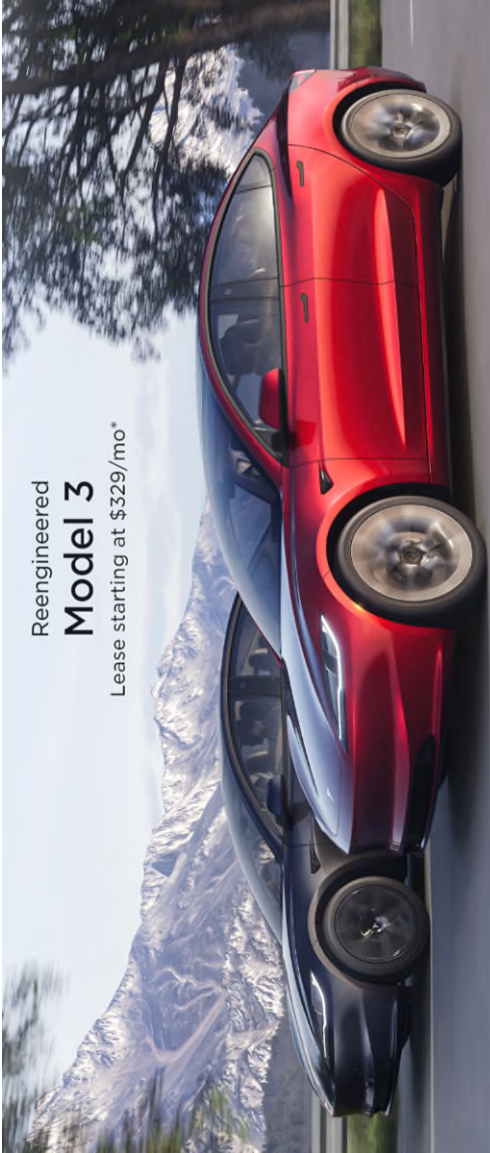
Plaintiff Intellectual Ventures II LLC (“IV” or “Plaintiff”) does not intend this exemplary claim chart to be limiting, and IV reserves its rights to pursue other accused instrumentalities, patent claims, evidence, and infringement arguments in this case. Discovery has yet to begin and this case is still in its initial stages. Accordingly, IV reserves the right to amend and/or supplement these contentions to the full extent allowed by the Court, including but not limited to, incorporating additional information, claims, theories, and / or accused products.

IV contends that Tesla, including Tesla’s employees, directly infringes each of the Asserted Claims, either literally or under the doctrine of equivalents. IV also contends that Tesla has indirectly infringed and continues to indirectly infringe by contributing to and actively inducing customers to use the Tesla vehicles and providing product manuals² that provide instructions regarding how to use Tesla vehicles in an infringing manner. Tesla also infringes via contributory infringement by providing replacement parts to Tesla vehicles and repair facilities by least making components that suitable for direct infringement that do not have any substantial non-infringing use.

Tesla makes, uses, sells, offers for sale, and /or imports the Tesla Count VI Automobiles. For example, on information and belief, Tesla makes Tesla Count VI Automobiles, including at least in its Fremont, California; Lathrop, California; Grand Rapids, Michigan; Storey County, Nevada; Buffalo, New York; Brooklyn Park, Minnesota; Elgin, Illinois; and Austin, Texas manufacturing facilities. Further, Tesla sells and/or offers for sale the Tesla Count VI Automobiles in the United States through its sales centers.

¹ See, for example, <https://www.tesla.com/support/connectivity> (last accessed on April 10, 2024).

² See, for example, www.tesla.com/ownersmanual, www.tesla.com/support (last accessed on July 31, 2024).

Claim 1	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 10,952,153
1. A user equipment (UE) comprising:	On information and belief, the Tesla Automotive Vehicles include a user equipment (UE).  Source: https://www.tesla.com/ (last accessed on April 10, 2024).

Claim 1	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 10,952,153												
	Connectivity Connectivity is an important part of all Tesla vehicles, further enhancing the driving experience by providing access to features that require data usage — including streaming music and media, live traffic visualization and more. All Tesla vehicles come with access to Standard Connectivity. Standard Connectivity is included in your vehicle, at no additional cost, for eight years beginning on the first day your vehicle was delivered as new by Tesla or the first day it is put into service (for example, used as a demonstrator or service vehicle), whichever comes first. If you are purchasing a used vehicle, you will be notified of how long your vehicle will include access to Standard Connectivity. With Standard Connectivity, you have access to most connectivity features over Wi-Fi, in addition to basic maps and navigation and music streaming over Bluetooth*. Premium Connectivity provides the ability to access all connectivity features over cellular, in addition to Wi-Fi, for the most intuitive and engaging ownership experience. Premium Connectivity is currently available as a monthly subscription of \$9.99 plus applicable tax or as an annual subscription of \$99 plus applicable tax and can be purchased at any time from your vehicle touchscreen or the Tesla app. Orders of Model S, Model X, Model Y, Model 3 and future variants of Cybertruck will receive a Premium Connectivity trial at delivery. If you own a Tesla vehicle for personal use, you can subscribe to Premium Connectivity from your vehicle touchscreen or the Tesla app. If you are driving a company vehicle, contact your vehicle provider for more information. Source: https://www.tesla.com/support/connectivity (last accessed on April 10, 2024). For example, on information and belief, at least certain versions of the Tesla 3 include a Quectel AG525R-GL component that supports 4G LTE. Certification Conformity FCC and ISSED Certification <table><tr><th>Component</th><th>Manufacturer</th><th>Model</th><th>Operating Frequency (MHz)</th><th>FCC ID</th><th>IC ID</th></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr></table>	Component	Manufacturer	Model	Operating Frequency (MHz)	FCC ID	IC ID						
Component	Manufacturer	Model	Operating Frequency (MHz)	FCC ID	IC ID								

Claim 1	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 10,952,153			
	Car PC Manufactured approx. January–July 2022	Tesla	1960100	XMR2020AG525RGL YZP-ATC5CPC001 10224A-2020AG525R 7414C-ATC5CPC001
	Car PC Manufactured approx. August 2022+	Tesla	1960100	XMR2020AG525RGL XMR20201AF51Y 10224A-2020AG525R 10224A-20201AF51Y
Source: https://www.tesla.com/ownersmanual/model3/en_tw/GUID-1F854D6E-67FA-4262-BB76-904C71FAC59F.html (last accessed on April 10, 2024).  AG525R-GL QuecOpen Hardware Design Automotive Module Series Version: 1.0.0 Source: https://fcc.report/FCC-ID/XMR2020AG525RGL/5011285 (last accessed on April 10, 2024).				

