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**Re: White Paper on Artificial Intelligence - a European approach to excellence and trust**

Dear Mr. Gross,

Waymo respectfully submits these comments in response to the *Consultation on the White Paper on Artificial Intelligence - A European Approach* ("White Paper"), which was issued simultaneously with the *Report on the safety and liability implications of Artificial Intelligence, the Internet of Things and robotics* ("2020 Liability Report"). Please note that we submit these comments solely on behalf of Waymo and not on behalf of Google or any other entity that is also part of Alphabet Inc.

Waymo is a self-driving technology company with a mission to make it safe and easy for people and things to get where they're going. Every year, 1.2 million lives are lost to traffic crashes around the world and there are more than 40,000 deaths on European roads each year. Ninety percent (90%) of all accidents on EU roads are caused by human error and a large proportion are linked to drowsiness, distraction, and drunk driving. Waymo's fully self-driving technology - which we call the *Waymo Driver* - is designed to operate without a human driver. This is unlike technologies sold in cars today such as adaptive cruise-control or lane-keeping systems which require constant monitoring by the driver.

From our start as the Google self-driving car project in 2009 and since becoming a standalone company under Alphabet Inc. in December 2016, Waymo has been focused on improving transportation for all people by building the world's most experienced driver. To date, Waymo has driven over 32 million kilometers autonomously on public roads across 25 U.S. cities and completed over 24 billion kilometers of simulation testing. That's hundreds of years of human driving experience that benefits every vehicle in our fleet. The equivalent of 20,000 vehicles are driving 24-hours a day in simulation in order to develop, test and validate our technology.

While Waymo is building a self-driving system, the Waymo Driver, we are not currently a vehicle manufacturer. We work with several leading European automotive partners for vehicle supply and to enable key use cases. The vehicles in Waymo's fleet today are U.S. homologated vehicles from the FCA Group and Jaguar Land Rover. In addition, last June we entered into an exclusive partnership with Renault and Nissan on behalf of The Alliance to explore driverless mobility services for people and goods, starting in France and Japan.

Waymo's technology is being designed to work across a number of use cases, such as ride hailing, heavy-duty trucking, and local delivery, all of which are being tested. For example, we have been testing fully driverless vehicles (SAE Level 4)<sup>1</sup> with no human driver since 2017 in the greater metropolitan Phoenix, Arizona area of the

<sup>1</sup> The SAE defines 6 levels of vehicle automation, starting with Level 0 (no automation). See [J3016, Taxonomy and Definitions for Terms Related to Driving Automation Systems for On-road Motor Vehicles](#) (June 2018). To meet the definition of Level 3, the automated driving system must be capable of performing the entire dynamic driving task within its design limitations (known as the system's "operational design domain") but is dependent on a human driver for intervention in the event of a system failure. By contrast, a Level 4 system is also capable of performing the entire dynamic driving task within its design limitations but must also be capable of achieving—without human intervention—a condition of minimal risk in the event of a failure of the automation system or major vehicle system that prevents continued self-driving. The Commission's *EU Strategy for Mobility of the Future* (section 2 and f.n. 11) relies on these SAE definitions.

United States. To meet the definition of Level 4, an automated driving system must be able to perform the entire dynamic driving task and bring a vehicle to a safe condition in the event of a system failure without the need for human intervention. In 2019, riders in the Metro Phoenix area who are members of our Early Rider Program began to be matched with these fully driverless cars when they hail a Waymo vehicle using our mobile app. Waymo owns all of the automated vehicles it is operating and closely monitors the safety of its entire fleet.

To help safely navigate the complexities of the road without a human driver, our self-driving technology needs to see and identify what's around it. To perceive its surroundings, Waymo's SAE Level 4 automated driving system ("ADS") relies on its powerful custom sensor suite of lidar, cameras, and radars. The situations our Waymo vehicles experience on the road and in simulation give us opportunities continuously to improve our ADS. Waymo uses AI disciplines, such as machine learning, as a tool to improve our self-driving software, including its safety capabilities.<sup>2</sup> For example, machine learning has provided Waymo's ADS with enhanced capabilities to navigate nuanced and difficult situations, maneuver construction zones, yield to emergency vehicles, and give room to cars that are parallel parking, among many other areas.

