

**OCAS-DRI-FCW-19-12  
NEW CAR ASSESSMENT PROGRAM  
FORWARD COLLISION WARNING CONFIRMATION TEST**

**2019 Volkswagen Tiguan**

**DYNAMIC RESEARCH, INC.**

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**11 November 2019**

**Final Report**

**Prepared Under Contract No. DTNH22-14-D-00333**

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National Highway Traffic Safety Administration  
Office of Crash Avoidance Standards  
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16. Abstract These tests were conducted on the subject 2019 Volkswagen Tiguan in accordance with the specifications of the Office of Crash Avoidance Standards most current Test Procedure in docket NHTSA-2006-26555-0134 to confirm the performance of a forward collision warning system. The vehicle passed the requirements of the test for all three FCW test scenarios.			
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## Section I INTRODUCTION

This test evaluates the ability of a Forward Collision Warning (FCW) system to detect and alert drivers to potential hazards in the path of the vehicle as specified in the New Car Assessment Program's "Forward Collision Warning Confirmation" test procedure, dated February 2013. Three driving scenarios are utilized to assess this technology. In the first test, a subject vehicle (SV) approaches a stopped principle other vehicle (POV) in the same lane of travel. The second test begins with the SV initially following the POV at the same constant speed. After a short while, the POV stops suddenly. The third test consists of the SV, traveling at a constant speed, approaching a slower moving POV, which is also being driven at a constant speed.

Section II  
DATA SHEETS

**FORWARD COLLISION WARNING**

**DATA SHEET 1: TEST SUMMARY**

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2019 Volkswagen Tiguan

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VIN: 3VV4B7AX2KM0xxxx

Test Date: 5/13/2019

Forward Collision Warning setting: Early

Test 1 - Subject Vehicle Encounters  
Stopped Principal Other Vehicle: **Pass**

Test 2 - Subject Vehicle Encounters  
Decelerating Principal Other Vehicle: **Pass**

Test 3 - Subject Vehicle Encounters  
Slower Principal Other Vehicle: **Pass**

Overall: **Pass**

**Notes:**

**FORWARD COLLISION WARNING**

**DATA SHEET 2: VEHICLE DATA**

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2019 Volkswagen Tiguan

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**TEST VEHICLE INFORMATION**

VIN: 3VV4B7AX2KM0xxxx

Body Style: SUV

Color: Platinum Gray Metallic

Date Received: 4/29/2019

Odometer Reading: 65 mi

Engine: 2 L Inline 4

Transmission: Automatic

Final Drive: AWD

Is the vehicle equipped with:

ABS	<u>X</u>	Yes	<u>    </u>	No
Adaptive Cruise Control	<u>X</u>	Yes	<u>    </u>	No
Collision Mitigating Brake System	<u>X</u>	Yes	<u>    </u>	No

**DATA FROM VEHICLE'S CERTIFICATON LABEL**

Vehicle manufactured by: Volkswagen De Mexico S.A. De C.V.  
Mexico

Date of manufacture: 10/18

**DATA FROM TIRE PLACARD:**

Tires size as stated on Tire Placard: Front: 235/50R19

Rear: 235/50R19

Recommended cold tire pressure: Front: 280 kPa (41 psi)

Rear: 280 kPa (41 psi)

**FORWARD COLLISION WARNING**

**DATA SHEET 2: VEHICLE DATA**

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2019 Volkswagen Tiguan

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**TIRES**

Tire manufacturer and model: Pirelli Scorpion Verde All Season

Front tire size: 235/50R19

Rear tire size: 235/50R19

**VEHICLE ACCEPTANCE**

**Verify the following before accepting the vehicle:**

- All options listed on the “window sticker” are present on the test vehicle
- Tires and wheel rims are the same as listed.
- There are no dents or other interior or exterior flaws.
- The vehicle has been properly prepared and is in running condition.
- Verify that spare tire, jack, lug wrench, and tool kit (if applicable) is located in the vehicle cargo area.

**FORWARD COLLISION WARNING**  
**DATA SHEET 3: TEST CONDITIONS**

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2019 Volkswagen Tiguan

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**GENERAL INFORMATION**

Test date: 5/13/2019

**AMBIENT CONDITIONS**

Air temperature: 27.8 C (82 F)

Wind speed: 1.5 m/s (3.5 mph)

Wind speed  $\leq$  10 m/s (22 mph)

Tests were not performed during periods of inclement weather. This includes, but is not limited to, rain, snow, hail, fog, smoke, or ash.

Tests were conducted during daylight hours with good atmospheric visibility (defined as an absence of fog and the ability to see clearly for more than 5000 meters). The tests were not conducted with the vehicle oriented into the sun during very low sun angle conditions, where the sun is oriented 15 degrees or less from horizontal, and camera "washout" or system inoperability results.

**VEHICLE PREPARATION**

**Verify the following:**

All non consumable fluids at 100 % capacity :

Fuel tank is full:

Tire pressures are set to manufacturer's recommended cold tire pressure:

Front: 280 kPa (41 psi)

Rear: 280 kPa (41 psi)

**FORWARD COLLISION WARNING**  
**DATA SHEET 3: TEST CONDITIONS**

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**2019 Volkswagen Tiguan**

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**WEIGHT**

Weight of vehicle as tested including driver and instrumentation

Left Front: 551.6 kg (1216 lb)

Right Front: 524.4 kg (1156 lb)

Left Rear: 435.0 kg (959 lb)

Right Rear: 432.7 kg (954 lb)

Total: 1943.6 kg (4285 lb)

**FORWARD COLLISION WARNING**

**DATA SHEET 4: FORWARD COLLISION WARNING SYSTEM OPERATION**

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**2019 Volkswagen Tiguan**

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How is the Forward Collision Warning presented to the driver?  Warning light  
(Check all that apply)  Buzzer or audible alarm  
 Vibration  
 Other

Describe the method by which the driver is alerted. For example, if the warning is a light, where is it located, its color, size, words or symbol, does it flash on and off, etc. If it is a sound, describe if it is a constant beep or a repeated beep. If it is a vibration, describe where it is felt (e.g., pedals, steering wheel), the dominant frequency (and possibly magnitude), the type of warning (light, audible, vibration, or combination), etc.

An audible beep, as well as a red warning symbol is displayed in the instrument panel.

Is the vehicle equipped with a switch whose purpose is to render FCW inoperable?  Yes  
 No

If yes, please provide a full description including the switch location and method of operation, any associated instrument panel indicator, etc.

