IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
MARSHALL DIVISION

LONGHORN AUTOMOTIVE GROUP LLC, Plaintiff, v. HYUNDAI MOTOR COMPANY and KIA CORPORATION, Defendants.	Case No. 2:24-cv-00554-JRG **JURY TRIAL DEMANDED**

AMENDED COMPLAINT FOR PATENT INFRINGEMENT

Plaintiff Longhorn Automotive Group LLC ("LAG" or "Plaintiff") for its Amended Complaint for patent infringement against Defendants Hyundai Motor Company and Kia Corporation (collectively, "Hyundai" or "Defendants") alleges as follows:

THE PARTIES

1. LAG is a limited liability company organized and existing under the laws of the State of Texas, with its principal place of business located at 104 E. Houston Street, Marshall, Texas 75670.

2. Upon information and belief, Defendant Hyundai Motor Company is a Korean corporation, with its principal place of business located at 12 Heolleung-ro Seocho-gu Seoul 06797, Republic of Korea. Upon information and belief, Hyundai Motor Company does business in Texas and in the Eastern District of Texas, directly or through intermediaries.

3. Upon information and belief, Defendant Kia Corporation is a Korean corporation, with its principal place of business located at 730-7 Mok-dong, Yangcheon-gu Seoul, Seoul, 07946

Republic of Korea. Upon information and belief, Defendant Kia Corporation does business in Texas and in the Eastern District of Texas, directly or through intermediaries.

JURISDICTION

4. This is an action for patent infringement arising under the patent laws of the United States, 35 U.S.C. §§ 1, *et seq*. This Court has jurisdiction over this action pursuant to 28 U.S.C. §§ 1331 and 1338(a).

5. This Court has personal jurisdiction over Defendants. Defendants regularly conduct business and have committed acts of patent infringement and/or have induced acts of patent infringement by others in this Judicial District and/or have contributed to patent infringement by others in this Judicial District, the State of Texas, and elsewhere in the United States.

6. Venue is proper in this Judicial District pursuant to 28 U.S.C. § 1391 because, among other things, Defendants are not residents in the United States, and thus may be sued in any judicial district pursuant to 28 U.S.C. § 1391(c)(3).

7. Defendants are subject to this Court's jurisdiction pursuant to due process and/or the Texas Long Arm Statute due at least to their substantial business in this State and Judicial District, including (a) at least part of its past infringing activities, (b) regularly doing or soliciting business in Texas, and/or (c) engaging in persistent conduct and/or deriving substantial revenue from goods and services provided to customers in Texas.

PATENTS-IN-SUIT

8. On August 19, 2014, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 8,810,803 (the "'803 Patent ") entitled "Lens System". A true and

correct copy of the '803 Patent is available at: https://patentimages.storage.googleapis.com/b8/ee/03/9912346a786072/US8810803.pdf.

9. On July 26, 2011, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 7,987,002 (the "'002 Patent") entitled "Arrangement for Distributed Measurement System for Measurement and Simulation in Distributed Control Systems". A true and correct copy of the '002 Patent is available at: https://patentimages.storage.googleapis.com/2e/7c/c3/eaf362f9a8faf3/US7987002.pdf.

10. On April 7, 2009, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 7,513,238 (the "'238 Patent") entitled "Directly Injecting Internal Combustion Engine." A true and correct copy of the '238 Patent is available at: https://patentimages.storage.googleapis.com/23/6c/e0/5d3e6ec82760c9/US7513238.pdf.

11. On September 11, 2012, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 8,265,353 (the "'353 Patent") entitled "Method of Reconstructing an Image Acquired Using Several Imagery Modes." A true and correct copy of the '353 Patent is available at: https://patentimages.storage.googleapis.com/c3/ee/14/9676306bcc9887/US8265353.pdf.

12. On July 2, 2013, the United States Patent and Trademark Office duly and legally issued Reissued U.S. Patent No. RE44,331 (the '331 Patent") entitled "Vehicle Collision Detector". A true and correct copy of the '331 Patent is available at: https://patentimages.storage.googleapis.com/44/c0/3a/5548eb91a45bc8/USRE44331.pdf.

13. On August 8, 2006, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 7,089,101 (the "'101 Patent") entitled "Method for Assisting a Driver When

Performing Driving Maneuvers". A true and correct copy of the '101 Patent is available at: https://patentimages.storage.googleapis.com/5f/6d/df/4b65ee15a8037e/US7089101.pdf.

14. LAG is the sole and exclusive owner of all right, title, and interest in the '803 Patent, the '002 Patent, the '238 Patent, the '353 Patent, the '331 Patent, and the '101 Patent, (collectively, the "Patents-in-Suit") and holds the exclusive right to take all actions necessary to enforce its rights to the Patents-in-Suit, including the filing of this patent infringement lawsuit. LAG also has the right to recover all damages for the past, present, and future infringement of the Patents-in-Suit and to seek injunctive relief as appropriate under the law.

FACTUAL ALLEGATIONS

15. The '803 Patent generally relates to a plurality of lenses is used for focusing and projecting the light in plurality of directions. Such patterns include those generated by systems from an emitted light source. These patterns may be analyzed by computers to identify and determine aspects of the light patterns. The technology described in the '803 Patent was developed by inventor Matt Bell. For example, this technology is implemented in Defendants' headlight systems included in commercial and personal vehicles, in all trims and configurations, such as the Hyundai Veloster Turbo, Hyundai Elantra Sport, Hyundai Tucson, Hyundai Accent, Kia Soul Turbo, Kia Forte5 (Kia Cerato5 in some regions), Kia Forte Koup, Kia Ceed GT, Hyundai Creta Hyundai Accent, Hyundai Venue, Hyundai Kona, Hyundai Santa Cruz, Hyundai Tucson, Hyundai Tucson Hybrid, Hyundai Plug-in Hybrid, Hyundai Santa Fe, Hyundai Santa Fe Hybrid, Hyundai Santa Fe Plug-in Hybrid, Hyundai Palisade, Hyundai Fuel Cell, Hyundai Elantra, Hyundai Elantra Hybrid, Hyundai Elantra N, Hyundai Sonata, Hyundai Sonata N, Hyundai Sonata Hybrid, Hyundai Veloster, Hyundai Creta, Hyundai XCIENT, Kia Soul, Kia Seltos, Kia Sportage, Kia Sorento, Kia Carnival MPV, Kia Telluride, Kia Niro, Kia Sportage Hybrid, Kia Miro Plug-in Hybrid, Kia

Sorento Hybrid, Kia Sportage Plug-in Hybrid, Kia Sorento Plug-in Hybrid, Kia Rio, Kia Rio 5-Door, Kia Forte, Kia K5, Kia Stinger, Genesis GV60, Genesis GV70, Genesis Electrified GV70, Genesis GV80, Genesis G70, Genesis G80, Genesis, Electrified G80, Genesis G90, and Genesis GV60, among other automotive vehicles (collectively, the "Accused Vehicles").

16. The '002 Patent generally relates to a monitoring system with plurality of monitoring units communicating with a first interface in a first protocol which in turn is connected to a distributed control systems using a second protocol. The technology described in the '002 Patent was developed by inventor Lars-Berno Fredriksson. For example, this technology is implemented in Hyundai Bluelink technology, and all previous versions and iterations, included with commercial and personal vehicles, in all trims and configurations, including the Accused Vehicles.

17. The '238 Patent generally relates to novel direct injection in internal combustion engines where the shapes of the piston allow for early or late injection to optimize the direct injection. The technology described in the '238 Patent was developed by inventors Ruediger Pfaff, Martin Schnabel, and Joachim Suess at DaimlerChrysler AG. For example, this technology is implemented in Hyundai and Kia internal combustion engines included in commercial and personal vehicles, in all trims and configurations, such as the Gamma 1.6 Turbo GD Engine, including the Accused Vehicles.

18. The '353 Patent generally relates to measuring a mobile object using a plurality of imaging techniques in synchronization to provide video images of an object's state. The technology described in the '353 Patent was developed by Stéphane Bonnet and Pierre Grangeat. For example, this technology is implemented in Defendants' driver assistance systems, including

Hyundai's SmartSense, and all previous versions and iterations, in all trims and configurations, including in the Accused Vehicles.

19. The '331 Patent generally relates to a system and method for preventing collisions in vehicles. The technology described in the '331 Patent was developed by Göran Sjönell. For example, this technology is implemented in Hyundai-Kia's driver assistance systems, including Hyundai's Night Vision, and all previous versions and iterations, in all trims and configurations, including the Accused Vehicles.

20. The '101 Patent generally relates to a method for assisting a driver of a vehicle when performing driving maneuvers. The technology described in the '101 Patent was developed by Eckart Fischer, Helmut Keller, Jens Koehnlein, Jakob Seiler, Andreas Spieker, David Ulmer, and Andy Yap at DaimlerChrysler AG. For example, this technology is implemented in Hyundai-Kia's driver assistance systems, including Hyundai's SmartSense, and all previous versions and iterations, in all trims and configurations, including the Accused Vehicles.

21. Hyundai has infringed the Patents-in-Suit and is continuing to infringe '803 Patent, the 238 Patent, the '002 Patent, the '353 Patent, and the '331 Patent by one or more of making, using, selling, offering to sell, and/or importing, and by actively inducing others to make, use, sell, offer to sell, and/or importing commercial and personal vehicles, which are used or tested by Hyundai and its direct or indirect customers or users in the United States.

COUNT I
(Infringement of the '803 Patent)

22. Paragraphs 1 through 21 are incorporated by reference as if fully set forth herein.

23. LAG has not licensed or otherwise authorized Defendants to make, use, offer for sale, sell, or import any products that embody the inventions of the '803 Patent.

24. Defendants have and continue to directly infringe the '803 Patent, either literally or

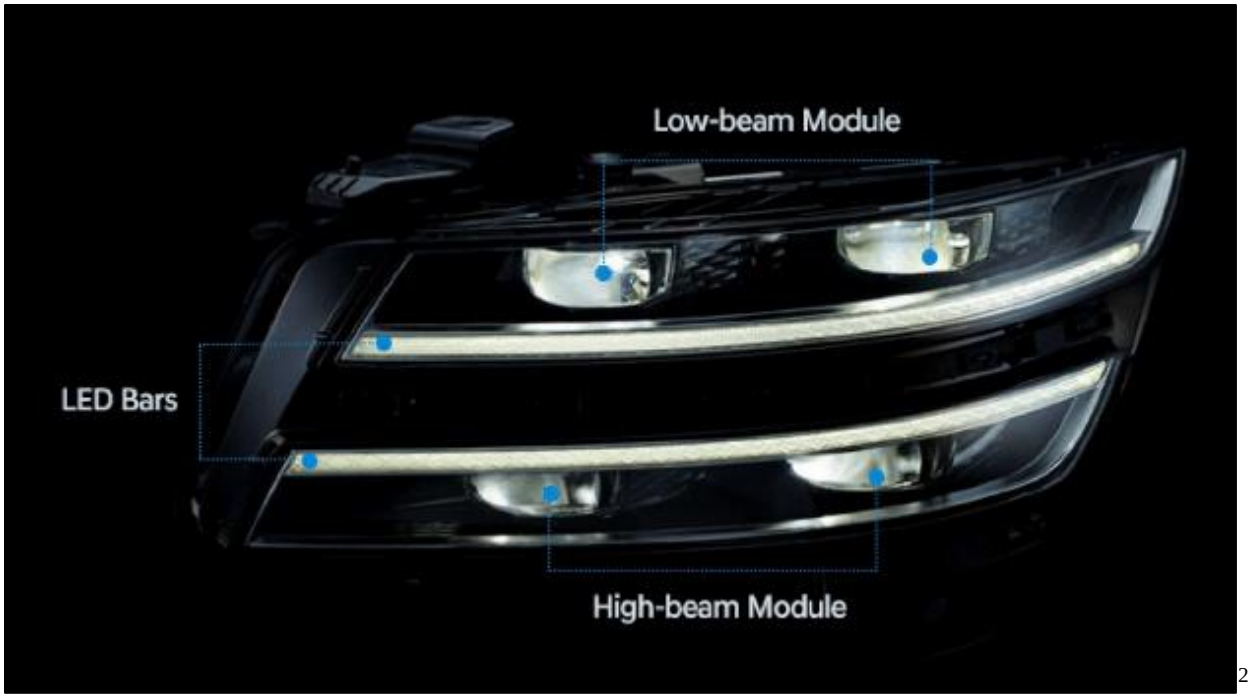
under the doctrine of equivalents, without authority and in violation of 35 U.S.C. § 271, by one or more of making, using, offering to sell, selling, and/or importing into the United States products that satisfy each and every limitation of one or more claims of the '803 Patent. Such products include, but are not limited to, the Genesis G80, equipped with Intelligent Front-Sighting System (IFS) with Matrix Beam LED headlights, among other vehicles.

25. For example, Defendants have and continue to directly infringe at least claim 15 of the '803 Patent by making, using, offering to sell, selling, and/or importing the Accused Vehicles into the United States that include Matrix Beam LED headlights, or equivalent thereof, such as the Genesis G80, among other products.

26. For example, the Genesis G80 comprises a system for projecting a pattern of light.

[1]

[1] https://www.hyundaimotorgroup.com/story/CONT0000000000003757.

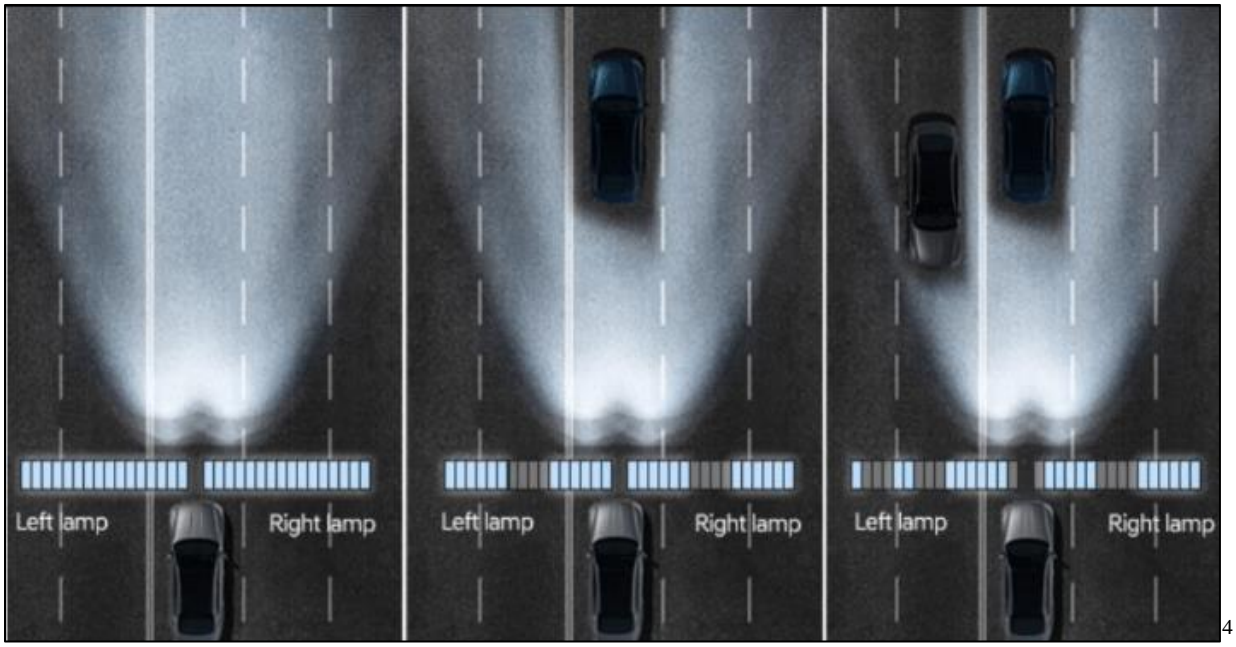


[2]

> The IFS technology was applied to the high-beam module encased in the lower lamps. High-beams are often considered a double-edged sword: while they ensure the visibility of the driver who uses them, the added visibility often comes at a sacrifice of the driver from the oncoming car, who may be blinded by the powerful stream of light. The IFS, though, comes with the partial light control capability that prevents such dazzling effects from happening, ensuring added visibility without inconveniencing other drivers.
>
> Each high-beam module contains a Matrix Beam LED, which aligns a whopping 8 LEDs in a row and therefore can offer high, concentrated visibility. As each headlamp contains two high-beam modules, a total of 32 LEDs collaborate to light the front. Thanks to this diversification of light sources, the IFS can precisely control the direction and the intensity of light beams.

[3]

[2] *Id.*
[3] *Id.*



[4]

27. The Genesis G80 comprises a light source (e.g., Matrix Beam LED headlights) including a plurality of emitters configured to emit light:

[5]

[4] *Id.*
[5] *Id.*

> Each high-beam module contains a Matrix Beam LED, which aligns a whopping 8 LEDs in a row and therefore can offer high, concentrated visibility. As each headlamp contains two high-beam modules, a total of 32 LEDs collaborate to light the front. Thanks to this diversification of light sources, the IFS can precisely control the direction and the intensity of light beams.

[6]

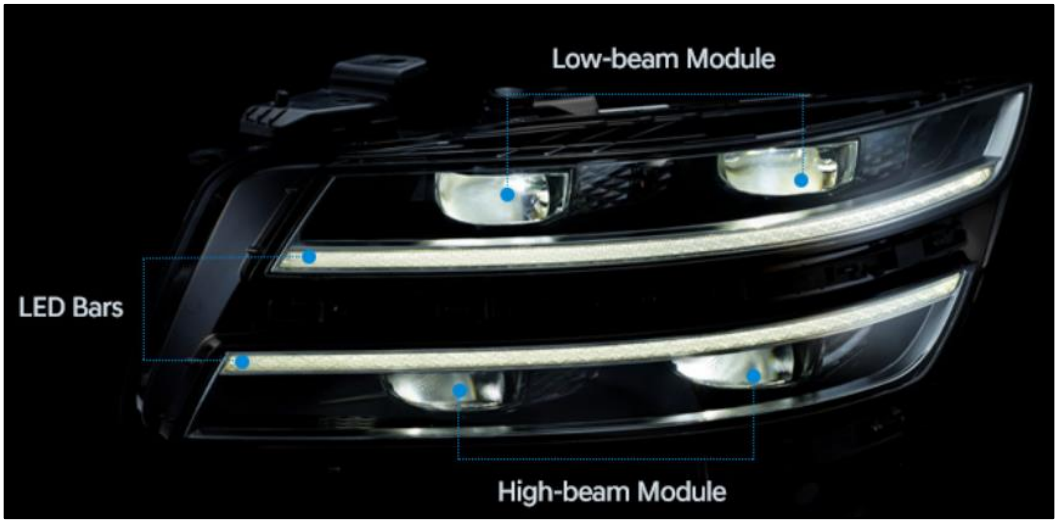
28. The Genesis G80 comprises a cluster of lenses (e.g., freeform lenses of the high beam module), each lens included in the cluster of lenses being configured to receive the emitted light from each of the plurality of emitters (e.g., each of the multiple LEDs):

> The light waves generated by the Matrix Beam LED are subjected through two special lenses that control the beam patterns. The optic lens positioned directly in front of the light source creates rectangular matrix beam patterns; these patterns then go through the freeform lens, which refracts and/or diffuses the pattern. The powerful lights from the IFS's efficient LEDs would be in vain if not for the assistance from these optical structures.

[7]

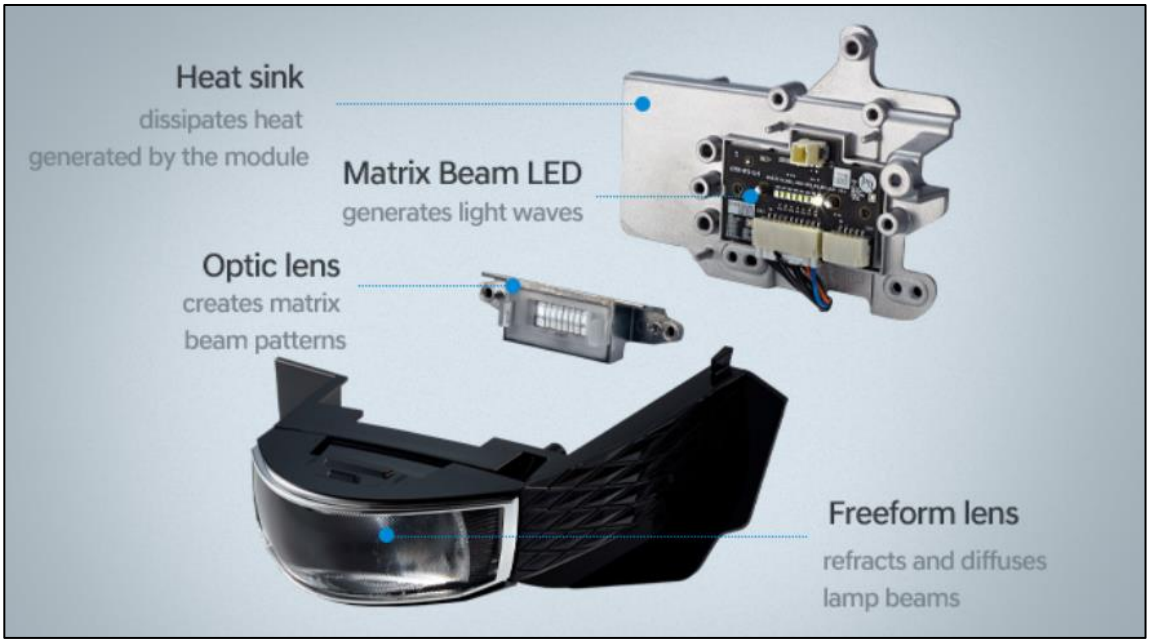
> Each high-beam module contains a Matrix Beam LED, which aligns a whopping 8 LEDs in a row and therefore can offer high, concentrated visibility. As each headlamp contains two high-beam modules, a total of 32 LEDs collaborate to light the front. Thanks to this diversification of light sources, the IFS can precisely control the direction and the intensity of light beams.

