

Summary of Autonomous Vehicle Disengagements

Delphi Corporation

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This document contains a summary of all instances in which the safety driver of one of Delphi's two licensed autonomous vehicles (both Audi SQ5s) chose to intervene and retake manual control. This summary covers all such instances which occurred between the date of licensure, 7 October 2014, and the end date of 30 November 2015.

Overview

As of 30 November 2015, Delphi has two autonomous vehicles licensed for operation in California. Both vehicles are 2014 Audi SQ5s. The vehicles are referred to as "SQ5-1" and "SQ5-2" in this document.

2014 Black Audi SQ5 "SQ5-1"

Autonomous Distance: 7157 miles

Oct-14	397 miles
Nov-14	586 miles
Dec-14	577 miles
Jan-15	242 miles
Feb-15	381 miles
Mar-15	3837 miles
Apr-15	48 miles
May-15	32 miles
Jun-15	95 miles
Jul-15	244 miles
Aug-15	566 miles
Sep-15	91 miles
Oct-15	41 miles
Nov-15	20 miles

2014 White Audi SQ5 "SQ5-2"

Autonomous Distance: 9505 miles

Oct-14	894 miles
Nov-14	578 miles
Dec-14	559 miles
Jan-15	214 miles
Feb-15	3560 miles
Mar-15	2767 miles
Apr-15	16 miles
May-15	48 miles
Jun-15	147 miles
Jul-15	227 miles
Aug-15	66 miles
Sep-15	400 miles
Oct-15	0 miles
Nov-15	28 miles

Locations of Autonomous Operation

The highway testing documented in this report occurred along US-101, Hwy 85, Central Expressway, I-280 in the San Francisco Bay Area, on the I-5 corridor between Stockton and Los Angeles, I-10, and many out-of-state highways.

Disengagements which Occurred During Planned Testing

Both of Delphi's autonomous vehicles are still prototypes, and thus all driving performed on these vehicles is considered testing for the purposes of this report.

Time Needed to Take Over

Both of Delphi's autonomous vehicles are designed such that any hardware failure triggers a buzzer to alert the vehicle operator that he/she needs to take over.

The vehicle operator always has one hand on the steering wheel and one hand on the auto/manual toggle switch on the vehicle's center console. Pressing the auto/manual switch kills all power to the automated system actuators (throttle, steering, brakes, and shifter) and allows the operator to instantaneously take full control. Hence, all Disengagements documented in this report were executed in less than one second.

Summary of Causes of Driver Disengagement

Issue	No. of Incidences
Construction Zones	17
Driver Disengagement required to complete lane change in heavy traffic	50
Emergency Vehicles	7
Poor lane markings	110
Precautionary intervention due to heavy pedestrian traffic	22
Precautionary intervention to give extra space for a cyclist	6
Stock Vehicle Failure	8
System tuning and calibration	62
Traffic light detection	102
Unexpected behavior from another driver	21

Summary of Disengagements – October 2014

SQ5-1:

Issue	Time to Disengagement	Location	Conditions
Traffic light detection	N/A	Street	Poor Sun Conditions
System tuning and calibration	N/A	Highway	Typical
Poor lane markings	< 1 sec	Highway	Freshly Paved Roadway
System tuning and calibration	N/A	Street	Typical
System tuning and calibration	N/A	Street	Typical
Traffic light detection	N/A	Street	Poor Sun Conditions
Poor Lane Markings	< 1 sec	Street	Bott's Dots
System tuning and calibration	N/A	Highway	Typical
Poor Lane Markings	< 1 sec	Highway	Bott's Dots
Poor Lane Markings	< 1 sec	Street	Bott's Dots
System tuning and calibration	N/A	Street	Typical
Construction Zone	N/A	Highway	Construction
Complete lane change	N/A	Street	Heavy Traffic
Poor lane markings	< 1 sec	Street	Freshly Paved Roadway
Complete lane change	N/A	Street	Heavy Traffic
System tuning and calibration	N/A	Street	Typical
System tuning and calibration	N/A	Street	Typical
Complete lane change	N/A	Street	Heavy Traffic

SQ5-2:

Issue	Time to Disengagement	Location	Conditions
System tuning and calibration	N/A	Street	Typical
Traffic light detection	N/A	Street	Poor Sun Conditions
System tuning and calibration	N/A	Street	Typical
Stock Vehicle Fault	< 1 sec	Street	Typical
System tuning and calibration	N/A	Street	Typical
System tuning and calibration	N/A	Highway	Typical
Poor lane markings	< 1 sec	Highway	Freshly Paved Roadway
System tuning and calibration	N/A	Street	Typical
System tuning and calibration	N/A	Street	Typical
System tuning and calibration	N/A	Street	Typical
Traffic light detection	N/A	Street	Poor Sun Conditions
Construction Zone	N/A	Street	Construction
Complete lane change	N/A	Street	Heavy Traffic
Complete lane change	N/A	Street	Heavy Traffic
Poor lane markings	< 1 sec	Street	Bott's Dots
Complete lane change	N/A	Street	Heavy Traffic
Complete lane change	N/A	Street	Heavy Traffic

System tuning and calibration	N/A	Street	Typical
System tuning and calibration	N/A	Street	Typical
Complete lane change	N/A	Street	Heavy Traffic
System tuning and calibration	N/A	Street	Typical

Summary of Disengagements – November 2014

SQ5-1:

Issue	Time to Disengagement	Location	Conditions
Construction Zones	N/A	Street	Construction
Complete lane change	N/A	Street	Heavy Traffic
System tuning and calibration	N/A	Street	Typical
System tuning and calibration	N/A	Street	Typical
Other driver unexpected behavior	N/A	Street	Typical
Complete lane change	N/A	Street	Heavy Traffic
Complete lane change	N/A	Street	Heavy Traffic
Complete lane change	N/A	Street	Heavy Traffic
Traffic light detection	N/A	Street	Poor Sun Conditions
Traffic light detection	N/A	Street	Poor Sun Conditions
Complete lane change	N/A	Street	Heavy Traffic
Other driver unexpected behavior	N/A	Street	Typical
Complete lane change	N/A	Street	Heavy Traffic
Traffic light detection	N/A	Street	Poor Sun Conditions
Complete lane change	N/A	Street	Heavy Traffic
Poor lane markings	< 1 sec	Street	Bott's Dots
Heavy pedestrian traffic	N/A	Street	Typical
Complete lane change	N/A	Street	Heavy Traffic
Traffic light detection	N/A	Street	Poor Sun Conditions
Traffic light detection	N/A	Street	Poor Sun Conditions

SQ5-2:

Issue	Time to Disengagement	Location	Conditions
Heavy pedestrian traffic	N/A	Street	Typical
Complete lane change	N/A	Street	Heavy Traffic
Complete lane change	N/A	Street	Heavy Traffic
Complete lane change	N/A	Street	Heavy Traffic
Complete lane change	N/A	Street	Heavy Traffic
Traffic light detection	N/A	Street	Poor Sun Conditions
System tuning and calibration	N/A	Street	Typical
Complete lane change	N/A	Street	Heavy Traffic
Traffic light detection	N/A	Street	Poor Sun Conditions
Complete lane change	N/A	Street	Heavy Traffic
Complete lane change	N/A	Street	Heavy Traffic
System tuning and calibration	N/A	Street	Typical
System tuning and calibration	N/A	Street	Heavy Traffic
Complete lane change	N/A	Street	Heavy Traffic
Complete lane change	N/A	Street	Heavy Traffic

Traffic light detection	N/A	Street	Poor Sun Conditions
Traffic light detection	N/A	Street	Poor Sun Conditions
Traffic light detection	N/A	Street	Poor Sun Conditions
Complete lane change	N/A	Street	Heavy Traffic
Poor lane markings	< 1 sec	Street	Bott's Dots
Other driver unexpected behavior	N/A	Street	Heavy Traffic
Complete lane change	N/A	Street	Heavy Traffic
Traffic light detection	N/A	Street	Poor Sun Conditions

Summary of Disengagements – December 2014

SQ5-1:

Issue	Time to Disengagement	Location	Conditions
Traffic light detection	N/A	Street	Poor Sun Conditions
System tuning and calibration	N/A	Street	Typical
Traffic light detection	N/A	Street	Poor Sun Conditions
Traffic light detection	N/A	Street	Poor Sun Conditions
Poor lane markings	< 1 sec	Street	Bott's Dots
Traffic light detection	N/A	Street	Poor Sun Conditions
Emergency Vehicles	N/A	Street	Emergency
Complete lane change	N/A	Street	Heavy Traffic
Stock Vehicle Failure	< 1 sec	Street	Typical
Traffic light detection	N/A	Street	Poor Sun Conditions
Stock Vehicle Failure	< 1 sec	Street	Typical
Heavy pedestrian traffic	N/A	Street	Typical
Traffic light detection	N/A	Street	Poor Sun Conditions
Traffic light detection	N/A	Street	Poor Sun Conditions
Traffic light detection	N/A	Street	Poor Sun Conditions
Traffic light detection	N/A	Street	Poor Sun Conditions
Traffic light detection	N/A	Street	Poor Sun Conditions
System tuning and calibration	N/A	Street	Typical
System tuning and calibration	N/A	Street	Typical
Traffic light detection	N/A	Street	Poor Sun Conditions
Poor lane markings	< 1 sec	Street	Bott's Dots
Traffic light detection	N/A	Street	Poor Sun Conditions
System tuning and calibration	N/A	Street	Typical
System tuning and calibration	N/A	Street	Typical
System tuning and calibration	N/A	Street	Typical
Traffic light detection	N/A	Street	Poor Sun Conditions
System tuning and calibration	N/A	Street	Typical
Cyclist	N/A	Street	Typical
Traffic light detection	N/A	Street	Poor Sun Conditions
Poor lane markings	< 1 sec	Street	Bott's Dots
System tuning and calibration	N/A	Street	Typical
Traffic light detection	N/A	Street	Poor Sun Conditions
Traffic light detection	N/A	Street	Poor Sun Conditions
Construction Zones	N/A	Street	Construction
System tuning and calibration	N/A	Street	Typical
Traffic light detection	N/A	Street	Poor Sun Conditions
System tuning and calibration	N/A	Street	Typical
Traffic light detection	N/A	Street	Poor Sun Conditions
Poor lane markings	< 1 sec	Street	Bott's Dots

Poor lane markings	< 1 sec	Street	Bott's Dots
Traffic light detection	N/A	Street	Poor Sun Conditions

SQ5-2:

Issue	Time to Disengagement	Location	Conditions
Traffic light detection	N/A	Street	Poor Sun Conditions
Cyclist	N/A	Street	Typical
System tuning and calibration	N/A	Street	Typical
System tuning and calibration	N/A	Street	Typical
Traffic light detection	N/A	Street	Poor Sun Conditions
Traffic light detection	N/A	Street	Poor Sun Conditions
Traffic light detection	N/A	Street	Poor Sun Conditions
Traffic light detection	N/A	Street	Poor Sun Conditions
System tuning and calibration	N/A	Street	Typical
Complete lane change	N/A	Street	Heavy Traffic
Traffic light detection	N/A	Street	Poor Sun Conditions
Traffic light detection	N/A	Street	Poor Sun Conditions
Traffic light detection	N/A	Street	Poor Sun Conditions
Other driver unexpected behavior	N/A	Street	Typical
Traffic light detection	N/A	Street	Poor Sun Conditions
System tuning and calibration	N/A	Street	Typical
System tuning and calibration	N/A	Street	Typical
Traffic light detection	N/A	Street	Poor Sun Conditions
System tuning and calibration	N/A	Street	Typical
System tuning and calibration	N/A	Street	Typical
System tuning and calibration	N/A	Street	Typical
Traffic light detection	N/A	Street	Poor Sun Conditions
Poor lane markings	< 1 sec	Street	Bott's Dots
Poor lane markings	< 1 sec	Street	Bott's Dots
Traffic light detection	N/A	Street	Poor Sun Conditions
Other driver unexpected behavior	N/A	Street	Heavy Traffic
Heavy pedestrian traffic	N/A	Street	Typical
Traffic light detection	N/A	Street	Poor Sun Conditions
System tuning and calibration	N/A	Street	Typical
Heavy pedestrian traffic	N/A	Street	Typical
System tuning and calibration	N/A	Street	Typical
Heavy pedestrian traffic	N/A	Street	Typical
Poor lane markings	< 1 sec	Street	Bott's Dots
Traffic light detection	N/A	Street	Poor Sun Conditions
System tuning and calibration	N/A	Street	Typical
Construction Zones	N/A	Street	Construction
Emergency Vehicles	N/A	Street	Emergency