While the majority of this technology development has been in the United States, in December 2019, Waymo announced the acquisition of Latent Logic. Latent Logic is an Oxford, UK-based technology company, spun out of Oxford University's Computer Science Department. Latent Logic uses a form of machine learning, called imitation learning, to develop realistic simulations of the behavior of motorists, cyclists, and pedestrians to help autonomous vehicles coexist and interact safely with humans in the real world, at scale. This acquisition also signaled the creation of Waymo's first European engineering hub, in Oxford, UK, which is at the cutting-edge of global machine learning and robotics research. Waymo plans to look for opportunities to grow the team in the UK and Europe, and to continue partnering with leading European automotive makers in the region - including Fiat Chrysler, Jaguar Land Rover, as well as Renault and Nissan of The Alliance.

We believe that the European Commission's 2018 *EU Strategy for Mobility of the Future* ("EU Strategy")<sup>3</sup> comprehensively described the benefits of this technology in Europe, and how topics like artificial intelligence affect the development of this technology and interrelate with both existing European and member state automated vehicle ("AV") policies and laws.

In November 2019, [Regulation 2019/2144](#) amended the EU type approval framework for motor vehicles<sup>4</sup> and stated (paragraph 23) that:

Automated vehicles have the potential to make a huge contribution to reducing road fatalities, given that more than 90 % of road accidents are estimated to result from some level of human error. As automated vehicles will gradually take over the tasks of the driver, harmonised rules and technical requirements for automated vehicle systems, including those regarding verifiable safety assurance for decision-making by automated vehicles, should be adopted at Union level, while respecting the principle of technological neutrality, and promoted at international level in the framework of the UNECE's World Forum for Harmonization of Vehicle Regulations (WP.29).

The 2019 type approval regulation directs (at Article 11) the Commission to adopt procedures and technical specifications covering a range of subjects for both "automated vehicles" and "fully automated vehicles" (defined in the regulation as "a motor vehicle that has been designed and constructed to move autonomously without any driver supervision").

We applaud the Commission's progress towards a harmonized approach and ongoing work with European member states enabling key use cases to realize the benefits of fully automated vehicles.

We believe the Commission is right in directing its efforts towards boosting R&D funding via its 'Ecosystem of Excellence' actions on AI, which will help develop and propagate the necessary know-how for the development of the EU's AV industry and supply chain ecosystem. Federated investments, research networks, academic programs, testing centres as well as an inclusive private-public partnership framework on AI are all important prerequisites for the development of the right talent, skills and infrastructure to drive innovation in connected

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<sup>2</sup> More information is available in Waymo's Safety Report (<https://www.waymo.com/safety>)

<sup>3</sup> [On the road to automated mobility: An EU strategy for mobility of the future](#) (May 2018).

<sup>4</sup> The General Safety Regulation (Regulation (EC) No 661/2009) sets out safety technologies and design features that must become standard for all new vehicles sold by defined dates. The Type Approval Framework Regulation 2018/858 implements the Safety Regulation and [Regulation 2019/2144](#) amends the Type Approval Framework in some respects, including by adding specific provisions for AVs.

and autonomous mobility. As a technology leader in AVs, and as we explore growing our team and our partnerships in Europe, we look forward to playing an active role in the EU's ecosystem of excellence on AI.

Nonetheless, the AI white paper's regulatory proposals in relation to fostering an ecosystem of trust for the AI of automated vehicles raise serious concerns and potential conflicts with the approach developed by the Commission for implementing the 2019 Type Approval Regulation as it pertains to AVs. The Commission's AI proposals, if implemented, may create new and unanticipated barriers to the development of AV technology in Europe. AVs are already being regulated by the Commission and are subject to European type approval standards and guidelines. Operation of AVs must already conform to existing European and member state traffic laws and operating requirements. Waymo's comments outline these issues in detail below and recommendations for their resolution.

## **1. Separate AI regulations must not conflict with already planned and pending AV-related regulatory developments of the revised Type Approval Regulation 2019/2144**

The White Paper and the 2020 Liability Report consider the implementation of horizontal AI regulations separate and apart from sectoral regulations covering the products in which AI may be used. However, these AI regulations must not conflict with already planned or pending EU type-approval and/or international AV safety regulations.