[8]



[9]

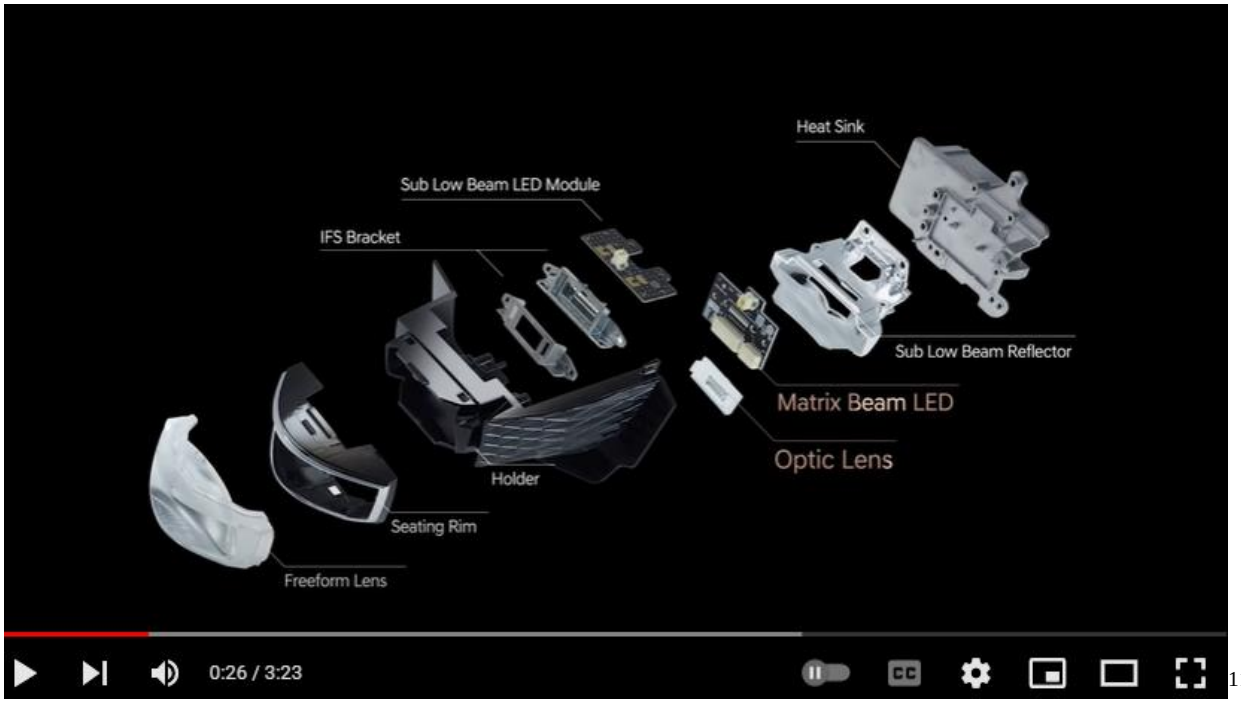
[6] *Id.*
[7] *Id.*
[8] *Id.*
[9] *Id.*



[10]

29. The Genesis G80 comprises a condenser lens (e.g., the optics lens) located between said light source (e.g., the Matric Beam LED) and said cluster of lenses (e.g. the freeform lenses of both the lamps of the high beam modules), the condenser lens concentrating light from each of the plurality of emitters towards a center of the cluster of lenses:

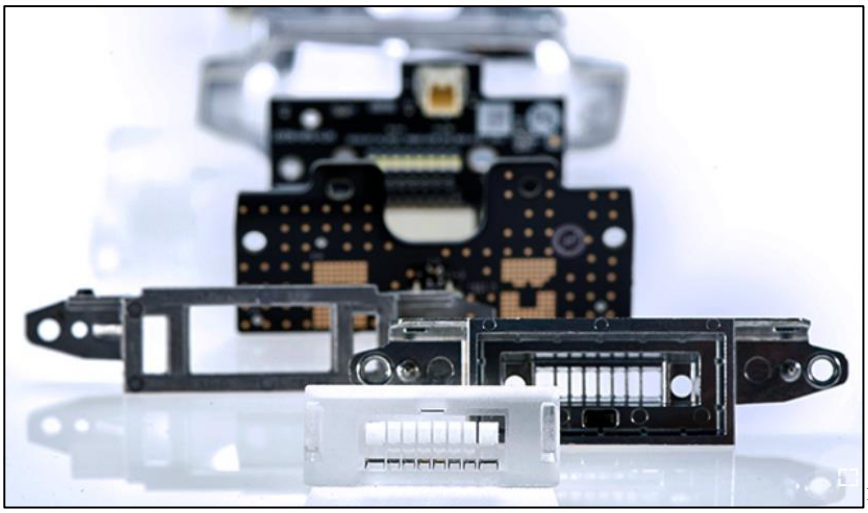
[10] *Id.*



[11]

> Each high-beam module contains a Matrix Beam LED, which aligns a whopping 8 LEDs in a row and therefore can offer high, concentrated visibility. As each headlamp contains two high-beam modules, a total of 32 LEDs collaborate to light the front. Thanks to this diversification of light sources, the IFS can precisely control the direction and the intensity of light beams.

[12]


[13]

30. Defendants have and continue to indirectly infringe one or more claims of the '803

[11] https://www.youtube.com/watch?v=fGwt2uA7MlM&t=1s.
[12] https://www.hyundaimotorgroup.com/story/CONT0000000000003757.
[13] *Id.*

Patent by knowingly and intentionally inducing others, including Hyundai customers and end-users, to directly infringe, either literally or under the doctrine of equivalents, by making, using, offering to sell, selling, and/or importing into the United States products that include infringing technology.

31. Defendants, with knowledge that these products, or the use thereof, infringe the '803 Patent at least as of the date of the Original Complaint, knowingly and intentionally induced, and continue to knowingly and intentionally induce, direct infringement of the '803 Patent by providing these products to customers and end-users for use in an infringing manner. Alternatively, on information and belief, Defendants have adopted a policy of not reviewing the patents of others, including specifically those related to Defendants' specific industry, thereby remaining willfully blind to the Patents-in-Suit at least as early as the issuance of the Patents-in-Suit.

32. Defendants have and continue to induce infringement by others, including customers and end-users, with the intent to cause infringing acts by others or, in the alternative, with the belief that there was a high probability that others, including end-users, infringe the '803 Patent, but while remaining willfully blind to the infringement. Defendants have and continue to induce infringement by their customers and end-users by supplying them with instructions on how to operate the infringing technology in an infringing manner, while also making publicly available information on the infringing technology via Defendants' website, product literature and packaging, and other publications.[14]

33. LAG has suffered damages as a result of Defendants' direct and indirect

[14] *See, e.g.*, Genesis Owner's Manuals, Quick Reference Guides, and other materials, available at: https://owners.genesis.com/us/en/resources/manuals-warranties.html.

infringement of the ’803 Patent in an amount to be proved at trial.

34. LAG has suffered, and will continue to suffer, irreparable harm as a result of Defendants’ infringement of the ’803 Patent, for which there is no adequate remedy at law, unless Defendants’ infringement is enjoined by this Court.

COUNT II
(Infringement of the ’002 Patent)

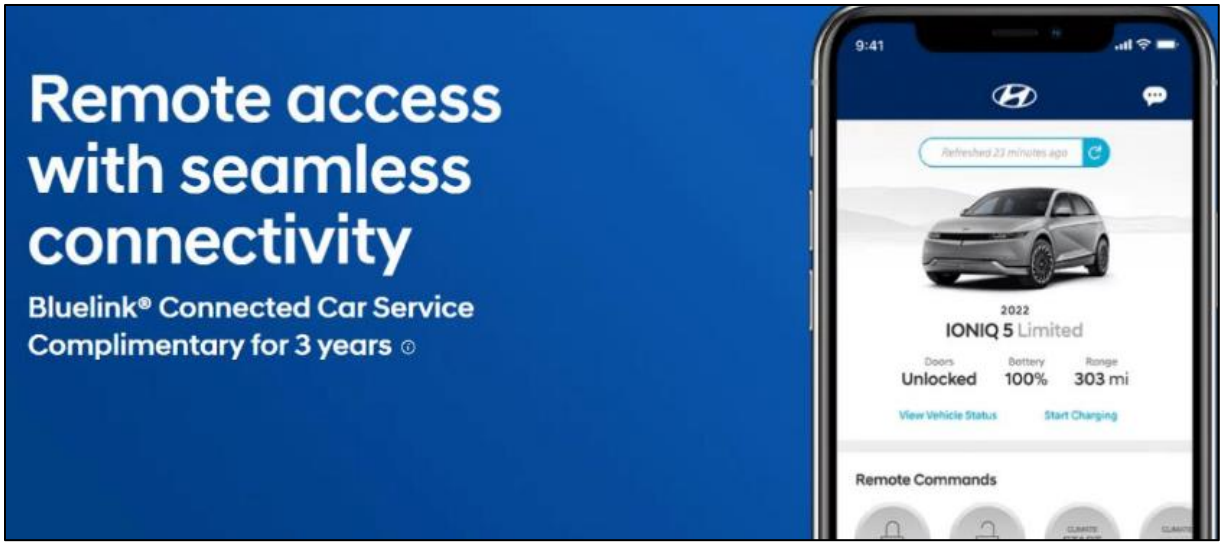
35. Paragraphs 1 through 21 are incorporated by reference as if fully set forth herein.

36. LAG has not licensed or otherwise authorized Defendants to make, use, offer for sale, sell, or import any products that embody the inventions of the ’002 Patent.

37. Defendants have and continue to infringe the ’002 Patent, either literally or under the doctrine of equivalents, without authority and in violation of 35 U.S.C. § 271, by one or more of making, using, offering to sell, selling, and/or importing into the United States products that satisfy each and every limitation of one or more claims of the ’002 Patent. Such products include, but are not limited to, the Accused Vehicles equipped with Bluelink technology, or the equivalent thereto, included in commercial and personal vehicles, in all trims and configurations.

38. For example, Defendants have and continue to directly infringe at least claim 15 of the ’002 Patent by making, using, offering to sell, selling, and/or importing into the United States products that include the Bluelink system, such as the Hyundai Sonata, among other products.

39. The Hyundai Sonata comprises a monitoring system. The Hyundai Sonata includes Bluelink technology, which provides a system for remote monitoring and control services for Hyundai vehicle owners, including features like remote door lock/unlock, remote climate control, remote horn, and light control, and many more including diagnostic information:



[15]

[15] https://www.hyundaiusa.com/us/en/blue-link.

Bluelink®

Bluelink® is a dynamic, telematics technology that allows Hyundai vehicles to send—and receive—important and useful information. The system uses an enhanced cellular network, with automatic roaming, that optimizes connections and prioritizes emergency requests. In your vehicle, Bluelink uses voice-response technology, with the addition of GPS and a live assistance team for selected needs.

With Bluelink you get...

- Automatic emergency assistance, in the unfortunate event of a collision.
- The convenience of Destination Search by Voice, as well as the ability to remotely operate various vehicle features.
- The peace of mind that comes with in-vehicle, on-demand diagnostics, and more...

An available smart phone mobile app gives you direct access to selected Remote features such as Remote Start with Climate Control* and Remote Door Lock/Unlock.[16]

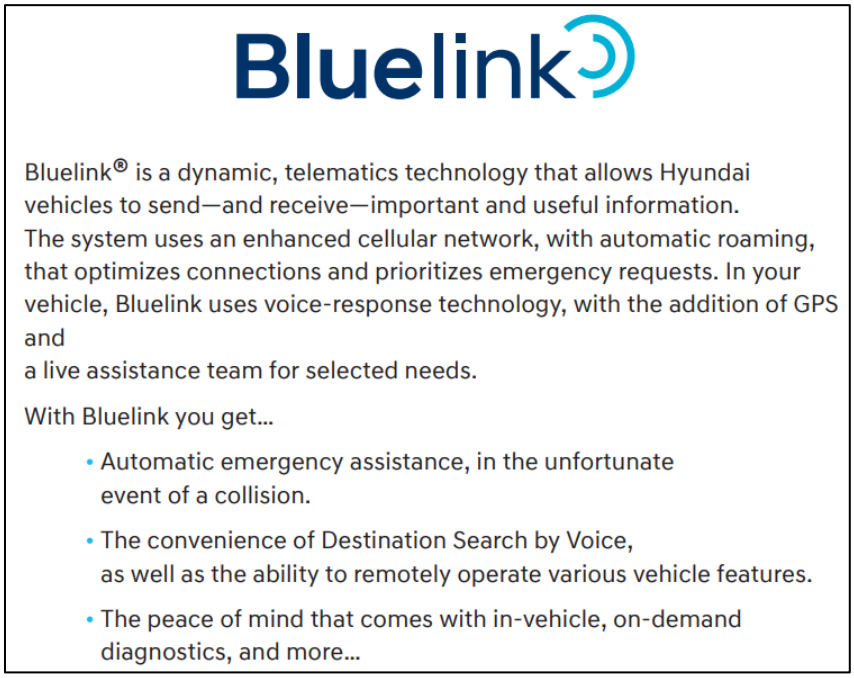
Remote

- Remote Service:
  - Remote Door Lock/ Unlock
  - Remote Horn/Lights
  - Remote Start with Climate Control*
  - Car Finder**
- Vehicle Safeguard:
  - Stolen Vehicle Recovery
  - Stolen Vehicle Immobilization
  - Alarm Notification
  - Panic Notification
- Vehicle Safeguard Alert***:
  - Valet Alert
  - Geo-Fence
  - Speed Alert
  - Curfew Alert

[17]

[16] https://owners.hyundaiusa.com/content/dam/hyundai/us/myhyundai/manuals/factory-warranty/2022/Bluelink-User-Manual.pdf.
[17] *Id.*

40. The Hyundai Sonata comprises a plurality of monitoring units (e.g., a mobile device with the MyHyundai App along with the Hyundai Bluelink Server) configured to communicate with at least one interface unit (e.g., the telematics control unit) using a first protocol (e.g., a cellular network), wherein the at least one interface unit is communicably connected to a distributed control system (e.g., the vehicle's electronic control modules such as Tire Pressure measuring Sensors (TPMS)), and the at least one interface unit is further configured to receive data values from the distributed control system using a second protocol (e.g., the CAN bus):



An available smart phone mobile app gives you direct access to selected Remote features such as Remote Start with Climate Control* and Remote Door Lock/Unlock.[18]

[18] https://owners.hyundaiusa.com/content/dam/hyundai/us/myhyundai/manuals/factory-warranty/2022/Bluelink-User-Manual.pdf.

Remote

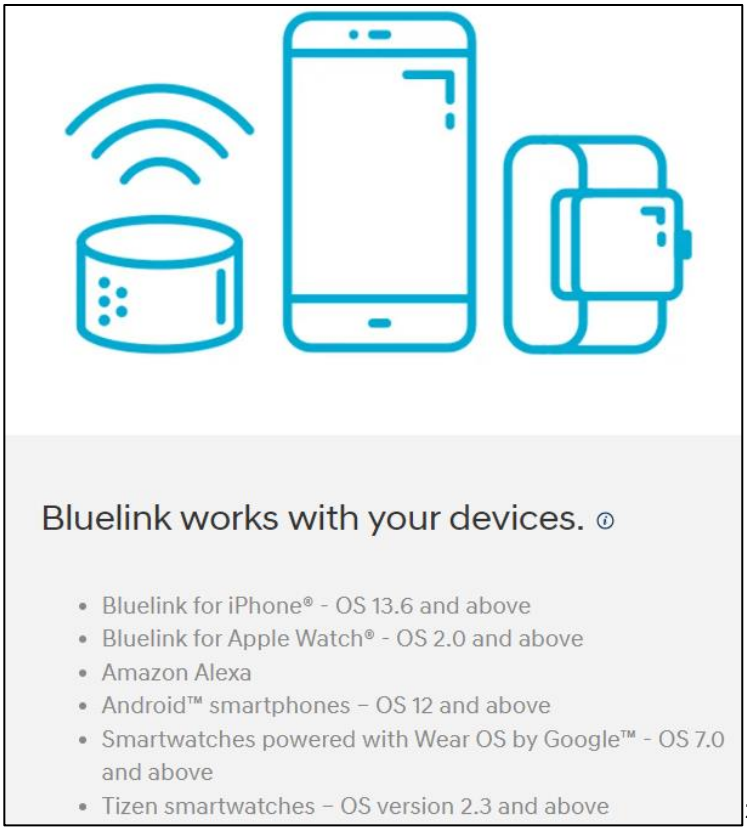
- Remote Service:
  - Remote Door Lock/ Unlock
  - Remote Horn/Lights
  - Remote Start with Climate Control*
  - Car Finder**
- Vehicle Safeguard:
  - Stolen Vehicle Recovery
  - Stolen Vehicle
  - Vehicle Immobilization
  - Alarm Notification
  - Panic Notification
- Vehicle Safeguard Alert***:
  - Valet Alert
  - Geo-Fence
  - Speed Alert
  - Curfew Alert

[19]

[20]

[19] *Id.*

[20] https://www.youtube.com/watch?v=1fmGag8Nq48.



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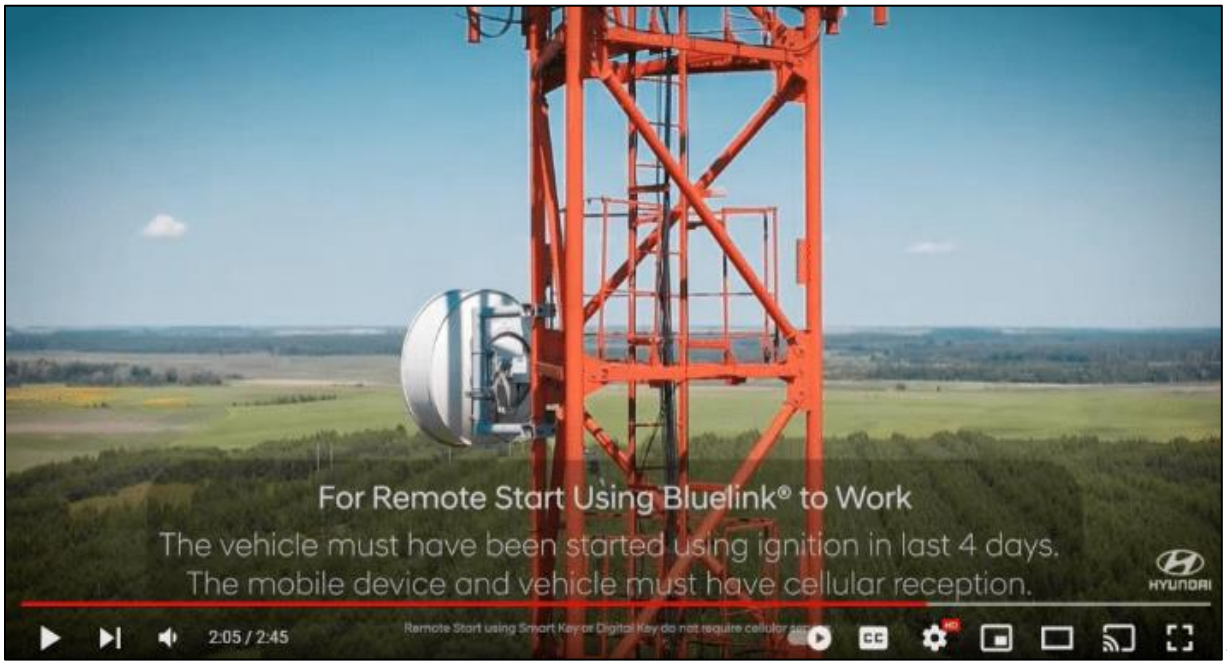


[22]

[21] https://www.hyundaiusa.com/us/en/blue-link.
[22] https://www.youtube.com/watch?v=Z6UaZSZAOA4&t=2s.

You can change the data network settings, including Bluelink and Wi-Fi Hotspot.

1 On the All Menus screen, press **Setup ▶ Data/Network**.

The Data/Network Settings screen appears.

[23]

Configuring the Wi-Fi settings (if equipped)

You can change the Wi-Fi connection settings for wireless phone projection.

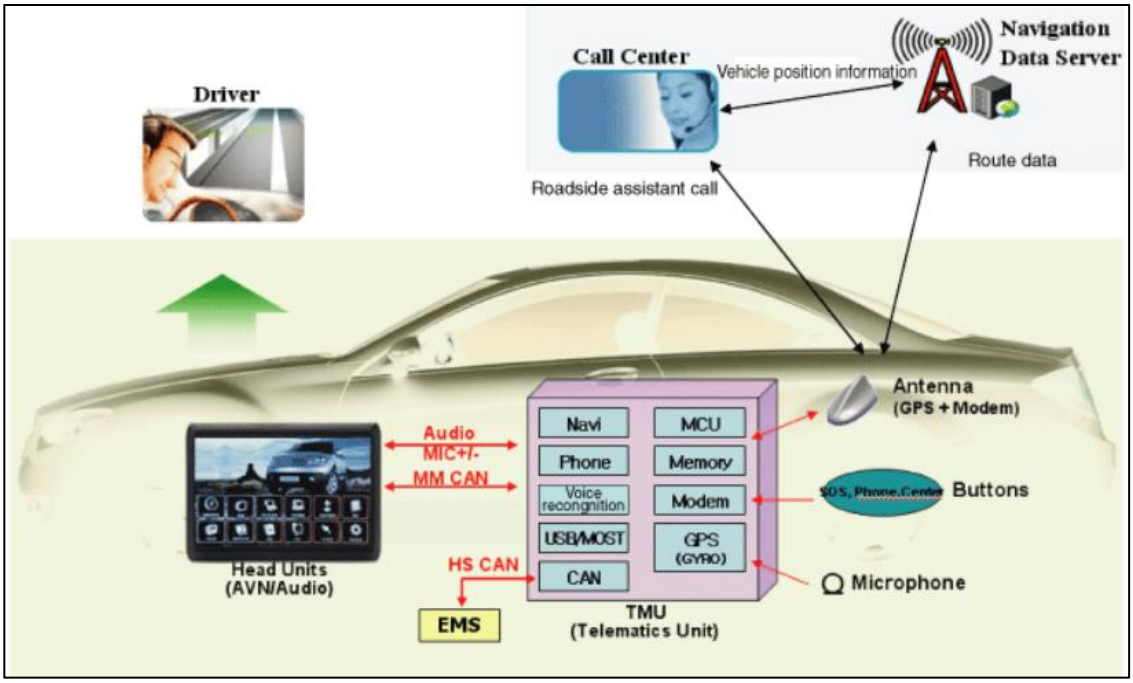
Depending on the vehicle model or specifications, displayed screens and available options may vary.