Traffic light detection	N/A	Street	Poor Sun Conditions
Traffic light detection	N/A	Street	Poor Sun Conditions
Traffic light detection	N/A	Street	Poor Sun Conditions
System tuning and calibration	N/A	Street	Typical
Poor lane markings	< 1 sec	Street	Bott's Dots
Poor lane markings	< 1 sec	Street	Bott's Dots
Traffic light detection	N/A	Street	Poor Sun Conditions
Traffic light detection	N/A	Street	Poor Sun Conditions
System tuning and calibration	N/A	Street	Typical
Poor lane markings	< 1 sec	Street	Bott's Dots
Traffic light detection	N/A	Street	Poor Sun Conditions
Poor lane markings	< 1 sec	Street	Bott's Dots
Complete lane change	N/A	Street	Heavy Traffic
System tuning and calibration	N/A	Street	Typical
Complete lane change	N/A	Street	Heavy Traffic
Complete lane change	N/A	Street	Heavy Traffic
Traffic light detection	N/A	Street	Poor Sun Conditions
Traffic light detection	N/A	Street	Poor Sun Conditions
Emergency Vehicles	N/A	Street	Emergency
Poor lane markings	< 1 sec	Street	Bott's Dots
Traffic light detection	N/A	Street	Poor Sun Conditions
Traffic light detection	N/A	Street	Poor Sun Conditions
Traffic light detection	N/A	Street	Poor Sun Conditions
Traffic light detection	N/A	Street	Poor Sun Conditions
Traffic light detection	N/A	Street	Poor Sun Conditions
Traffic light detection	N/A	Street	Poor Sun Conditions
Traffic light detection	N/A	Street	Poor Sun Conditions
Traffic light detection	N/A	Street	Poor Sun Conditions
Poor lane markings	< 1 sec	Street	Bott's Dots

Summary of Disengagements – January 2015

SQ5-1:

Issue	Time to Disengagement	Location	Conditions
Traffic light detection	N/A	Street	Poor Sun Conditions
Heavy pedestrian traffic	N/A	Street	Typical
Poor lane markings	< 1 sec	Street	Bott's Dots
Heavy pedestrian traffic	N/A	Street	Typical
Poor lane markings	< 1 sec	Street	Bott's Dots
Complete lane change	N/A	Street	Heavy Traffic
Traffic light detection	N/A	Street	Poor Sun Conditions
Heavy pedestrian traffic	N/A	Street	Typical
Heavy pedestrian traffic	N/A	Street	Typical
Poor lane markings	< 1 sec	Street	Bott's Dots
Cyclist	N/A	Street	Typical
Heavy pedestrian traffic	N/A	Street	Typical
Poor lane markings	< 1 sec	Street	Bott's Dots
Traffic light detection	N/A	Street	Poor Sun Conditions
Heavy pedestrian traffic	N/A	Street	Typical
Other driver unexpected behavior	N/A	Street	Typical
Poor lane markings	< 1 sec	Street	Bott's Dots
Heavy pedestrian traffic	N/A	Street	Typical
Cyclist	N/A	Street	Typical
Traffic light detection	N/A	Street	Poor Sun Conditions
Emergency Vehicles	N/A	Street	Emergency
Stock Vehicle Failure	< 1 sec	Street	Typical

SQ5-2:

Issue	Time to Disengagement	Location	Conditions
Complete lane change	N/A	Street	Heavy Traffic
Heavy pedestrian traffic	N/A	Street	Typical
Poor lane markings	< 1 sec	Street	Bott's Dots
Traffic light detection	N/A	Street	Poor Sun Conditions
Poor lane markings	< 1 sec	Street	Bott's Dots
Poor lane markings	< 1 sec	Street	Bott's Dots
Poor lane markings	< 1 sec	Street	Bott's Dots
Heavy pedestrian traffic	N/A	Street	Typical
Traffic light detection	N/A	Street	Poor Sun Conditions
Stock Vehicle Failure	< 1 sec	Street	Typical
Cyclist	N/A	Street	Typical

Construction Zones	N/A	Street	Construction
Cyclist	N/A	Street	Typical

Summary of Disengagements – February 2015

SQ5-1:

Issue	Time to Disengagement	Location	Conditions
Stock Vehicle Failure	< 1 sec	Street	Typical
Poor lane markings	< 1 sec	Street	Bott's Dots

SQ5-2:

Issue	Time to Disengagement	Location	Conditions
Poor lane markings	< 1 sec	Street	Bott's Dots
Poor lane markings	< 1 sec	Street	Bott's Dots
Poor lane markings	< 1 sec	Street	Bott's Dots
Traffic light detection	N/A	Street	Poor Sun Conditions
Traffic light detection	N/A	Street	Poor Sun Conditions
Poor lane markings	< 1 sec	Street	Bott's Dots
Traffic light detection	N/A	Street	Poor Sun Conditions
Traffic light detection	N/A	Street	Poor Sun Conditions

Summary of Disengagements – March 2015

SQ5-1:

Issue	Time to Disengagement	Location	Conditions
Complete lane change	N/A	Street	Heavy Traffic
Poor lane markings	< 1 sec	Street	Faded Markings
Poor lane markings	< 1 sec	Highway	Freshly Paved Roadway
System tuning and calibration	N/A	Interstate	Typical
Poor lane markings	< 1 sec	Interstate	Bott's Dots
Poor lane markings	< 1 sec	Highway	Bott's Dots
Complete lane change	N/A	Interstate	Heavy Traffic
Poor lane markings	< 1 sec	Highway	Bott's Dots
Poor lane markings	< 1 sec	Interstate	Freshly Paved Roadway
Poor lane markings	< 1 sec	Highway	Freshly Paved Roadway
Poor lane markings	< 1 sec	Highway	Faded Markings
System tuning and calibration	N/A	Highway	Typical
System tuning and calibration	N/A	Interstate	Typical
Poor lane markings	< 1 sec	Highway	Bott's Dots
Complete lane change	N/A	Interstate	Heavy Traffic
Poor lane markings	< 1 sec	Highway	Faded Markings
Poor lane markings	< 1 sec	Interstate	Faded Markings
Poor lane markings	< 1 sec	Highway	Freshly Paved Roadway
Poor lane markings	< 1 sec	Interstate	Freshly Paved Roadway
Poor lane markings	< 1 sec	Interstate	Faded Markings
Poor lane markings	< 1 sec	Interstate	Faded Markings
Poor lane markings	< 1 sec	Highway	Freshly Paved Roadway
Poor lane markings	< 1 sec	Interstate	Freshly Paved Roadway
Other driver unexpected behavior	N/A	Interstate	Heavy Traffic
Poor lane markings	< 1 sec	Interstate	Faded Markings
Poor lane markings	< 1 sec	Interstate	Faded Markings
Complete lane change	N/A	Interstate	Heavy Traffic
Poor lane markings	< 1 sec	Interstate	Faded Markings
Emergency Vehicles	N/A	Interstate	Emergency
System tuning and calibration	N/A	Interstate	Typical
Poor lane markings	< 1 sec	Interstate	Faded Markings
Construction Zones	N/A	Interstate	Construction
Construction Zones	N/A	Interstate	Construction
Construction Zones	N/A	Interstate	Construction
Construction Zones	N/A	Interstate	Construction

SQ5-2:

Issue	Time to Disengagement	Location	Conditions
Poor lane markings	< 1 sec	Highway	Faded Markings
Poor lane markings	< 1 sec	Interstate	Faded Markings
System tuning and calibration	N/A	Highway	Typical
Poor lane markings	< 1 sec	Highway	Faded Markings
Poor lane markings	< 1 sec	Highway	Freshly Paved Roadway
Poor lane markings	< 1 sec	Interstate	Faded Markings
Poor lane markings	< 1 sec	Interstate	Freshly Paved Roadway
Poor lane markings	< 1 sec	Interstate	Freshly Paved Roadway
Poor lane markings	< 1 sec	Highway	Freshly Paved Roadway
Other driver unexpected behavior	N/A	Highway	Typical
Complete lane change	N/A	Interstate	Heavy Traffic
Poor lane markings	< 1 sec	Interstate	Faded Markings
Poor lane markings	< 1 sec	Interstate	Faded Markings
Poor lane markings	< 1 sec	Interstate	Faded Markings
Complete lane change	N/A	Interstate	Heavy Traffic
Poor lane markings	< 1 sec	Interstate	Bott's Dots
Poor lane markings	< 1 sec	Interstate	Faded Markings
Poor lane markings	< 1 sec	Interstate	Bott's Dots
Poor lane markings	< 1 sec	Interstate	Faded Markings
Other driver unexpected behavior	N/A	Interstate	Typical
Poor lane markings	< 1 sec	Interstate	Faded Markings
Poor lane markings	< 1 sec	Interstate	Faded Markings
System tuning and calibration	N/A	Interstate	Typical
Other driver unexpected behavior	N/A	Interstate	Heavy Traffic
Complete lane change	N/A	Interstate	Heavy Traffic
Poor lane markings	< 1 sec	Interstate	Bott's Dots
Poor lane markings	< 1 sec	Interstate	Bott's Dots
Poor lane markings	< 1 sec	Interstate	Bott's Dots
Other driver unexpected behavior	N/A	Interstate	Heavy Traffic
Poor lane markings	< 1 sec	Interstate	Bott's Dots
Other driver unexpected behavior	N/A	Interstate	Typical
Poor lane markings	< 1 sec	Interstate	Faded Markings
Poor lane markings	< 1 sec	Interstate	Faded Markings
Other driver unexpected behavior	N/A	Interstate	Typical
Other driver unexpected behavior	N/A	Interstate	Typical
Poor lane markings	< 1 sec	Interstate	Faded Markings
Poor lane markings	< 1 sec	Interstate	Faded Markings
Other driver unexpected behavior	N/A	Interstate	Typical
Poor lane markings	< 1 sec	Interstate	Bott's Dots
Other driver unexpected behavior	N/A	Interstate	Heavy Traffic
Poor lane markings	< 1 sec	Interstate	Bott's Dots
Other driver unexpected behavior	N/A	Interstate	Typical

System tuning and calibration	N/A	Interstate	Typical
System tuning and calibration	N/A	Interstate	Typical

Summary of Disengagements – April 2015

SQ5-1:

Issue	Time to Disengagement	Location	Conditions
Stock Vehicle Failure	< 1 sec	Interstate	Typical
Construction Zones	N/A	Highway	Construction
System tuning and calibration	N/A	Interstate	Typical
System tuning and calibration	N/A	Highway	Typical
Complete lane change	N/A	Street	Heavy Traffic
Complete lane change	N/A	Street	Heavy Traffic
Poor lane markings	< 1 sec	Street	Bott's Dots
Complete lane change	N/A	Street	Heavy Traffic

SQ5-2:

Issue	Time to Disengagement	Location	Conditions
Construction Zones	N/A	Street	Construction
Traffic light detection	N/A	Street	Poor Sun Conditions
Poor lane markings	< 1 sec	Street	Bott's Dots

Summary of Disengagements – May 2015

SQ5-1:

Issue	Time to Disengagement	Location	Conditions
Complete lane change	N/A	Street	Heavy Traffic
Poor lane markings	< 1 sec	Street	Bott's Dots

SQ5-2:

Issue	Time to Disengagement	Location	Conditions
Poor lane markings	< 1 sec	Street	Bott's Dots
Poor lane markings	< 1 sec	Street	Bott's Dots
Poor lane markings	< 1 sec	Street	Bott's Dots
Complete lane change	N/A	Street	Heavy Traffic

Summary of Disengagements – June 2015

SQ5-1:

Issue	Time to Disengagement	Location	Conditions
Traffic light detection	N/A	Street	Poor Sun Conditions
Emergency Vehicles	N/A	Street	Emergency
Poor lane markings	< 1 sec	Street	Bott's Dots
Traffic light detection	N/A	Street	Poor Sun Conditions
Poor lane markings	< 1 sec	Street	Bott's Dots
Stock Vehicle Failure	< 1 sec	Street	Typical

SQ5-2:

Issue	Time to Disengagement	Location	Conditions
Complete lane change	N/A	Street	Heavy Traffic
Traffic light detection	N/A	Street	Poor Sun Conditions
Heavy pedestrian traffic	N/A	Street	Typical

Summary of Disengagements – July 2015

SQ5-1:

Issue	Time to Disengagement	Location	Conditions
Traffic light detection	N/A	Street	Poor Sun Conditions
Traffic light detection	N/A	Street	Poor Sun Conditions
Traffic light detection	N/A	Street	Poor Sun Conditions
Poor lane markings	< 1 sec	Street	Bott's Dots
Traffic light detection	N/A	Street	Poor Sun Conditions
Traffic light detection	N/A	Street	Poor Sun Conditions
Traffic light detection	N/A	Street	Poor Sun Conditions
Other driver unexpected behavior	N/A	Street	Typical