Claim 1	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 10,952,153						
	Table 1: Frequency Bands of AG525R-GL QuecOpen® Module <table data-bbox="232 426 448 1560"> <tr> <th data-bbox="250 898 277 1549">Network Type</th><th data-bbox="250 898 277 1549">AG525R-GL QuecOpen Module</th></tr> <tr> <td data-bbox="302 1352 362 1549">LTE-FDD (with Rx-diversity)</td><td data-bbox="302 506 329 1549">B1/B2/B3/B4/B5/B7/B8/B9/B11/B12/B13/B18/B19/B20/B21/B25/B26/ B28/B29¹⁾/B30¹⁾/B32¹⁾/B66/B71</td></tr> <tr> <td data-bbox="378 1352 438 1549">LTE-TDD (with Rx-diversity)</td><td data-bbox="396 1014 423 1549">B34/B38/B39/B40/B41</td></tr> </table> Source: https://fcc.report/FCC-ID/XMR2020AG525RGL/5011285 (last accessed on April 10, 2024). Typical Functional Block Diagram Figure 1 shows a very high-level, functional block diagram of a typical smartphone. It consists of a few sub-systems that are found in all smartphones. Source: https://predictabledesigns.com/whats-inside-a-smartphone/ (last accessed on April 10, 2024). So, part of the RF sub-system consists of duplexers, duplexers and RF switches that allow the RF antenna to be tuned to the required band, and also be able to transmit and receive signals at the same time. Source: https://predictabledesigns.com/whats-inside-a-smartphone/ (last accessed on April 10, 2024).	Network Type	AG525R-GL QuecOpen Module	LTE-FDD (with Rx-diversity)	B1/B2/B3/B4/B5/B7/B8/B9/B11/B12/B13/B18/B19/B20/B21/B25/B26/ B28/B29 ¹⁾ /B30 ¹⁾ /B32 ¹⁾ /B66/B71	LTE-TDD (with Rx-diversity)	B34/B38/B39/B40/B41
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LTE-TDD (with Rx-diversity)	B34/B38/B39/B40/B41						

Claim 1	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 10,952,153 <pre> graph TD RF[RF sub-system] <--> Processor[Processor sub-system] Processor <--> Display[Display sub-system] Processor <--> Peripherals[Peripherals eg. Camera, audio, GPS etc.] Processor <--> PM[Power Management sub-system] PM <--> Charger[Charger sub-system] PM --- Battery[Battery] </pre> Figure 1 – Major functional blocks of a typical smartphones Source: https://predictabledesigns.com/whats-inside-a-smartphone/ (last accessed on April 10, 2024).
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Claim 1	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 10,952,153
1[a] a transmitter;	On information and belief, the Tesla Automotive Vehicles include a transmitter. Connectivity Connectivity is an important part of all Tesla vehicles, further enhancing the driving experience by <u>providing access to features that require data usage — including streaming music and media, live traffic visualization and more.</u> All Tesla vehicles come with access to Standard Connectivity. Standard Connectivity is included in your vehicle, at no additional cost, for eight years beginning on the first day your vehicle was delivered as new by Tesla or the first day it is put into service (for example, used as a demonstrator or service vehicle), whichever comes first. If you are purchasing a used vehicle, you will be notified of how long your vehicle will include access to Standard Connectivity. With Standard Connectivity, you have access to most connectivity features over Wi-Fi, in addition to basic maps and navigation and music streaming over Bluetooth*. Premium Connectivity provides the ability to access all connectivity features over cellular, in addition to Wi-Fi, for the most intuitive and engaging ownership experience. Premium Connectivity is currently available as a monthly subscription of \$9.99 plus applicable tax or as an annual subscription of \$99 plus applicable tax and can be purchased at any time from your vehicle touchscreen or the <u>Tesla app</u>. Orders of Model S, Model X, Model Y, Model 3 and future variants of Cybertruck will receive a Premium Connectivity trial at delivery. If you own a Tesla vehicle for personal use, you can subscribe to Premium Connectivity from your vehicle touchscreen or the Tesla app. If you are driving a company vehicle, contact your vehicle provider for more information. Source: https://www.tesla.com/support/connectivity (last accessed on April 10, 2024). For example, on information and belief, at least certain versions of the Tesla 3 include a Quectel AG525R-GL component that supports 4G LTE.

Claim 1	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 10,952,153																		
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Component	Manufacturer	Model	Operating Frequency (MHz)	FCC ID	IC ID														
Car PC Manufactured approx. January–July 2022	Tesla	1960100		XMR2020AG525RGL YZP-ATC5CPC001	10224A-2020AG525R 7414C-ATC5CPC001														
Car PC Manufactured approx. August 2022+	Tesla	1960100		XMR2020AG525RGL XMR2020IAF51Y	10224A-2020AG525R 10224A-20220IAF51Y														
	Source: https://www.tesla.com/ownersmanual/model3/en_tw/GUID-1F854D6E-67FA-4262-BB76-904C71FAC59F.html (last accessed on April 10, 2024).																		

Claim 1	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 10,952,153  Build a Smarter World AG525R-GL QuecOpen Hardware Design Automotive Module Series Version: 1.0.0 Source: https://fcc.report/FCC-ID/XMR2020AG525RGL/5011285 (last accessed on April 10, 2024). Table 1: Frequency Bands of AG525R-GL QuecOpen® Module <table> <tr> <th>Network Type</th><th>AG525R-GL QuecOpen Module</th></tr> <tr> <td>LTE-FDD (with Rx-diversity)</td><td>B1/B2/B3/B4/B5/B7/B8/B9/B11/B12/B13/B18/B19/B20/B21/B25/B26/ B28/B29¹⁾/B30¹⁾/B32¹⁾/B66/B71</td></tr> <tr> <td>LTE-TDD (with Rx-diversity)</td><td>B34/B38/B39/B40/B41</td></tr> </table>	Network Type	AG525R-GL QuecOpen Module	LTE-FDD (with Rx-diversity)	B1/B2/B3/B4/B5/B7/B8/B9/B11/B12/B13/B18/B19/B20/B21/B25/B26/ B28/B29 ¹⁾ /B30 ¹⁾ /B32 ¹⁾ /B66/B71	LTE-TDD (with Rx-diversity)	B34/B38/B39/B40/B41
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LTE-TDD (with Rx-diversity)	B34/B38/B39/B40/B41						

