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Administration**



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July 2019

Rear Amber Turn Signal Lamps Confirmation Test – Example Measurements

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16. Abstract This report summarizes an effort to carry out and evaluate a draft test procedure for confirming amber rear turn signal lamp color. The procedure adapts existing test procedures from Federal Motor Vehicle Safety Standard (FMVSS) No. 108, Lamps, reflective devices, and associated equipment, to accommodate testing the lamps as installed on the vehicle. The draft laboratory test procedure consists of measuring the color of the emitted light using a colorimeter and an adaptation of the tristimulus method and chromaticity coordinates as described in FMVSS No. 108. Four vehicles were subjected to the draft test procedure. Two vehicles were confirmed to have amber rear turn signal lamps, one was confirmed to be red, and the fourth was determined to be a color other than amber or red. Overall, the test procedure was found to be easy to carry out and effective in determining turn signal lamp color.			
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1.0 INTRODUCTION

A 2009 National Highway Traffic Safety Administration report [1] summarized an analysis of the effect of rear turn signal color as a means to reduce the frequency of passenger vehicles crashes. Specifically, an answer was sought as to whether amber or red turn signals were more effective at preventing rear-end crashes in which the lead vehicle was engaged in a maneuver where a turn signal was assumed to be engaged – turning, changing lanes, merging, or parking. The study used State data and a “switch pair” method that considered only vehicles having turn signals that switched signal color, either from red to amber or amber to red across model years. The analysis concluded that amber rear turn signals show a 5.3 percent effectiveness in reducing involvement in two-vehicle crashes where a lead vehicle is rear-ended in the act of turning left, turning right, merging into traffic, changing lanes, or entering/leaving a parking space. The advantage of amber rear turn signal color was shown to be statistically significant.

This report documents testing performed to evaluate a test procedure to confirm the existence of amber rear turn signal lamps. The test is intended to be applicable to passenger vehicles with gross vehicle weight ratings (GVWR) under 10,000 pounds. The test procedure adapts existing test procedures from FMVSS No. 108, Lamps, reflective devices, and associated equipment, to accommodate testing the lamps as installed on the vehicle.

The test procedure involves using the tristimulus method to determine the color of a vehicle’s rear turn signal lamps. This method measures the light emitted by the rear turn signal as measured by photoelectric receivers with spectral responses that approximate International Commission on Illumination (CIE) standard spectral tristimulus values. The details of this procedure are specified in FMVSS No. 108, paragraph S14.4.1.4. [2]. The results of this test demonstrate broad differences between red and amber, but cannot be used to determine compliance with FMVSS No. 108. NHTSA cannot, outside the context of an actual compliance proceeding, make a determination of whether particular vehicles fail to comply with a FMVSS.

2.0 METHOD

The test method evaluated consists of measuring the color of the light emitted by the rear turn signals of a production light vehicle. Measurements are made using a colorimeter and an adaptation of the tristimulus method and chromaticity coordinates as described in FMVSS No. 108 [2]. A summary of the test procedure is provided below.

2.1 Photographic Documentation

Still, color photographs were taken of each vehicle tested including the following views.

- Vehicle exterior, driver's side
- Vehicle exterior, oblique passenger's side/rear view
- Rear turn signal or combination lamp, close-up
- Rear turn signal, illuminated
- Dealer's window sticker
- Manufacturer's label
- Tire placard

2.2 Test Vehicle Preparation

Per the draft test procedure, each vehicle was prepared for testing by ensuring that the vehicle's hood, trunk, and all doors were closed and the rear turn signal lamp lenses were wiped clean.

2.3 Equipment

Measurements were made using a Konica-Minolta CL-200A chroma meter.

2.4 Measurement Procedure

For this effort, measurements were made indoors in a temperature-controlled laboratory setting. Overhead lighting was turned off during measurements to achieve an ambient illumination level of less than 0.20 lux. Rear turn signal color was measured two to three times for each vehicle. Individual measurements for a particular vehicle were taken on separate days. Vehicle turn signal lamps were tested for color in accordance with tristimulus method outlined below.

2.4.1 Tristimulus Method Procedure

Per the draft test procedure, the tristimulus method was used to determine the color of a vehicle's rear turn signal lamps. This method measures the light emitted by the rear turn signal as measured by photoelectric receivers with spectral responses that approximate CIE standard spectral tristimulus values. The details of this procedure are specified in FMVSS No. 108, paragraph S14.4.1.4. To determine the color of the vehicle's rear turn signal the general test procedure in FMVSS No. 108, paragraph S14.4, was followed:

With the vehicle placed in park and the vehicular hazard warning signal operating unit engaged so that both rear turn signals flash, the color of light from the rear turn signal device must be measured by photoelectric receivers with spectral responses that approximate CIE standard spectral tristimulus values.

2.4.2 Tristimulus Method Performance Requirements

The color of light as expressed by the chromaticity coordinates according to the CIE 1931 Standard Colorimetric System, described in the CIE 1931 Chromaticity Diagram (and FMVSS No. 108 Figure 1) must fall within the following boundaries.

Red

$y = 0.33$ (yellow boundary)

$y = 0.98 - x$ (purple boundary)

Yellow (Amber)

$y = 0.39$ (red boundary)

$y = x - 0.12$ (green boundary)

$y = 0.79 - 0.67x$ (white boundary)