To turn the system off, use the touch screen on the center console or buttons on the left side of the steering wheel to interact with the vehicle system menus. Select:

-Menu

-Vehicle

-Assistance Systems

-Front Assist (Forward Collision Warning)

-Advance Warning: select Off

## FORWARD COLLISION WARNING

### DATA SHEET 4: FORWARD COLLISION WARNING SYSTEM OPERATION

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#### 2019 Volkswagen Tiguan

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Is the vehicle equipped with a control whose purpose is to adjust the range setting or otherwise influence the operation of FCW?  Yes  
 No

If yes, please provide a full description.

To adjust the warning timing use the touch screen on the center console or buttons on the left side of the steering wheel to interact with the vehicle system menus. Select:

- Menu
- Vehicle
- Assistance Systems
- Front Assist (Forward Collision Warning)
- Advance warning: select from Early, Medium, Late or Off

Are there other driving modes or conditions that render FCW inoperable or reduce its effectiveness?  Yes  
 No

If yes, please provide a full description.

#### Delayed Response

- If the radar sensor is exposed to environmental conditions that impair sensor function, the system may detect this only after a certain delay. For this reason, possible functional restrictions may be displayed only after a delay after you start driving and while driving.

#### Objects that cannot be detected

- Front Assist may react unnecessarily, react with delay, or not react at all in the following situations:
- When vehicles or motorcycles are traveling slightly offset to the left or right in front of your vehicle.
- When vehicles are crossing in front of your vehicle.
- When loads or attachment parts on other vehicles in front of your vehicle protrude to the side, rear, or above the normal vehicle dimensions.
- When there is oncoming traffic.
- When pedestrians are standing or moving toward you.

(Continued next page)

## FORWARD COLLISION WARNING

### DATA SHEET 4: FORWARD COLLISION WARNING SYSTEM OPERATION

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#### 2019 Volkswagen Tiguan

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##### System limitations

- Front Assist may react unnecessarily, react with delay, or not react at all in the following situations:
- When driving in tight curves.
- When the accelerator pedal is depressed.
- When Front Assist is switched off or if there is a system fault.
- When the ASR is manually switched off.
- When the ESC is taking corrective action.
- When several brake lights on the vehicle or on a trailer connected to the vehicle electrical system are not working.
- When the radar sensor is dirty or covered.
- When the vehicle is in Reverse.
- When the vehicle is accelerating quickly.
- When weather conditions are poor.
- When the system cannot detect the traffic situation clearly.
- When there are metal objects, for example, tracks or metal plates in the road.
- When driving in parking garages.
- When the off-road driving mode is switched on.

Notes:

### Section III

## TEST PROCEDURES

### A. Test Procedure Overview

Three test procedures were used, as follows:

- Test 1. Subject Vehicle (SV) Encounters Stopped Principal Other Vehicle (POV) on a Straight Road
- Test 2. Subject Vehicle Encounters Decelerating Principal Other Vehicle
- Test 3. Subject Vehicle Encounters Slower Principal Other Vehicle

With the exception of trials associated with Test 1, all trials were performed with SV and POV automatic transmissions in “Drive” or with manual transmissions in the highest gear capable of sustaining the desired test speed. Manual transmission clutches remained engaged during all maneuvers. Except for Test 2, the brake lights of the POV were not illuminated.

In order to pass the test, if the FCW system provides a warning timing adjustment for the driver, at least one setting must meet the criterion of the test procedure. Therefore, if the vehicle was equipped with a warning timing adjustment, only the most “conservative” (earliest warning) setting was tested.

An overview of each of the test procedures follows.

#### 1. TEST 1 – SUBJECT VEHICLE ENCOUNTERS STOPPED PRINCIPAL OTHER VEHICLE ON A STRAIGHT ROAD

This test evaluates the ability of the FCW function to detect a stopped lead vehicle, as depicted in Figure 1.

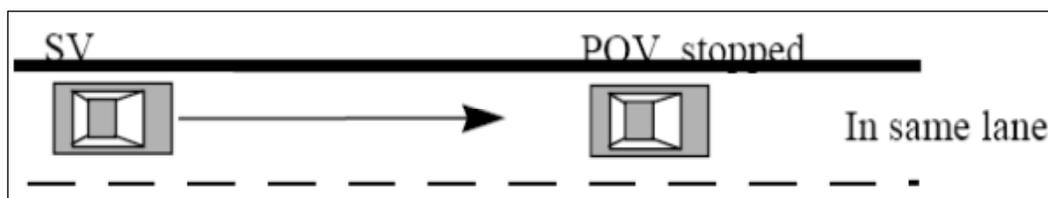


Figure 1. Depiction of Test 1

#### a. Alert Criteria

In order to pass the test, the FCW alert must be issued when the time-to-collision (TTC) is at least 2.1 seconds. The TTC for this test was calculated by considering the speeds of the SV and the POV at the time of the FCW alert (i.e., when the SV and POV speeds are nominally equal to 45 and 0 mph (72.4 and 0 kph), respectively).

b. Procedure

The POV was parked in the center of a travel lane, with its longitudinal axis oriented parallel to the roadway edge and facing the same direction as the SV so that the SV approaches the rear of the POV.

The SV was driven at a nominal speed of 45 mph (72.4 kph) in the center of the lane of travel, toward the parked POV. The test began when the SV was 492 ft (150 m) from the POV and ended when either of the following occurred:

- The required FCW alert occurred.
- The TTC to the POV fell to less than 90% of the minimum allowable range (i.e.,  $TTC = 1.9$  sec) for the onset of the required FCW alert.

The SV driver then steered and/or braked to keep the SV from striking the POV.

For an individual test trial to be valid, the following was required throughout the test:

- The SV vehicle speed could not deviate from the nominal speed by more than 1.0 mph (1.6 kph) for a period of three seconds prior to (1) the required FCW alert or (2) before the range fell to less than 90% of the minimum allowable range for onset of the required FCW alert.
- The SV driver could not apply any force to the brake pedal before (1) the required FCW alert occurred, (2) or before the range fell to less than 90% of the minimum allowable range for onset of the required FCW alert.
- The lateral distance between the centerline of the SV, relative to the centerline of the POV, in road coordinates, could not exceed 2.0 ft (0.6 m).
- The yaw rate of the SV could not exceed  $\pm 1$  deg/sec during the test.

Nominally, the Test 1 series was comprised of seven individual trials. The FCW system must satisfy the TTC alert criteria for at least five of the seven test trials.

## 2. TEST 2 – SUBJECT VEHICLE ENCOUNTERS DECELERATING PRINCIPAL OTHER VEHICLE

The SV in this test initially followed the POV at a constant time gap, and then the POV suddenly decelerated, as depicted in Figure 2. The test evaluates the ability of the FCW to recognize a decelerating lead vehicle and to issue an alert to SV driver in a timely manner.