Claim 1	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 10,952,153
	5.1.1 Physical uplink shared channel 5.1.1.1 UE behaviour The setting of the UE Transmit power P_{PUSCH} for the physical uplink shared channel (PUSCH) transmission in subframe i is defined by $P_{\text{PUSCH}}(i) = \min\{P_{\text{CMAX}}, 10\log_{10}(M_{\text{PUSCH}}(i)) + P_{\text{O_PUSCH}}(j) + \alpha(j) \cdot PL + \Delta_{\text{TF}}(i) + f(i)\} \text{ [dBm]}$ See 3GPP TS 36.213 V8.8.0 at 9. Typical Functional Block Diagram Figure 1 shows a very high-level, functional block diagram of a typical smartphone. It consists of a few sub-systems that are found in all smartphones. Source: https://predictabledesigns.com/whats-inside-a-smartphone/ (last accessed on April 10, 2024). So, part of the RF sub-system consists of duplexers, duplexers and RF switches that allow the RF antenna to be tuned to the required band, and also be able to transmit and receive signals at the same time. Source: https://predictabledesigns.com/whats-inside-a-smartphone/ (last accessed on April 10, 2024).

Claim 1	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 10,952,153 <pre> graph TD RF[RF sub-system] <--> Processor[Processor sub-system] Display[Display sub-system] <--> Processor Processor <--> Peripherals[Peripherals eg. Camera, audio, GPS etc.] Processor <--> PM[Power Management sub-system] PM <--> Charger[Charger sub-system] PM --- Battery[Battery] PM <--> I/O[....] </pre> <i>Figure 1 – Major functional blocks of a typical smartphones</i> Source: https://predictabledesigns.com/whats-inside-a-smartphone/ (last accessed on April 10, 2024).
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Claim 1	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 10,952,153
1[b] a receiver; and	On information and belief, the Tesla Automotive Vehicles include a receiver. Connectivity <u>Connectivity is an important part of all Tesla vehicles, further enhancing the driving experience by providing access to features that require data usage — including streaming music and media, live traffic visualization and more.</u> All Tesla vehicles come with access to Standard Connectivity. Standard Connectivity is included in your vehicle, at no additional cost, for eight years beginning on the first day your vehicle was delivered as new by Tesla or the first day it is put into service (for example, used as a demonstrator or service vehicle), whichever comes first. If you are purchasing a used vehicle, you will be notified of how long your vehicle will include access to Standard Connectivity. With Standard Connectivity, you have access to most connectivity features over Wi-Fi, in addition to basic maps and navigation and music streaming over Bluetooth*. <u>Premium Connectivity provides the ability to access all connectivity features over cellular, in addition to Wi-Fi, for the most intuitive and engaging ownership experience. Premium Connectivity is currently available as a monthly subscription of \$9.99 plus applicable tax or as an annual subscription of \$99 plus applicable tax and can be purchased at any time from your vehicle touchscreen or the <u>Tesla app</u>. Orders of Model S, Model X, Model Y, Model 3 and future variants of Cybertruck will receive a Premium Connectivity trial at delivery.</u> If you own a Tesla vehicle for personal use, you can subscribe to Premium Connectivity from your vehicle touchscreen or the Tesla app. If you are driving a company vehicle, contact your vehicle provider for more information. Source: https://www.tesla.com/support/connectivity (last accessed on April 10, 2024). For example, on information and belief, at least certain versions of the Tesla 3 include a Quectel AG525R-GL component that supports 4G LTE.

Claim 1	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 10,952,153																		
	Certification Conformity FCC and ISED Certification <table><tr><th>Component</th><th>Manufacturer</th><th>Model</th><th>Operating Frequency (MHz)</th><th>FCC ID</th><th>IC ID</th></tr><tr><td>Car PC Manufactured approx. January–July 2022</td><td>Tesla</td><td>1960100</td><td></td><td>XMR2020AG525RGL YZP-ATC5CPC001</td><td>10224A-2020AG525R 7414C-ATC5CPC001</td></tr><tr><td>Car PC Manufactured approx. August 2022+</td><td>Tesla</td><td>1960100</td><td></td><td>XMR2020AG525RGL XMR20201AF51Y</td><td>10224A-2020AG525R 10224A-202201AF51Y</td></tr></table>	Component	Manufacturer	Model	Operating Frequency (MHz)	FCC ID	IC ID	Car PC Manufactured approx. January–July 2022	Tesla	1960100		XMR2020AG525RGL YZP-ATC5CPC001	10224A-2020AG525R 7414C-ATC5CPC001	Car PC Manufactured approx. August 2022+	Tesla	1960100		XMR2020AG525RGL XMR20201AF51Y	10224A-2020AG525R 10224A-202201AF51Y
Component	Manufacturer	Model	Operating Frequency (MHz)	FCC ID	IC ID														
Car PC Manufactured approx. January–July 2022	Tesla	1960100		XMR2020AG525RGL YZP-ATC5CPC001	10224A-2020AG525R 7414C-ATC5CPC001														
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	Source: https://www.tesla.com/ownersmanual/model3/en_tw/GUID-1F854D6E-67FA-4262-BB76-904C71FAC59F.html (last accessed on April 10, 2024).																		

Claim 1	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 10,952,153  AG525R-GL QuecOpen Hardware Design Automotive Module Series Version: 1.0.0 Source: https://fcc.report/FCC-ID/XMR2020AG525RGL/5011285 (last accessed on April 10, 2024). Table 1: Frequency Bands of AG525R-GL QuecOpen® Module <table> <tr> <th>Network Type</th><th>AG525R-GL QuecOpen Module</th></tr> <tr> <td>LTE-FDD (with Rx-diversity)</td><td>B1/B2/B3/B4/B5/B7/B8/B9/B11/B12/B13/B18/B19/B20/B21/B25/B26/ B28/B29¹⁾/B30¹⁾/B32¹⁾/B66/B71</td></tr> <tr> <td>LTE-TDD (with Rx-diversity)</td><td>B34/B38/B39/B40/B41</td></tr> </table>	Network Type	AG525R-GL QuecOpen Module	LTE-FDD (with Rx-diversity)	B1/B2/B3/B4/B5/B7/B8/B9/B11/B12/B13/B18/B19/B20/B21/B25/B26/ B28/B29 ¹⁾ /B30 ¹⁾ /B32 ¹⁾ /B66/B71	LTE-TDD (with Rx-diversity)	B34/B38/B39/B40/B41
Network Type	AG525R-GL QuecOpen Module						
LTE-FDD (with Rx-diversity)	B1/B2/B3/B4/B5/B7/B8/B9/B11/B12/B13/B18/B19/B20/B21/B25/B26/ B28/B29 ¹⁾ /B30 ¹⁾ /B32 ¹⁾ /B66/B71						
LTE-TDD (with Rx-diversity)	B34/B38/B39/B40/B41						