There are currently already several planned and pending regulatory developments. The 2018 EU Strategy for AVs envisioned a robust regulatory regime specifically developed for AV safety and cybersecurity:

The EU vehicle approval framework was overhauled in 2018. The EU is the first region in the world to combine vehicle approval rules with market surveillance rules. Building on this new framework, the Commission will start working on the development of a new approach for certifying the safety of automated vehicles which will be less design specific and more adapted to the evolutionary nature of these vehicles. (Footnote omitted)

The EU Strategy went on to say:

The complete revision of the General Safety Regulation for motor vehicles, presented together with this Communication, will provide the opportunity to cover missing aspects in the present vehicle safety legislation for the expected automation use cases. The revision will also allow the Commission to adopt the relevant implementing rules. In adopting new safety rules, the Commission will follow the guiding principles for human-machine interface proposed by GEAR 2030 and ensure that road safety considerations (mixed traffic, interaction with other road users) are fully taken into account. The Commission will support the international technical harmonisation of automated vehicles within the framework of the United Nations in coherence with EU rules. (Footnote omitted)

As called for in the EU Strategy, EU lawmakers passed the amendment (Regulation (EU) 2019/2144) to the Type-Approval Framework Regulation ((EU) 2018/858) to bring AVs within that important safety regime for motor vehicles. These already-passed EU laws will ensure product safety and product compliance regarding AVs. As with existing vehicle type approval in the EU, the updated type approval framework for AVs will address all important safety risks presented by AVs for systems that "replace the driver's control of the vehicle, including signalling, steering, accelerating and braking". EU regulations concerning AV safety will address key factors that may affect the safe performance of the driving task by AVs. To the extent AI plays a role in the safe performance of the driving task by the AV (e.g., by enhancing object recognition or responsive maneuver planning), those regulations will necessarily include measures to ensure that the type approved AV, including its AI element, does not present unreasonable risks. For example, both EU and international regulations on AV safety are likely to include a pre-type approval assessment process to examine the manufacturer's proper application of broadly accepted principles of systems engineering, including principles addressing software design, in developing and validating its ADS. Those regulations are also likely to require a panoply of scenario-based performance tests to ensure that the ADS performs safely in a broad range of likely traffic situations. There is no need for separate AI market entry requirements for AVs.<sup>5</sup>

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<sup>5</sup> The Commission's [Guidelines on the exemption procedure for the EU approval of automated vehicles](#) (2019) reveal the likely elements of pending EU rules on AVs and provides a means of securing type approval of Level 3 and 4 AVs while those rules are being developed. The Guidelines (at 1) state: "Pending the adoption of harmonised EU requirements, the approval is granted on the basis of a national ad-hoc safety assessment which is mutually recognized by other Member States through a Commission decision. The vehicle type can then be

Moreover, in addition to relevant EU vehicle laws, the safety of AVs (and, by necessity, their AI element) will be addressed by international motor vehicle safety regulations being developed by the United Nations Economic Commission for Europe (UNECE). The UNECE's *Working Party on Automated/Autonomous and Connected Vehicles (Groupe de Rapporteurs pour les Véhicules Autonomes or GRVA)* has four working groups actively developing globally harmonized product safety standards for AVs, which will address the full range of risks relating to Level 4 systems that replace a human driver's control of a vehicle.<sup>6</sup> Similar to previous UNECE Regulations, the EU is expected to fully accept and implement these UNECE Regulations on AVs.

As with the EU's own regulatory efforts on AV safety, the Commission should not adopt additional regulations on AI that would impose market entry requirements that would contradict or violate such international agreements and laws. As a technical matter, effective regulation of AV safety must address all safety risks associated with AVs, as the EU and UNECE regulations will do. There is no effective way to regulate the AI element of AVs in isolation, nor would such a fragmented approach to AV technology be logical. The ADS performs the driving task through a sophisticated interplay between software and hardware (including a range of sensor types and computers) and only a comprehensive approach to the entire ADS system as designed to operate within its operational design constraints can address related safety risks in a way that is consistent with sound principles of systems engineering.

In addition to AI regulations, particularly because of the reasons outlined above, the Commission should seek to avoid any revisions to the EU liability and safety scheme for AI products including AVs that would contradict or violate existing, planned or pending EU type-approval and/or international AV safety regulations.