SQ5-2:

Issue	Time to Disengagement	Location	Conditions
Traffic light detection	N/A	Street	Poor Sun Conditions
Traffic light detection	N/A	Street	Poor Sun Conditions
Traffic light detection	N/A	Street	Poor Sun Conditions
Poor lane markings	< 1 sec	Street	Bott's Dots
Poor lane markings	< 1 sec	Street	Bott's Dots

Summary of Disengagements – August 2015

SQ5-1:

Issue	Time to Disengagement	Location	Conditions
Traffic light detection	N/A	Street	Poor Sun Conditions
Construction Zones	N/A	Street	Construction
Traffic light detection	N/A	Street	Poor Sun Conditions

SQ5-2:

Issue	Time to Disengagement	Location	Conditions
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
Other driver unexpected behavior	N/A	Street	Heavy Traffic

Summary of Disengagements – September 2015

SQ5-1:

Issue	Time to Disengagement	Location	Conditions
System tuning and calibration	N/A	Street	Typical
Heavy pedestrian traffic	N/A	Street	Typical
System tuning and calibration	N/A	Street	Typical
Construction Zones	N/A	Street	Construction
Construction Zones	N/A	Street	Construction

SQ5-2:

Issue	Time to Disengagement	Location	Conditions
Emergency Vehicles	N/A	Street	Emergency

Summary of Disengagements – October 2015

SQ5-1:

Issue	Time to Disengagement	Location	Conditions
Heavy pedestrian traffic	N/A	Street	Typical
Heavy pedestrian traffic	N/A	Street	Typical
System tuning and calibration	N/A	Street	Typical
System tuning and calibration	N/A	Street	Typical
Poor lane markings	< 1 sec	Street	Bott's Dots
Construction Zones	N/A	Street	Construction

SQ5-2:

Issue	Time to Disengagement	Location	Conditions
Heavy pedestrian traffic	N/A	Street	Typical
System tuning and calibration	N/A	Street	Typical
Complete lane change	N/A	Street	Heavy Traffic
Traffic light detection	N/A	Street	Poor Sun Conditions
Complete lane change	N/A	Street	Heavy Traffic
Poor lane markings	< 1 sec	Street	Bott's Dots

Summary of Disengagements – November 2015

SQ5-1:

Issue	Time to Disengagement	Location	Conditions
Traffic light detection	N/A	Street	Poor Sun Conditions
Poor lane markings	< 1 sec	Street	Bott's Dots
System tuning and calibration	N/A	Street	Typical
Poor lane markings	< 1 sec	Street	Bott's Dots
Poor lane markings	< 1 sec	Street	Bott's Dots
Heavy pedestrian traffic	N/A	Street	Typical
Heavy pedestrian traffic	N/A	Street	Typical
Poor lane markings	< 1 sec	Street	Bott's Dots
Poor lane markings	< 1 sec	Street	Bott's Dots
Poor lane markings	< 1 sec	Street	Bott's Dots
Traffic light detection	N/A	Street	Poor Sun Conditions
Traffic light detection	N/A	Street	Poor Sun Conditions
Poor lane markings	< 1 sec	Street	Bott's Dots
Poor lane markings	< 1 sec	Street	Bott's Dots
Traffic light detection	N/A	Street	Poor Sun Conditions
Poor lane markings	< 1 sec	Street	Bott's Dots
Traffic light detection	N/A	Street	Poor Sun Conditions
Traffic light detection	N/A	Street	Poor Sun Conditions
Traffic light detection	N/A	Street	Poor Sun Conditions
Traffic light detection	N/A	Street	Poor Sun Conditions

SQ5-2:

Issue	Time to Disengagement	Location	Conditions
Poor lane markings	< 1 sec	Street	Bott's Dots
Construction Zones	N/A	Street	Construction
Traffic light detection	N/A	Street	Poor Sun Conditions
Traffic light detection	N/A	Street	Poor Sun Conditions
Traffic light detection	N/A	Street	Poor Sun Conditions
Traffic light detection	N/A	Street	Poor Sun Conditions
Poor lane markings	< 1 sec	Street	Bott's Dots
Poor lane markings	< 1 sec	Street	Bott's Dots