Claim 1	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 10,952,153 11.1.2 Uplink Scheduling In the uplink, E-UTRAN can dynamically allocate resources (PRBs and MCS) to UEs at each TTI via the C-RNTI on PDCCH(s). A UE always monitors the PDCCH(s) in order to find possible allocation for uplink transmission when its downlink reception is enabled (activity governed by DRX when configured). See 3GPP TS 36.300 V8.12.0 at 67. <pre> sequenceDiagram participant UE participant eNB participant MME UE->>UE: NAS UE->>UE: RRC UE->>UE: PDCP UE->>UE: RLC UE->>UE: MAC UE->>UE: PHY UE->>eNB: RRC UE->>eNB: PDCP UE->>eNB: RLC UE->>eNB: MAC UE->>eNB: PHY eNB->>eNB: RRC eNB->>eNB: PDCP eNB->>eNB: RLC eNB->>eNB: MAC eNB->>eNB: PHY eNB->>MME: NAS MME->>eNB: NAS </pre> Figure 4.3.2-1: Control-plane protocol stack See 3GPP TS 36.300 V8.12.0 at Fig. 4.3.2-1. Typical Functional Block Diagram Figure 1 shows a very high-level, functional block diagram of a typical smartphone. It consists of a few sub-systems that are found in all smartphones. Source: https://predictabledesigns.com/whats-inside-a-smartphone/ (last accessed on April 10, 2024).
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Claim 1	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 10,952,153 So, part of the RF sub-system consists of duplexers, duplexers and RF switches that allow the RF antenna to be tuned to the required band, and also be able to transmit and receive signals at the same time. Source: https://predictabledesigns.com/whats-inside-a-smartphone/ (last accessed on April 10, 2024). <pre>graph TD; RF[RF sub-system] <--> P[Processor sub-system]; P <--> D[Display sub-system]; P <--> PR[Peripherals eg. Camera, audio, GPS etc.]; P <--> PM[Power Management sub-system]; PM <--> C[Charger sub-system]; PM --- B[Battery];</pre> Figure 1 – Major functional blocks of a typical smartphones Source: https://predictabledesigns.com/whats-inside-a-smartphone/ (last accessed on April 10, 2024).
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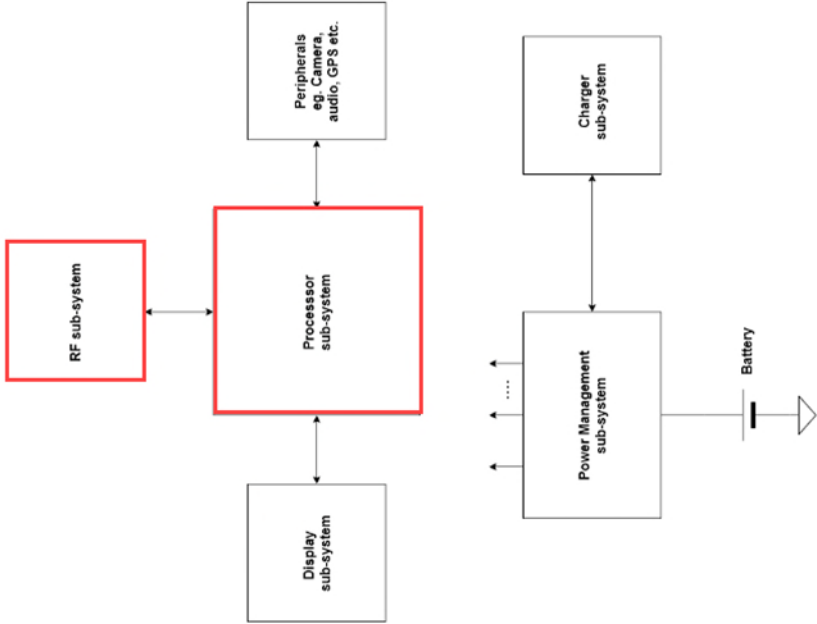
Claim 1	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 10,952,153
1[c] a processor operatively coupled to the transmitter and the receiver,	On information and belief, the Tesla Automotive Vehicles include a processor operatively coupled to the transmitter and the receiver. Connectivity Connectivity is an important part of all Tesla vehicles, further enhancing the driving experience by providing access to features that require data usage — including streaming music and media, live traffic visualization and more. All Tesla vehicles come with access to Standard Connectivity. Standard Connectivity is included in your vehicle, at no additional cost, for eight years beginning on the first day your vehicle was delivered as new by Tesla or the first day it is put into service (for example, used as a demonstrator or service vehicle), whichever comes first. If you are purchasing a used vehicle, you will be notified of how long your vehicle will include access to Standard Connectivity. With Standard Connectivity, you have access to most connectivity features over Wi-Fi, in addition to basic maps and navigation and music streaming over Bluetooth®. Premium Connectivity provides the ability to access all connectivity features over cellular, in addition to Wi-Fi, for the most intuitive and engaging ownership experience. Premium Connectivity is currently available as a monthly subscription of \$9.99 plus applicable tax or as an annual subscription of \$99 plus applicable tax and can be purchased at any time from your vehicle touchscreen or the Tesla app. Orders of Model S, Model X, Model Y, Model 3 and future variants of Cybertruck will receive a Premium Connectivity trial at delivery. If you own a Tesla vehicle for personal use, you can subscribe to Premium Connectivity from your vehicle touchscreen or the Tesla app. If you are driving a company vehicle, contact your vehicle provider for more information. Source: https://www.tesla.com/support/connectivity (last accessed on April 10, 2024). For example, on information and belief, at least certain versions of the Tesla 3 include a Quectel AG525R-GL component that includes a processor and supports 4G LTE.