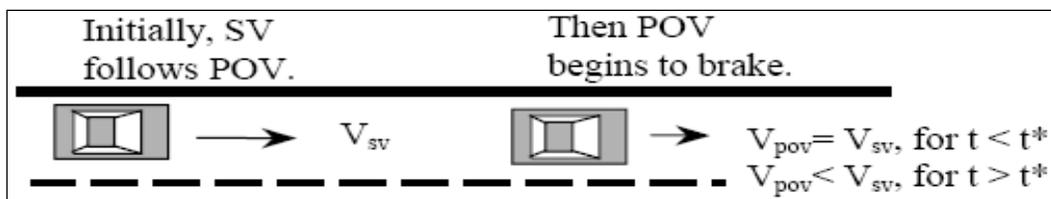


Figure 2. Depiction of Test 2

### a. Alert Criteria

In order to pass the test, the FCW alert must be issued when TTC is at least 2.4 seconds. The TTC for this test, a prediction of the time it would take for the SV to collide with the POV, was calculated by considering three factors at the time of the FCW alert: (1) the speed of the SV, (2) the speed of the POV, and (3) the deceleration of the POV<sup>1</sup>.

<sup>1</sup>To simplify calculation of the TTC for Test 2, the deceleration of the POV is assumed to remain constant from the time of the FCW alert until the POV comes to a stop (i.e., a "constant" rate of slowing is assumed).

## b. Procedure

Test 2 began with the SV and the POV traveling on a straight, flat road at a constant speed of 45.0 mph (72.4 kph), in the center of the lane of travel. The headway from the SV to the POV was nominally maintained at 98.4 ft (30 m) until the POV braking was initiated.

The test began approximately 7 seconds before the driver of the POV started a braking maneuver in which the POV brakes were rapidly applied and modulated such that a constant deceleration of 0.3 g was achieved within 1.5 seconds after braking is initiated. The test ended when either of the following conditions was satisfied:

- The required FCW alert occurred.
- The TTC to the POV fell to less than 90% of the minimum allowable range (i.e.,  $TTC = 2.2$  sec) for the onset of the required FCW alert.

The SV driver then steered and/or braked to keep the SV from striking the POV.

For an individual test trial to be valid, the following was required throughout the test:

- The initial POV vehicle speed could not deviate from the nominal speed by more than 1.0 mph (1.6 kph) for a period of 3 seconds prior to the initiation of POV braking.
- The speed of the SV could not deviate from the nominal speed by more than 1.0 mph (1.6 kph) for a period of 3 seconds prior to (1) the required FCW alert or (2) before the range fell to less than 90% of the minimum allowable range for onset of the required FCW alert.
- The lateral distance between the centerline of the SV, relative to the centerline of the POV, in road coordinates, could not exceed 2.0 ft (0.6 m).
- The yaw rates of the SV and POV could not exceed  $\pm 1$  deg/sec during the test.
- The POV deceleration level was nominally required to be 0.3 g within 1.5 seconds after initiation of POV braking. The acceptable error magnitude of the POV deceleration was  $\pm 0.03g$ , measured at the time the FCW alert first occurred. An initial overshoot beyond the deceleration target was acceptable, however the first local

deceleration peak observed during an individual trial could not exceed 0.375 g for more than 50 ms. Additionally, the deceleration could not exceed 0.33 g over a period defined from (1) 500 ms after the first local deceleration peak occurs, to (2) the time when the FCW alert first occurred.

- The tolerance for the headway from the SV to the POV was  $\pm 8.2$  ft ( $\pm 2.5$  m), measured at two instants in time: (1) three seconds prior to the time the POV brake application was initiated, and (2) at the time the POV brake application was initiated.
- SV driver could not apply any force to the brake pedal before (1) the required FCW alert occurred, or (2) before the range fell to less than 90% of the minimum allowable range for onset of the required FCW alert.

Nominally, the Test 2 series was comprised of seven individual trials. The FCW system must satisfy the TTC alert criteria for at least five of the seven test trials.

### 3. TEST 3 – SUBJECT VEHICLE ENCOUNTERS SLOWER PRINCIPAL OTHER VEHICLE

This test examines the ability of the FCW system to recognize a slower lead vehicle being driven with a constant speed and to issue a timely alert. As depicted in Figure 3, the scenario was conducted with a closing speed equal to 25.0 mph (40.2 kph).

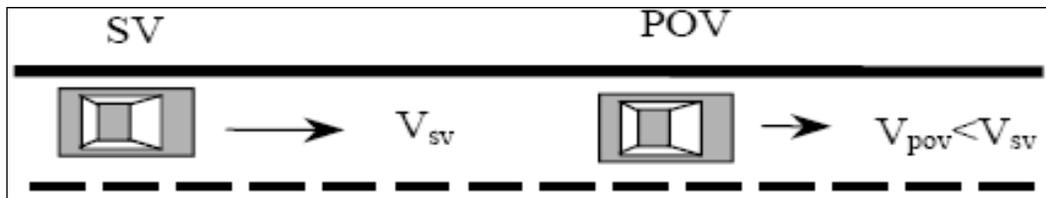


Figure 3. Depiction of Test 3

#### a. Alert Criteria

In order to pass the test, the FCW alert must be issued when TTC is at least 2.0 seconds. The TTC for this test, a prediction of the time it would take for the SV to collide with the POV, was calculated by considering the speeds of the SV and POV at the time of the FCW alert.

#### b. Procedure

Throughout the test, the POV was driven at a constant 20.0 mph (32.2 kph) in the center of the lane of travel.

The SV was driven at 45.0 mph (72.4 kph), in the center lane of travel, toward the slow-moving POV.

The test began when the headway from the SV to the POV was 329 ft (100 m) and ended when either of the following occurred:

- The required FCW alert occurred.
- The TTC to the POV fell to less than 90% of the minimum allowable range (i.e.,  $TTC = 1.8$  sec) for the onset of the required FCW alert.

The SV driver then steered and/or braked to keep the SV from striking the POV.

For an individual test trial to be valid, the following was required throughout the test:

- The SV vehicle speed could not deviate from the nominal speed by more than 1.0 mph (1.6 kph) for a period of 3 seconds prior to (1) the required FCW alert or (2) before the range fell to less than 90% of the minimum allowable range for onset of the required FCW alert.
- Speed of the POV could not deviate from the nominal speed by more than 1.0 mph (1.6 kph) during the test.
- The lateral distance between the centerline of the SV, relative to the centerline of the POV, in road coordinates, could not exceed 2.0 ft (0.6 m).
- The yaw rates of the SV and POV could not exceed  $\pm 1$  deg/sec during the test.
- SV driver could not apply any force to the brake pedal before (1) the required FCW alert occurred, or (2) before the range fell to less than 90% of the minimum allowable range for onset of the required FCW alert.