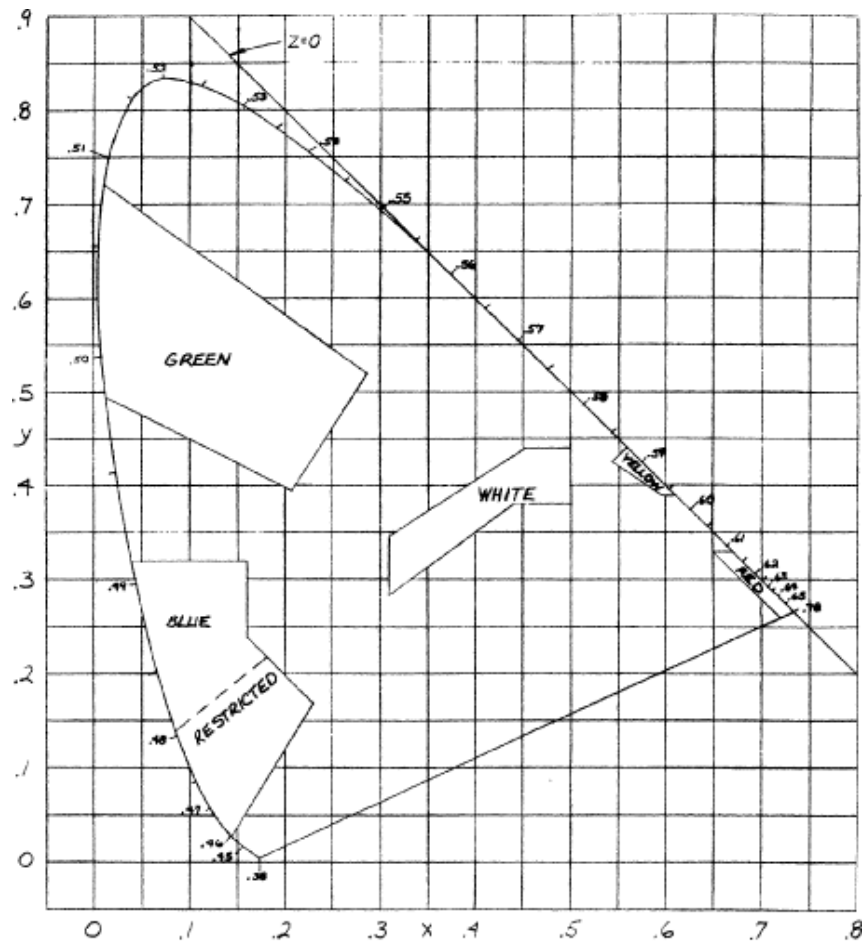


Figure 1. FMVSS No. 108 Figure 1 Chromaticity Diagram

3.0 RESULTS

The following sections presents the rear turn signal color measurement results for the stated vehicles. All vehicles measured had colored turn signal bulbs with clear lenses. No vehicles having amber-colored rear turn signal lenses were tested.

Vehicles examined in this effort are listed in Table 1.

Table 1. Vehicles Examined

Vehicle Model Info	Mileage	Light Source Type
2012 Mercedes S400 Hybrid	<500	LEDs
2016 Nissan Rogue	<100	Bulb
2015 Subaru Legacy	2,064	Bulb
2016 Chevrolet Malibu	<100	LEDs

3.1 2012 Mercedes S400 Hybrid

3.1.1 Vehicle Photos

Still, color photographs of the measured 2012 Mercedes S400 Hybrid are presented in the Figures 2 to 5. Photos of the vehicle's window sticker, manufacturing label, and tire placard are shown in Figures 6 to 8.



Figure 2. 2012 Mercedes S400 Hybrid - Driver's Side



Figure 3. 2012 Mercedes S400 Hybrid - Oblique Passenger's Side/Rear View



Figure 4. 2012 Mercedes S400 Hybrid - Rear Combination Lamp, Close-up



Figure 5. 2012 Mercedes S400 Hybrid - Rear Turn Signal Illuminated, Close-up

2012 S400 HYBRID
3.5L V-6 Engine Mild-Hybrid

PO#: 0270552649
VIN: WDDNG9FB8CA444343

SUGGESTED RETAIL PRICE **\$91,850**

PAINT/UPHOLSTERY & TRIM
775 Indium Silver
211 Black Leather
H15 Eucalyptus Wood Trim

OPTIONAL EQUIPMENT AND VALUE ADDED PACKAGES
237 Power Rear Side Window Sunblinds 750.00
443 Heated Steering Wheel 490.00
P02 Premium Package: Drive-Dynamic Multicontour Front Seats with Massage, KEYLESS-GO, PARKTRONIC (with Parking Guidance), Rear View Camera 3,630.00
Destination and Delivery 875.00
Total Retail Price **\$97,595.00**

PERFORMANCE/HANDLING

- 205 Horsepower @ 6,000rpm (Combined)
- 284-hp @ 2,400 - 5,000 rpm (Combined)
- Acceleration: 0-60 mph: 7.2 sec.
- Top Speed 130 mph (Electronically Limited)
- 7-Speed Driver-Adaptive Transmission with Sport and ECO Shift Modes
- Direct-steer Power Assisted Speed-sensitive Rack-and-Pinion Steering
- AIRMATIC Air Suspension with Adaptive Damping System
- Front Suspension: 4-link Independent with AntiRiR Control and Stabilizer Bar
- Rear Suspension: Multilink Independent with Antiroll and Adaptive System
- Front Brakes: Internally Ventilated and Cross Drilled 13.2" Discs w/ 4-Piston Fixed Calipers
- Rear Brakes: Internally Ventilated 11.8" Discs w/ Single Piston Sliding Calipers
- 18" 10-Spoke Alloy Wheels
- 255/45 R18 (Front and Rear)
- All-Season Tires
- Dual Exhaust with Chrome Tailpipes

COMFORT/CONVENIENCE

- COMAND w/ Hard-Drive GPS Navigation with Bluetooth interface and Voice Control
- harman/kardon LOGIC7 Surround Sound System with Dolby Digital 5.1, HD Digital Radio, In-dash DVD/CD Changer, In-dash SD Card Reader, Media Interface, & SIRIUS Satellite Radio
- Central Controller with 8" COMAND Display
- Power Tilt/Sliding Sunroof with One Touch Open/Close
- Power Rear Window Sunshade
- Active Bi-Xenon Headlamps w/ Adaptive Highbeam Assist, Cornering Lights, & LED Daytime Running Lamps
- Electronic Trunk Closer
- Leather Interior with Wood Trim and Wood/Leather Steering Wheel
- 14-Way Power Heated and Active Ventilated Front Seats with Adjustable Lumbar Support and Memory
- Dual-Zone Automatic Climate Control System
- Interior Ambient Lighting Feature

SAFETY/SECURITY

- Intrace - In-Vehicle Services incl. 6 mo. of service by Hughes Telematics
- New Vehicle 4 Year/50,000 Mile Warranty
- 24-Hour Roadside Assistance Program
- Steel Reinforced Cabin with Front & Rear Crumple Zones
- 3-Point Seatbelts with Pre-Tensioners and Force Limiters
- ISOFIX Anchor and Tether System
- Adaptive Dual Stage Front Airbags
- Side Airbags Mounted in Front and Rear
- Full-Length Head Protection Curtain
- NECK-PRO Active Head Restraints
- 4-Wheel Disc Brakes with ABS & BAS
- Electronic Stability Control (ESC)
- PRE-SAFE (Predictive Protection System)
- Anti-Theft Alarm with Engine Immobilizer
- Tire Pressure Monitoring System

EPA Fuel Economy Estimates

CITY MPG 19
Expected range for most drivers 15 to 23 MPG

Estimated Annual Fuel Cost \$2,820
based on 15,000 miles at \$3.95 per gallon

HIGHWAY MPG 25
Expected range for most drivers 20 to 30 MPG

Combined Fuel Economy This Vehicle 21
14 — 28
All Large Cars

GOVERNMENT 5-STAR SAFETY RATINGS

This vehicle has not been rated by the government for overall vehicle score, frontal crash, side crash or rollover risk.