Claim 1	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 10,952,153																		
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Claim 1	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 10,952,153  Build a Smarter World AG525R-GL QuecOpen Hardware Design Automotive Module Series Version: 1.0.0 Source: https://fcc.report/FCC-ID/XMR2020AG525RGL/5011285 (last accessed on April 10, 2024). Table 1: Frequency Bands of AG525R-GL QuecOpen® Module <table> <tr> <th>Network Type</th><th>AG525R-GL QuecOpen Module</th></tr> <tr> <td>LTE-FDD (with Rx-diversity)</td><td>B1/B2/B3/B4/B5/B7/B8/B9/B11/B12/B13/B18/B19/B20/B21/B25/B26/ B28/B29¹⁾/B30¹⁾/B32¹⁾/B66/B71</td></tr> <tr> <td>LTE-TDD (with Rx-diversity)</td><td>B34/B38/B39/B40/B41</td></tr> </table>	Network Type	AG525R-GL QuecOpen Module	LTE-FDD (with Rx-diversity)	B1/B2/B3/B4/B5/B7/B8/B9/B11/B12/B13/B18/B19/B20/B21/B25/B26/ B28/B29 ¹⁾ /B30 ¹⁾ /B32 ¹⁾ /B66/B71	LTE-TDD (with Rx-diversity)	B34/B38/B39/B40/B41
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Claim 1	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 10,952,153
	1 Introduction QuecOpen® is an application solution where the module acts as a main processor. With the development of communication technology and the ever-changing market demands, more and more customers have realized the advantages of QuecOpen® solution. Especially, its advantage in reducing the product cost is greatly valued by customers. With QuecOpen® solution, development flow for wireless application and hardware design will be simplified. Main features of QuecOpen® solution are listed below: Source: https://fcc.report/FCC-ID/XMR2020AG525RGL/5011285 (last accessed on April 10, 2024). 2.1. General Description AG525R-GL QuecOpen module is a baseband processor platform based on ARM Cortex A7 kernel. The maximum dominant frequency is up to 1.497 GHz. AG525R-GL QuecOpen module is a series of automotive-grade LTE-FDD/LTE-TDD/WCDMA/GSM wireless communication modules with receive diversity. It provides data connectivity on LTE-FDD, LTE-TDD, DC-HSDPA, HSPA+, HSDPA, WCDMA, EDGE and GPRS networks. It also provides GNSS function (optional) and audio function to meet specific application demands. Source: https://fcc.report/FCC-ID/XMR2020AG525RGL/5011285 (last accessed on April 10, 2024).

Claim 1	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 10,952,153
	The diagram illustrates the control-plane protocol stack between a User Equipment (UE) and an evolved NodeB (eNB). The UE side (left) includes blocks for NAS, RRC, PDCP, RLC, MAC, and PHY. The eNB side (right) includes blocks for RRC, PDCP, RLC, MAC, and PHY. A dashed box labeled 'MME' (Mobility Management Entity) is positioned above the eNB side, containing a NAS block. Arrows indicate the flow of control signaling: from UE NAS to eNB RRC, and from eNB RRC to UE RRC. Subsequent layers (PDCP, RLC, MAC, PHY) are connected sequentially on both sides. Figure 4.3.2-1: Control-plane protocol stack See 3GPP TS 36.300 V8.12.0 at Fig. 4.3.2-1. Typical Functional Block Diagram Figure 1 shows a very high-level, functional block diagram of a typical smartphone. It consists of a few sub-systems that are found in all smartphones. Source: https://predictabledesigns.com/whats-inside-a-smartphone/ (last accessed on April 10, 2024). So, part of the RF sub-system consists of duplexers, duplexers and RF switches that allow the RF antenna to be tuned to the required band, and also be able to transmit and receive signals at the same time. Source: https://predictabledesigns.com/whats-inside-a-smartphone/ (last accessed on April 10, 2024).

Claim 1	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 10,952,153
	 <i>Figure 1 – Major functional blocks of a typical smartphones</i> Source: https://predictabledesigns.com/whats-inside-a-smartphone/ (last accessed on April 10, 2024).
1[d] wherein the processor is configured to cause: the receiver to receive, from a network device, an	On information and belief, the Tesla Automotive Vehicles include the processor that is configured to cause the receiver to receive, from a network device, an indication that transmit power control (TPC) command accumulation is enabled. On information and belief, the Tesla Automotive Vehicles receive an UplinkPowerControl information element containing an indication of whether accumulation of TPC commands is enabled or not.

Claim 1	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 10,952,153
indication that transmit power control (TPC) command accumulation is enabled,	– <i>UplinkPowerControl</i> The IE <i>UplinkPowerControlCommon</i> and IE <i>UplinkPowerControlDedicated</i> are used to specify parameters for uplink power control in the system information and in the dedicated signalling, respectively. See 3GPP TS 36.331 V8.21.0 at 136. <i>UplinkPowerControl</i> information elements <pre>-- ASN1START UplinkPowerControlCommon ::= p0-NominalPUSCH alpha p0-NominalPUCCH deltaFList-PUCCH deltaPreambleMsg3 } UplinkPowerControlDedicated ::= p0-UE-PUSCH deltaMCS-Enabled accumulationEnabled p0-UE-PUCCH pSRS-Offset filterCoefficient } DeltaFList-PUCCH ::= deltaF-PUCCH-Format1 deltaF-PUCCH-Format1b deltaF-PUCCH-Format2 deltaF-PUCCH-Format2a deltaF-PUCCH-Format2b } -- ASN1STOP</pre>

See 3GPP TS 36.331 V8.21.0 at 137.