On the Home screen, press **All Menus ▶ Setup ▶ Wi-Fi** and select an option to change.

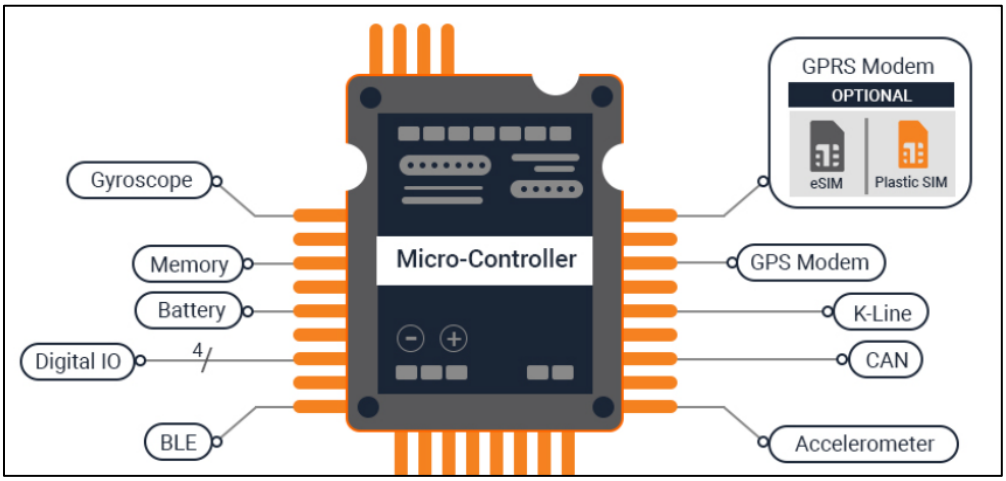
[24]

[23] http://webmanual.hyundai.com/STD_GEN5W/AVNT/USA/English/010_Settings_datanetwork2.html.

[24] http://webmanual.hyundai.com/DA_GEN2_V/AV/USA/English/010_Settings_wifi.html.



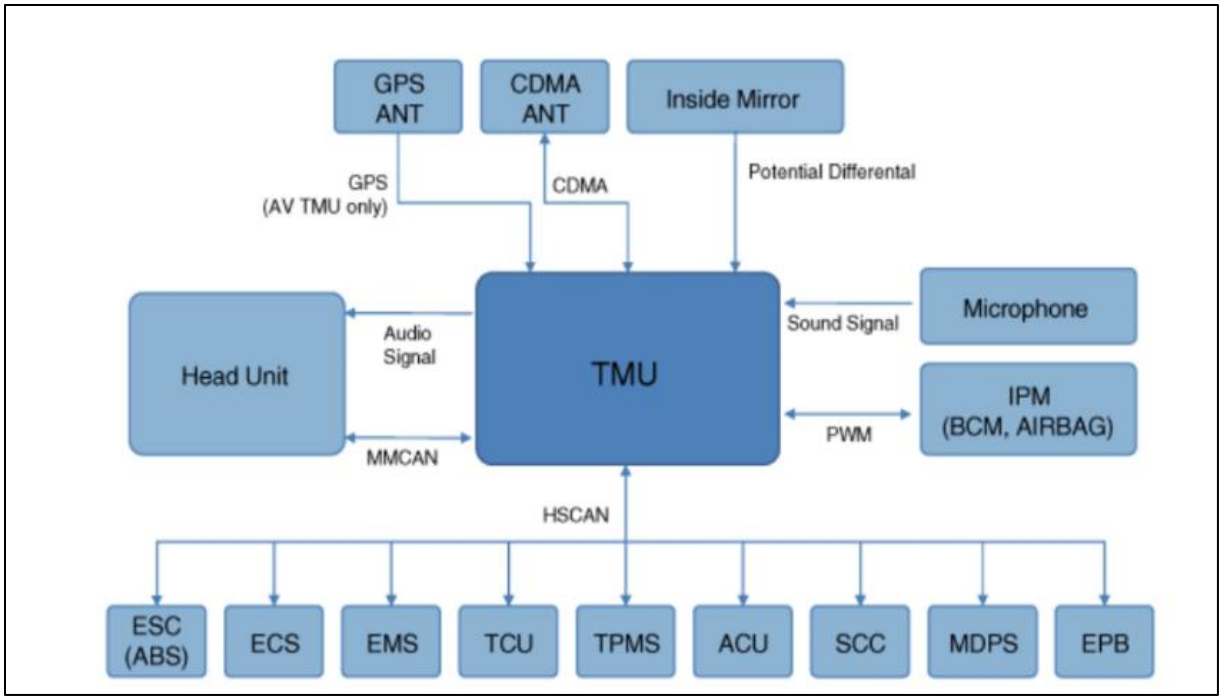
[25]



- A **CAN Bus** module that manages all the communication with the vehicle ECUs. Many of the commercially available telematics devices also support OBD II, MOST, LIN interfaces.The TCU communicates with the vehicle ECUs through CAN bus and fetches crucial information such as engine performance, vehicle speed, data from the Tire Pressure measuring Sensors, etc.A telematics system may also use K/Line bus to alert the user about theft (by notifying the user if the vehicle is switched on by anyone), or to enable remote locking and unlocking of the vehicle.

[26]

[25] https://www.hgmanual.com/description_and_operation-1226.html.
[26] https://www.embitel.com/blog/embedded-blog/tech-behind-telematics-explained-how-does-a-vehicle-telematics-solution-work.



[27]

41. The Hyundai Sonata comprises a plurality of monitoring units wherein the plurality of monitoring units comprises at least one complex monitoring unit (e.g., the Hyundai Bluelink Server Platform) and at least one basic monitoring unit (e.g., a mobile device running the My Hyundai App with Bluelink Remote Service):

Blue Link® Mobile App Highlights

- Completely redesigned interface and navigation
- Swipe gestures allow quick access to core features
- Remotely access many Blue Link® features found on MyHyundai.com
- Manage multiple Blue-Link-enrolled vehicles
- Remotely control vehicle functions: Door lock/unlock, horn & lights, lights-only and remote vehicle start (not available on all models)
- Search, save and send POIs to vehicles for in-car navigation
- Innovative new features: car finder, parking meter/timer and vehicle diagnostics
- Remotely manage Blue Link alerts and notifications

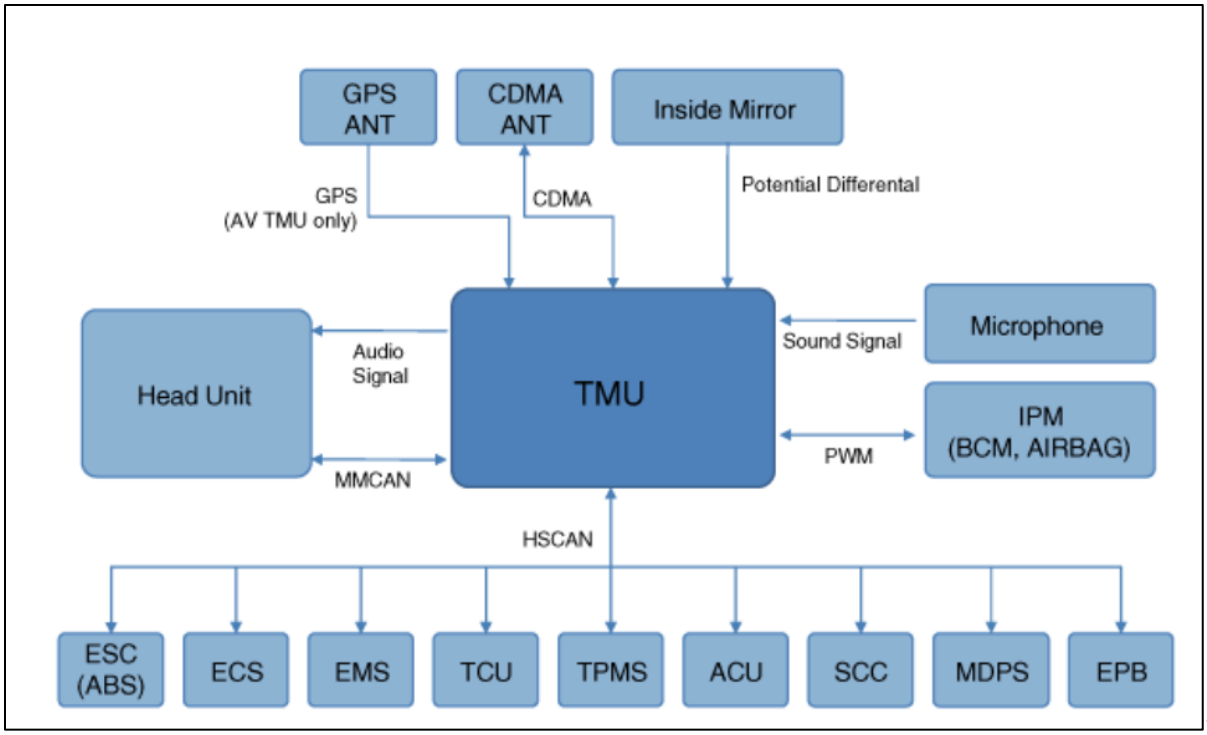
[27] *Id.*

REMOTE ACCESS FEATURES

Blue Link® Essentials subscribers can access a number of key vehicle functions remotely from the mobile application without the need to be in the proximity of the vehicle. Remote Door Lock or unlock allows for remote control and convenience from virtually anywhere. Remote Horn & Lights allows the subscriber to remotely activate the horn and lights. Remote Lights allows subscriber to remotely activate the vehicle lights only. Remote Vehicle Start, which has been expanded to include more Hyundai models, allows the subscriber to remotely start their vehicle, an especially convenient feature in cold states during winter months. Vehicles equipped with push-button start and automatic or dual-clutch transmissions are supported for Remote Vehicle Start. For added security, all remote access features require the vehicle PIN to be entered prior to the command being sent.[28]

42. The Hyundai Sonata comprises a plurality of monitoring units wherein the at least one complex monitoring unit (e.g., the Hyundai Bluelink server) is configured to receive a plurality of data values from the at least one interface unit using the first protocol (e.g., a cellular network) and to generate programmatic instructions (e.g., remote engine start) for the at least one basic monitoring unit (e.g., a mobile device running the My Hyundai App with Bluelink Remote Service):

[28] https://www.hyundainews.com/en-us/releases/2256.



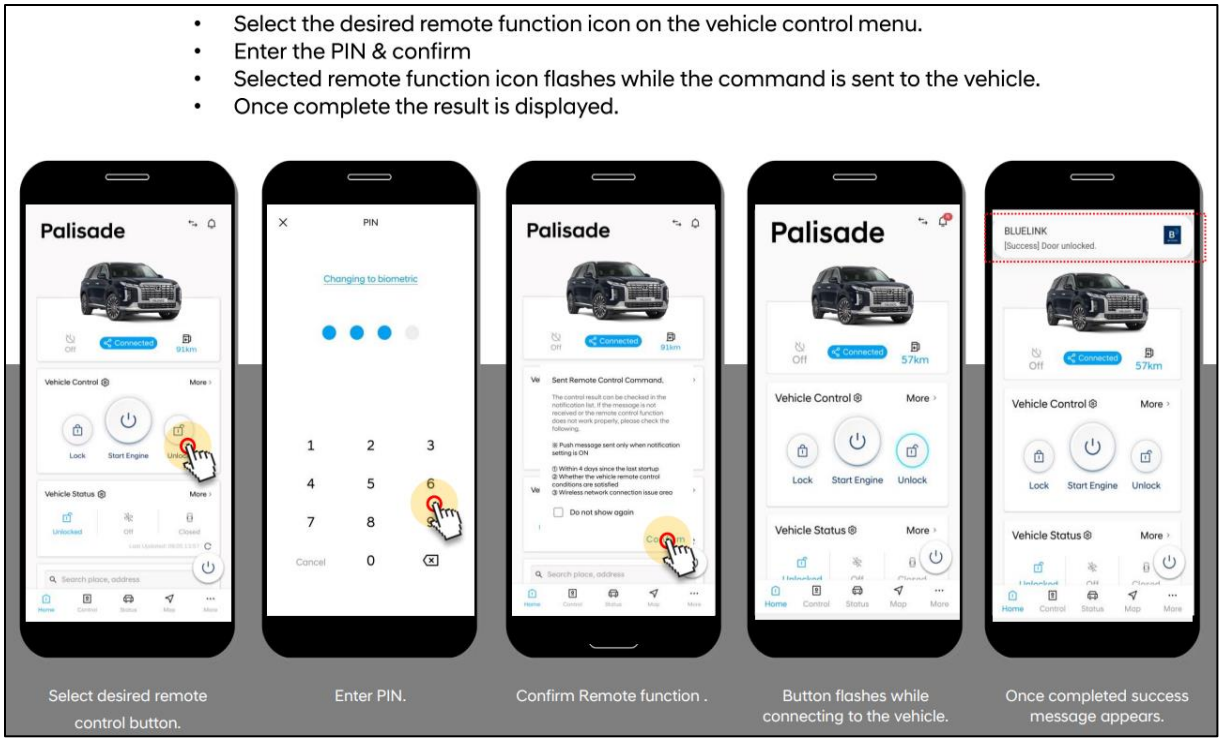
[29]

To Activate Remote Start with Climate Control

- **By Mobile App:** Select Remote features and REMOTE START.
  - Enter your Bluelink PIN.
  - Set engine duration and temperature control settings, if desired.
  - The engine start command will be sent to your vehicle.
- **By website:** Log on to www.MyHyundai.com, select Bluelink.
  - Select Remote Start.
  - Select Remote Start, set a desired engine duration for remote start and temperature control settings, then input your Bluelink PIN.

[30]

[29] https://www.hgmanual.com/description_and_operation-1226.html.
[30] https://owners.hyundaiusa.com/content/dam/hyundai/us/myhyundai/manuals/factory-warranty/2022/Bluelink-User-Manual.pdf.



[31]

43. The Hyundai Sonata comprises a plurality of monitoring units wherein the at least one basic monitoring unit (e.g., a mobile device running the My Hyundai App with Bluelink Remote Service) is configured to receive the programmatic instructions (e.g., vehicle status data) and in response thereto to receive a subset of the plurality of data values (e.g. vehicle status) from the at least one interface unit (e.g. the telematics control unit of the vehicle) using the first protocol (e.g. a cellular network):

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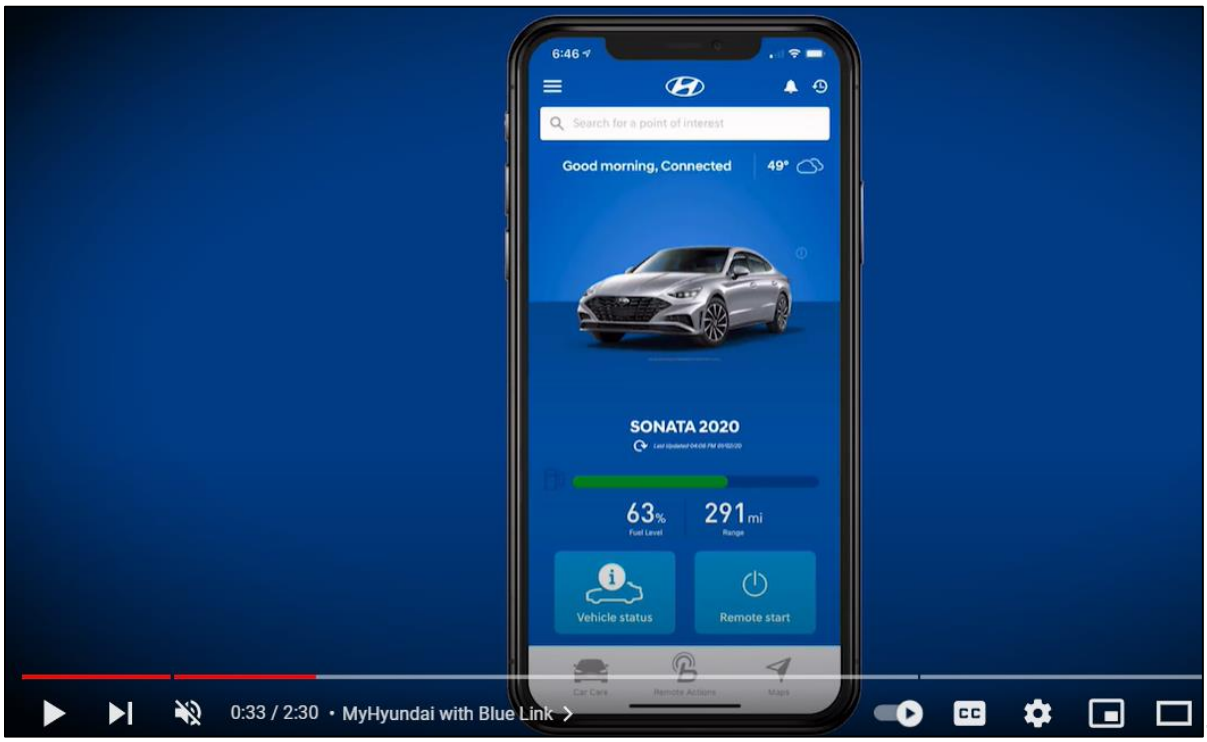
31 https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjP0cX5vf-AAxV41jgGHXwoCbMQFnoECCwQAQ&url=https%3A%2F%2Fwww.hyundai.com%2Fcontent%2Fdam%2Fhyundai%2Fau%2Fen%2Fowning%2Fmanuals%2Fbluelink-manuals%2FBluelink-App-User-Manual-AUS.pdf&usg=AOvVaw1QmAAAq94hwvn80ltSRFev&opi=89978449.

The new home page will greet you, and in most cases, an image representing your vehicle will appear along with a quick view of your vehicle name, door lock status, fuel or battery status, and estimated range. The page provides access to these features:

- Your vehicle status information
- Remote Commands such as Start, Lock, Unlock, Stop, or Locate Vehicle
- Options to View Vehicle Status page and Start Charging (for EV vehicles)
- Driving Score (if enabled)
- Vehicle Safeguard Alerts
- Utilities Menu (three bars on the bottom left)
- Message Center (envelope icon on the bottom right)

[32]

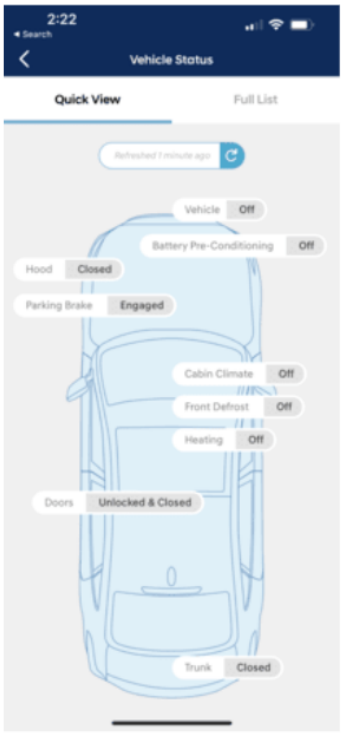


[33]

[32] https://owners.hyundaiusa.com/us/en/resources/technology-and-navigation/getting-to-know-the-redesigned-myhyundai-app.html.

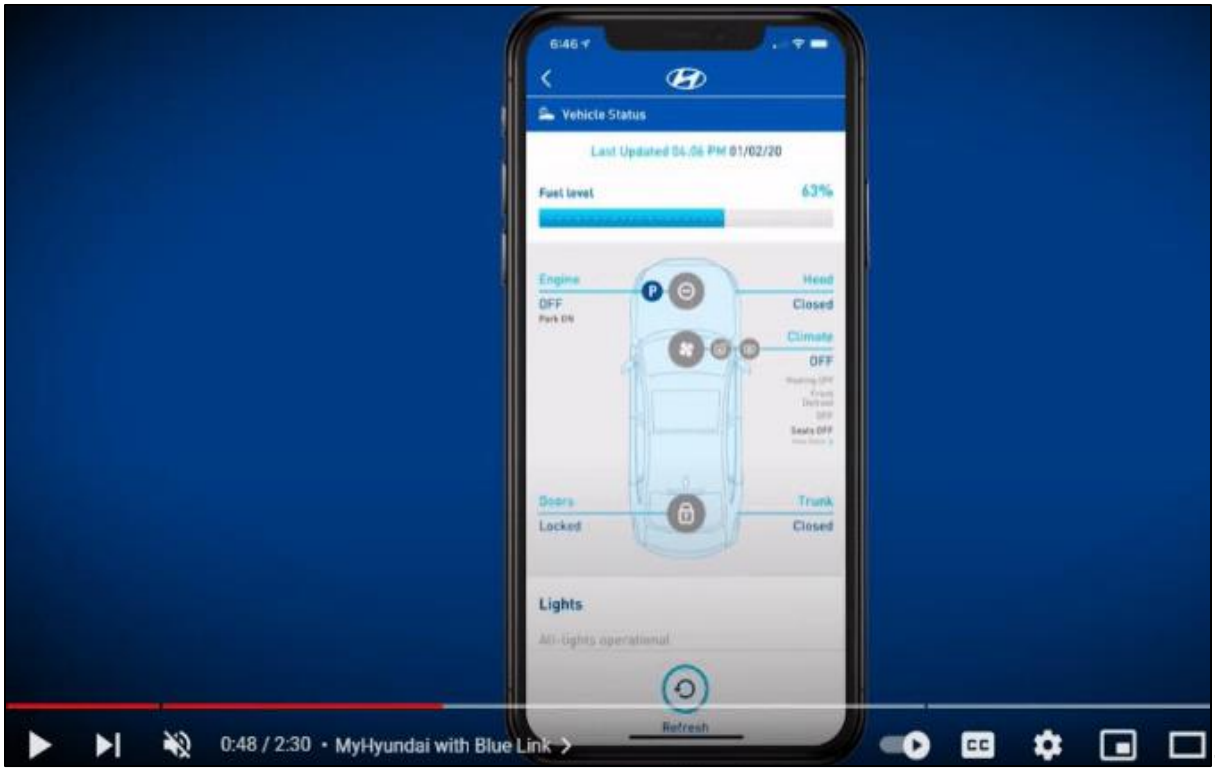
[33] https://www.youtube.com/watch?v=jg3BCA6YzcY.