Source: National Highway Traffic Safety Administration (NHTSA) www.safercar.gov or 1-888-327-4236

Figure 6. 2012 Mercedes S400 Hybrid - Window Sticker

MFD BY DAIMLER AG STUTTGART

KG LBS PASSENGER CAR 775 10/11

GWR 2600 5732

GAWR FRONT 1300 2866

GAWR REAR 1375 3031

THIS VEHICLE CONFORMS TO ALL APPLICABLE U.S. FEDERAL MOTOR VEHICLE SAFETY, BUMPER AND THEFT PREVENTION STANDARDS IN EFFECT ON THE DATE OF MANUFACTURE SHOWN ABOVE

WDDNG9FB8CA444343 MADE IN GERMANY

Figure 7. 2012 Mercedes S400 Hybrid - Manufacturer's Label

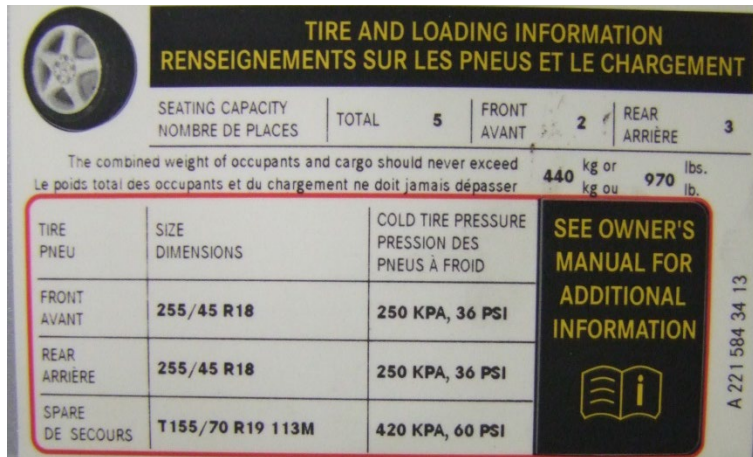


Figure 8. 2012 Mercedes S400 Hybrid - Tire Placard

3.1.2 Turn Signal Color Measurement Results

Rear turn signal color measurements and an average value for the 2012 Mercedes S400 Hybrid are provided in Table 2.

Table 2. Summary of Rear Turn Signal Color Measurement Data for 2012 Mercedes S400

Trial	x	y
1	0.5519	0.4468
2	0.5545	0.4443
3	0.5579	0.4408
Average:	0.5548	0.4440

The following figure shows the measured values from all trials for this vehicle overlaid on the CIE 1931 Chromaticity Diagram (and FMVSS No. 108 Figure 1). All three measurement trial results were outside both the amber and red color boundaries.

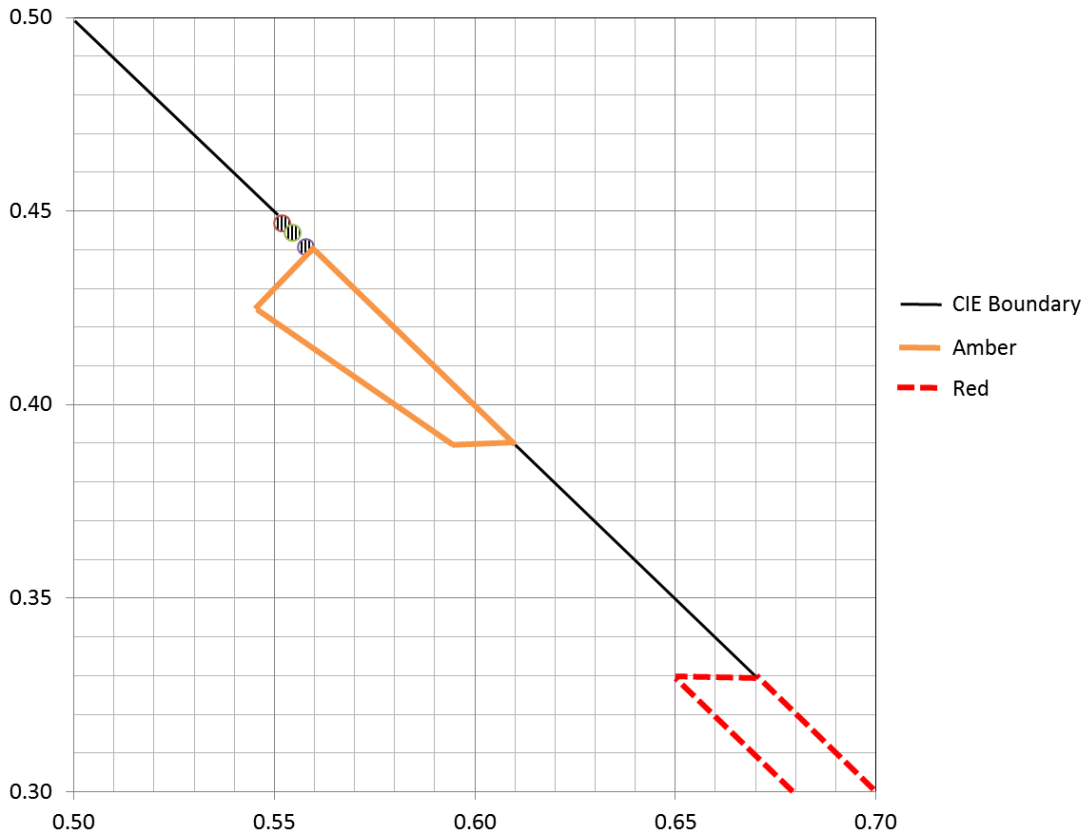


Figure 9. Plot of 3 data points for 2012 Mercedes S400 Hybrid

3.2 2016 Nissan Rogue

3.2.1 Vehicle Photos

Still, color photographs of the measured 2016 Nissan Rogue are presented in the Figures 10 to 13. Photos of the vehicle's manufacturing label, and tire placard are shown in Figures 6 to 8.



Figure 10. 2016 Nissan Rogue - Driver's Side



Figure 11. 2016 Nissan Rogue - Oblique Passenger's Side/Rear View



Figure 12. 2016 Nissan Rogue - Rear Combination Lamp, Close-up



Figure 13. 2016 Nissan Rogue - Rear Turn Signal Illuminated, Close-up



Figure 14. 2016 Nissan Rogue - Manufacturer's Label



Figure 15. 2016 Nissan Rogue - Tire Placard

3.2.2 Turn Signal Color Measurement Results

Rear turn signal color measurements and an average value for the 2016 Nissan Rogue are provided in Table 3.

Table 3. Summary of Rear Turn Signal Color Measurement Data for 2016 Nissan Rogue

Trial	x	y
1	0.5801	0.4137
2	0.5751	0.4181
3	0.5796	0.4181
Average:	0.5783	0.4166

Figure 16 shows the measured chromaticity values from all trials for this vehicle. All three measurement trial values were within the amber color boundary.