Nominally, the Test 3 series was comprised of seven individual trials. The FCW system must satisfy the TTC alert criteria for at least five of the seven test trials.

## **B. Principal Other Vehicle**

The vehicle used as the Principal Other Vehicle (POV) was a 2006 Acura RL. This satisfied the test requirement that the POV be a mid-size sedan. The vehicle had a rear license plate in order to provide a suitable representative radar profile. Vehicle loading consisted of the driver plus equipment and instrumentation.

### **C. Automatic Braking System**

The POV was equipped with an automatic braking system, which was used in Test 2. The braking system consisted of the following components:

- High pressure nitrogen bottle, strapped to the front passenger seat, with regulator and pressure gauges
- Pneumatic piston-type actuator, with solenoid valve
- “Pickle” switch to activate brakes

### **D. Instrumentation**

Table 1 lists the sensors, signal conditioning, and data acquisition equipment used for these tests.

**TABLE 1. TEST INSTRUMENTATION AND EQUIPMENT**

Type	Output	Range	Accuracy, Other Primary Specs	Mfr, Model	Serial Number	Calibration Dates Last Due
Tire Pressure Gauge	Vehicle Tire Pressure	0-100 psi 0-690 kPa	< 1% error between 20 and	Omega DPG8001	17042707002	By: DRI Date: 6/21/2018 Due: 6/21/2019
Platform Scales	Vehicle Total, Wheel, and Axle Load	1200 lb/platform 5338 N/	0.5% of applied load	Intercomp SWI	1110M206352	By: DRI Date: 1/3/2019 Due: 1/3/2020
Differential Global Positioning System	Position, Velocity	Latitude: ±90 deg Longitude: ±180 deg Altitude: 0-18 km Velocity: 0-1000 knots	Horizontal Position: ±1 cm Vertical Position: ±2 cm Velocity: 0.05 km/h	Trimble GPS Receiver, 5700 (base station and in-vehicle)	00440100989	NA
Multi-Axis Inertial Sensing System	Position; Longitudinal, Lateral, and Vertical Accels; Lateral, Longitudinal and Vertical Velocities; Roll, Pitch, Yaw Rates; Roll, Pitch, Yaw Angles	Accels ± 10g, Angular Rat	Accels .01g, Angular Rate	Oxford Inertial +		By: Oxford Technical Solutions
					2182	Date: 10/16/2017 Due: 10/16/2019
					2176	Date: 4/11/2018 Due: 4/11/2020
Real-Time Calculation of Position and Velocity Relative to Lane Markings (LDW) and POV (FCW)	Distance and Velocity to lane markings (LDW) and POV (FCW)	Lateral Lane Dist: ±30 m Lateral Lane Velocity: ±20 m/sec Longitudinal Range to POV: ±200 m Longitudinal Range Rate: ±50 m/sec	Lateral Distance to Lane Marking: ±2 cm Lateral Velocity to Lane Marking: ±0.02m/sec Longitudinal Range: ±3 cm Longitudinal Range Rate: ±0.02 m/sec	Oxford Technical Solutions (OXTS), RT-Range	97	NA

**TABLE 1. TEST INSTRUMENTATION AND EQUIPMENT (continued)**

Type	Output	Range	Accuracy, Other Primary Specs	Mfr, Model	Serial Number	Calibration Dates Last Due
Microphone	Sound (to measure time at auditory alert)	Frequency Response: 80 Hz – 20 kHz	Signal-to-noise: 64 dB, 1 kHz at 1 Pa	Audio-Technica AT899	NA	NA
Light Sensor	Light intensity (to measure time at visual alert)	Spectral Bandwidth: 440-800 nm	Rise time < 10 msec	DRI designed and developed Light Sensor	NA	NA
Accelerometer	Acceleration (to measure time at haptic alert)	±5g	≤ 3% of full range	Silicon Designs, 2210-005	NA	NA
Coordinate Measurement Machine	Inertial Sensing System Coordinates	0-8 ft 0-2.4 m	±.0020 in. ±.051 mm (Single point articulation accuracy)	Faro Arm, Fusion	UO8-05-08-06636	By: DRI Date: 1/2/2019 Due: 1/2/2020
Type	Description			Mfr, Model	Serial Number	
Data Acquisition System	Data acquisition is achieved using a dSPACE MicroAutoBox II Data from the Oxford IMU, including Longitudinal, Lateral, and Vertical Acceleration, Roll, Yaw, and Pitch Rate, Forward and Lateral Velocity, Roll and Pitch Angle are sent over Ethernet to the MicroAutoBox. The Oxford IMUs are calibrated per the manufacturer's recommended schedule (listed above).			dSPACE Micro-Autobox II 1401/1513		
				Base Board	549068	
				I/O Board	588523	

For systems that implement audible or haptic alerts, part of the pre-test instrumentation verification process is to determine the tonal frequency of the audible warning or the vibration frequency of the tactile warning through use of the PSD (Power Spectral Density) function in Matlab. This is accomplished in order to identify the center frequency around which a band-pass filter is applied to subsequent audible or tactile warning data so that the beginning of such warnings can be programmatically determined. The bandpass filter used for these warning signal types is a phaseless, forward-reverse pass, elliptical (Cauer) digital filter, with filter parameters as listed in Table 2.

**Table 2. Audible and Tactile Warning Filter Parameters**

<b>Warning Type</b>	<b>Filter Order</b>	<b>Peak-to-Peak Ripple</b>	<b>Minimum Stop Band Attenuation</b>	<b>Pass-Band Frequency Range</b>
Audible	5 <sup>th</sup>	3 dB	60 dB	Identified Center Frequency $\pm$ 5%
Tactile	5 <sup>th</sup>	3 dB	60 dB	Identified Center Frequency $\pm$ 20%

## APPENDIX A

### Photographs

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Figure A1. Front View of Subject Vehicle



Figure A2. Rear View of Subject Vehicle

**EPA DOT Fuel Economy and Environment**

**Fuel Economy**  
**24** MPG  
combined city/hwy  
 21 city  
 29 highway  
 4.2 gallons per 100 miles

**You spend \$1,000 more in fuel costs over 5 years** compared to the average new vehicle.

**Annual fuel cost \$1,600**

**Fuel Economy & Greenhouse Gas Rating** (tailpipe only) **Smog Rating** (tailpipe only)

**1** **5** **10** **1** **7** **10**

This vehicle emits 367 grams of CO<sub>2</sub> per mile. The best emits 0 grams per mile (tailpipe only). Producing and distributing fuel also create emissions; learn more at [fuelconomy.gov](http://fuelconomy.gov).