## **2. AVs with AI must not be prejudged as "high-risk" products**

The White Paper and the 2020 Liability Report consider the implementation of special liability schemes for application to so-called "*high risk*" AI products, a category in which those documents include prominent examples of AVs. AVs with AI must not be prejudged as "*high-risk*" products. The two-prong test used in the White Paper for determining that level of risk does not adequately substitute for comprehensive risk assessments under existing EU guidelines.

The term "*risk*" is a cornerstone of the EU product liability and product safety framework. The concept is clearly defined and used in a specific context. In particular, the EU's Market Surveillance Regulation (EU) 2019/1020 defines "*risk*" as follows: "*For the purposes of this Regulation, the following definitions shall apply: 'risk' means the combination of the probability of an occurrence of a hazard causing harm and the degree of severity of that harm.*"

Classifying an entire product category (such as AVs) as "*high risk*" should not rest merely on a general assumption of the level of risk such products may present. Even if such a category were deemed to be in a segment where it was likely to be high risk, a proper risk assessment analysis should be made to determine actual risk level, in line with the European Commission's Implementing Decision 2019/417/EU, which includes detailed risk assessment guidelines. Those guidelines say that risk assessment analysis should be made on a case-by-case basis with regard to a specifically definable product (such as a specific vehicle model) of an individual manufacturer rather than grouping together a class of products that share one element (AI) but may be manufactured to significantly different designs by different manufacturers.

As written, the White Paper deviates significantly from the underlying EU principle of determining risk based on the specific facts pertaining to particular products. Instead, the White Paper (at 17) sets out a two-factor test for determining that an AI application (not a specific product) is high-risk: (1) the application's employment in a sector where "significant risks can be expected to occur," and (2) the application is "used in such a manner that significant risks are likely to arise." The White Paper indicates (at 21) that "driverless cars" (without further definition or any recognition of the safety capabilities that a Level 4 ADS must include) are among the AI applications that would be considered high risk under this two-part test, apparently based on an unstated conclusion that such vehicles will be used in a manner that significant risks are likely.

Although the first factor (employment in a sector where significant risks can be expected) provides a reasonable threshold for considering risk level, application of the second factor (use in a manner that significant risks are

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placed on the EU market like any other EU approved vehicle." The Guidelines (at 5-6) outline the "Safety Assessment and Tests" that must be successfully completed prior to any exemption being granted.

<sup>6</sup> The comprehensive approach to AV regulation being developed by the UNECE can readily be discerned by reviewing the [WP.29 Framework document on automated/autonomous vehicles](#) (WP.29/2019/34/Rev.1) and the [GRVA website](#) (in particular the working and informal documents available there).

likely) may lead to incorrect conclusions if based on overly broad assumptions about an entire class of products. This is particularly true in the case of AVs, where fundamental design principles are intended to guard against use that creates significant risks. In fact, a vehicle with a Level 4 ADS must, by design, be capable of performing the entire dynamic driving task safely and of achieving a safe condition in the event of system failure. With proper design and validation under an appropriate vehicle safety regime (discussed above), such an ADS will not be used in such a manner that “significant risks are likely to arise” merely because AI is one element of the ADS. In fact, the very purpose of the use of AI in the ADS is to improve roadway safety. A mere presumption to the contrary, particularly one that cuts across a wide range of products and designs, cannot provide a firm foundation for a determination that vehicles equipped with such an ADS inherently present a high risk, thereby triggering imposition of a separate horizontal regulatory regime or unique liability requirements focused only on the AI element.

As explained in the first section of these comments, the current and pending EU and UNECE regulatory efforts concerning AV safety will address any risks that AI’s use as an element in AVs may present. Accordingly, there is no need for consideration of a parallel and potentially conflicting regulatory initiative focused on AI’s use in AVs. However, should the Commission consider whether certain AI applications present risks warranting a different approach, we believe the Commission would benefit from a much more rigorous use of accepted EU risk analysis principles in deciding which applications actually present a “high risk.”

We would recommend therefore that the Commission introduce an additional step in the proposed process, such that any product or service that triggers the two-factor test is deemed only potentially to be high risk, with the actual determination based on a detailed risk assessment carried out on a case-by-case basis in accordance with existing guidelines. Only if this detailed assessment yields a high risk determination should any mandatory requirements for high risk AI applications apply.