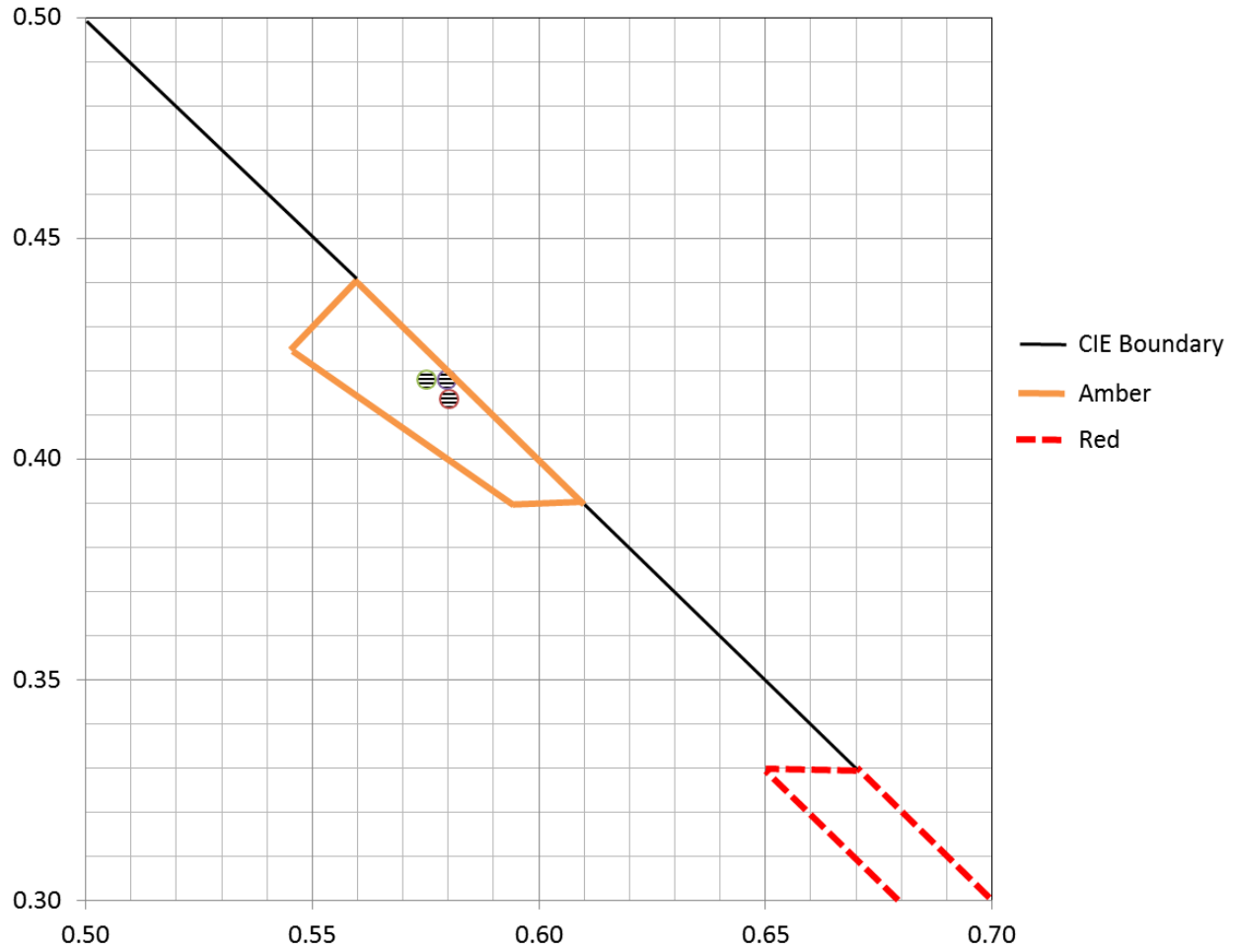


Figure 16. Plot of 3 data points for 2016 Nissan Rogue

3.3 2015 Subaru Legacy

3.3.1 Vehicle Photos

Still, color photographs of the measured 2015 Subaru Legacy are presented in Figures 17 to 20. Photos of the vehicle's manufacturing label, and tire placard are shown in Figures 21 to 22.



Figure 17. 2015 Subaru Legacy - Driver's Side



Figure 18. 2015 Subaru Legacy - Oblique Passenger's Side/Rear View



Figure 19. 2015 Subaru Legacy - Rear Combination Lamp, Close-up



Figure 20. 2015 Subaru Legacy - Rear Turn Signal Illuminated, Close-up

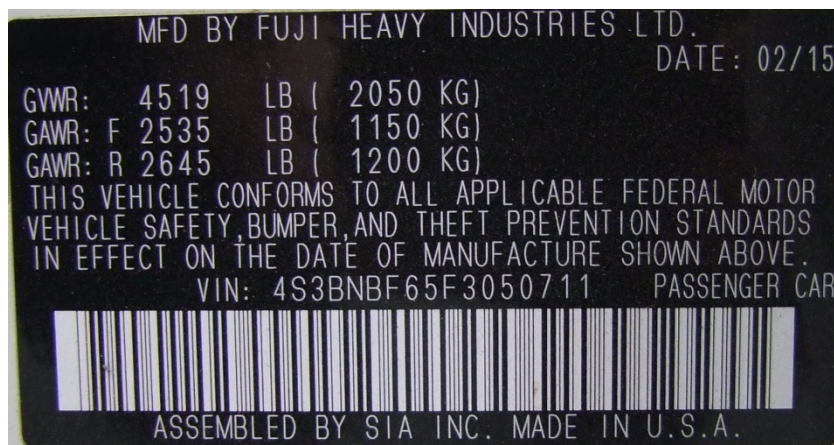


Figure 21. 2015 Subaru Legacy - Manufacturer's Label

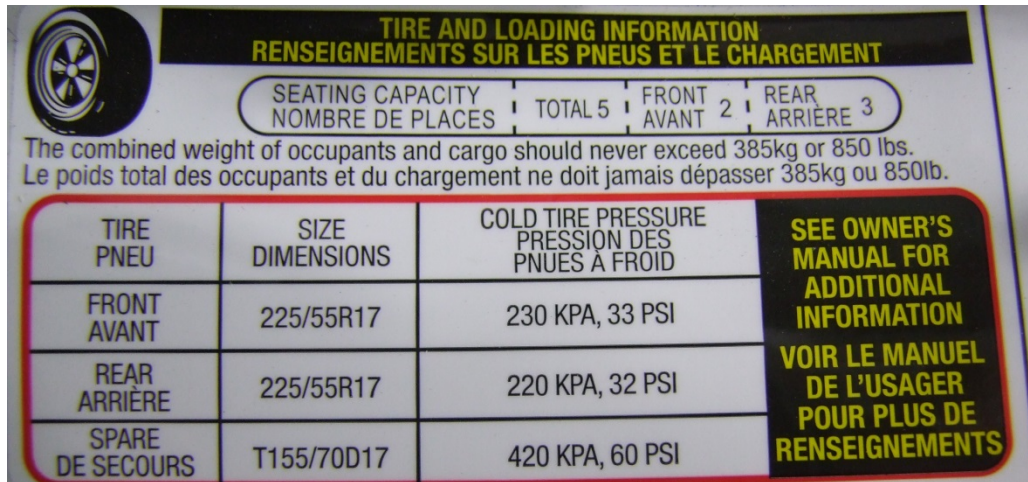


Figure 22. 2015 Subaru Legacy - Tire Placard

3.3.2 Turn Signal Color Measurement Results

Rear turn signal color measurements and an average value for the 2015 Subaru Legacy are provided in the following table.