Claim 1	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 10,952,153 The diagram illustrates the control-plane protocol stack across three network elements: UE (User Equipment), eNB (E-UTRAN NodeB), and MME (Mobility Management Entity). The UE and eNB are shown with identical protocol layers: NAS, RRC, PDCP, RLC, MAC, and PHY. The MME is shown with a NAS layer. Arrows indicate the flow of signaling between the UE and eNB across all layers, and between the eNB and MME at the NAS layer. The RRC layer in both UE and eNB is highlighted with a red box. Figure 4.3.2-1: Control-plane protocol stack See 3GPP TS 36.300 V8.12.0 at Fig. 4.3.2-1.															
1[e] the receiver to receive, from the network device, on a single physical channel, scheduling information and power control information that includes a multi-level TPC command, and	On information and belief, the Tesla Automotive Vehicles include the processor that is configured to cause the receiver to receive, from the network device, on a single physical channel, scheduling information and power control information that includes a multi-level TPC command. On information and belief, the Tesla Automotive Vehicles, along with the information regarding uplink resources, also receive a multi-level TPC command on the PDCCH. There are multiple levels (e.g., 1 dB, 3dB, -1 dB, etc.) by which a TPC command can step up or step down the power level in the UE. Table 5.1.1.1-2: Mapping of TPC Command Field in DCI format 0/3 to absolute and accumulated δ_{PUSCH} values. <table><tr><th>TPC Command Field in DCI format 0/3</th><th>Accumulated δ_{PUSCH} [dB]</th><th>Absolute δ_{PUSCH} [dB] only DCI format 0</th></tr><tr><td>0</td><td>-1</td><td>-4</td></tr><tr><td>1</td><td>0</td><td>-1</td></tr><tr><td>2</td><td>1</td><td>1</td></tr><tr><td>3</td><td>3</td><td>4</td></tr></table> See 3GPP TS 36.213 V8.8.0 at 12.	TPC Command Field in DCI format 0/3	Accumulated δ_{PUSCH} [dB]	Absolute δ_{PUSCH} [dB] only DCI format 0	0	-1	-4	1	0	-1	2	1	1	3	3	4
TPC Command Field in DCI format 0/3	Accumulated δ_{PUSCH} [dB]	Absolute δ_{PUSCH} [dB] only DCI format 0														
0	-1	-4														
1	0	-1														
2	1	1														
3	3	4														

Claim 1	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 10,952,153
	4 Overall architecture The E-UTRAN consists of eNBs, providing the E-UTRA user plane (PDCP/RLC/MAC/PHY) and control plane (RRC) protocol terminations towards the UE. The eNBs are interconnected with each other by means of the X2 interface. The eNBs are also connected by means of the S1 interface to the EPC (Evolved Packet Core), more specifically to the MME (Mobility Management Entity) by means of the S1-MME and to the Serving Gateway (S-GW) by means of the S1-U. The S1 interface supports a many-to-many relation between MMEs / Serving Gateways and eNBs. See 3GPP TS 36.300 V8.12.0 at 15. 5.1.1 Physical uplink shared channel 5.1.1.1 UE behaviour The setting of the UE Transmit power P_{PUSCH} for the physical uplink shared channel (PUSCH) transmission in subframe i is defined by $P_{PUSCH}(i) = \min \{ P_{CMAX}, 10 \log_{10} (M_{PUSCH}(i)) + P_{O_{PUSCH}}(j) + \alpha(j) \cdot PL + \Delta_{TF}(i) + f(i) \} \text{ [dBm]}$ • δ_{PUSCH} is a UE specific correction value, also referred to as a TPC command and is included in PDCCH with DCI format 0 or jointly coded with other TPC commands in PDCCH with DCI format 3/3A whose CRC parity bits are scrambled with TPC-PUSCH-RNTI. The current PUSCH power control adjustment state is given by $f(i)$ which is defined by: ◦ $f(i) = f(i-1) + \delta_{PUSCH}(i - K_{PUSCH})$ if accumulation is enabled based on the UE-specific parameter <i>Accumulation-enabled</i> provided by higher layers or if the TPC command δ_{PUSCH} is included in a PDCCH with DCI format 0 where the CRC is scrambled by the Temporary C-RNTI See 3GPP TS 36.213 V8.8.0 at 9-10.

Claim 1	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 10,952,153
	5.3.3.1.1 Format 0 DCI format 0 is used for the scheduling of PUSCH. The following information is transmitted by means of the DCI format 0: - Flag for format0/format1A differentiation – 1 bit, where value 0 indicates format 0 and value 1 indicates format 1A - Hopping flag – 1 bit as defined in section 8.4 of [3] - Resource block assignment and hopping resource allocation – $\left\lceil \log_2 (N_{RB}^{UL} (N_{RB}^{UL} + 1) / 2) \right\rceil$ bits - TPC command for scheduled PUSCH – 2 bits as defined in section 5.1.1.1 of [3] See 3GPP TS 36.212 V8.8.0 at 43-44. 5.4 UL-SCH data transfer 5.4.1 UL Grant reception In order to transmit on the UL-SCH the UE must have a valid uplink grant (except for non-adaptive HARQ retransmissions) which it may receive dynamically on the PDCCH or in a Random Access Response or which may be configured semi-persistently. To perform requested transmissions, the MAC layer receives HARQ information from lower layers. See 3GPP TS 36.321 V8.12.0 at 20.
1[f] the transmitter to transmit, to the network device, an uplink signal based on the received scheduling information and the	On information and belief, the Tesla Automotive Vehicles include the processor that is configured to cause the transmitter to transmit, to the network device, an uplink signal based on the received scheduling information and the multi-level TPC command. For example, on information and belief, the Tesla Automotive Vehicles transmit an uplink signal, e.g., PUSCH transmission to the eNB, based on the allocated uplink transmission resources and multilevel TPC command.

Claim 1

multi-level TPC command.

Table 5.1.1.1-2: Mapping of TPC Command Field in DCI format 0/3 to absolute and accumulated δ_{PUSCH} values.

TPC Command Field in DCI format 0/3	Accumulated δ_{PUSCH} [dB]	Absolute δ_{PUSCH} [dB] only DCI format 0
0	-1	-4
1	0	-1
2	1	1
3	3	4

See 3GPP TS 36.213 V8.8.0 at 12.

11.1.2 Uplink Scheduling

In the uplink, E-UTRAN can dynamically allocate resources (PRBs and MCS) to UEs at each TTI via the C-RNTI on PDCCH(s). A UE always monitors the PDCCH(s) in order to find possible allocation for uplink transmission when its downlink reception is enabled (activity governed by DRX when configured).

See 3GPP TS 36.300 V8.12.0 at 67.

5.3.3.1.1 Format 0

DCI format 0 is used for the scheduling of PUSCH.

