



Summary of Autonomous Vehicle Disengagements  
Delphi Automotive Systems, LLC, a wholly-owned subsidiary of Aptiv PLC  
(Collectively referred to herein as “Aptiv”)  
January 1, 2018

This document contains a summary of all instances in which the safety driver of an Aptiv autonomous vehicle, licensed in the State of California, intervened and assumed manual control of the vehicle. Under California Code of Regulations title 13, article 3.7, section 227.46, Aptiv adheres to report all automated miles and takeovers.

This summary covers all such instances which occurred between December 1<sup>st</sup> 2016 and November 30<sup>th</sup> 2017.



**Overview:**

As of April 2017, Aptiv Labs Silicon Valley had one automated vehicle licensed and operable in the State of California. The vehicle platform used is a 2016 Audi SQ5 which is referred to as “Audi-4” in this document:

2016 Black Audi SQ5 “Audi-4”

Autonomous Distance: 1810.6 miles

16-Dec	0 miles
17-Jan	0 miles
17-Feb	0 miles
17-Mar	0 miles
17-Apr	43.6 miles
17-May	443.44 miles
17-Jun	481.7 miles
17-Jul	153.9 miles
17-Aug	94.1 miles
17-Sep	130.17 miles
17-Oct	335.38 miles
17-Nov	137.26 miles

**Locations of Autonomous Operation**

The testing documented in this report for Aptiv’s automated vehicle, Audi-4, occurred in three different cities in California. The first location is in San Jose, CA along surface streets and Montague Expressway. The second location is in Mountain View, CA surface streets, Hwy 85, I-280, US-101 and Central Expressway. The third location is in the Napa Valley area along Los Carneros Highway.

**Disengagements which Occurred During Planned Testing**

The Aptiv Autonomous Vehicle is still a prototype and as a result from all driving performed in this vehicle is considered testing for the purposes of this report.

**Time Needed to Take Over**

Aptiv’s Autonomous Vehicles are currently designed in a way that when operating in “Auto-Mode”, any mechanical/software failure will trigger a buzzer and alert the vehicle operator to manually take over the vehicle.

During operation in “Auto-Mode”, the vehicle operator always has one hand on the steering wheel and the other hand on the auto/manual toggle switch located on the vehicle center console. By pressing the auto/manual switch, this kills all power to entire automated system actuators (throttle, steering, brakes, and shifter). As a result from pressing the switch, this allows the vehicle operator to immediately take full control of the vehicle and all disengagements executed in a fraction of seconds resulting are documented in this report.



**Summary of Disengagements: December 2016- March 2017**

None to report. Zero miles driven.

**Summary of Disengagements – April 2017**

Issue	Time to Disengagement	Location	Conditions
Heavy pedestrian traffic	N/A	Street	Heavy Traffic
Heavy pedestrian traffic	N/A	Street	Typical
Heavy pedestrian traffic	N/A	Street	Heavy Traffic
Heavy pedestrian traffic	N/A	Street	Heavy Traffic

**Summary of Disengagements – May 2017**

Issue	Time to Disengagement	Location	Conditions
Heavy pedestrian traffic	N/A	Street	Heavy Traffic
Heavy pedestrian traffic	N/A	Street	Typical
Cyclist	N/A	Street	Heavy Traffic
Complete lane change	N/A	Street	Heavy Traffic
Traffic light detection	N/A	Street	Typical
Construction	N/A	Street	Heavy Traffic
Construction	N/A	Street	Heavy Traffic
Construction	N/A	Street	Heavy Traffic
Construction	N/A	Street	Heavy Traffic
Localization divergence	<1 sec	Interstate	Typical
Traffic light detection	<1 sec	Interstate	Poor Sun Conditions
Complete lane change	<1 sec	Interstate	Heavy Traffic
Complete lane change	<1 sec	Interstate	Heavy Traffic
Poor lane markings	<1 sec	Interstate	Faded Markings
Poor lane markings	<1 sec	Interstate	Faded Markings
Pedestrian traffic	N/A	Street	Typical
Cyclist	N/A	Street	Typical
Pedestrian traffic	N/A	Street	Typical
Pedestrian traffic	N/A	Street	Typical