Vehicle Status

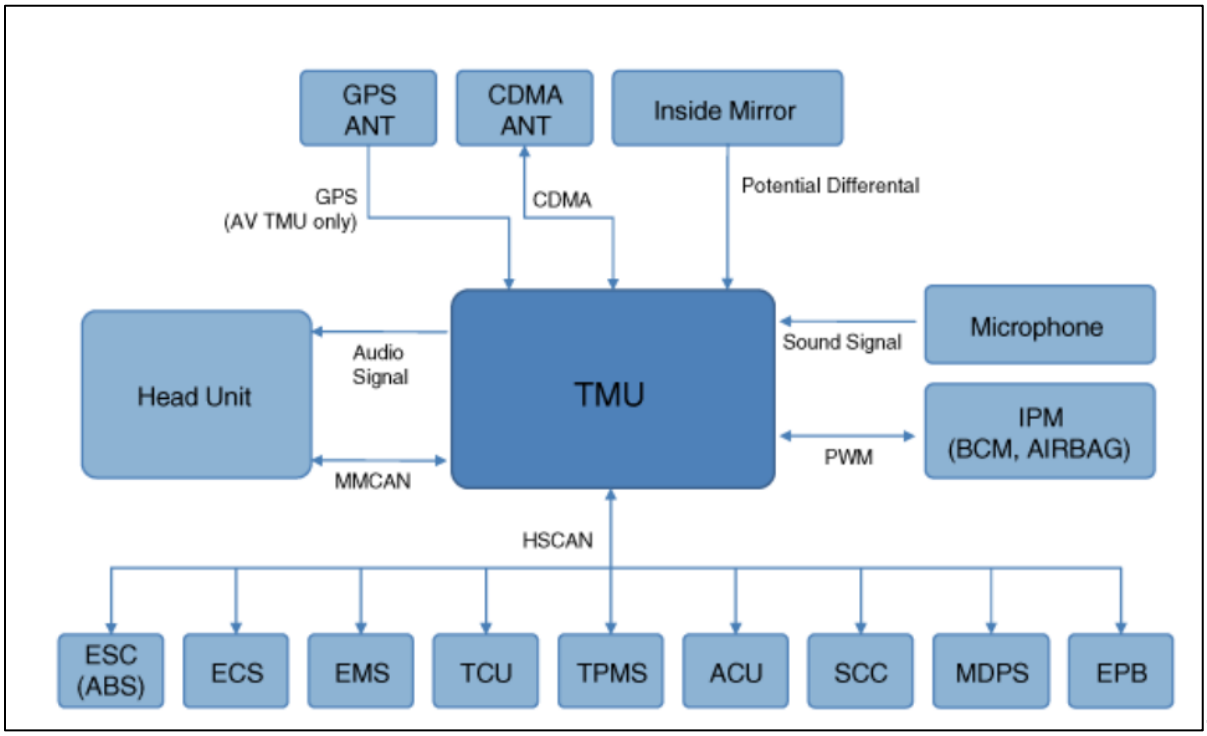


Clicking "View Vehicle Status" on the homepage will lead you to a quick view of your vehicle status, showing status of doors, hood, trunk, cabin climate, and more.[34]

[34] https://owners.hyundaiusa.com/us/en/resources/technology-and-navigation/getting-to-know-the-redesigned-myhyundai-app.html.



[35]



[36]

[35] https://www.youtube.com/watch?v=jg3BCA6YzcY.
[36] https://www.hgmanual.com/description_and_operation-1226.html.

44. Defendants have and continue to indirectly infringe one or more claims of the '002 Patent by knowingly and intentionally inducing others, including Hyundai customers and end-users, to directly infringe, either literally or under the doctrine of equivalents, by making, using, offering to sell, selling, and/or importing into the United States products that include infringing technology.

45. Defendants, with knowledge that these products, or the use thereof, infringe the '002 Patent at least as of the date of the Original Complaint, knowingly and intentionally induced, and continue to knowingly and intentionally induce, direct infringement of the '002 Patent by providing these products to customers and end-users for use in an infringing manner. Alternatively, on information and belief, Defendants have adopted a policy of not reviewing the patents of others, including specifically those related to Defendants' specific industry, thereby remaining willfully blind to the Patents-in-Suit at least as early as the issuance of the Patents-in-Suit.

46. Defendants have and continue to induce infringement by others, including customers and end-users, with the intent to cause infringing acts by others or, in the alternative, with the belief that there was a high probability that others, including end-users, infringe the '002 Patent, but while remaining willfully blind to the infringement. Defendants have and continue to induce infringement by their customers and end-users by supplying them with instructions on how to operate the infringing technology in an infringing manner, while also making publicly available information on the infringing technology via Defendants' website, product literature and packaging, and other publications.[37]

[37] *See, e.g.*, Hyundai Owner's Manuals, Quick Reference Guides, and other materials, available at: https://owners.hyundaiusa.com/us/en/resources/manuals-warranties.

47. LAG has suffered damages as a result of Defendants' direct and indirect infringement of the '002 Patent in an amount to be proved at trial.

48. LAG has suffered, and will continue to suffer, irreparable harm as a result of Defendants' infringement of the '002 Patent, for which there is no adequate remedy at law, unless Defendants' infringement is enjoined by this Court.

COUNT III
(Infringement of the '238 Patent)

49. Paragraphs 1 through 21 are incorporated by reference as if fully set forth herein.

50. LAG has not licensed or otherwise authorized Defendants to make, use, offer for sale, sell, or import any products that embody the inventions of the '238 Patent.

51. Defendants have and continue to infringe the '238 Patent, either literally or under the doctrine of equivalents, without authority and in violation of 35 U.S.C. § 271, by one or more of making, using, offering to sell, selling, and/or importing into the United States products that satisfy each and every limitation of one or more claims of the '238 Patent. Such products include, but are not limited to, the Accused Vehicles equipped with a direct injecting internal combustion engine, or the equivalent thereto, included in commercial and personal vehicles, in all trims and configurations.

52. For example, Defendants have and continue to directly infringe at least claim 1 of the '238 Patent by making, using, offering to sell, selling, and/or importing into the United States products that include a direct injecting internal combustion engine, such as the Gamma 1.6 Turbo GDI Engine in the Hyundai Accent, among other products.

53. The Hyundai Accent comprises a directly injecting internal combustion engine (e.g., the Gamma 1.6 Turbo GDI Engine), comprising at least one cylinder which has a combustion space:

> The all-new Gamma 1.6-liter four-cylinder engine is the smallest Hyundai engine to use Gasoline Direct Injection (GDI) in the U.S., which helps deliver an estimated highway fuel economy of up to 40 mpg, lower emissions and higher reliability. Through the use of GDI technology, the Gamma 1.6-liter engine delivers a peak output of 138 horsepower at 6,300 rpm and maximum torque of 123 lb.-ft. at 4,850 rpm. However, GDI is only part of the story, as the new Gamma also features Dual Continuously Variable Valve Timing, an electronic throttle control, a roller timing chain, variable induction and innovative anti-friction coatings such as CrN Physical Vapor Deposition (PVD) coating and Diamond Like Carbon (DLC) coating.[38]

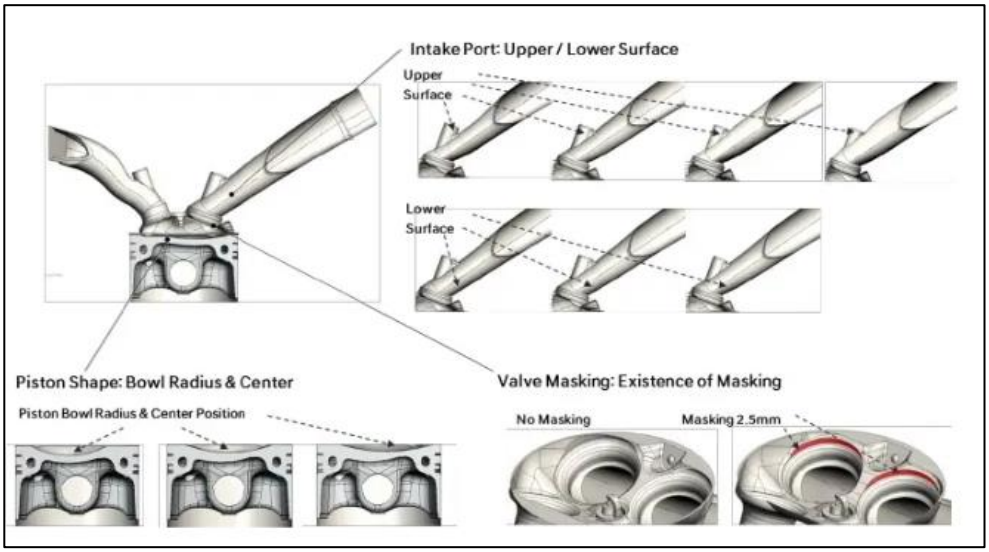
[39]

> Therefore in order to optimize the combustion system, we must optimize the design of the combustion chamber that determines the combustion speed, composition inside combustion chamber and heat transfer through the combustion chamber surfaces. For example, the shape of the intake port affects not only the in-cylinder flow and thus the combustion speed, but also controls the composition and heat transfer as well. Similarly, the shape of the piston not only affects the flow inside combustion chamber, but also the surface heat transfer. In addition the interactions between these components should also be considered.[40]

54. The Hyundai Accent comprises a directly injecting internal combustion engine (e.g., the Gamma 1.6 Turbo GDI Engine), comprising at least one cylinder which has a combustion space in which a piston executes an oscillating movement (e.g., the piston moving upwards to

[38] https://www.hyundai.com/worldwide/en/company/newsroom/hyundai-1.6-liter-gamma-engine-named-to-ward%25E2%2580%2599s-10-best-engines-list-0000001092.
[39] https://www.youtube.com/watch?v=8h49zmB7sos.
[40] https://www.scribd.com/document/553757052/1-6-Turbo-Gdi-Hyundai-Kim-e#.

compress air-fuel mixture withing the cylinder), and an injection nozzle for injection of fuel into the combustion space:



[41]

> open during significant portion of the compression stroke, and it turns out that a large amount of the flow momentum generated during the intake stroke is lost back to the intake port when the valve mask is not existent. However if we apply a well-designed intake valve mask, we could block the flow tumble momentum going back to the intake port and preserve it inside the combustion chamber as shown in figure 6. In addition, this helps to maintain the center of the tumble near the center of the pent-roof combustion chamber which prevents the early breakdown of the flow into smaller scale turbulence.

[42]

[41] https://www.scribd.com/document/553757052/1-6-Turbo-Gdi-Hyundai-Kim-e#.
[42] *Id.*

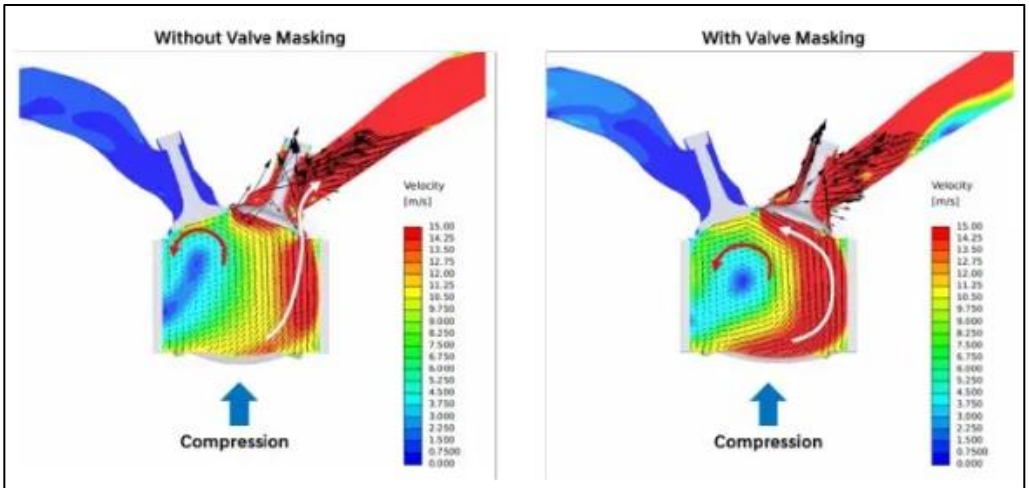


Fig. 6: Effect of intake valve masking to the flow characteristics [43]

> The injection is split into two phases to achieve optimum combustion: in the first phase, the pilot injection and ignition trigger the piston's downward power stroke. Then, in the main injection phase, during the piston's descent, more fuel is injected and is ignited. This split-injection technique reduces loading on the catalytic converter and helps lower emissions. This is particularly beneficial during cold starts when emissions are highest because the catalyst has not reached its optimal operating temperature. Split-injection enables the catalytic converter to reach the optimal operating temperature faster thus reducing emissions by 25 percent during cold starts and meet's California Air Resources Board's ULEV-2 and PZEV standards [44]

> In order to maximize the benefits of higher fuel pressure, newly developed next generation injectors are applied. As shown in figure 20, the HMG developed 350bar injectors have been extensively improved in terms of the nozzle structure, the dynamic fuel metering enhancement and durability in relation to increased fuel pressure. [45]

[43] *Id.*
[44] *Id.*
[45] https://www.scribd.com/document/553757052/1-6-Turbo-Gdi-Hyundai-Kim-e#.

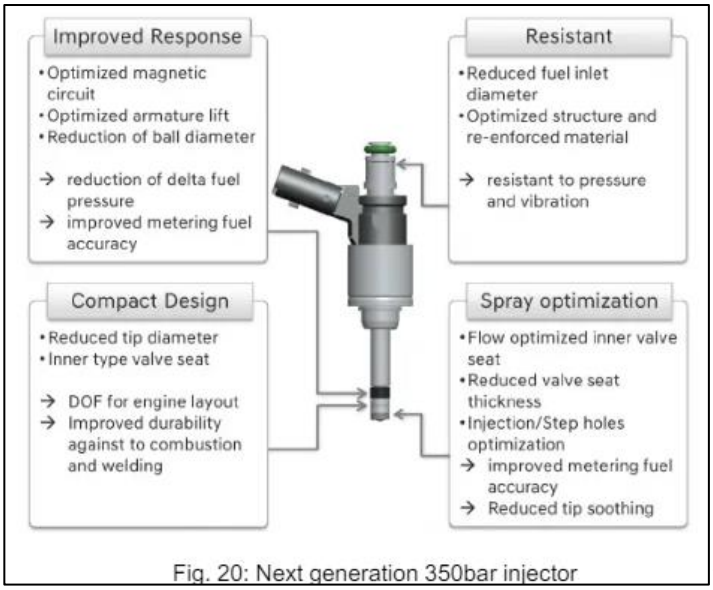


Fig. 20: Next generation 350bar injector [46]

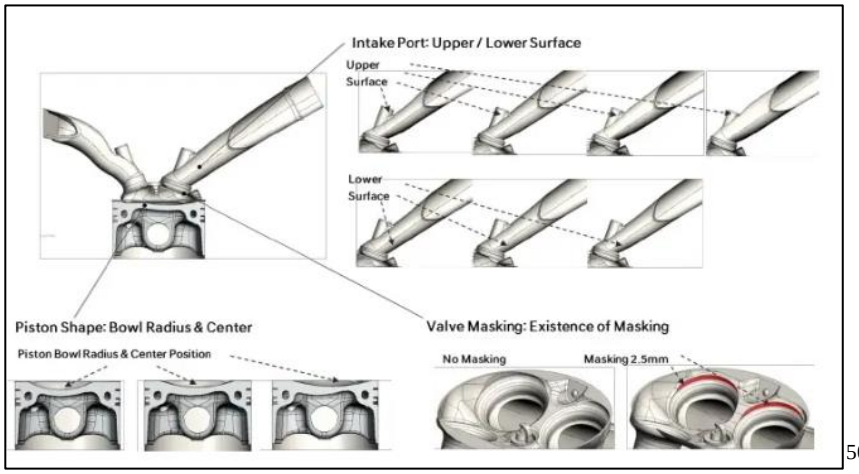
55. The Hyundai Accent comprises a directly injecting internal combustion engine (e.g., the Gamma 1.6 Turbo GDI Engine), comprising at least one cylinder which has a combustion space in which a piston executes an oscillating movement (e.g., the piston moving upwards to compress air-fuel mixture withing the cylinder), and an injection nozzle for injection of fuel into the combustion space wherein the piston has a piston recess (e.g., a bowl like shape), which, in a central region thereof, has an elevation extending in a cylinder head direction, and a surface of the piston recess adjoining the elevation in a recess edge direction is connected to the elevation via a radius (e.g., the radius of the bowl shape):

> To optimize the 5 parameters, 16 different DoE combustion chambers were designed as shown in figure 4. Based on the designs, we have prototyped four special engine heads with all 16 individual combustion chambers composed of the 16 DoE combustion chambers that we described above. We performed the combustion evaluation using these 4 special heads in the real firing engine. We also have performed the computational simulations for these 16 different combustion systems in order to understand the effect of the each parameter in more detail. [47]

[46] *Id.*
[47] *Id.*


48

49



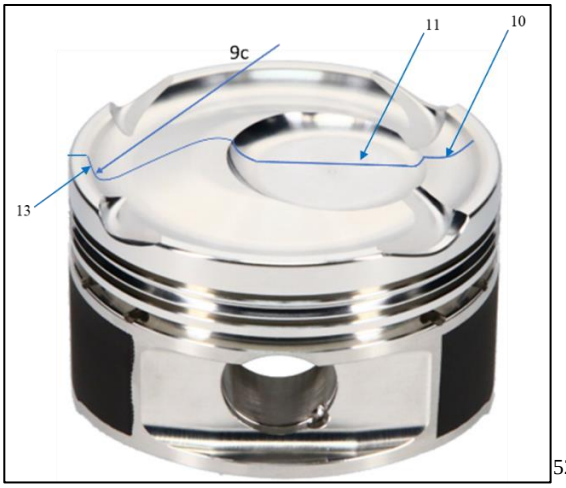
50

[48] https://www.jepistons.com/product/je-pistons-hyundai-1-6l-gamma-turbo-gdi-piston-77-00-mm-bore-1-099-in-ch-8-20-cc/.
[49] https://www.youtube.com/watch?v=0n3jim7ylTA.
[50] https://www.scribd.com/document/553757052/1-6-Turbo-Gdi-Hyundai-Kim-e#.

> To optimize this complex system, we decided to use the Design of Experiment (DoE) approach. By analyzing the system, we chose 5 important design parameters to optimize the combustion chamber. The 5 parameters are shown in figure 3, and they are intake port upper curvature, lower curvature, piston bowl position, bowl radius, and valve masking.[51]

56. The Hyundai Accent comprises a directly injecting internal combustion engine (e.g., the Gamma 1.6 Turbo GDI Engine), comprising at least one cylinder which has a combustion space in which a piston executes an oscillating movement (e.g., the piston moving upwards to compress air-fuel mixture withing the cylinder), and an injection nozzle for injection of fuel into the combustion space wherein the piston has a piston recess (e.g., a bowl like shape), which, in a central region thereof, has an elevation extending in a cylinder head direction, and a surface of the piston recess adjoining the elevation in a recess edge direction is connected to the elevation via a radius (e.g., the radius of the bowl shape) so that an injection jet impinging the surface and injected as early as possible is distributed both in a elevation direction and in the recess edge direction, and the surface is substantially planar and has an ascending gradient in the recess edge direction such that an injection jet injected as late as possible impinges onto the surface, the last-mentioned injection jet being distributed both in the elevation direction and in the recess edge direction:

[51] *Id.*



[52]

57. Defendants have and continue to indirectly infringe one or more claims of the ’238 Patent by knowingly and intentionally inducing others, including Hyundai customers and end-users, to directly infringe, either literally or under the doctrine of equivalents, by making, using, offering to sell, selling, and/or importing into the United States products that include infringing technology.

58. Defendants, with knowledge that these products, or the use thereof, infringe the ’238 Patent at least as of the date of the Original Complaint, knowingly and intentionally induced, and continue to knowingly and intentionally induce, direct infringement of the ’238 Patent by providing these products to customers and end-users for use in an infringing manner. Alternatively, on information and belief, Defendants have adopted a policy of not reviewing the patents of others, including specifically those related to Defendants’ specific industry, thereby remaining willfully blind to the Patents-in-Suit at least as early as the issuance of the Patents-in-Suit.

59. Defendants have and continue to induce infringement by others, including

[52] https://www.jepistons.com/product/je-pistons-hyundai-1-6l-gamma-turbo-gdi-piston-77-00-mm-bore-1-099-in-ch-8-20-cc/.

customers and end-users, with the intent to cause infringing acts by others or, in the alternative, with the belief that there was a high probability that others, including end-users, infringe the '238 Patent, but while remaining willfully blind to the infringement. Defendants have and continue to induce infringement by their customers and end-users by supplying them with instructions on how to operate the infringing technology in an infringing manner, while also making publicly available information on the infringing technology via Defendants' website, product literature and packaging, and other publications.[53]

60. LAG has suffered damages as a result of Defendants' direct and indirect infringement of the '238 Patent in an amount to be proved at trial.

61. LAG has suffered, and will continue to suffer, irreparable harm as a result of Defendants' infringement of the '238 Patent, for which there is no adequate remedy at law, unless Defendants' infringement is enjoined by this Court.

COUNT IV
(Infringement of the '353 Patent)

62. Paragraphs 1 through 21 are incorporated by reference as if fully set forth herein.

63. LAG has not licensed or otherwise authorized Defendants to make, use, offer for sale, sell, or import any products that embody the inventions of the '353 Patent.

64. Defendants have and continue to infringe the '353 Patent, either literally or under the doctrine of equivalents, without authority and in violation of 35 U.S.C. § 271, by one or more of making, using, offering to sell, selling, and/or importing into the United States products that satisfy each and every limitation of one or more claims of the '353 Patent. Such products include, but are not limited to, the Accused Vehicles equipped Hyundai's SmartSense integrated with a

[53] *See, e.g.*, Hyundai Owner's Manuals, Quick Reference Guides, and other materials, available at: https://owners.hyundaiusa.com/us/en/resources/manuals-warranties.

communication controller, such as the Hyundai Mobis Integrated Communication Controller, or the equivalent thereto, included in commercial and personal vehicles, in all trims and configurations.