**Actual results will vary for many reasons, including driving conditions and how you drive and maintain your vehicle. The average new vehicle gets 27 MPG and costs \$7,000 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at \$2.55 per gallon. MPGe is miles per gasoline gallon equivalent. Vehicle emissions are a significant cause of climate change and smog.**

**fuelconomy.gov**  
Calculate personalized estimates and compare vehicles

**Gasoline Vehicle**

**2019 Tiguan 2.0T SEL Premium w/ 4MOTION®**

Platinum Gray Metallic Exterior  
Titan Black Leather Interior

**STANDARD FEATURES** (unless replaced by packages or options)

**PERFORMANCE**

- 2.0L TSI® 16-valve DOHC turbocharged 4-cylinder engine w/ direct fuel injection
- 4MOTION® all-wheel drive system w/ Driving Mode selector
- Four-wheel independent suspension
- Electro-mechanical power steering w/ variable assistance

**SAFETY FEATURES**

- 3-point safety belts, all seating positions
- Advanced Airbag Protection System w/ 6 airbags
- Anti-lock Braking System (ABS) w/ disc brakes
- Anti-Slip Regulation (ASR) & Engine Brake Assist (EBA)
- Electronic Brake-pressure Distribution (EBD) & Hydraulic Brake Assist (HBA)
- Electronic Stability Control (ESC) & Electronic Differential Lock (EDL)
- Intelligent Crash Response System (ICRS)
- Lower Anchors & Tethers for Children (LATCH)
- Rear View Camera System
- Tire Pressure Monitoring System (TPMS)

**EXTERIOR**

- 19" alloy wheels w/ all-season tires
- Automatic LED headlights & LED Daytime Running Lights (DRL)
- Adaptive Front-lighting System (AFS)
- HaloGen front fog lights w/ low-speed cornering lights
- Power folding, heated side mirrors w/ position memory & integrated turn signals
- Rain-sensing, variable intermittent front wipers w/ heated washer nozzles
- Rear window washer & wiper
- Silver roof rails
- Power sitting & sliding panoramic sunroof

**INTERIOR**

- Climatronic® dual-zone automatic climate control w/ 2nd-row air vents
- Heated, leather-wrapped, 3-spoke, multi-function steering wheel
- Tilting & telescoping adjustable steering column
- Driver's seat: heated, 10-way power (includes lumbar support) w/ position memory
- Front passenger seat: heated, 6-way manual, includes height adjustment
- 2nd-row seat: 40/20/40 split-folding, sliding & reclining w/ armrest
- Leather seating surfaces (1st & 2nd rows)
- Front center console w/ cup holders, armrest & storage
- Carpeted cargo area w/ tie-downs & folding in-cabin privacy cover
- Auto-dimming interior rearview mirror
- Ambient interior lighting, front footwell lights & illuminated vanity mirrors
- Illuminated door sill scuff plates
- Carpeted floor mats, 1st & 2nd rows

**TECHNOLOGY & CONVENIENCE**

- Overhead View Camera (Area View)
- Volkswagen Digital Cockpit
- Park Distance Control, front & rear
- Adaptive Cruise Control (ACC) Stop & Go
- Forward Collision Warning & Autonomous Emergency Braking w/ Pedestrian Monitoring (Front Assist)
- Active Blind Spot Monitor w/ Rear Traffic Alert
- Lane Keeping System (Lane Assist)
- High Beam Control (Light Assist)
- Remote engine start; keyless access (doors & liftgate) w/ push-button start
- Remote power liftgate w/ hands-free Easy Open & Easy Close
- Discover Media: 8" touchscreen navigation system w/ AM/FM/HD Radio™ & CD player w/ USB, aux-in & voice control
- Fender® Premium Audio System w/ subwoofer
- Bluetooth® connectivity (for compatible devices)
- SiriusXM® Satellite Radio (w/ limited time trial subscription)
- Electric parking brake
- Anti-theft alarm system w/ engine immobilizer

**The People First Warranty**

5 Years/72,000 Miles (whichever occurs first)  
**New Vehicle Limited Warranty**  
 includes coverage for powertrain components

Your dealer details, see dealer for a copy of the VW warranty booklet.

**ADDITIONAL WARRANTY INFORMATION**

5 Years/72,000 Miles (whichever occurs first)  
 5 Years/100,000 Miles (whichever occurs first)  
\*\*See dealer for details, see dealer for a copy of the VW warranty booklet.

**24-HOUR ROADSIDE ASSISTANCE**

5 years/100,000 miles (whichever occurs first), for towing, jump starts, tire changes, lock-out & lock-out, services provided by third party supplier.

**SMART CAR-NEED™ features included:**

- App-to-Go: Smartphone synchronization & interface
- Apps & Alerts: (Navigation, Insurance)
- Analytics: Service, Charge-up Assistance, Remote Access & Vehicle Health;
- Check & Alert: service warnings temporarily active on delivery.
- Full suite of apps, data, device required.
- For details, please refer to Terms of Service available in glove box.

**Manufacturer's Suggested Retail Price: \$37,195.00**

**PACKAGES & OPTIONS**

Platinum Gray Metallic Exterior	No Charge
Titan Black Leather Interior	No Charge
Rear View Mirror w/ HomeLink®, Auto-Dimming w/ Compass	\$325.00
Weather Match® (set of 4) w/ Trunk Liner & VW CarGo Blocks	\$235.00
Splash Guards (set of 4)	\$220.00
Luggage Net for cargo area	\$100.00
Roadside Assistance Kit	\$85.00
8-Speed Automatic w/ Tiptronic®	No Charge

Destination Charge \$995.00

**Total Suggested Vehicle Price: \$39,155.00**  
Fuel, license, title fees, taxes and dealer-installed accessories are not included.

Ready to make this your new ride? Apply now with Volkswagen Credit! Volkswagen Credit

**GOVERNMENT 5-STAR SAFETY RATINGS**

**Overall Vehicle Score** Not Rated ▲  
Based on the combined ratings of frontal, side and rollover. Should ONLY be compared to other vehicles of similar size and weight. ▲ Safety Concerns: Visit [www.safercar.gov](http://www.safercar.gov) or call 1-888-327-4236 for more details.