The following information is transmitted by means of the DCI format 0:

- Flag for format0/format1A differentiation – 1 bit, where value 0 indicates format 0 and value 1 indicates format 1A
- Hopping flag – 1 bit as defined in section 8.4 of [3]

- Resource block assignment and hopping resource allocation – $\left\lfloor \log_2 (N'_{RB} (N'_{RB} + 1) / 2) \right\rfloor$ bits
- For PUSCH hopping:
 - N_{UL_hop} MSB bits are used to obtain the value of $\tilde{n}_{PRB}(i)$ as indicated in subclause [8.4] of [3]
 - $\left(\left\lfloor \log_2 (N'_{RB} (N'_{RB} + 1) / 2) \right\rfloor - N_{UL_hop} \right)$ bits provide the resource allocation of the first slot in the UL subframe
- For non-hopping PUSCH:
 - $\left(\left\lfloor \log_2 (N'_{RB} (N'_{RB} + 1) / 2) \right\rfloor \right)$ bits provide the resource allocation in the UL subframe as defined in section 8.1 of [3]

- TPC command for scheduled PUSCH – 2 bits as defined in section 5.1.1.1 of [3]

See 3GPP TS 36.212 V8.8.0 at 43-44.

5.1.1 Physical uplink shared channel

5.1.1.1 UE behaviour

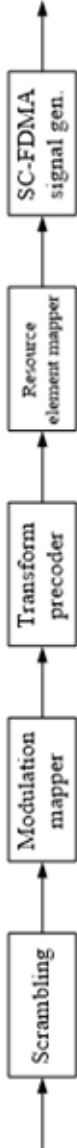
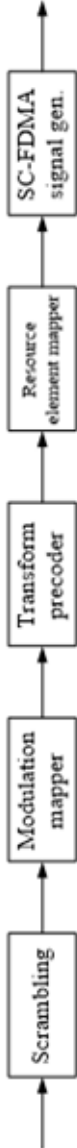
The setting of the UE Transmit power P_{PUSCH} for the physical uplink shared channel (PUSCH) transmission in subframe i is defined by

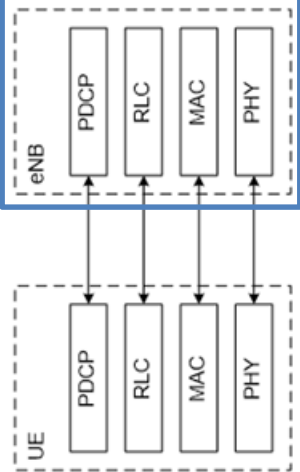
$$P_{PUSCH}(i) = \min\{P_{CMAX}, 10\log_{10}(M_{PUSCH}(i)) + P_{O_PUSCH}(j) + \alpha(j) \cdot PL + \Delta_{TF}(i) + f(i)\} \text{ [dBm]}$$

See 3GPP TS 36.213 V8.8.0 at 9.

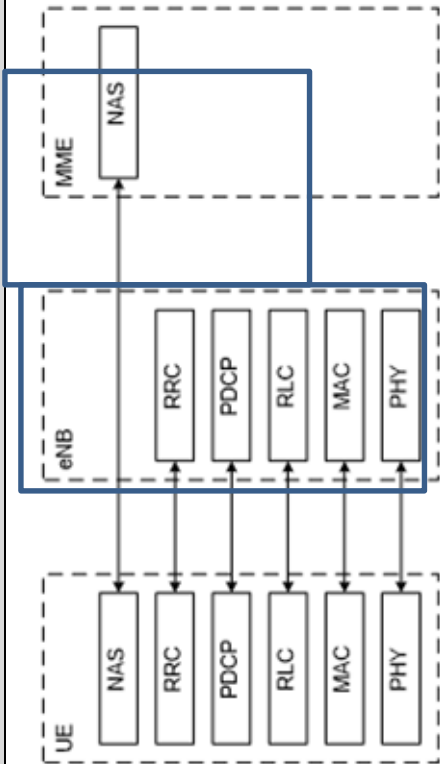
Claim 2	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 10,952,153															
2. The UE of claim 1, wherein the multi-level TPC command includes a value selected from a plurality of pre-defined values	On information and belief, the Tesla Automotive Vehicles include a UE of claim 1, wherein the multi-level TPC command includes a value selected from a plurality of pre-defined values. See Claim 1. As an example, the multi-level TPC command includes a value selected from a plurality of pre-defined values: Table 5.1.1.1-2: Mapping of TPC Command Field in DCI format 0/3 to absolute and accumulated δ_{PUSCH} values. <table><tr><th>TPC Command Field in DCI format 0/3</th><th>Accumulated- δ_{PUSCH} [dB]</th><th>Absolute δ_{PUSCH} [dB] only DCI format 0</th></tr><tr><td>0</td><td>-1</td><td>-4</td></tr><tr><td>1</td><td>0</td><td>-1</td></tr><tr><td>2</td><td>1</td><td>1</td></tr><tr><td>3</td><td>3</td><td>4</td></tr></table> See 3GPP TS 36.213 V8.8.0 at 12. 5.1.1 Physical uplink shared channel 5.1.1.1 UE behaviour The setting of the UE Transmit power P_{PUSCH} for the physical uplink shared channel (PUSCH) transmission in subframe i is defined by $P_{PUSCH}(i) = \min \{ P_{CMAX}, 10 \log_{10} (M_{PUSCH}(i)) + P_{O_{PUSCH}}(j) + \alpha(j) \cdot PL + \Delta_{TF}(i) + f(i) \} \text{ [dBm]}$	TPC Command Field in DCI format 0/3	Accumulated- δ_{PUSCH} [dB]	Absolute δ_{PUSCH} [dB] only DCI format 0	0	-1	-4	1	0	-1	2	1	1	3	3	4
TPC Command Field in DCI format 0/3	Accumulated- δ_{PUSCH} [dB]	Absolute δ_{PUSCH} [dB] only DCI format 0														
0	-1	-4														
1	0	-1														
2	1	1														
3	3	4														

Claim 2	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 10,952,153
	δ_{PUSCH} is a UE specific correction value, also referred to as a TPC command and is included in PDCCH with DCI format 0 or jointly coded with other TPC commands in PDCCH with DCI format 3/3A whose CRC parity bits are scrambled with TPC-PUSCH-RNTI. The current PUSCH power control adjustment state is given by $f(i)$ which is defined by: $f(i) = f(i-1) + \delta_{\text{PUSCH}}(i - K_{\text{PUSCH}})$ if accumulation is enabled based on the UE-specific parameter <i>Accumulation-enabled</i> provided by higher layers or if the TPC command δ_{PUSCH} is included in a PDCCH with DCI format 0 where the CRC is scrambled by the Temporary C-RNTI δ_{PUSCH} dB accumulated values signalled on PDCCH with DCI format 0 are given in Table 5.1.1.1-2. If the PDCCH with DCI format 0 is validated as a SPS activation or release PDCCH, then δ_{PUSCH} is 0dB. See 3GPP TS 36.213 V8.8.0 at 9-10. 5.3.3.1.1 Format 0 DCI format 0 is used for the scheduling of PUSCH. The following information is transmitted by means of the DCI format 0: - Flag for format0/format1A differentiation – 1 bit, where value 0 indicates format 0 and value 1 indicates format 1A - Hopping flag – 1 bit as defined in section 8.4 of [3] - Resource block assignment and hopping resource allocation – $\left\lceil \log_2(N_{\text{RB}}^{\text{UL}}(N_{\text{RB}}^{\text{UL}} + 1)/2) \right\rceil$ bits - TPC command for scheduled PUSCH – 2 bits as defined in section 5.1.1.1 of [3] See 3GPP TS 36.212 V8.8.0 at 43-44.