Table 4. Summary of Rear Turn Signal Color Measurement Data for 2015 Subaru Legacy.

Trial	x	y
1	0.5662	0.4252
2	0.5838	0.4064
3	0.5684	0.4236
Average:	0.5728	0.4184

Figure 23 shows the measured values from all trials for this vehicle overlaid on the CIE 1931 Chromaticity Diagram (and FMVSS No. 108 Figure 1). All three measurement trial values were within the amber color boundary.

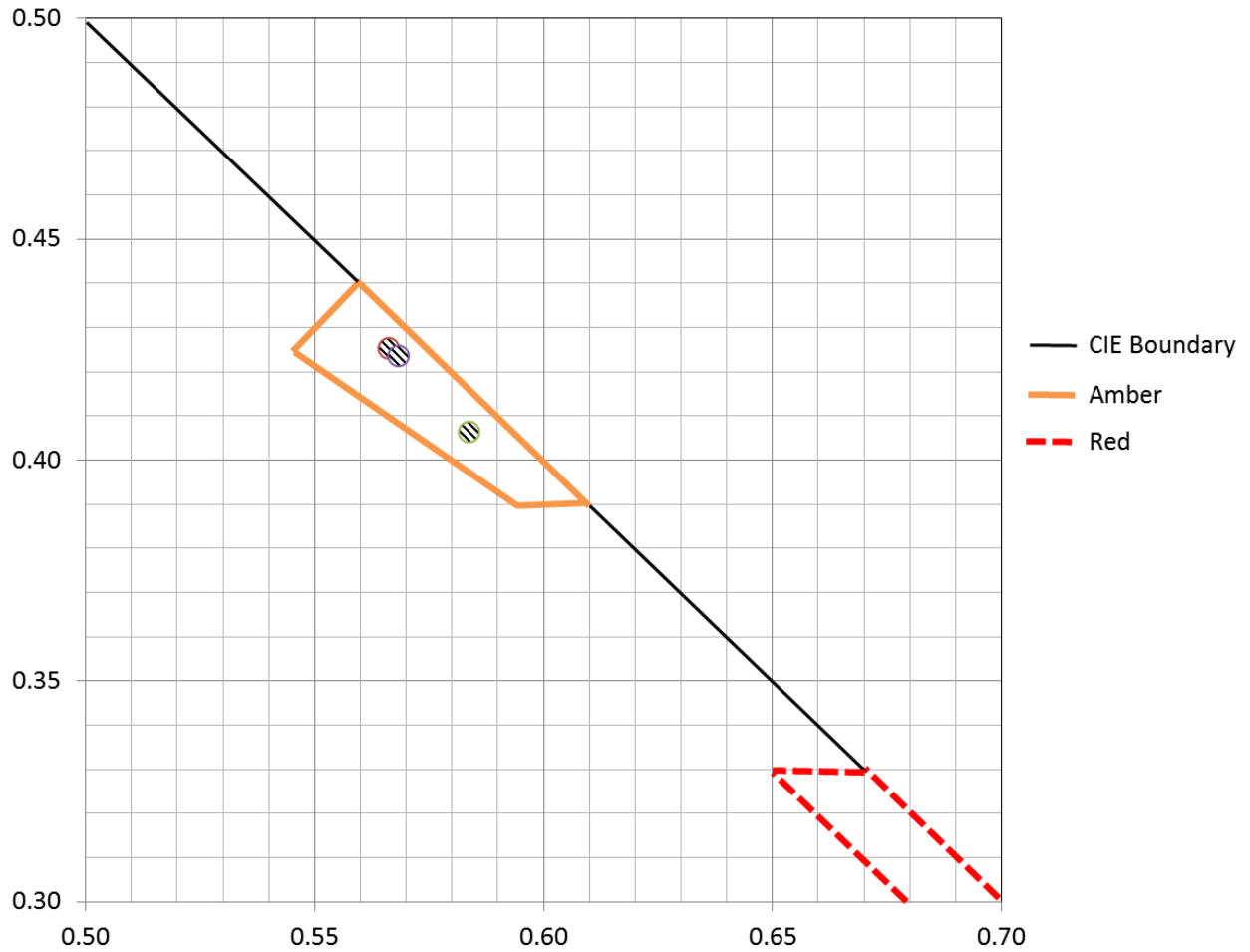


Figure 23. Plot of 3 data points for 2015 Subaru Legacy

3.4 2016 Chevrolet Malibu

3.4.1 Vehicle Photos

Still, color photographs of the measured 2016 Chevrolet Malibu are presented in Figures 24 to 27. Photos of the vehicle's window sticker, manufacturing label, and tire placard are shown in Figures 28 to 30.