### **3. The existing Product Liability Directive provides sufficient protection for parties allegedly injured by Automated Vehicles**

The White Paper and the 2020 Liability Report consider implementing a strict liability scheme for (allegedly) “high risk” AI products such as AVs and making other changes to European liability law to address the AI aspects of AVs. The source of this suggestion is the Commission’s 2019 report on [Liability for Artificial Intelligence and Other Emerging Digital Technologies](#) (“2019 LiabilityReport”).

As explained previously in these comments, a robust regulatory effort is already underway within the EU and UNECE to address all safety hazards that AVs may present. Any determination of whether the use of AI in AVs presents a uniquely high risk warranting a separate regulatory regime from the type approval framework for AVs, should be made only after a thorough, product-specific risk analysis. If, nevertheless, the Commission finds it necessary to consider whether changes in EU liability laws are needed to address the use of AI in AVs, a thorough look at how current liability law guarantees protection of accident victims is in order.

Such a review indicates there is no need for a revision of EU liability laws as they pertain to AVs. The EU’s Product Liability Directive 85/374/EEC, which applies to motor vehicles (including AVs), provides an adequate and sufficient level of protection for all parties by creating a delicate, effective and justified balance between claimants and defendants. This has already been shown by several consultations (including consultations by the European Commission itself).

The drafting of the Product Liability Directive was a diligent and long process. For the lawmakers, it was of utmost importance to find the right balance between claimants and defendants. Changing individual aspects (such as including a new strict liability regime against product owners or reversing the burden of proof) would inevitably jeopardize this successfully achieved and proven balance.

The 2020 Liability Report includes (at 12) a useful summary of the current state of liability law in the EU:

Liability frameworks in the Union have functioned well. They rely on the parallel application of the Product Liability Directive (Directive 85/374/EEC), which harmonised the liability of the producer of defective products, and other non-harmonised national liability regimes.

The Product Liability Directive provides a layer of protection that national fault-based liability alone does not provide. It introduces a system of strict liability of the producer for damage caused by a defect in their products. In case of a physical or material damage, the injured party is entitled to compensation if



he or she proves the damage, the defect in the product (i.e. that it did not provide the safety that the public is entitled to expect) and the causal link between the defective product and the damage.

National non-harmonised regimes provide fault-based liability rules, according to which victims of damage need to prove the fault of the liable person, the damage and causality between the fault and the damage in order to establish a successful liability claim. They also provide strict liability regimes where the national legislator has attributed liability for a risk to a specific person, without the need for a victim to prove fault/defect or causality between fault/defect and the damage.

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For instance, a victim involved in a car accident typically has a strict-liability claim against the owner of the car (i.e. the person who takes out motor vehicle liability insurance) and a fault-based liability claim against the driver, both under national civil law, as well as a claim under the Product Liability Directive against the producer if the car had a defect.

The 2020 Liability report goes on to explain the obligatory insurance requirements and notes (at 13):

Autonomous vehicles are not treated in Union legislation any differently from non-autonomous vehicles as regards motor insurance. Such vehicles, like all vehicles, must be covered by the third party motor liability insurance, which is the easiest way for the injured party to get compensation.

Despite this fulsome system for compensating victims of car accidents and its clear applicability to AVs, both the 2019 and 2020 Liability Reports analyze a variety of impediments to possible recovery that may occur in the context of “high risk” AI systems, particularly those in AVs. The reports speculate about possible difficulties a victim may have in proving causation or the presence of a defect due to the complexity of AI systems. The reports then suggest that certain modifications to liability laws (including reversals of the burden of proof, eliminating the need to prove various elements of a victim's claim, applying strict liability in situations where fault would otherwise have to be established, and restrictions on offering certain well established defenses to claims) may be needed to alleviate those difficulties.