65. For example, Defendants have and continue to directly infringe at least claim 1of the ’353 Patent by making, using, offering to sell, selling, and/or importing into the United States products that include Hyundai SmartSense, such as the Hyundai Kona, among other products.

66. The Hyundai Kona performs a method of forming an image of a mobile object:

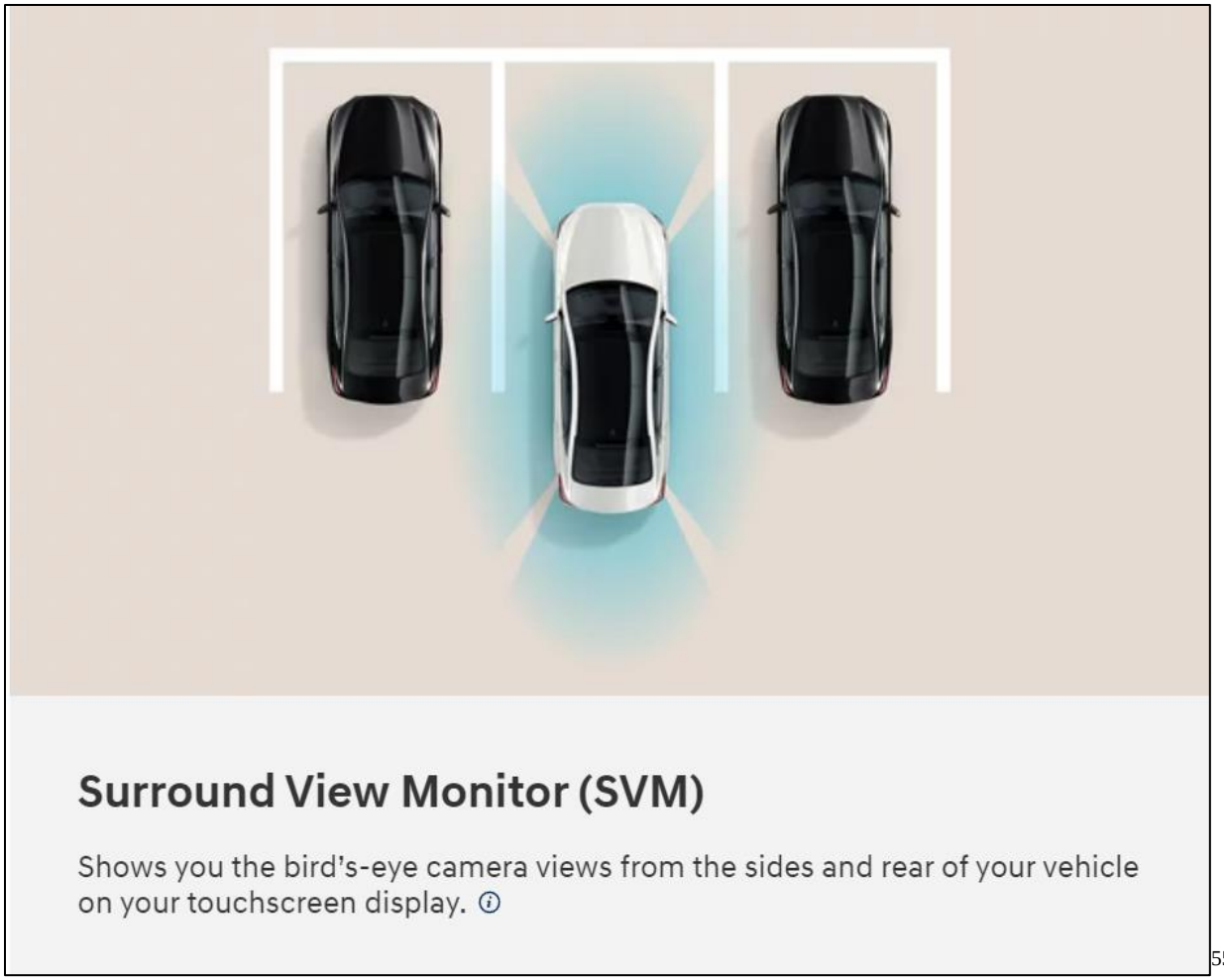
The Integrated Communication Controller, developed by Hyundai Mobis, connects various Electronic Control Units (ECU) mounted on the vehicle, e.g. the powertrain, multimedia, airbags and brake systems, through wired communication to collect and analyze various kinds of vehicle operation data in real time. It can process large amounts of data, including the data from various sensors like radars, lidars and cameras, and autonomous driving-related data.

Hyundai Mobis Integrated Communication Controller

It also communicates this information with the outside through full-time wireless network connectivity. It can also implement various connected car services, such as remote vehicle control and automatic update of the software of various systems, and functions like eCall which automatically transmits accident information in case of an emergency.[54]

67. The Hyundai Kona performs the step of obtaining a plurality of first images of the mobile object using a first imaging technique (e.g., the Bird’s-eye image camera processing) while obtaining a plurality of first measurements corresponding to movements of the mobile object using a first sensor system (e.g., ultrasonic sensor), the first sensor system being independent from the first imaging technique (e.g., the Bird’s-eye image camera processing):

[54] https://www.prnewswire.com/news-releases/hyundai-mobis-develops-integrated-communication-controller-the-next-generation-v2x-control-technology-for-the-first-time-in-korea-301084287.html.



[55]

[55] https://www.hyundaiusa.com/us/en/safety.

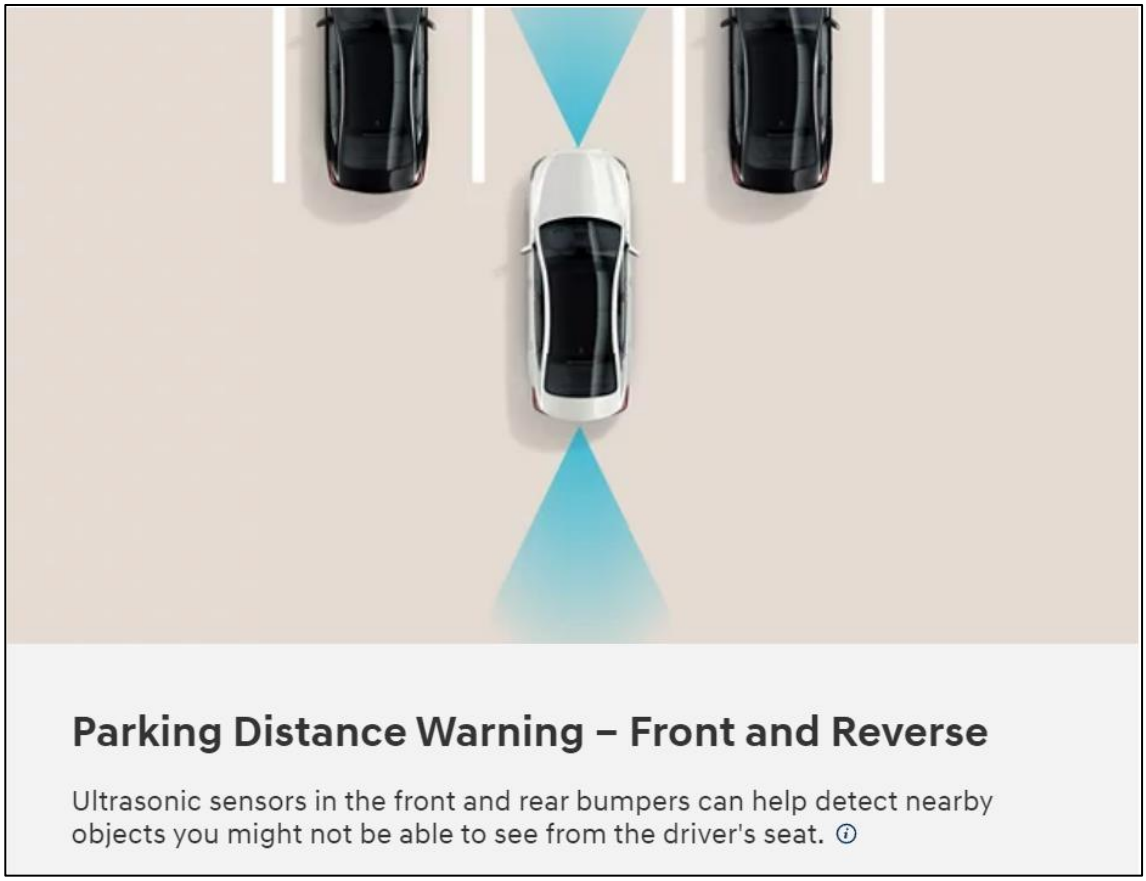
[56]

[57]

[56] https://youtu.be/Y82vK_E6c08?si=0SYuXC3qDtSzAr5d.
[57] *Id.*


K O N A
KONA
and the front and rear of the vehicle.
HYUNDAI
0:23 / 2:58 • Introduction
[58]

[58] *Id.*



[59]

68. The Hyundai Kona performs the step of associating the plurality of first images (e.g., the Bird's-eye view) with first movement states of the mobile object using the first measurements (e.g., ultrasonic sensor data):

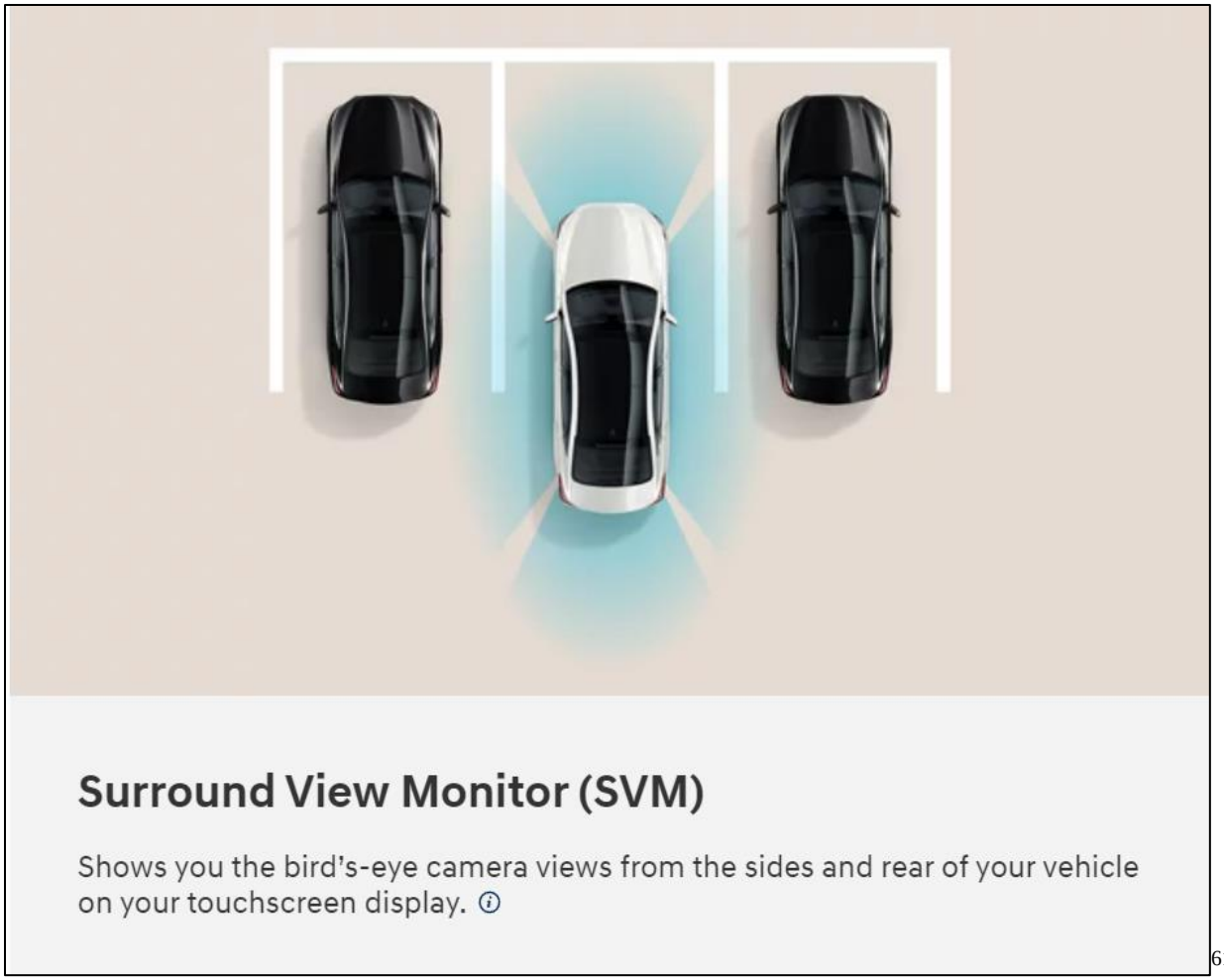
[59] https://www.hyundaiusa.com/us/en/safety.

The Integrated Communication Controller, developed by Hyundai Mobis, connects various Electronic Control Units (ECU) mounted on the vehicle, e.g. the powertrain, multimedia, airbags and brake systems, through wired communication to collect and analyze various kinds of vehicle operation data in real time. It can process large amounts of data, including the data from various sensors like radars, lidars and cameras, and autonomous driving-related data.

Hyundai Mobis Integrated Communication Controller

It also communicates this information with the outside through full-time wireless network connectivity. It can also implement various connected car services, such as remote vehicle control and automatic update of the software of various systems, and functions like eCall which automatically transmits accident information in case of an emergency.[60]

[60] https://www.prnewswire.com/news-releases/hyundai-mobis-develops-integrated-communication-controller-the-next-generation-v2x-control-technology-for-the-first-time-in-korea-301084287.html.



[61]

[61] https://www.hyundaiusa.com/us/en/safety.

[62]

[63]

[62] https://youtu.be/Y82vK_E6c08?si=0SYuXC3qDtSzAr5d.
[63] *Id.*


K O N A
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and the front and rear of the vehicle.
HYUNDAI
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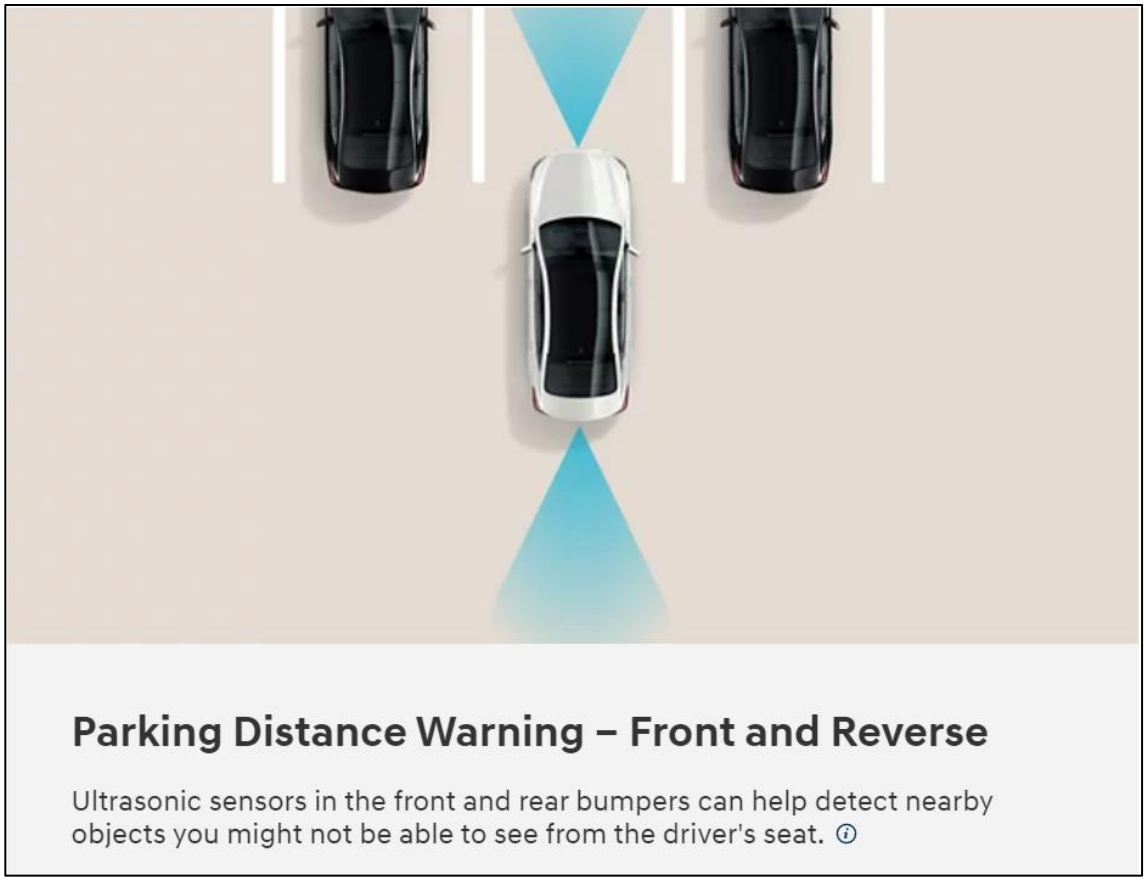
[64]

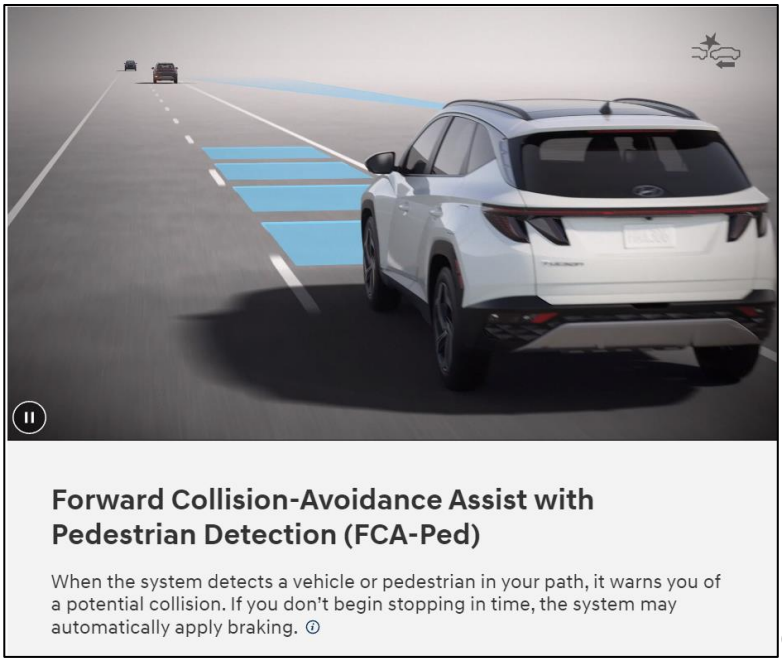
[64] *Id.*



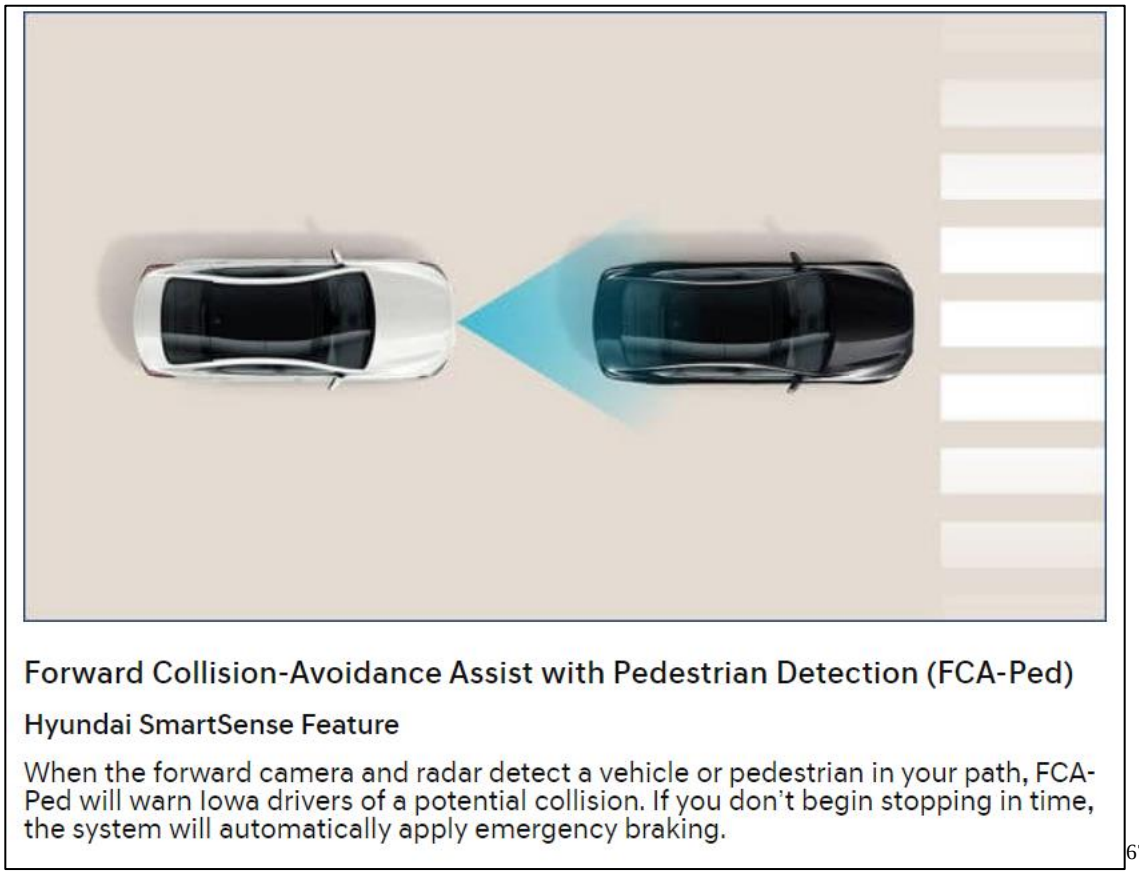
[65]

69. The Hyundai Kona performs the step of obtaining a plurality of second images of the mobile object using a second imaging technique (e.g., forward camera image processing) while obtaining a plurality of second measurements corresponding to movements of the mobile object using a second sensor system (e.g., radar sensors), the second sensor system being independent from the second imaging technique (e.g., forward camera image processing):

[65] https://www.hyundaiusa.com/us/en/safety.



[66]



[67]

[66] https://www.hyundaiusa.com/us/en/safety.