<b>Frontal Crash</b>	<b>Driver Passenger</b>	<b>Not Rated</b>
<b>Side Crash</b>	<b>Front Seat Rear Seat</b>	<b>★★★★▲</b>

Based on the risk of injury in a frontal impact. Should ONLY be compared to other vehicles of similar size and weight.

<b>Rollover</b>	<b>★★★★</b>
-----------------	-------------

Based on the risk of rollover in a single-vehicle crash.

Star ratings range from 1 to 5 stars (★★★★★) with 5 being the highest.  
 Source: National Highway Traffic Safety Administration (NHTSA).  
[www.safercar.gov](http://www.safercar.gov) or 1-888-327-4236

Port of Entry: SAN DIEGO

**PARTS CONTENT INFORMATION**

For vehicles in this carline:  
**U.S./CANADIAN PARTS CONTENT: 3%**  
 Major sources of foreign parts content:  
**MEXICO 35%**

Note: parts content does not include final assembly, distribution or other non-parts costs.

For this vehicle:  
 Final assembly point:  
**PUEBLA, MEXICO**  
 Country of origin:  
**ENGINE: MEXICO**  
**TRANSMISSION: JAPAN**

VIN: 3VV4B7AX2KM03

SOLD TO: \_\_\_\_\_ SHIP TO: \_\_\_\_\_

Figure A3. Window Sticker (Monroney Label)

MFD BY VOLKSWAGEN DE MEXICO S.A. DE C.V. MEXICO 10/18

GVWR LBS 5071 KG 2300

GAWR FRONT LBS 2601, KG 1180

WITH 235/50 R19 TIRES,

7JX19 RIMS, AT 280 KPA, 41 PSI COLD

GAWR REAR LBS 2579, KG 1170

WITH 235/50 R19 TIRES,

7JX19 RIMS, AT 280 KPA, 41 PSI COLD

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

3VV4B7AX2KM03



TYPE:MPV

4330507 3427

Figure A4. Vehicle Certification Label

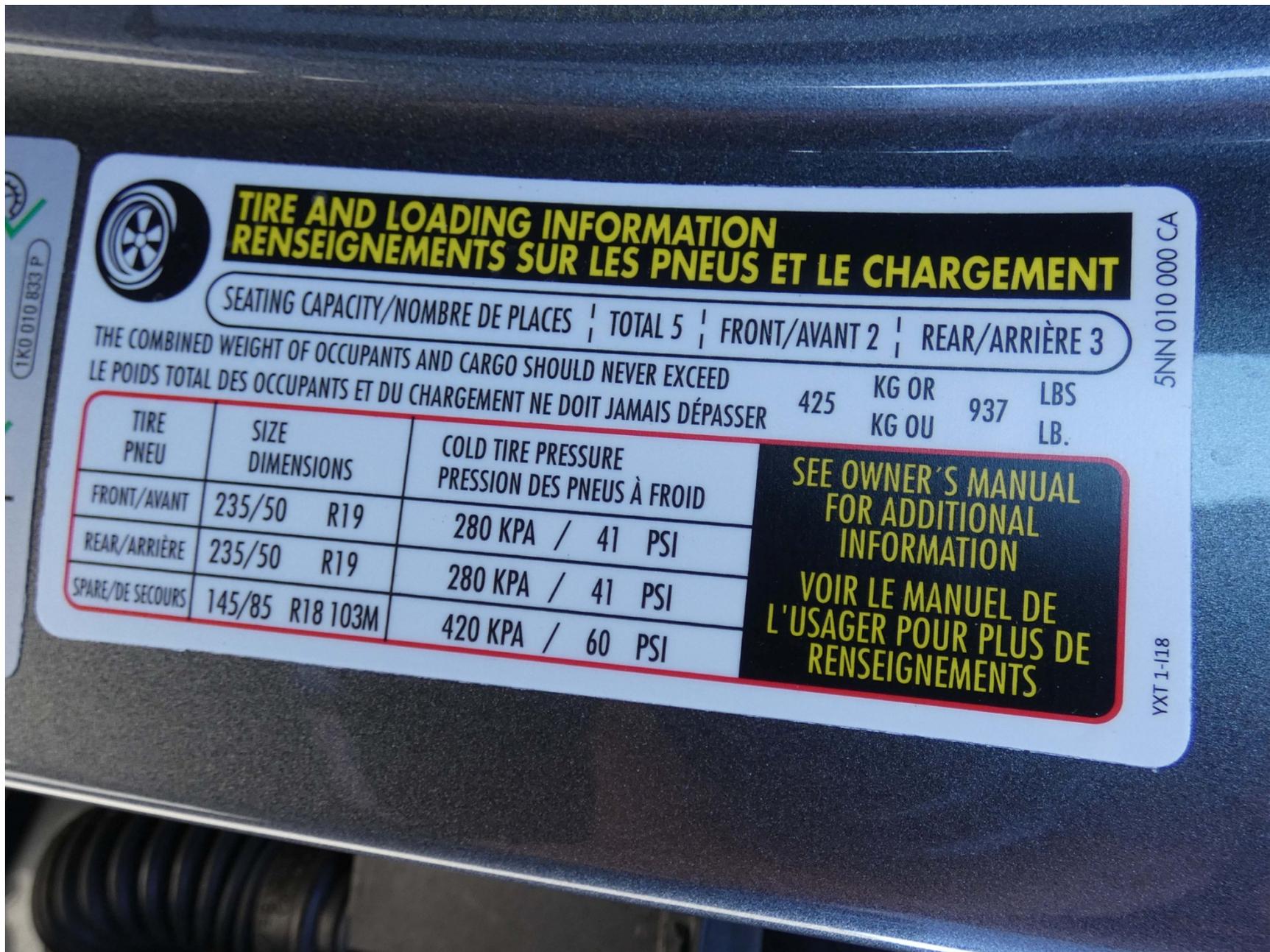


Figure A5. Tire Placard



Figure A6. Front View of Principal Other Vehicle



Figure A7. Rear View of Principal Other Vehicle



Figure A8. DGPS, Inertial Measurement Unit, and MicroAutoBox Installed in Subject Vehicle