Figure 24. 2016 Chevrolet Malibu - Driver's Side




Figure 25. 2016 Chevrolet Malibu - Oblique Passenger's Side/Rear View



Figure 26. 2016 Chevrolet Malibu - Rear Combination Lamp, Close-up



Figure 27. 2016 Chevrolet Malibu - Rear Turn Signal Illuminated, Close-up



2016 MALIBU 2LZ

EXTERIOR: MOSAIC BLACK METALLIC
INTERIOR: JET BLACK

ENGINE, 2.0L TURBO DOHC 4-CYL
TRANSMISSION, 8-SPD AUTOMATIC

Visit us at www.chevy.com

<p>STANDARD EQUIPMENT</p> <p>ITEMS FEATURED BELOW ARE INCLUDED AT NO EXTRA CHARGE IN THE STANDARD VEHICLE PRICE SHOWN.</p> <ul style="list-style-type: none"> • CHEVROLET COMPLETE CARE * SEE WWW.CHEVY.COM OR DEALER FOR TERMS, DETAILS & LIMITS * TWO MAINTENANCE VISITS OIL & FILTER CHANGE 4-WHEEL TIRE ROTATION 27 POINT INSPECTION * 3 YR/50,000 MILES BUMPER-TO-BUMPER WARRANTY * 5 YR/60,000 MILES POWERTRAIN LIMITED WARRANTY * ROADSIDE ASSISTANCE * COURTESY TRANSPORTATION <p>MECHANICAL</p> <ul style="list-style-type: none"> • ENGINE, 2.0L TURBO DOHC 4-CYL • TRANSMISSION, 8-SPD AUTOMATIC • REMOTE VEHICLE START <p>SAFETY & SECURITY</p> <ul style="list-style-type: none"> • AIRBAGS, DRIVER & PASSENGER • FRONTAL, KNEE & SIDE IMPACT 	<p>HEAD SIDE CURTAIN</p> <ul style="list-style-type: none"> • AIR BAGS, THORAX SIDE-IMPACT SEAT MOUNTED, SIDE-FRONT AND REAR OUTBOARD SEAT POSITIONS • STABILITRAK-STABILITY CONTROL • INCLUDES TRACTION CONTROL • ANTILOCK BRAKE SYSTEM, 4 WHEEL DISC • THEFT DETERENT SYSTEM, CONTENT THEFT ALARM • REAR DR LOCKS, CHILD SECURITY • TIRE SEALANT & INFLATOR KIT IN PLACE OF SPARE TIRE • REMOTE PANIC ALARM • TIRE PRESSURE MONITOR SYSTEM • REAR VISION CAMERA <p>EXTERIOR</p> <ul style="list-style-type: none"> • WHEELS, 19" ALUMINUM • HEADLAMPS, HALOGEN • AUTOMATIC HEADLAMP CONTROL • DAYTIME RUNNING LAMPS, LED • EZ KEY PASSIVE ENTRY SYSTEM • MIRRORS, OUTSIDE HEATED, 	<p>POWER ADJUSTABLE, BODY COLOR</p> <ul style="list-style-type: none"> • EXHAUST, DUAL STAINLESS STEEL WITH POLISHED TIPS • DOOR HANDLES, CHROME <p>INTERIOR</p> <ul style="list-style-type: none"> • KEYLESS START • PWR SEAT ADJUST-DRIVER, 8-WAY • POWER LUMBAR, DRIVER SEAT • DRIVER & FRONT PASSENGER HEATED SEATS • DRIVER & FRONT PASSENGER VENTILATED SEATS • MEMORY SETTINGS, DRIVER SEAT, OUTSIDE MIRRORS • INSIDE REARVIEW MIRROR, AUTO DIMMING • STEERING COLUMN, TILT & TELESCOPI • LEATHER WRAP STEERING WHEEL • HEATED STEERING WHEEL • LEATHER TRIMMED SHIFT KNOB • AIR CONDITIONING, DUAL ZONE • AUTOMATIC CLIMATE CONTROL 	<ul style="list-style-type: none"> • DISPLAY, MULTI-COLOR DRIVER INSTRUMENT INFO ENHANCED • BOSE PREMIUM 9 SPEAKERS AUDIO • STEERING WHEEL CONTROLS, AUDIO, CRUISE, BLUETOOTH • POWER WINDOWS EXPRESS DOWN, DRIVER EXPRESS UP • WIRELESS DEVICE CHARGING • REAR SEAT, 60/40 SPLIT FOLDING SEATBACK • 120V POWER OUTLET • CARDO MAT <p>CONNECTIVITY FEATURES</p> <ul style="list-style-type: none"> • CHEVROLET MYLINK AUDIO SYSTEM W/ NAVIGATION, 8" DIAGONAL TOUCHSCREEN, SELECT BLUETOOTH STREAMING • APPLE CARPLAY CAPABILITY PROVIDED BY APPLE. AVAILABLE WITH COMPATIBLE SMARTPHONES • XM RADIO + SERVICE SUBSCRIPTION SOLD SEPARATELY BY SIRIUSXM AFTER 3 MTHS 																
<p style="text-align: center; font-size: x-small; margin: 0;">MANUFACTURER'S SUGGESTED RETAIL PRICE</p> <table border="1" style="width: 100%; border-collapse: collapse; font-size: x-small;"> <tr> <td style="width: 60%;">STANDARD VEHICLE PRICE</td> <td style="text-align: right;">\$30,920.00</td> </tr> <tr> <td colspan="2" style="font-size: x-small;">OPTIONS INSTALLED BY THE MANUFACTURER (MAY REPLACE STANDARD EQUIPMENT SHOWN)</td> </tr> <tr> <td>DRIVER CONFIDENCE PACKAGE II:</td> <td style="text-align: right;">1,295.00</td> </tr> <tr> <td>• BRAKE, PARKING</td> <td></td> </tr> <tr> <td>• ADAPTIVE CRUISE CONTROL</td> <td></td> </tr> <tr> <td>• SEMI-AUTOMATIC PARKING ASSIST</td> <td></td> </tr> <tr> <td>• FRONT AUTOMATIC BRAKING</td> <td></td> </tr> <tr> <td>POWER SUNROOF W/ 2ND ROW SKYLIGHT</td> <td style="text-align: right;">1,270.00</td> </tr> </table>				STANDARD VEHICLE PRICE	\$30,920.00	OPTIONS INSTALLED BY THE MANUFACTURER (MAY REPLACE STANDARD EQUIPMENT SHOWN)		DRIVER CONFIDENCE PACKAGE II:	1,295.00	• BRAKE, PARKING		• ADAPTIVE CRUISE CONTROL		• SEMI-AUTOMATIC PARKING ASSIST		• FRONT AUTOMATIC BRAKING		POWER SUNROOF W/ 2ND ROW SKYLIGHT	1,270.00
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DESTINATION CHARGE	875.00																		
TOTAL VEHICLE PRICE*	\$35,555.00																		
<p style="font-size: x-small; margin: 0;">* EXONSTAR(R) INCLUDES 5 YR BASIC PLAN PLUS 6 MTH SERVICE W/ AUTOMATIC CRASH RESPONSE, NAVIGATION & MORE (SUBJECT TO TERMS SEE ONSTAR.COM)</p> <p style="font-size: x-small; margin: 0;">* 4G LTE W/FI(R) HOTSPOT WITH LIMITED DATA TRIAL AND MORE. (SUBJECT TO TERMS SEE ONSTAR.COM)</p> <p style="font-size: x-small; margin: 0;">• FLOOR MATS, PREMIUM FRIT/REAR</p> <p style="font-size: x-small; margin: 0;">• UNIVERSAL HOME REMOTE</p> <p style="font-size: x-small; margin: 0;">DRIVER CONFIDENCE PACKAGE:</p> <ul style="list-style-type: none"> • HEADLAMPS, INTELLIBEAM AUTO HIGH BEAM CONTROL • SENSOR INDICATOR, FOLLOWING DISTANCE • FORWARD COLLISION ALERT • REAR CROSS TRAFFIC ALERT • LANE KEEP ASSIST • SIDE BLIND ZONE ALERT WITH LANE CHANGE ALERT • PEDESTRIAN DETECTION, FRONT 																			