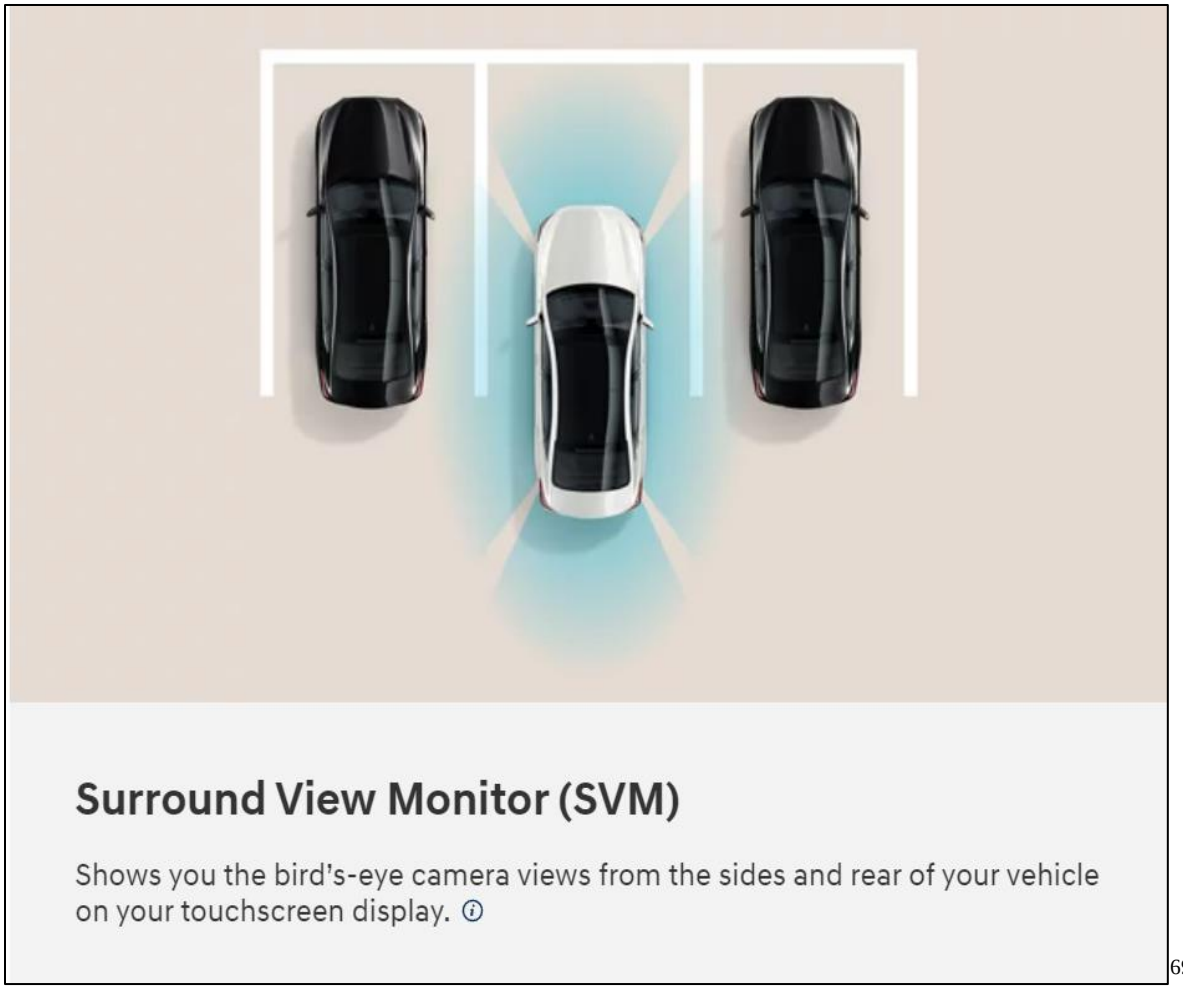
[67] https://www.verneidehyundaisiouxcity.com/hyundai-smartsense-safety-pack/.

70. The Hyundai Kona performs the step of associating the plurality of second images (e.g., images from the forward camera) with second movement states of the mobile object using the first measurements (e.g., radar sensor data using the ultrasonic sensor data):

> The Integrated Communication Controller, developed by Hyundai Mobis, connects various Electronic Control Units (ECU) mounted on the vehicle, e.g. the powertrain, multimedia, airbags and brake systems, through wired communication to collect and analyze various kinds of vehicle operation data in real time. It can process large amounts of data, including the data from various sensors like radars, lidars and cameras, and autonomous driving-related data.
>
> 
>
> Hyundai Mobis Integrated Communication Controller
>
> It also communicates this information with the outside through full-time wireless network connectivity. It can also implement various connected car services, such as remote vehicle control and automatic update of the software of various systems, and functions like eCall which automatically transmits accident information in case of an emergency.

[68]

[68] https://www.prnewswire.com/news-releases/hyundai-mobis-develops-integrated-communication-controller-the-next-generation-v2x-control-technology-for-the-first-time-in-korea-301084287.html.



[69]

[69] https://www.hyundaiusa.com/us/en/safety.

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[70] https://youtu.be/Y82vK_E6c08?si=0SYuXC3qDtSzAr5d.
[71] *Id.*


K O N A
KONA
and the front and rear of the vehicle.
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HYUNDAI
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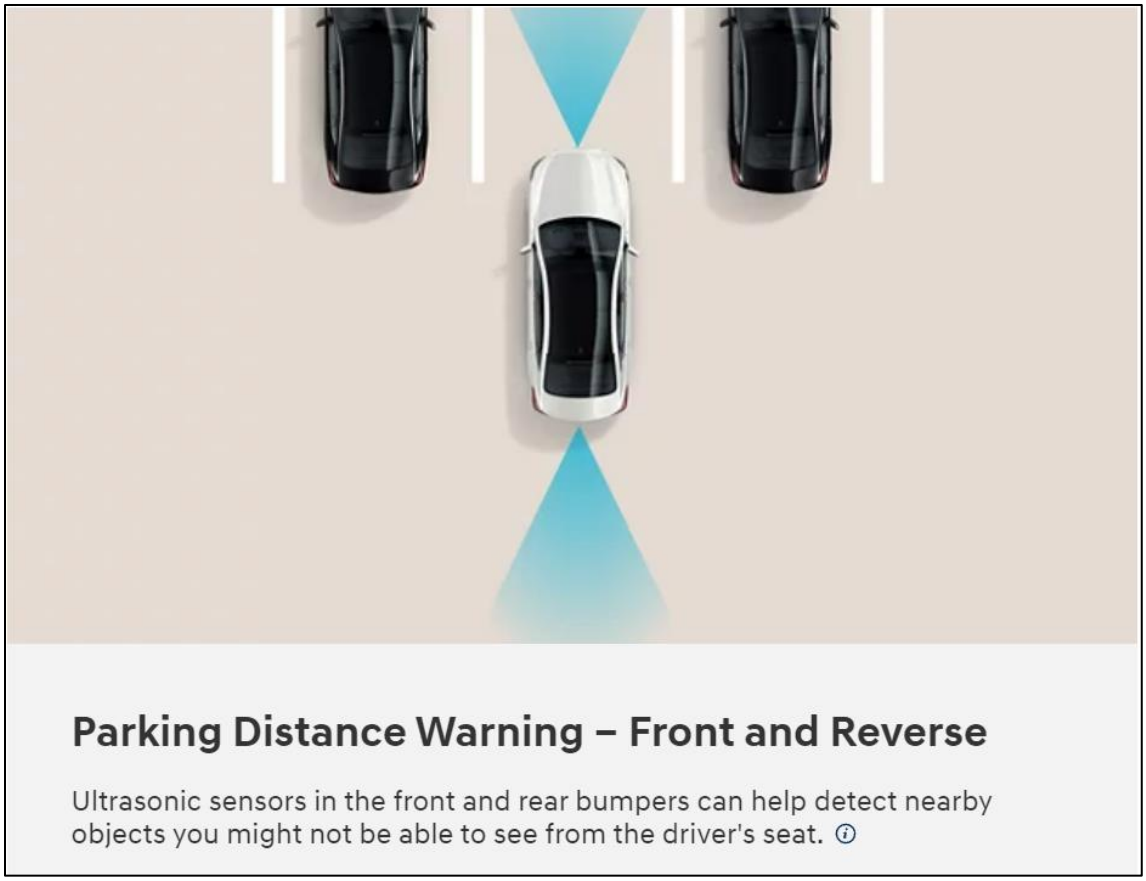
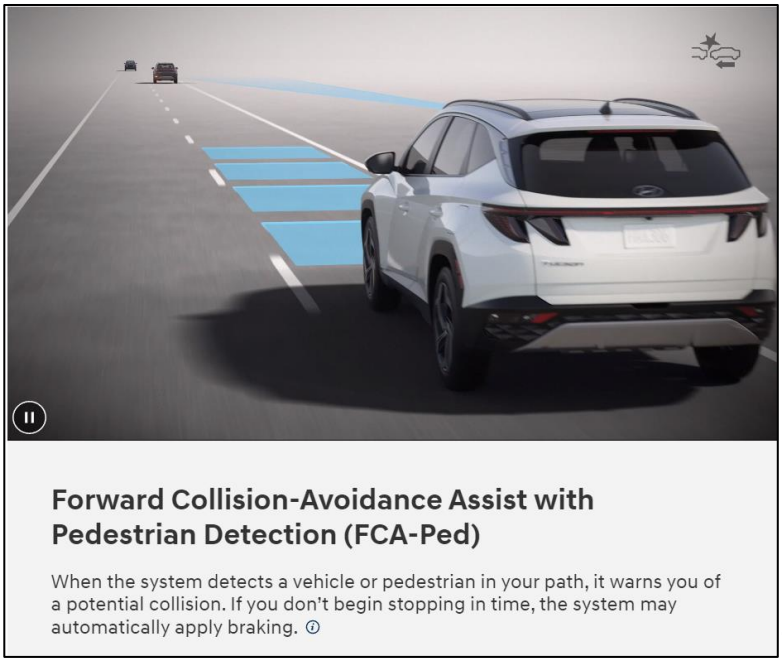
[72] *Id.*



[73]

[73] https://www.hyundaiusa.com/us/en/safety.



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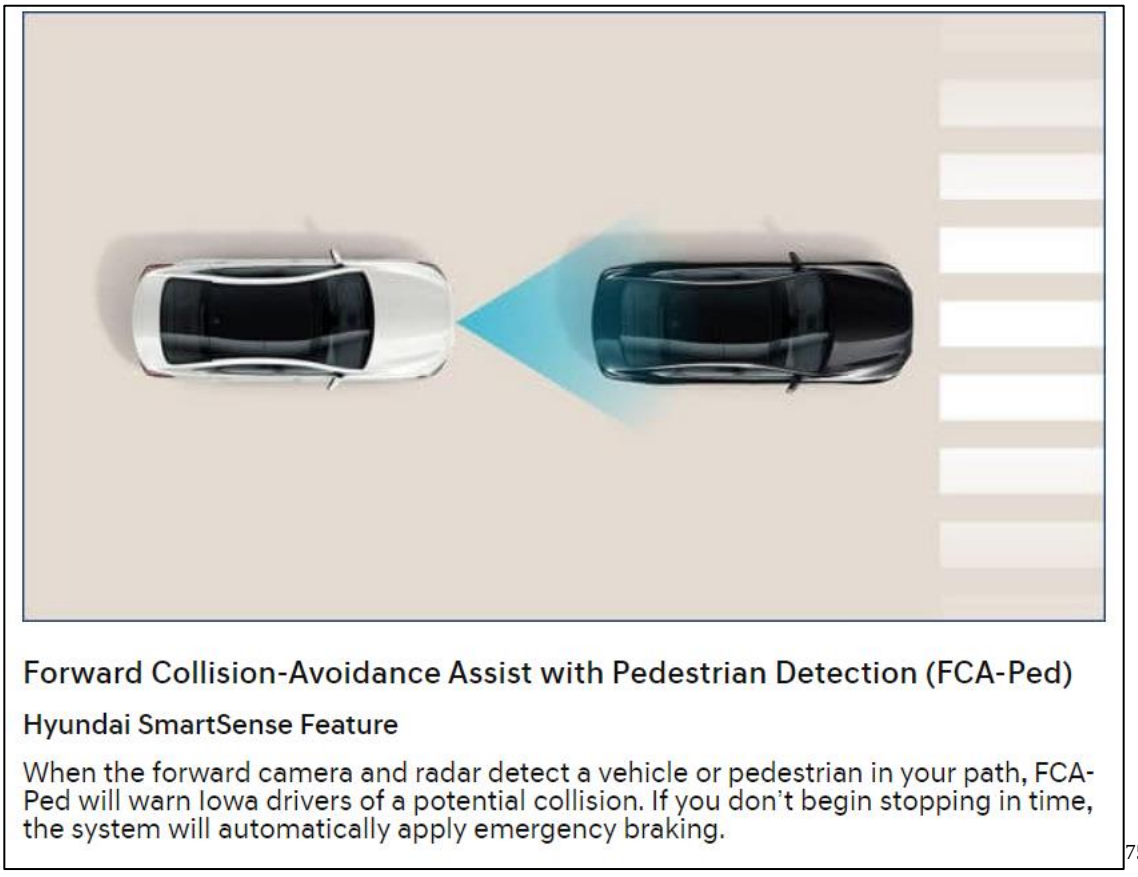


[75]

[74] https://www.hyundaiusa.com/us/en/safety.

[75] https://www.verneidehyundaisiouxcity.com/hyundai-smartsense-safety-pack/.

71. The Hyundai Kona performs the step of forming an image of the mobile object based on said plurality of first images (e.g., images from the Bird's-eye view cameras), said associated plurality of first movement measurements, and said first movement states (e.g., ultrasonic sensors) and on said plurality of second images (e.g. images from the forward camera), said associated plurality of second movement measurements, and said second movement states (e.g., from the radar sensors), wherein the first imaging technique (e.g., the Bird's-eye view cameras) is different from the second imaging technique (e.g., the forward camera):

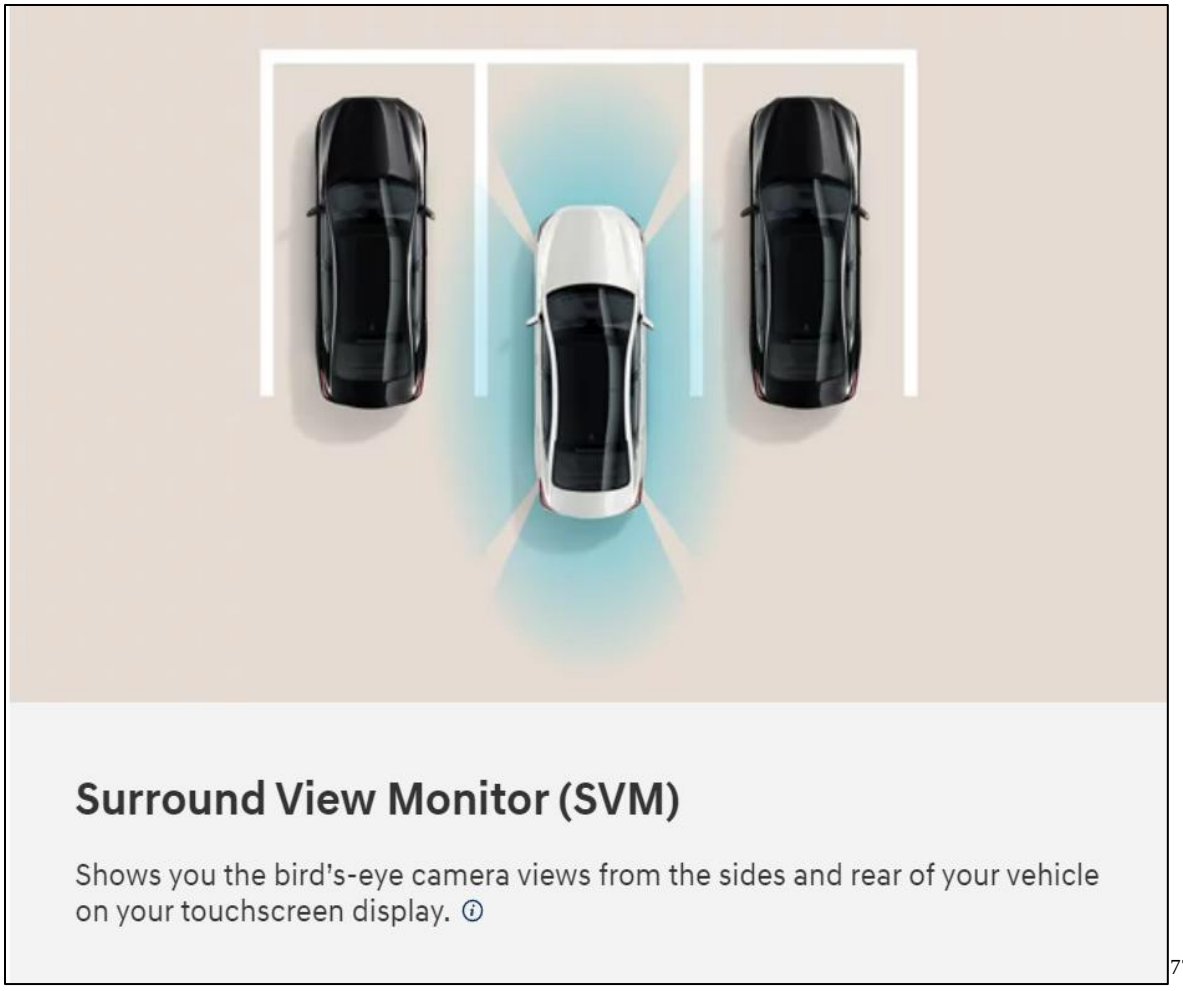
The Integrated Communication Controller, developed by Hyundai Mobis, connects various Electronic Control Units (ECU) mounted on the vehicle, e.g. the powertrain, multimedia, airbags and brake systems, through wired communication to collect and analyze various kinds of vehicle operation data in real time. It can process large amounts of data, including the data from various sensors like radars, lidars and cameras, and autonomous driving-related data.

Hyundai Mobis Integrated Communication Controller

It also communicates this information with the outside through full-time wireless network connectivity. It can also implement various connected car services, such as remote vehicle control and automatic update of the software of various systems, and functions like eCall which automatically transmits accident information in case of an emergency.

[76]

[76] https://www.prnewswire.com/news-releases/hyundai-mobis-develops-integrated-communication-controller-the-next-generation-v2x-control-technology-for-the-first-time-in-korea-301084287.html.



[77]

[77] https://www.hyundaiusa.com/us/en/safety.

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[78] https://youtu.be/Y82vK_E6c08?si=0SYuXC3qDtSzAr5d.
[79] *Id.*


K O N A
KONA
and the front and rear of the vehicle.
HTRAC
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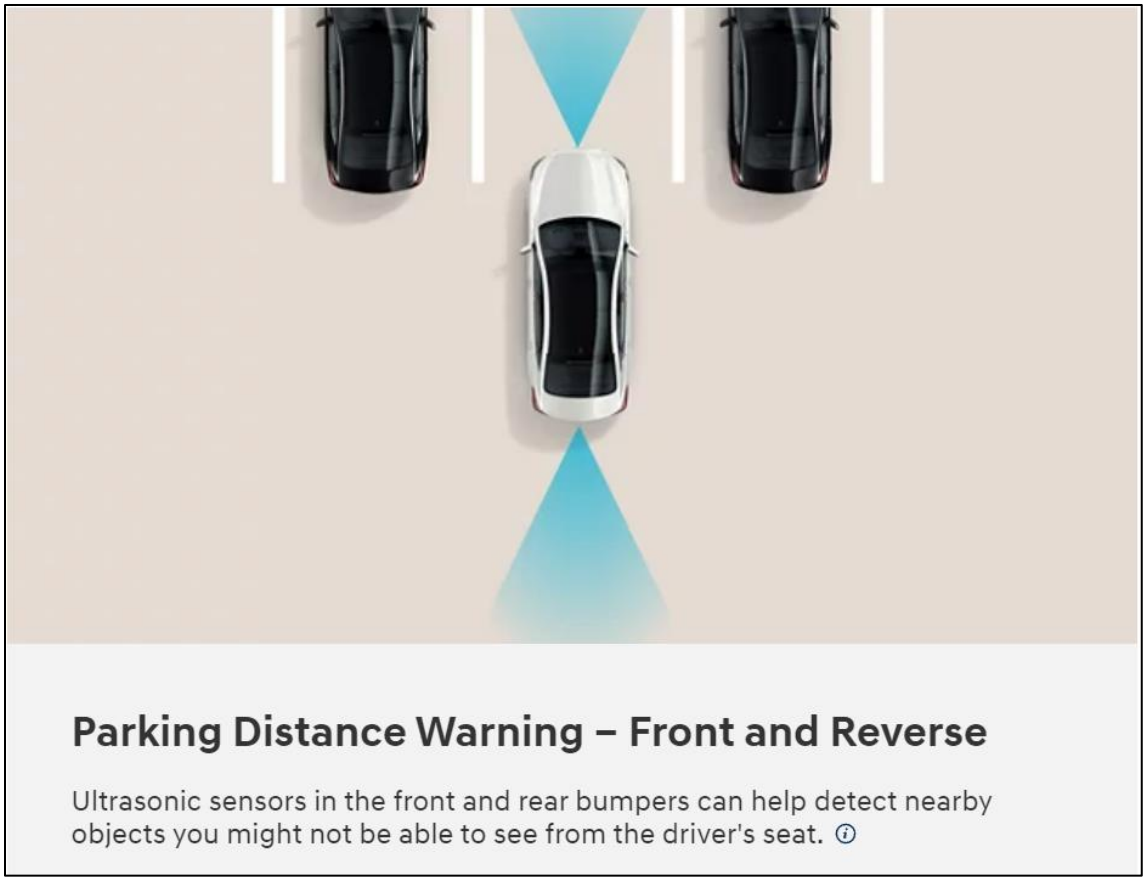
[80] *Id.*