Figure A9. Sensors for Detecting Auditory and Visual Alerts



Figure A10. Computer Installed in Subject Vehicle



Figure A11. Brake Actuation System Installed in Principal Other Vehicle



Figure A12. FCW Visual Alert

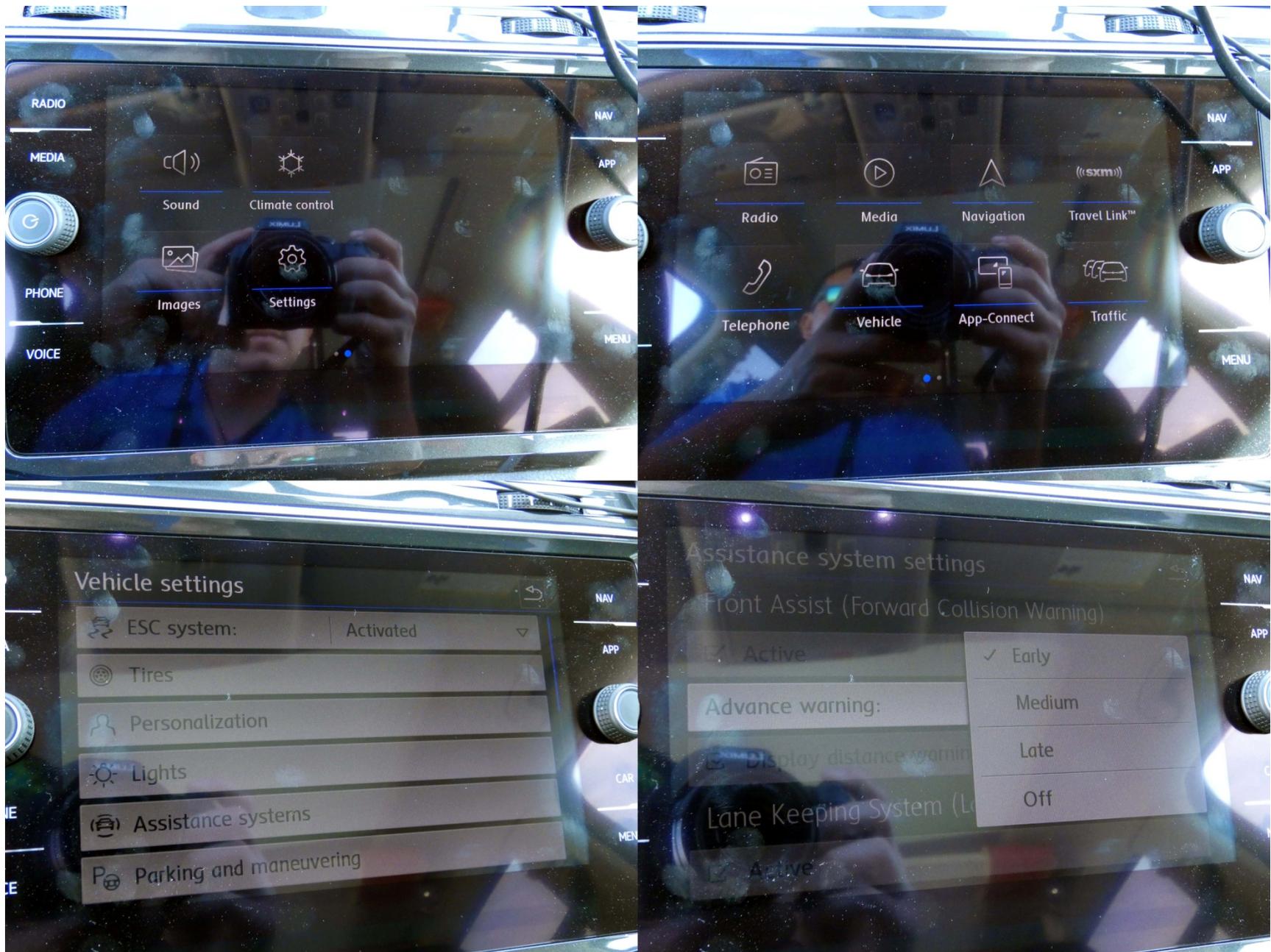


Figure A13. FCW Setup Menus

## APPENDIX B

Excerpts from Owner's Manual

## Volkswagen Information System

### Warning and indicator lights

Warning and indicator lights notify you of warnings →  and malfunctions → , or tell you about certain functions. Some warning and indicator lights come on when the ignition is switched on and should go out when the engine is running or when the vehicle is moving.

Additional text messages appear in the instrument cluster of appropriately equipped vehicles to give more information or prompt you to take certain actions → page 15, *Instrument cluster*.

Depending on the vehicle options, a symbol may appear in the instrument cluster instead of a warning light.

In addition, a warning chime or other acoustic warning sounds when certain warning and indicator lights go on.

Symbol	Meaning →  → 
	Central warning light: Read and follow the text messages in the instrument cluster display.
	<b>Stop!</b> Electronic parking brake engaged → page 217.
<b>PARK</b>	
	<b>Stop!</b> Brake fluid level too low → page 300. <b>OR:</b> Brake system malfunction → page 231. <b>OR:</b> Together with the ABS indicator light  or <b>ABS:</b> ABS failure → page 231.
<b>BRAKE</b>	
	<b>Stop!</b> Engine coolant level too low, engine coolant temperature too high, or engine coolant system malfunction, → page 24.
	<b>Stop!</b> Engine oil pressure too low → page 292.
	<b>Stop!</b> Lights up: Steering system malfunction → page 179.

Symbol	Meaning →  → 
	<b>Stop!</b> Flashes: Electronic steering column lock malfunction → page 179.
	Driver and/or passenger safety belts not buckled → page 37.
	<b>Brake or take action to avoid the vehicle ahead!</b> Front Assist Forward Collision Warning (if equipped) → page 205. <b>OR:</b> Pedestrian Monitoring system warning.
	<b>Brake!</b> Depress brake pedal. ACC driver intervention warning → page 200.
	Alternator malfunction → page 302.
	Central caution light: Read and follow the text messages in the instrument cluster display.
<b>BRAKE WEAR</b>	Brake pads worn. Immediately contact an authorized Volkswagen dealer or authorized Volkswagen Service Facility to have the brake pads checked and, if necessary, replaced → page 159.
	Lights up: ESC malfunction or ESC switched off by the system → page 231. <b>OR:</b> Together with  or <b>ABS:</b> ABS malfunction. <b>OR:</b> The vehicle battery has been reconnected.
	Flashes: ESC or ASR is active → page 231.
	ASR manually deactivated → page 231. <b>OR:</b> ESC Sport mode manually activated → page 231. <b>OR:</b> Off-road mode activated → page 181.
	<b>OR:</b> Together with <b>ESC Off:</b> ESC manually switched off (only possible in Off-road or Custom off-road mode) → page 231, → page 181.
	ABS malfunction → page 231.
<b>ABS</b>	
	Electronic parking brake malfunction → page 217. ▶

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### Driver assistance systems button

📖 Please read the introductory information and heed the Warnings and Notice ⚠️ on page 28.