<p>EPA DOT Fuel Economy and Environment</p> <p style="text-align: center;">Mid-size cars range from 13 to 114 MPG. The best vehicle rates 119 MPGe.</p> <p style="text-align: center; font-size: 2em; font-weight: bold;">26</p> <p style="text-align: center;">combined city/hwy</p> <p style="text-align: center;">22 city</p> <p style="text-align: center;">33 highway</p> <p style="text-align: center;">3.8 gallons per 100 miles</p> <p style="text-align: center; font-size: 2em; font-weight: bold;">You save \$250</p> <p style="text-align: center;">in fuel costs over 5 years compared to the average new vehicle.</p>	<p>GOVERNMENT 5-STAR SAFETY RATINGS</p> <p style="text-align: center;">This vehicle has not been rated by the government for overall vehicle score, frontal crash, side crash or rollover risk.</p>	<p>PARTS CONTENT INFORMATION</p> <p>FOR VEHICLES IN THIS CARLINE: U.S./CANADIAN PARTS CONTENT: 65% MAJOR SOURCES OF FOREIGN PARTS CONTENT: MEXICO 18%</p> <p>NOTE: PARTS CONTENT DOES NOT INCLUDE FINAL ASSEMBLY, DISTRIBUTION, OR OTHER NON-PARTS COSTS.</p> <p>FOR THIS VEHICLE: FINAL ASSEMBLY POINT: KANSAS CITY, KS U.S.A. COUNTRY OF ORIGIN: ENGINE: UNITED STATES TRANSMISSION: JAPAN</p>	
<p>Annual fuel cost \$1,750</p> <p>Fuel Economy & Greenhouse Gas Rating (tailpipe only)</p> <p style="text-align: center;">1 6 10</p> <p style="text-align: center;">Best</p> <p>Smog Rating (tailpipe only)</p> <p style="text-align: center;">1 6 10</p> <p style="text-align: center;">Best</p>	<p>Source: National Highway Traffic Safety Administration (NHTSA) www.safercar.gov or 1-888-327-4236</p>		
<p>Actual results will vary for many reasons, including driving conditions and how you drive and maintain your vehicle. The average new vehicle gets 26 MPG and costs \$9,000 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at \$3.00 per gallon. MPG is in miles per gallon equivalent. Vehicle emissions are a significant cause of climate change and smog.</p> <p style="text-align: center;">fuel economy.gov</p> <p style="text-align: center; font-size: x-small;">Calculate personalized estimates and compare vehicles</p>			<p>CRUISER NO TREAD: SALES CODE E SALES MODEL CODE: 15PFR DEALER NO: 15034 FINAL ASSEMBLY: KANSAS CITY, KS U.S.A. VIN: 1G1ZH5SX3GF239534 SEALER TO WINDOW DELIVERED: JEFF WYLER CHEVROLET OF COLUMBUS PO BOX 188 CANAL WINCHESTER, OH 43110-0188</p>

Figure 28. 2016 Chevrolet Malibu - Dealer's Sticker

MFD BY GENERAL MOTORS LLC

DATE	GVWR	GAWR FRT	GAWR RR
02/16	1942 KG	1029 KG	913 KG
	4282 LB	2269 LB	2013 LB

THIS VEHICLE CONFORMS TO ALL APPLICABLE U.S. FEDERAL MOTOR VEHICLE SAFETY, BUMPER, AND THEFT PREVENTION STANDARDS IN EFFECT ON THE DATE OF MANUFACTURE SHOWN ABOVE.

1G1ZH5SX3GF239534 TYPE: PASS CAR

Figure 29. 2016 Chevrolet Malibu - Manufacturer's Label

TIRE AND LOADING INFORMATION

SEATING CAPACITY	TOTAL 5	FRONT 2	REAR 3
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The combined weight of occupants and cargo should never exceed 408 kg or 899 lbs.

TIRE	ORIGINAL SIZE	COLD TIRE PRESSURE	
FRONT	245/40R19	W 240 kPa, 35 PSI	SEE OWNER'S MANUAL FOR ADDITIONAL INFORMATION
REAR	245/40R19	W 240 kPa, 35 PSI	
SPARE	NONE	NONE	

Figure 30. 2016 Chevrolet Malibu - Tire Placard

3.4.2 Turn Signal Color Measurement Results

Rear turn signal color measurements and an average value for the 2016 Chevrolet Malibu are provided in Table 5.

Table 5. Summary of Rear Turn Signal Color Measurement Data for 2016 Chevrolet Malibu

Trial	x	y
1	0.6811	0.3184
2	0.6908	0.3089
Average:	0.6860	0.3137

The following figure shows the measured values from all trials for this vehicle overlaid on the CIE 1931 Chromaticity Diagram (and FMVSS No. 108 Figure 1). All three measurement trial values were outside the amber color boundary.