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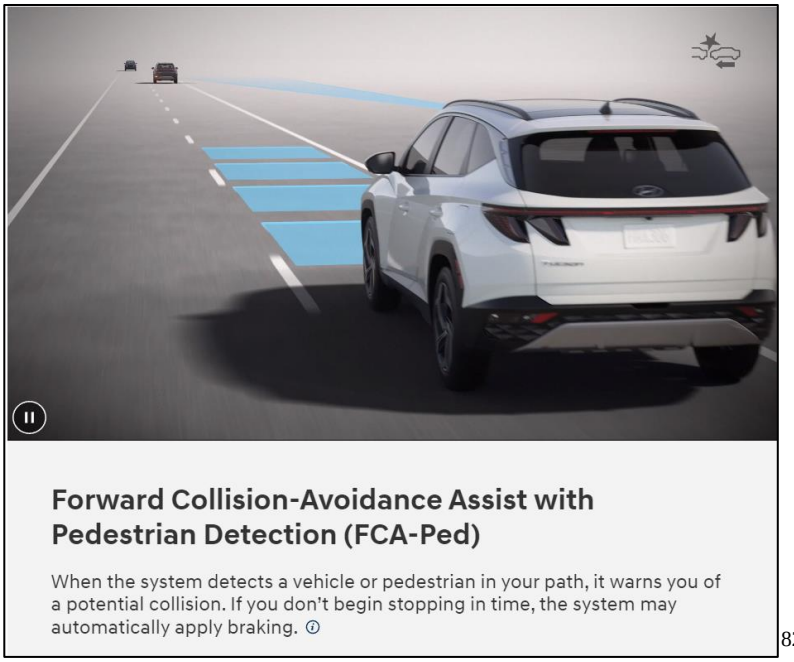
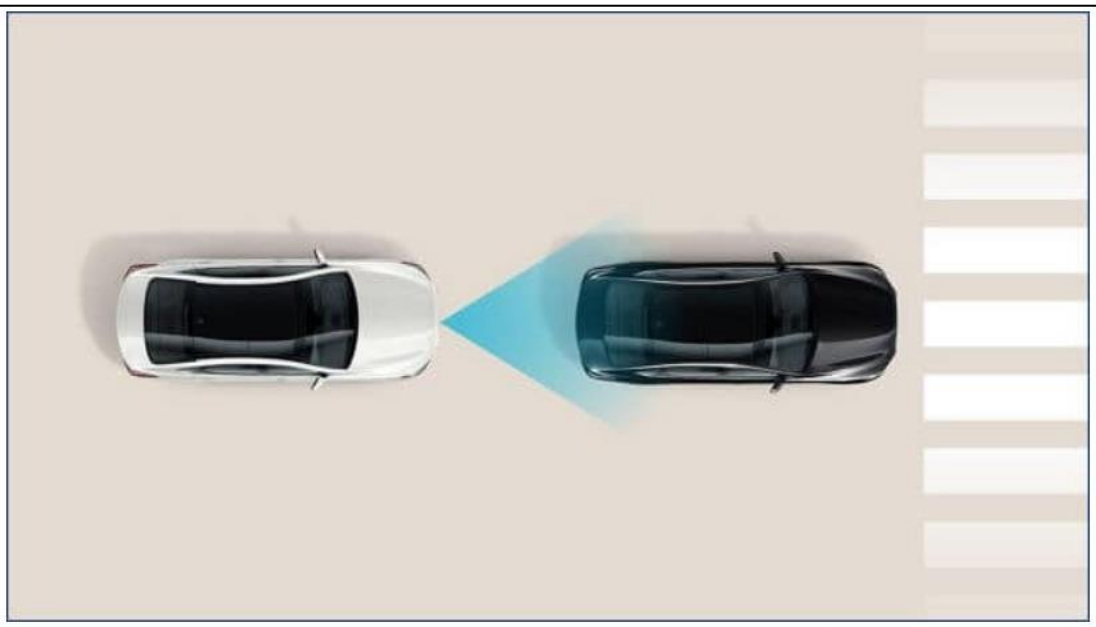
[81] https://www.hyundaiusa.com/us/en/safety.



Forward Collision-Avoidance Assist with Pedestrian Detection (FCA-Ped)

When the system detects a vehicle or pedestrian in your path, it warns you of a potential collision. If you don't begin stopping in time, the system may automatically apply braking.

[82]



Forward Collision-Avoidance Assist with Pedestrian Detection (FCA-Ped)

Hyundai SmartSense Feature

When the forward camera and radar detect a vehicle or pedestrian in your path, FCA-Ped will warn Iowa drivers of a potential collision. If you don't begin stopping in time, the system will automatically apply emergency braking.

[83]

[82] https://www.hyundaiusa.com/us/en/safety.

[83] https://www.verneidehyundaisiouxcity.com/hyundai-smartsense-safety-pack/.

72. Defendants have and continue to indirectly infringe one or more claims of the ’353 Patent by knowingly and intentionally inducing others, including Hyundai customers and end-users, to directly infringe, either literally or under the doctrine of equivalents, by making, using, offering to sell, selling, and/or importing into the United States products that include infringing technology.

73. Defendants, with knowledge that these products, or the use thereof, infringe the ’353 Patent at least as of the date of the Original Complaint, knowingly and intentionally induced, and continue to knowingly and intentionally induce, direct infringement of the ’353 Patent by providing these products to customers and end-users for use in an infringing manner. Alternatively, on information and belief, Defendants have adopted a policy of not reviewing the patents of others, including specifically those related to Defendants’ specific industry, thereby remaining willfully blind to the Patents-in-Suit at least as early as the issuance of the Patents-in-Suit.

74. Defendants have and continue to induce infringement by others, including customers and end-users, with the intent to cause infringing acts by others or, in the alternative, with the belief that there was a high probability that others, including end-users, infringe the ’353 Patent, but while remaining willfully blind to the infringement. Defendants have and continue to induce infringement by their customers and end-users by supplying them with instructions on how to operate the infringing technology in an infringing manner, while also making publicly available information on the infringing technology via Defendants’ website, product literature and packaging, and other publications.[84]

[84] *See, e.g.*, Hyundai Owner’s Manuals, Quick Reference Guides, and other materials, available at: https://owners.hyundaiusa.com/us/en/resources/manuals-warranties.

75. LAG has suffered damages as a result of Defendants' direct and indirect infringement of the '353 Patent in an amount to be proved at trial.

76. LAG has suffered, and will continue to suffer, irreparable harm as a result of Defendants' infringement of the '353 Patent, for which there is no adequate remedy at law, unless Defendants' infringement is enjoined by this Court.

COUNT V
(Infringement of the '331 Patent)

77. Paragraphs 1 through 21 are incorporated by reference as if fully set forth herein.

78. LAG has not licensed or otherwise authorized Defendants to make, use, offer for sale, sell, or import any products that embody the inventions of the '331 Patent.

79. Defendants have and continue to infringe the '331 Patent, either literally or under the doctrine of equivalents, without authority and in violation of 35 U.S.C. § 271, by one or more of making, using, offering to sell, selling, and/or importing into the United States products that satisfy each and every limitation of one or more claims of the '331 Patent. Such products include, but are not limited to, Accused Vehicles equipped with advanced driver assistance systems, such as Hyundai's Night Vision, or the equivalent thereto, included in commercial and personal vehicles, in all trims and configurations.

80. For example, Defendants have and continue to directly infringe at least claim 1 of the '331 Patent by making, using, offering to sell, selling, and/or importing into the United States products that include Hyundai Night Vision, such as the Hyundai XCIENT, among other products.

81. The Hyundai XCIENT comprises a collision prevention detector (e.g., the Night Vision system using both near-infrared and/or far-infrared sensors, as well as other sensors).

[85]

[86]

[85] https://trucknbus.hyundai.com/global/en/brand/technology/future-technology.
[86] https://trucknbus.hyundai.com/global/en/brand/technology/future-technology.

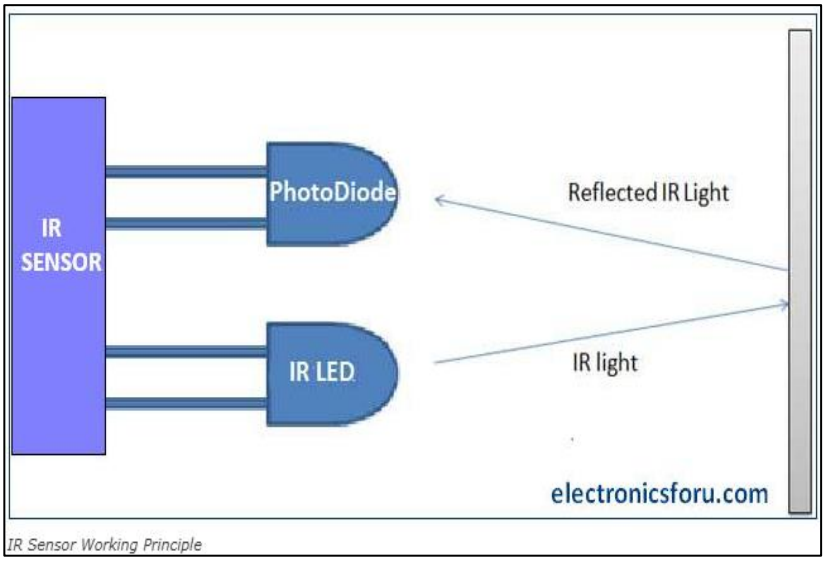
IR Sensor Working Principle

An IR sensor consists of two parts, the emitter circuit, and the receiver circuit. This is collectively known as a photo-coupler or an optocoupler.

The emitter is an IR LED and the detector is an IR photodiode. The IR photodiode is sensitive to the IR light emitted by an IR LED. The photodiode's resistance and output voltage change in proportion to the IR light received. This is the underlying working principle of the IR sensor.

The type of incidence can be direct incidence or indirect incidence. In direct incidence, the IR LED is placed in front of a photodiode with no obstacle.

In indirect incidence, both the diodes are placed side by side with an opaque object in front of the sensor. The light from the IR LED hits the opaque surface and reflects back to the photodiode. [87]



IR Sensor Working Principle [88]

[87] https://www.electronicsforu.com/technology-trends/learn-electronics/ir-led-infrared-sensor-basics.

[88] https://www.electronicsforu.com/technology-trends/learn-electronics/ir-led-infrared-sensor-basics.

> Infrared (IR) sensors are the foundation of night vision technology. They detect and measure infrared radiation emitted by objects and pedestrians, even in the absence of visible light. IR sensors are commonly employed in thermal imaging cameras, which capture temperature differences to create images that highlight objects and pedestrians based on their heat signatures. Visible light cameras and Near Infrared (NIR) cameras are utilized to complement Far Infrared Sensors (FIR) in some night vision and pedestrian detection systems. They provide high-resolution images that help identify objects and pedestrians based on their visual characteristics such as shape and color.[89]

> Vendors are investing significantly in the R&D of new products to expand their product portfolio and increase their automotive night vision and pedestrian detection technology market share. They are also adopting collaboration, partnership, and M&A strategies to broaden their customer base.
>
> Advics Co. Ltd., Autoliv Inc., Marelli Holdings Co., Ltd., Continental AG, Delphi Automotive, DENSO Corporation, Hyundai Mobis, Infineon Technologies, Lear Corporation, OMRON Corporation, Panasonic Corporation, Pioneer Corporation, Robert Bosch GmbH, Siemens AG, Texas Instruments, Valeo, and ZF Friedrichshafen AG are key entities operating in this industry.[90]

82. The Hyundai XCIENT comprises at least two sets of LEDs positioned to the right and to the left (e.g., the IR LED associated with the near-infrared sensor and the IR LED associated with the far-infrared sensor), whereby a first set detects objects in a near-field zone of the vehicle (e.g., close to the vehicle within a certain range), and a second set beyond said first field in a far-field zone (e.g., father away from the vehicle within a certain range), wherein the at least two sets of LEDs are configured to transmit a sequence of transmissions of IR signals (e.g., signals received from the near-infrared and/or far-infrared sensors) alternating between at least one LED to the right and at least one LED to the left.

[89] https://www.transparencymarketresearch.com/automotive-night-vision-and-pedestrian-detection-technology-market.html

[90] https://www.transparencymarketresearch.com/automotive-night-vision-and-pedestrian-detection-technology-market.html.

NV (Night Vision)

Near-infrared and far-infrared sensors are used to secure visibility at night to ensure safe nighttime driving.[91]

IR Sensor Working Principle

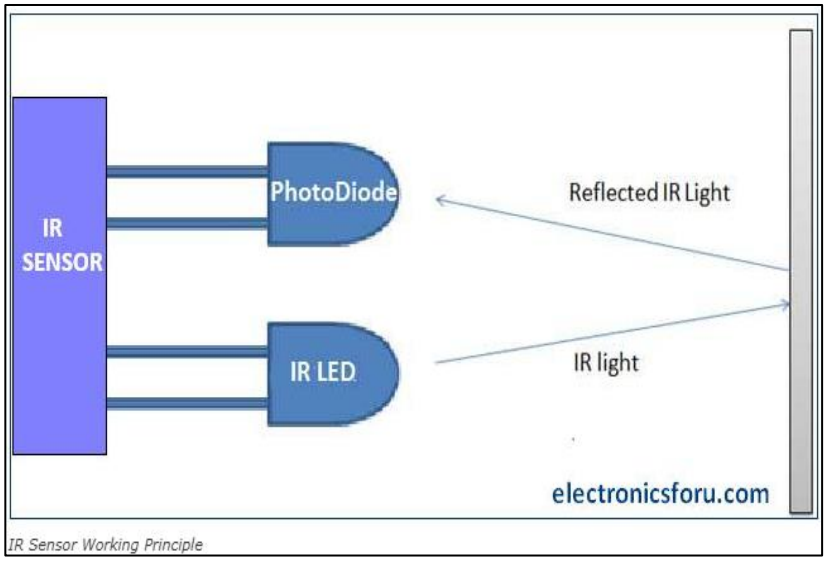
An IR sensor consists of two parts, the emitter circuit, and the receiver circuit. This is collectively known as a photo-coupler or an optocoupler.

The emitter is an IR LED and the detector is an IR photodiode. The IR photodiode is sensitive to the IR light emitted by an IR LED. The photodiode's resistance and output voltage change in proportion to the IR light received. This is the underlying working principle of the IR sensor.

The type of incidence can be direct incidence or indirect incidence. In direct incidence, the IR LED is placed in front of a photodiode with no obstacle.

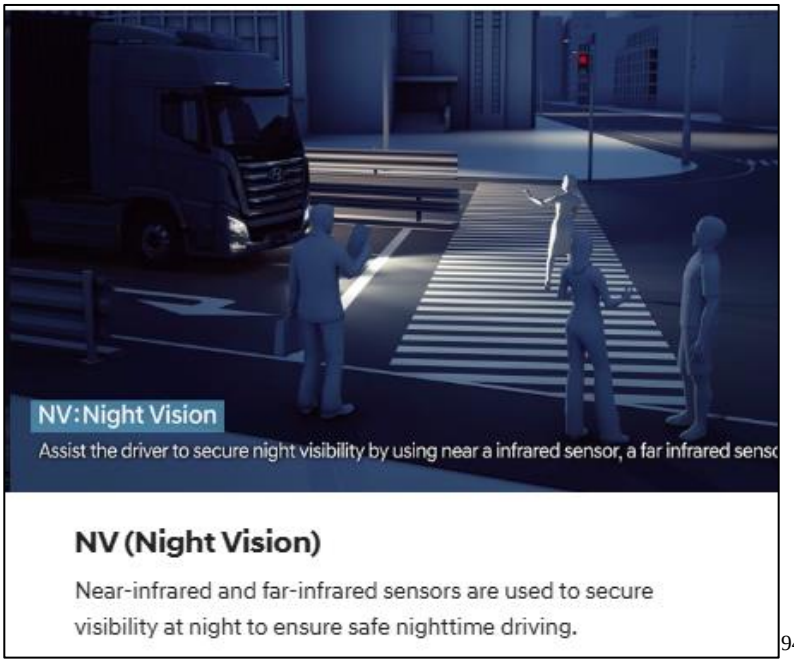
In indirect incidence, both the diodes are placed side by side with an opaque object in front of the sensor. The light from the IR LED hits the opaque surface and reflects back to the photodiode.[92]

[91] https://trucknbus.hyundai.com/global/en/brand/technology/future-technology.
[92] https://www.electronicsforu.com/technology-trends/learn-electronics/ir-led-infrared-sensor-basics.



[93]

83. The Hyundai XCIENT comprises at least one IR receiver (e.g., near-infrared sensor or the far-infrared sensor or both) configured to receive the sequence of transmissions of IR signals such that receiving both of the alternating IR signals indicates the presence of an object (e.g., vehicle, pedestrian, or other object) within an area where the transmitted signals cross.



[94]

[93] https://www.electronicsforu.com/technology-trends/learn-electronics/ir-led-infrared-sensor-basics.
[94] https://trucknbus.hyundai.com/global/en/brand/technology/future-technology.

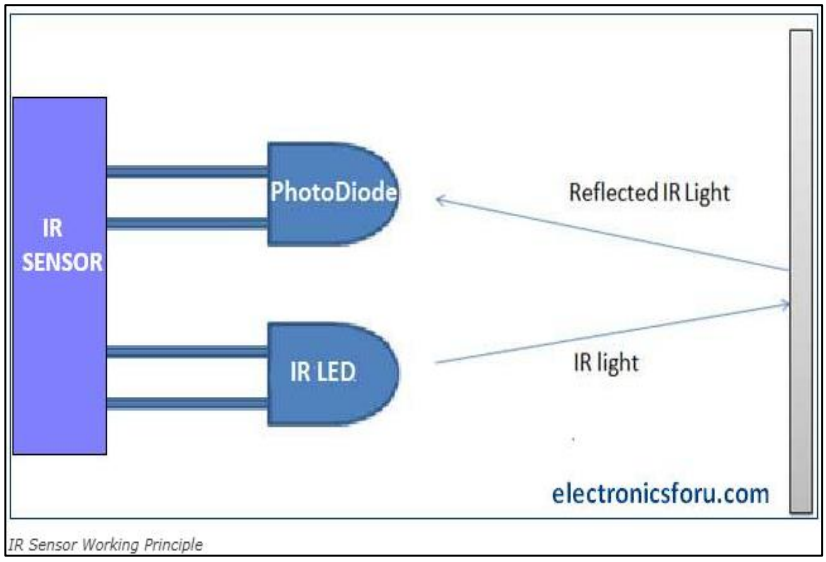
IR Sensor Working Principle

An IR sensor consists of two parts, the emitter circuit, and the receiver circuit. This is collectively known as a photo-coupler or an optocoupler.

The emitter is an IR LED and the detector is an IR photodiode. The IR photodiode is sensitive to the IR light emitted by an IR LED. The photodiode's resistance and output voltage change in proportion to the IR light received. This is the underlying working principle of the IR sensor.

The type of incidence can be direct incidence or indirect incidence. In direct incidence, the IR LED is placed in front of a photodiode with no obstacle.

In indirect incidence, both the diodes are placed side by side with an opaque object in front of the sensor. The light from the IR LED hits the opaque surface and reflects back to the photodiode.[95]



IR Sensor Working Principle[96]

84. The Hyundai XCIENT comprises a processor connected to the at least one IR receiver (e.g., the Hyundai XCIENT's near-infrared and/or far-infrared sensors) configured to detect the object in the near-field (e.g., close to the vehicle within a certain range) and far-field

[95] https://www.electronicsforu.com/technology-trends/learn-electronics/ir-led-infrared-sensor-basics.
[96] https://www.electronicsforu.com/technology-trends/learn-electronics/ir-led-infrared-sensor-basics.

zones (e.g., father away from the vehicle within a certain range).

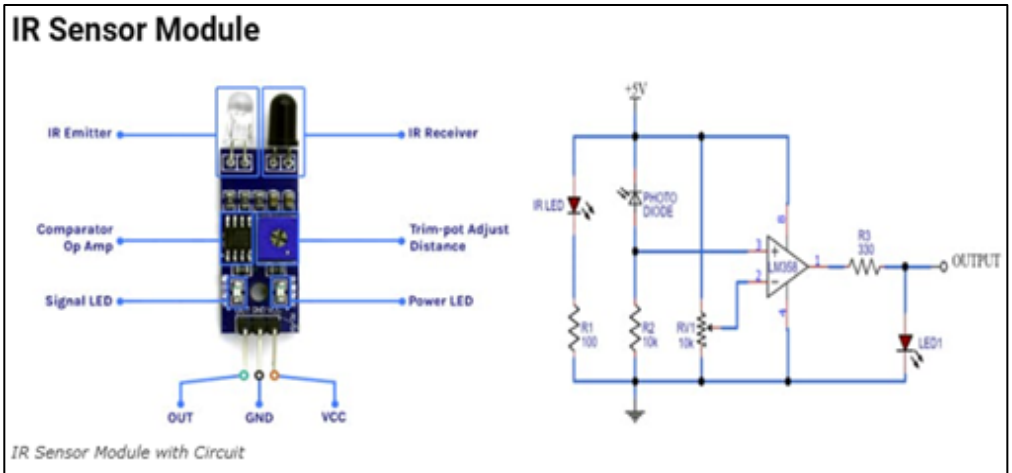
The company previews a cabin enhancement concept and the addition of ADAS features for the Class 8 XCIENT Fuel Cell electric truck

Hyundai Motor and Plus collaborate to test Level 4 autonomous driving technology on XCIENT Fuel Cell truck[97]

NV (Night Vision)

Near-infrared and far-infrared sensors are used to secure visibility at night to ensure safe nighttime driving.[98]

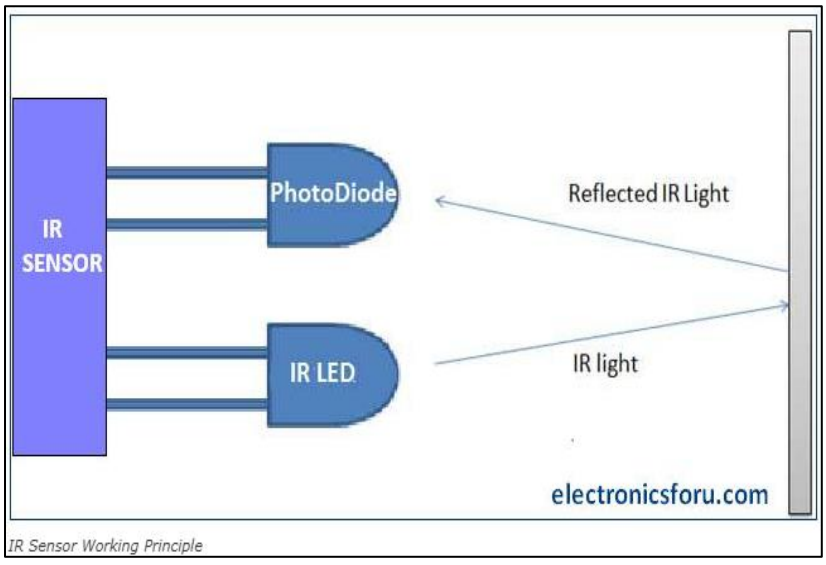
[97] https://www.hyundainews.com/en-us/releases/4145.
[98] https://trucknbus.hyundai.com/global/en/brand/technology/future-technology.