Claim 3	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 10,952,153
3. The UE of claim 1, wherein the transmitter is further configured to transmit the uplink signal on an uplink shared channel.	On information and belief, the Tesla Automotive Vehicles include a UE of claim 1, wherein the transmitter is further configured to transmit the uplink signal on an uplink shared channel. See Claim 1.
5	<u>Physical Layer for E-UTRA</u>
...	The physical channels of E-UTRA are:
...	Physical uplink shared channel (PUSCH)
...	- Carries the UL-SCH.
See 3GPP TS 36.300 V8.12.0 at 23 and 25.	See 3GPP TS 36.300 V8.12.0 at 23 and 25.
5.3	Physical uplink shared channel
The baseband signal representing the physical uplink shared channel is defined in terms of the following steps:	The baseband signal representing the physical uplink shared channel is defined in terms of the following steps:
- scrambling	- scrambling
- modulation of scrambled bits to generate complex-valued symbols	- modulation of scrambled bits to generate complex-valued symbols
- transform precoding to generate complex-valued symbols	- transform precoding to generate complex-valued symbols
- mapping of complex-valued symbols to resource elements	- mapping of complex-valued symbols to resource elements
- generation of complex-valued time-domain SC-FDMA signal for each antenna port	- generation of complex-valued time-domain SC-FDMA signal for each antenna port
 <pre> graph LR A[Scrambling] --> B[Modulation mapper] B --> C[Transform precoder] C --> D[Resource element mapper] D --> E[SC-FDMA signal gen.] </pre>	 <pre> graph LR A[Scrambling] --> B[Modulation mapper] B --> C[Transform precoder] C --> D[Resource element mapper] D --> E[SC-FDMA signal gen.] </pre>
See 3GPP TS 36.211 V8.8.0 at 13.	Figure 5.3-1: Overview of uplink physical channel processing.

Claim 4	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 10,952,153
4. The UE of claim 1, wherein the network device is one of a Node-B or a base station.	On information and belief, the Tesla Automotive Vehicles include a UE of claim 1, wherein the network device is one of a Node-B or a base station. See Claim 1. 4.3.1 User plane The figure below shows the protocol stack for the user-plane, where PDCP, RLC and MAC sublayers (terminated in eNB on the network side) perform the functions listed for the user plane in subclause 6, e.g. header compression, ciphering, scheduling, ARQ and HARQ;  The diagram illustrates the user-plane protocol stack between a User Equipment (UE) and an evolved NodeB (eNB). On the UE side (left), the layers from top to bottom are PDCP, RLC, MAC, and PHY. On the eNB side (right), the layers from top to bottom are PDCP, RLC, MAC, and PHY. Bidirectional arrows connect the corresponding layers between the UE and eNB: PDCP to PDCP, RLC to RLC, MAC to MAC, and PHY to PHY. The eNB side is enclosed in a dashed box labeled 'eNB' at the top, and the UE side is enclosed in a dashed box labeled 'UE' at the top. Figure 4.3.1-1: User-plane protocol stack

Claim 4	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 10,952,153
	4 Overall architecture The E-UTRAN consists of eNBs, providing the E-UTRA user plane (PDCP/RLC/MAC/PHY) and control plane (RRC) protocol terminations towards the UE. The eNBs are interconnected with each other by means of the X2 interface. The eNBs are also connected by means of the S1 interface to the EPC (Evolved Packet Core), more specifically to the MME (Mobility Management Entity) by means of the S1-MME and to the Serving Gateway (S-GW) by means of the S1-U. The S1 interface supports a many-to-many relation between MMEs / Serving Gateways and eNBs. The E-UTRAN architecture is illustrated in Figure 4 below. The diagram illustrates the E-UTRAN architecture. On the left, two server icons represent the MME / S-GW. On the right, three blue antenna icons represent eNBs. Dashed green lines labeled 'S1' connect each MME / S-GW to all three eNBs, indicating a many-to-many relationship. Solid red lines labeled 'X2' connect the eNBs to each other, indicating they are interconnected. A bracket on the right groups the eNBs under the label 'E-UTRAN'. Figure 4-1: Overall Architecture 4.3.2 Control plane The figure below shows the protocol stack for the control-plane, where:

Claim 4	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 10,952,153  Figure 4.3.2-1: Control-plane protocol stack See 3GPP TS 36.300 V8.12.0 at 15 and 18-19.															
Claim 5	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 10,952,153 The UE of claim 1, wherein the multi-level TPC command includes a set of values that includes at least two values up or at least two values down. Table 5.1.1.1-2: Mapping of TPC Command Field in DCI format 0/3 to absolute and accumulated δ_{PUSCH} values. <table><tr><th>TPC Command Field in DCI format 0/3</th><th>Accumulated δ_{PUSCH} [dB]</th><th>Absolute δ_{PUSCH} [dB] only DCI format 0</th></tr><tr><td>0</td><td>-1</td><td>-4</td></tr><tr><td>1</td><td>0</td><td>-1</td></tr><tr><td>2</td><td>1</td><td>1</td></tr><tr><td>3</td><td>3</td><td>4</td></tr></table> See 3GPP TS 36.213 V8.8.0 at 12	TPC Command Field in DCI format 0/3	Accumulated δ_{PUSCH} [dB]	Absolute δ_{PUSCH} [dB] only DCI format 0	0	-1	-4	1	0	-1	2	1	1	3	3	4
TPC Command Field in DCI format 0/3	Accumulated δ_{PUSCH} [dB]	Absolute δ_{PUSCH} [dB] only DCI format 0														
0	-1	-4														
1	0	-1														
2	1	1														
3	3	4														