**Summary of Disengagements – June 2017**

Issue	Time to Disengagement	Location	Conditions
Heavy pedestrian traffic	N/A	street	Heavy Traffic
Heavy pedestrian traffic	N/A	street	typical
Heavy pedestrian traffic	N/A	street	typical
Vehicle cut in	N/A	street	Heavy Traffic
Vehicle cut in	N/A	street	Heavy Traffic
Complete lane change	N/A	street	Heavy Traffic
Complete lane change	N/A	street	Heavy Traffic
Construction	N/A	street	Heavy Traffic
Construction	N/A	street	Heavy Traffic
Pedestrian traffic	N/A	street	typical
Pedestrian traffic	N/A	street	Heavy Traffic
Car blocking lane	N/A	street	typical
Car blocking lane	N/A	street	typical
Car blocking lane	N/A	street	typical
cyclist	N/A	street	Heavy Traffic

**Summary of Disengagements – July 2017**

Issue	Time to Disengagement	Location	Conditions
Traffic light detection	<1 sec	street	typical
Localization divergence	<1 sec	street	typical
Pedestrian traffic	N/A	street	heavy traffic
Pedestrian traffic	N/A	street	heavy traffic

**Summary of Disengagements – Aug 2017**

Issue	Time to Disengagement	Location	Conditions
Pedestrian traffic	N/A	street	typical
Localization divergence	<1 sec	street	typical
Poor lane markings	< 1 sec	street	typical
Complete lane change	N/A	interstate	moderate
Pedestrian traffic	N/A	street	traffic
Traffic light detection	< 1 sec	street	typical
Pedestrian traffic	N/A	street	typical



**Summary of Disengagements – Sept 2017**

Issue	Time to Disengagement	Location	Conditions
Poor lane markings	N/A	street	typical
Poor lane markings	N/A	highway	heavy traffic
Other Driver-unexpected behavior	N/A	street	typical
Poor lane markings	N/A	street	typical
Poor lane markings	N/A	street	typical
Poor lane markings	N/A	street	typical
Poor lane markings	N/A	street	typical
Traffic light detection	< 1 sec	highway	typical
Traffic light detection	< 1 sec	highway	typical
Traffic light detection	< 1 sec	highway	typical
Traffic light detection	< 1 sec	highway	typical
Traffic light detection	< 1 sec	highway	typical
Pedestrian traffic	N/A	street	moderate
Pedestrian traffic	N/A	street	moderate

**Summary of Disengagements – Oct 2017**

Issue	Time to Disengagement	Location	Conditions
Heavy pedestrian traffic	N/A	street	Heavy Traffic
Complete lane change	N/A	street	Heavy Traffic
Other Driver-unexpected behavior	N/A	street	Heavy Traffic
Other Driver-unexpected behavior	N/A	street	Heavy Traffic
Pedestrian traffic	N/A	street	Heavy Traffic
Cyclist	N/A	street	Typical
Localization divergence	<1 sec	interstate	Typical
Traffic light detection	<1 sec	interstate	Typical
Complete lane change	<1 sec	interstate	Typical
Heavy pedestrian traffic	N/A	street	Conditions

**Summary of Disengagements – Nov 2017**

Issue	Time to Disengagement	Location	Conditions
Traffic light detection	<1 sec	Interstate	typical
Car blocking lane	N/A	street	typical
Complete lane change	N/A	street	Heavy Traffic
Traffic light detection	<1 sec	street	typical
Traffic light detection	<1 sec	street	typical
Heavy pedestrian traffic	N/A	Street	Heavy Traffic
Vehicle cut in	N/A	street	Heavy Traffic
Car blocking lane	N/A	street	typical