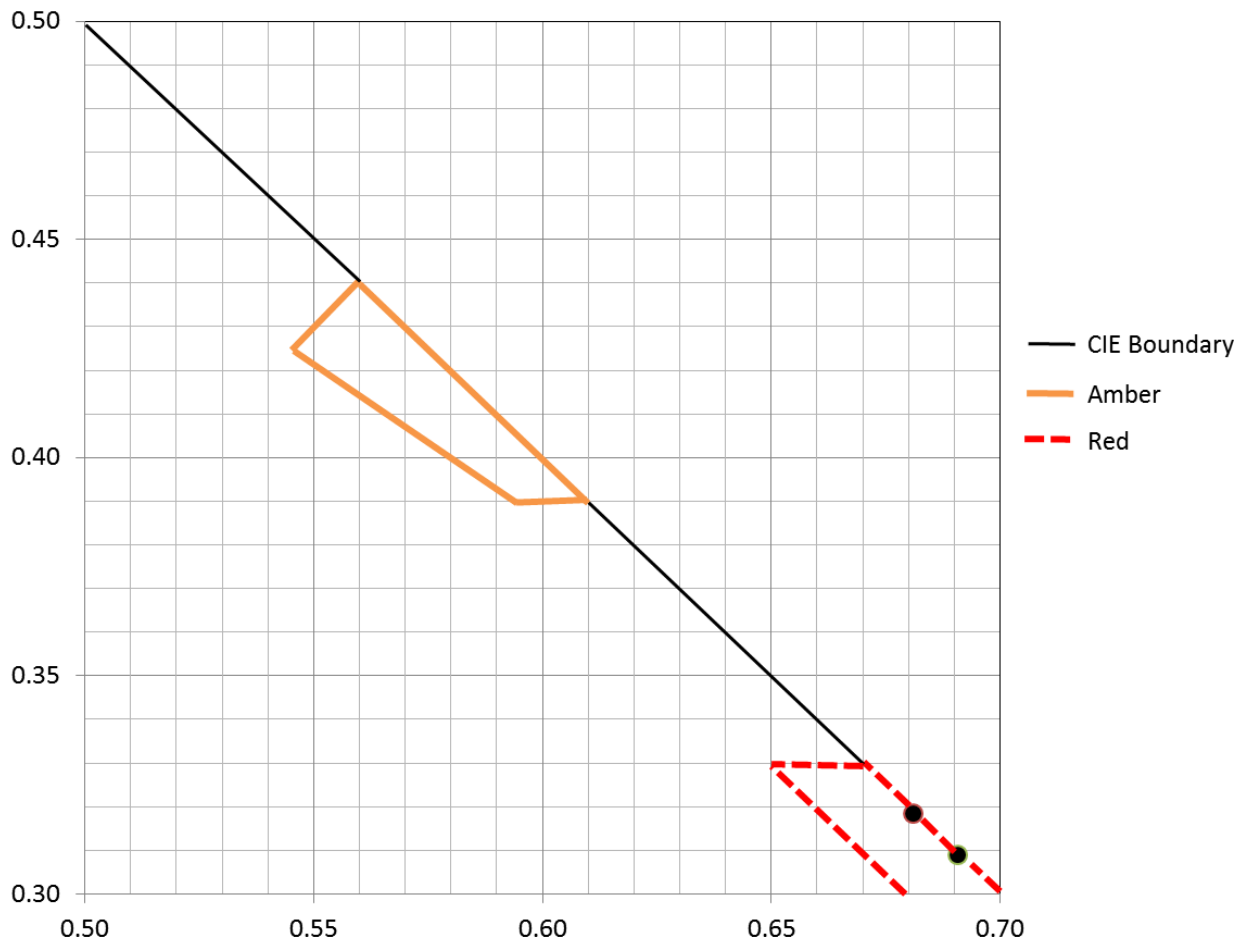


Figure 31. Plot of 2 data points for 2016 Chevrolet Malibu

4.0 SUMMARY

This report summarizes an effort to evaluate a test procedure for confirming the color of rear turn signal lamps on a production light vehicle. The draft laboratory test procedure consists of measuring the color of the light emitted by a vehicle turn signal lamp using a colorimeter and an adaptation of the tristimulus method and chromaticity coordinates as described in FMVSS No. 108. The results of this test demonstrate broad differences between the color red and amber but cannot be used to determine compliance with FMVSS No. 108.

Four vehicles were subjected to the draft test procedure. Rear turn signal lamps were determined to be amber in color for two vehicles, red for the third vehicle, and a color other than amber or red for the fourth vehicle. Figure 32 summarizes these results. Overall, the test procedure was found to be easy to carry out and effective in determining turn signal lamp color.

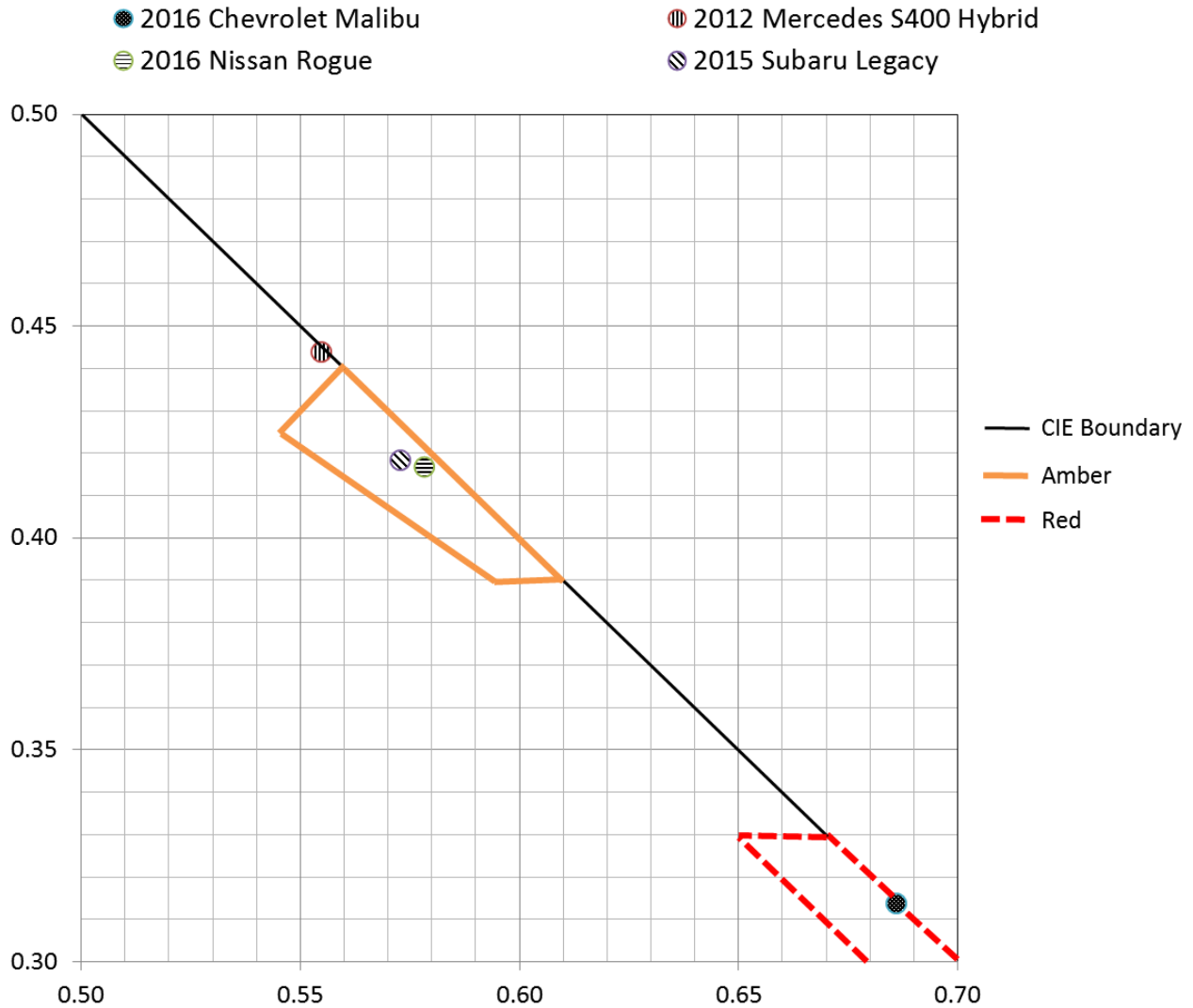


Figure 32. Summary Plot of Turn Signal Color Measurement Average Values by Vehicle

5.0 REFERENCES

1. Allen, K. (2009, April). The effectiveness of amber rear turn signals for reducing rear impacts (Report No. DOT HS 811 115). Washington, DC: National Highway Traffic Safety Administration.
2. 49 CFR Sec. 571.108, Standard No. 108; Lamps, reflective devices, and associated equipment.

DOT HS 812 740
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U.S. Department
of Transportation
**National Highway
Traffic Safety
Administration**