IR Sensor Module with Circuit

An IR sensor module is a device that contains an IR receiver LED and other components that are used to detect and process IR signals. It typically includes an IR receiver LED, a signal amplifier, and a demodulator circuit.

The IR receiver LED is used to detect IR signals, while the signal amplifier and demodulator circuit are used to amplify and process the received signal, respectively.[99]



IR Sensor Working Principle[100]

[99] https://www.electronicsforu.com/technology-trends/learn-electronics/ir-led-infrared-sensor-basics.

[100] https://www.electronicsforu.com/technology-trends/learn-electronics/ir-led-infrared-sensor-basics.

IR Sensor Working Principle

An IR sensor consists of two parts, the emitter circuit, and the receiver circuit. This is collectively known as a photo-coupler or an optocoupler.

The emitter is an IR LED and the detector is an IR photodiode. The IR photodiode is sensitive to the IR light emitted by an IR LED. The photodiode's resistance and output voltage change in proportion to the IR light received. This is the underlying working principle of the IR sensor.[101]

85. The Hyundai XCIENT comprises a comparator associated with the processor (e.g., portion of the processor) configured to compare a vehicle speed with a pre-determined loss of measured distance by measuring how fast the vehicle approaches the object closing in from the far-field zone to the near-field zone, whereby an alarm is by an indicator device (e.g., an alert on the multi-display unit).

NV (Night Vision)

Near-infrared and far-infrared sensors are used to secure visibility at night to ensure safe nighttime driving.[102]

[101] https://www.electronicsforu.com/technology-trends/learn-electronics/ir-led-infrared-sensor-basics.
[102] https://trucknbus.hyundai.com/global/en/brand/technology/future-technology.

The company previews a cabin enhancement concept and the addition of ADAS features for the Class 8 XCIENT Fuel Cell electric truck

Hyundai Motor and Plus collaborate to test Level 4 autonomous driving technology on XCIENT Fuel Cell truck [103]

[104]

86. Defendants have and continue to indirectly infringe one or more claims of the '331 Patent by knowingly and intentionally inducing others, including Hyundai customers and end-users, to directly infringe, either literally or under the doctrine of equivalents, by making, using, offering to sell, selling, and/or importing into the United States products that include infringing technology.

87. Defendants, with knowledge that these products, or the use thereof, infringe the '331 Patent at least as of the date of the Original Complaint, knowingly and intentionally induced, and continue to knowingly and intentionally induce, direct infringement of the '331 Patent by providing these products to customers and end-users for use in an infringing manner. Alternatively, on information and belief, Defendants have adopted a policy of not reviewing the patents of others, including specifically those related to Defendants' specific industry, thereby remaining willfully blind to the Patents-in-Suit at least as early as the issuance of the Patents-in-

[103] https://www.hyundainews.com/en-us/releases/4145.
[104] https://trucknbus.hyundai.com/global/en/products/truck/xcient.

Suit.

88. Defendants have and continue to induce infringement by others, including customers and end-users, with the intent to cause infringing acts by others or, in the alternative, with the belief that there was a high probability that others, including end-users, infringe the ’331 Patent, but while remaining willfully blind to the infringement. Defendants have and continue to induce infringement by their customers and end-users by supplying them with instructions on how to operate the infringing technology in an infringing manner, while also making publicly available information on the infringing technology via Defendants’ website, product literature and packaging, and other publications.[105]

89. LAG has suffered damages as a result of Defendants’ direct and indirect infringement of the ’331 Patent in an amount to be proved at trial.

90. LAG has suffered, and will continue to suffer, irreparable harm as a result of Defendants’ infringement of the ’331 Patent, for which there is no adequate remedy at law, unless Defendants’ infringement is enjoined by this Court.

COUNT VI
(Infringement of the ’101 Patent)

91. Paragraphs 1 through 21 are incorporated by reference as if fully set forth herein.

92. LAG has not licensed or otherwise authorized Defendants to make, use, offer for sale, sell, or import any products that embody the inventions of the ’101 Patent.

93. Defendants have infringed the ’101 Patent, either literally or under the doctrine of equivalents, without authority and in violation of 35 U.S.C. § 271, by one or more of making, using, offering to sell, selling, and/or importing into the United States products that satisfy each

[105] *See, e.g.*, Hyundai Owner’s Manuals, Quick Reference Guides, and other materials, available at: https://owners.hyundaiusa.com/us/en/resources/manuals-warranties.

and every limitation of one or more claims of the '101 Patent. Such products include, but are not limited to, Accused Vehicles equipped with advanced driver assistance systems, such as Hyundai's SmartSense, or the equivalent thereto, included in commercial and personal vehicles, in all trims and configurations.

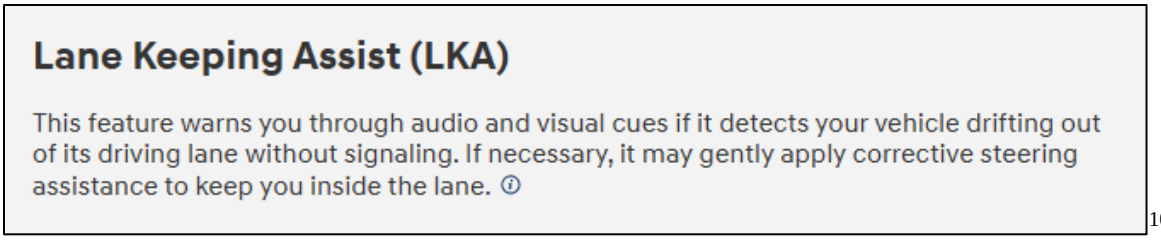
94. For example, Defendants have and continue to directly infringe at least claim 1 of the '101 Patent by making, using, offering to sell, selling, and/or importing into the United States products that include Hyundai SmartSense, such as the Hyundai SANTA FE, among other products.

95. The Hyundai SANTA FE performs a method for assisting the driver of a vehicle when performing a driving maneuver formed by a parking or shunting maneuver (e.g. through the Hyundai SmartSense system performing drive assisted functions).

106

107

[106] https://www.hyundaiusa.com/us/en/safety.
[107] https://www.hyundaiusa.com/us/en/safety.



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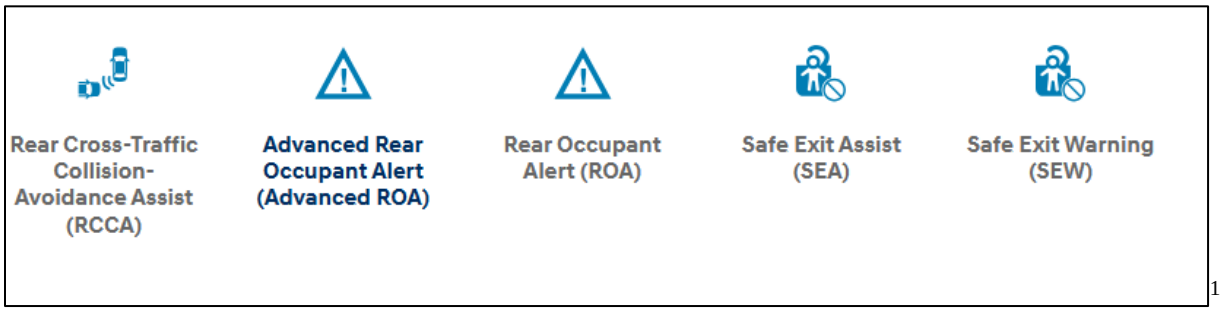

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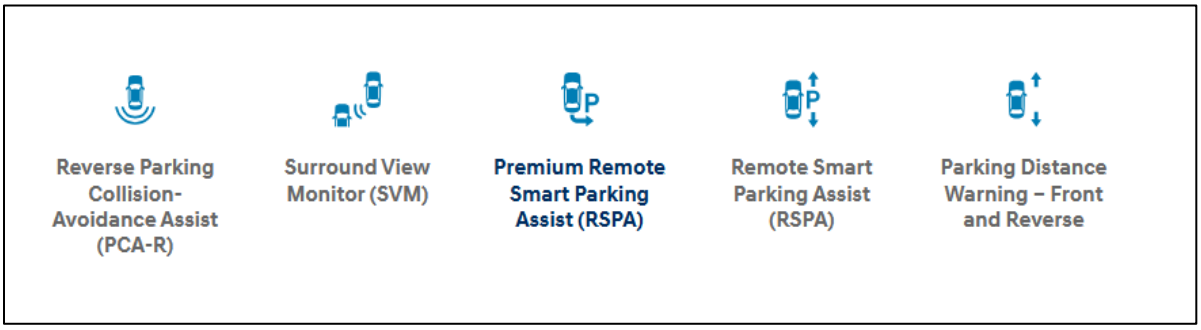

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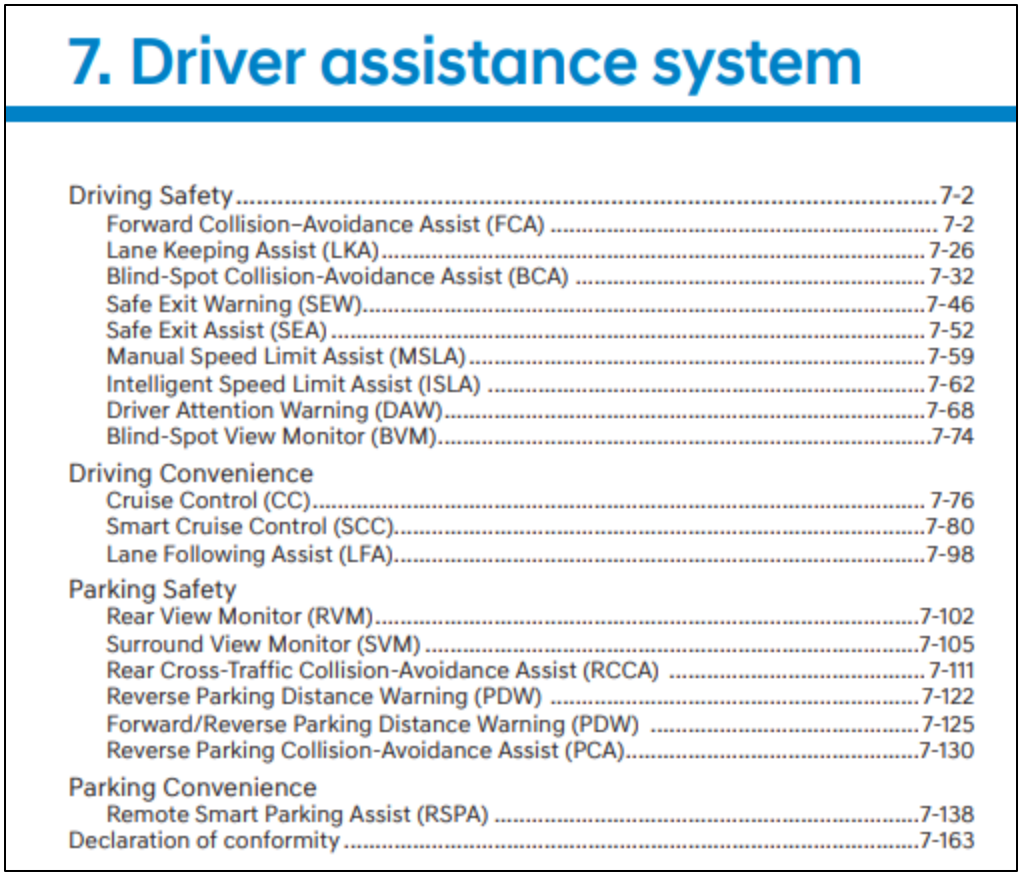
[108] https://www.hyundaiusa.com/us/en/safety.
[109] https://www.hyundaiusa.com/us/en/safety.
[110] https://www.hyundaiusa.com/us/en/safety.
[111] https://www.hyundaiusa.com/us/en/safety.



7. Driver assistance system

[112]

96. The Hyundai SANTA FE performs a method for assisting the driver of a vehicle when performing a driving maneuver formed by a parking or shunting maneuver, a reference trajectory corresponding to the driving maneuver being determined (e.g., a display of the road on the heads-up display or dashboard), along which the vehicle is to be moved, and the steering wheel position to be set in each case and controlling the vehicle along the reference trajectory being indicated to the driver during the driving maneuver (e.g., lane change direction during driver assisted functions, such as lane changes through the use of Lane Follow Assist) .

[112] https://www.hyundai.com/content/dam/hyundai/au/en/owning/manuals/vehicle-manuals/ioniq-5/2023/IONIQ%205%202023%20Owner%20Manual.pdf.

[113]

[114]

[113] https://www.youtube.com/watch?v=8-adriws9Jk.
[114] https://www.youtube.com/watch?v=8-adriws9Jk.

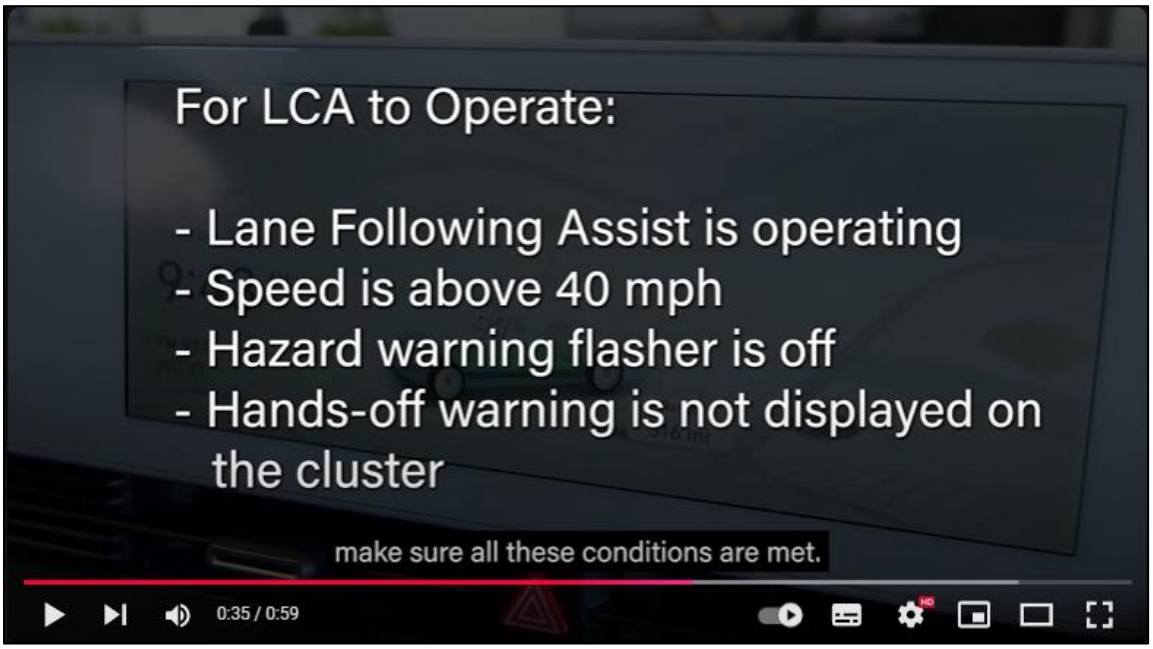
[115]

97. The Hyundai SANTA FE performs a method for assisting the driver of a vehicle when performing a driving maneuver formed by a parking or shunting maneuver, a reference trajectory corresponding to the driving maneuver being determined, along which the vehicle is to be moved, and the steering wheel position to be set in each case and controlling the vehicle along the reference trajectory being indicated to the driver during the driving maneuver the vehicle longitudinal speed being influenced independently of the driver in the event of a steering angle deviation between the actual steering angle actually set by the driver and the desired steering angle corresponding to the requested steering wheel position (e.g., removing hands from the wheel and/or over/under steering based on the trajectory, such as turning too sharply), characterized in that the vehicle longitudinal speed is influenced on the basis of the magnitude of the steering angle deviation in such a way that a greater vehicle retardation is carried out, the greater the magnitude

[115] https://www.youtube.com/watch?v=8-adriws9Jk.

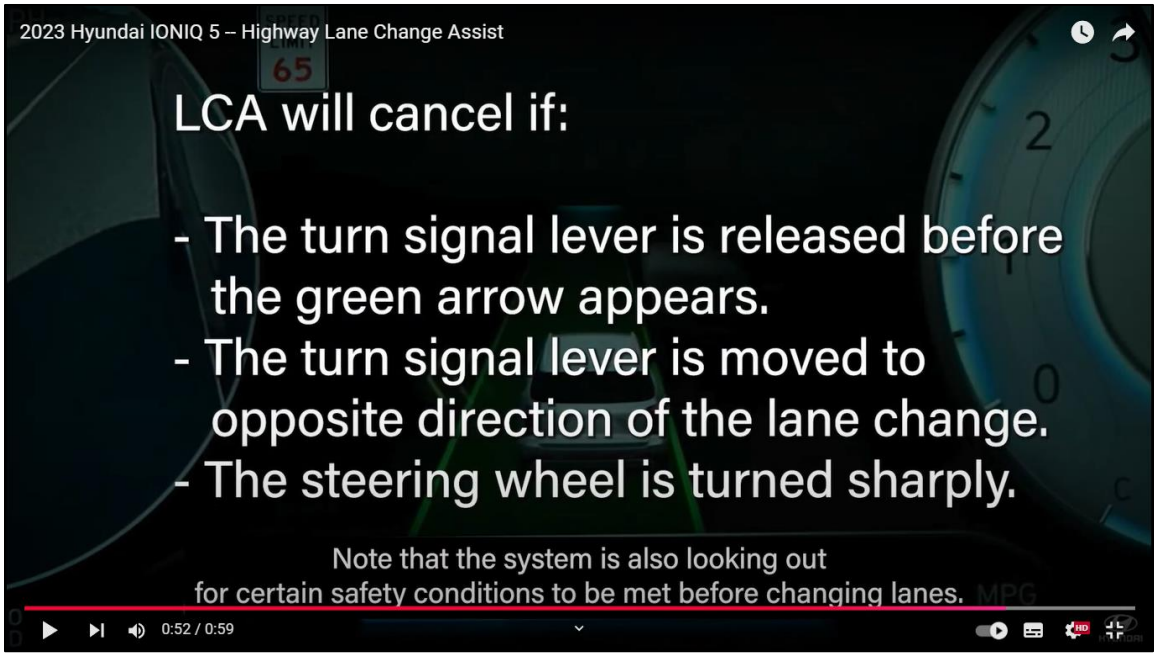
of the steering angle deviation is (e.g., the vehicle slows down).

[116]



[117]

[116] https://www.youtube.com/watch?v=8-adriws9Jk.
[117] https://www.youtube.com/watch?v=XuLief0aVTU.



[118]

[119]

98. Through demonstrations, testing, repairs, and instructional guidance, such as at trade shows, Hyundai has used the Accused Vehicles in a manner that directly infringes at least claim 1 of the '101 Patent.

[118] https://www.youtube.com/watch?v=XuLief0aVTU.
[119]

99. Defendants have indirectly infringed one or more claims of the ’101 Patent by knowingly and intentionally inducing others, including Hyundai customers and end-users, to directly infringe, either literally or under the doctrine of equivalents, by making, using, offering to sell, selling, and/or importing into the United States products that include infringing technology.

100. Defendants, with knowledge[120] that these products, or the use thereof, infringe the ’101 Patent at least as of the date of the Original Complaint, knowingly and intentionally induced direct infringement of the ’101 Patent by providing these products to customers and end-users for use in an infringing manner. Alternatively, on information and belief, Defendants have adopted a policy of not reviewing the patents of others, including specifically those related to Defendants’ specific industry, thereby remaining willfully blind to the Patents-in-Suit at least as early as the issuance of the Patents-in-Suit.

101. Defendants have induced infringement by others, including customers and end-users, with the intent to cause infringing acts by others or, in the alternative, with the belief that there was a high probability that others, including end-users, infringe the ’101 Patent, but while remaining willfully blind to the infringement. Defendants have induced infringement by their customers and end-users by supplying them with instructions on how to operate the infringing technology in an infringing manner, while also making publicly available information on the infringing technology via Defendants’ website, product literature and packaging, and other publications.[121]

102. LAG has suffered damages as a result of Defendants’ direct and indirect

[120] Defendant Hyundai Motor Company cited to the ’101 Patent family in relation to its own foreign patent application KR20160072576A, which was published on June 6, 2016, and was issued as KR102326052B1 on November 15, 2021.

[121] *See, e.g.*, Hyundai Owner’s Manuals, Quick Reference Guides, and other materials, available at: https://owners.hyundaiusa.com/us/en/resources/manuals-warranties.

infringement of the ’101 Patent in an amount to be proved at trial.

DEMAND FOR JURY TRIAL

Plaintiff hereby demands a jury for all issues so triable.

PRAYER FOR RELIEF

WHEREFORE, LAG prays for relief against Defendants as follows:

a. Entry of judgment declaring that Defendants have directly and/or indirectly infringed one or more claims of the Patents-in-Suit;

b. An order pursuant to 35 U.S.C. § 283 permanently enjoining Defendants, their officers, agents, servants, employees, attorneys, and those persons in active concert or participation with them, from further acts of infringement of the ’803 Patent, the ’002 Patent, the ’238 Patent, the ’353 Patent, and the ’331 Patent;

c. An order awarding damages sufficient to compensate LAG for Defendants’ infringement of the Patents-in-Suit, but in no event less than a reasonable royalty, together with interest and costs;

d. Entry of judgment declaring that this case is exceptional and awarding LAG its costs and reasonable attorney fees under 35 U.S.C. § 285; and

e. Such other and further relief as the Court deems just and proper.

Dated: January 10, 2025

Respectfully submitted,

/s/ Vincent J. Rubino, III

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