The posited difficulties described in the Liability Reports are nothing new and instead are rather quite common with applying current liability laws to new technologies. The EU's Product Liability Directive 85/374/EEC was passed in 1985. Since then, numerous new technologies have emerged. The 2019 Liability Report (at 21) notes that, “Problems of uncertain causation are of course not new to European legal systems,” and goes on to explain that European courts are already showing flexibility in assessing claims related to new technologies:

This all-or-nothing dilemma is already being addressed throughout Europe by some modifications that aid the victim in proving causation under certain circumstances. Courts may for instance be willing to accept prima facie evidence in complex scenarios, such as those emerging digital technologies give rise to, where the exact sequence of events may be difficult to prove. While the burden of proving causation is not shifted yet, it is clearly alleviated for the victim, who need not prove every single link in the chain of causation if courts accept that a given outcome is the typical effect of a certain development in that chain. Furthermore, as past medical malpractice cases have shown, courts tend to be willing to place the burden of producing evidence on the party who is or should be in control of the evidence, with failure to bring forward such evidence resulting in a presumption to the disadvantage of that party. If, for example, certain log files cannot be produced or properly read, courts may be prepared to hold this against the party that was in charge of these recordings (and/or of the technology for analysing them). (footnote omitted)

Given the robust liability and insurance systems already in place in Europe for victims of car accidents and the applicability of those systems to AVs, including especially the strict liability for producers already provided for by the Product Liability Directive, and given the ability of European courts to adapt those sound liability principles to new circumstances presented by new technologies, we see no compelling reason to treat AVs differently from all other new technologies that were introduced since these legal protections were first put into place. The fundamental balance between the interests of victims and potentially liable parties is well established, particularly in the area of vehicle accidents. Imposing strict liability where it does not already exist or depriving a defendant of the ability to use certain justified and legitimate defense arguments<sup>7</sup> would upset that historic

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<sup>7</sup> This includes defenses such as the contributory negligence defense, the “no product defect” defense, the “later defect” defense, the “development risk” defense and the “no causation” defense).

balance in a way that may seriously disrupt the Commission's desire to foster the life-saving and mobility-enhancing benefits that AVs may provide for Europe. We are confident that existing law will ensure just compensation for any deserving person who may be in an accident involving an AV.

#### **4. Mandating Ongoing Human Supervision and Intervention Capabilities for Fully Automated Vehicles Would Undermine How Such Vehicles can Safely Operate on European Roadways**

Waymo's fully self-driving (SAE Level 4) system includes the software and hardware that, when integrated into the vehicle, perform all driving functions. Unlike systems at lower levels of automation (SAE Level 1, Level 2, and Level 3), a Level 4 system also has the ability to bring a vehicle to a safe condition (i.e. achieve a minimal risk condition) in the event of any system failures, without the need for any intervention by a human driver.

The White Paper's section on human oversight of AI describes (at 21) this example of human oversight for the AI of fully automated ("driverless") vehicles that may be appropriate for inclusion in an AI regulation:

monitoring of the AI system while in operation and the ability to intervene in real time and deactivate (e.g. a stop button or procedure is available in a driverless car when a human determines that car operation is not safe);

Regulation (EU) 2019/2144 specifically distinguishes "automated vehicles" from "fully automated vehicles," while making it clear that fully automated vehicles (such as those in Waymo's fleet) are "designed and constructed to move autonomously without any driver supervision." The White Paper's suggestion that a human would need to monitor the "AI system" and determine that operation of a fully automated vehicle is not safe disregards the inherent capabilities or safety benefits of vehicles with higher level automated driving systems, especially fully automated vehicles.

Mandatory human supervision and intervention, along the lines suggested in the White Paper, would also deter the development and introduction of fully automated vehicle technologies in Europe and stand in stark contrast with Regulation (EU) 2019/2144 and the SAE J3016. We recommend that any further examination of the role of AI in fully automated vehicles be informed by a thorough understanding of the accepted definitions of automation levels, the inherent capabilities of a system that can correctly be described as an "automated driving system," and the appropriate role of humans in connection with vehicles equipped with an ADS (i.e., a central role in the design and validation stages and, at Level 3, a role as a necessary fallback driver in the event of system failure).

In conclusion, we appreciate the opportunity to provide these comments, and we look forward to continuing to participate in the Commission's process, as it considers future governance frameworks relating to the testing and operation of fully automated vehicles in Europe.

Sincerely,

/s/ George Ivanov

George Ivanov  
Head of International Policy and Government Affairs

/s/ Daniel Smith

Daniel Smith  
Managing Counsel, Regulatory