**Fig. 18** On the multi-function steering wheel: Driver assistance systems button.

Your vehicle may have a driver assistance systems button on the multi-function steering wheel, which lets you switch some driver assistance systems on or off in the **Assist systems** menu → page 20, *Instrument cluster menus*.

#### Switching individual driver assistance systems on or off

- Press the button → fig. 18 (A) to open the **Assist systems** menu.
- Using the arrow up and down buttons  or  on the multi-function steering wheel, select the driver assistance system (for example, Lane Assist, if equipped). A "check mark" indicates if the selected driver assistance system is switched on.
- Confirm the selection by pressing the  button on the multi-function steering wheel.

You can also switch driver assistance systems on and off in the **Vehicle settings** menu in the infotainment system → page 30, *Vehicle settings menu*.

## Infotainment system operation and displays

### Introduction

#### General information on operating the unit

The following section contains information on the settings that can be adjusted in the **Vehicle settings** menu. You can find information on operating the Infotainment system as well as warning and safety instructions in a separate manual. See → booklet *Infotainment System*.

Some Infotainment features can only be accessed and operated when the vehicle is standing still and the automatic transmission selector lever is in park (P).

#### Vehicle settings and information

After pressing the  button, you can tap the corresponding function key on the Infotainment screen to display information or adjust the following settings:

-  **Selection (Vehicle information)**
  - **Active Info Display** (Settings for the Volkswagen Digital Cockpit, if equipped) → page 17
  - **Offroad View** the off-road display (if equipped) → page 184
  - **Energy consumers** → page 20, *Driving data (Multi-Function Display)*
  - **Driving data** (Since start, extend. period, since refuel) → page 20, *Driving data (Multi-Function Display)*
  - **Think Blue. Trainer.** (if equipped) → page 158, *Think Blue. Trainer.*
  - **Vehicle status** (Current warning and information messages)
-  **Radio or Media** (Radio station or media selection) → booklet *Infotainment System*
-  **Settings or Setup** → page 30, *Vehicle settings menu*

#### ⚠️ WARNING

Driving on today's roads demands the full attention of the driver at all times. Driver distraction causes accidents, collisions and serious personal injury! ▶

- Setting short distances to the traffic ahead reduces the time and distance available to bring your vehicle to a safe stop and makes it even more necessary to pay close attention or traffic.
- Always use good judgment and select a safe following distance for the traffic, road and weather conditions.
- Never use Adaptive Cruise Control on narrow or winding roads or under poor road conditions (snow, ice, streets covered with standing water or gravel, for example) or when visibility is poor, especially when it is foggy.
- Always select a greater following distance to the vehicle ahead on wet roads than on dry roads.

### Tips and troubleshooting

📖 Please read the introductory information and heed the Warnings and Notice ⚠️ and ⓘ on page 200.

#### 🚗 ACC not available

The yellow indicator light comes on.

Possible causes:

- The radar sensor is dirty. Clean the radar sensor → page 356, *Exterior care and cleaning*.
- Radar sensor visibility is impaired by weather conditions such as snow, or residue from abrasive cleaning agents or coatings. Clean the radar sensor → page 356, *Exterior care and cleaning*.
- Radar sensor visibility is impaired by aftermarket components, stickers, or accessories.
- The radar sensor has been damaged or misaligned in low speed impacts or parking maneuvers at the front of the vehicle. Have the sensor checked for damage → page 363, *Repairs and technical modifications*.
- ACC malfunction. Switch the engine off and on again.
- Paint work or structural modifications have been made at the front of the vehicle.
- The original Volkswagen emblem is not being used.
- If the problem persists, see an authorized Volkswagen dealer or authorized Volkswagen Service Facility.

#### If the system is not responding as expected

Possible causes:

- The radar sensor is dirty. Clean the radar sensor → page 356, *Exterior care and cleaning*.
- ACC is functioning in a situation in which it should be deactivated due to system limitations → page 202, *Limits of ACC*.
- The brakes are overheated from braking maneuvers or driving down steeper slopes. A driver information message appears in the instrument cluster display. Allow the brakes to cool down and activate ACC again.
- If the problem persists, see an authorized Volkswagen dealer or authorized Volkswagen Service Facility.

#### If ACC will not switch on

Make sure that the following conditions are met:

- The selector lever is in position **D/S** or Tiptronic position.
- The vehicle speed is at least 20 mph (30 km/h).
- The brake lights on the vehicle are working.
- ESC is not regulating.
- The brake pedal is not depressed.

#### If there are unusual noises during automatic braking

- This is normal and is not a malfunction.

## Forward Collision Warning (Front Assist)

### 📖 Introduction

Depending on vehicle equipment, the vehicle may be equipped with Forward Collision Warning (Front Assist), which can warn the driver of a possible collision with a vehicle on the road ahead, help prepare the vehicle for emergency braking, assist with braking, and initiate automatic braking, within physical and technical limits of the system. The timing of the warning varies depending on the traffic situation and the actions of the driver.

**The Front Assist system is not a substitute for the driver's full concentration.**

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### Driving with Front Assist

You can cancel Front Assist automatic braking interventions by steering or depressing the accelerator pedal.

### Automatic braking

The Front Assist system can, within system limits, slow your vehicle down to a standstill, but not keep your vehicle stopped for a long time. If necessary, apply the vehicle brakes!

During an automatic braking maneuver, the brake pedal will feel harder.

### Radar sensor

The Forward Collision Warning system, when switched on, uses a radar sensor to gather information about the driving situation → page 5, *Front view*.

### Features included

Front Assist includes Autonomous Emergency Braking and a Pedestrian Monitoring system. These systems are automatically activated when Front Assist is activated.

### WARNING

The Front Assist system technology cannot overcome the laws of physics and system-related limits. Do not allow the increased convenience Front Assist can provide tempt you into taking extra risks. The driver is always responsible for braking in time. If the Front Assist system issues a warning, immediately apply the brake to slow the vehicle down or avoid the obstacle, depending on the traffic situation.

- Always adjust your speed and driving style to road, traffic, weather, and visibility conditions.
- The Front Assist system cannot prevent accidents and serious injuries on its own.
- The Front Assist system can issue unnecessary warnings in certain complex driving situations, for example, when driving in tight curves.
- The Front Assist system can issue unnecessary warnings when its function is impaired, for example, if the radar sensor is dirty or if the position of the radar sensor has been changed.
- The Front Assist system does not react to animals.
- The Front Assist system does not react to vehicles crossing your path or approaching in the same lane.
- Always be prepared to take full control of the vehicle at all times.

### WARNING

Failure to heed warning lights and instrument cluster text messages can result in a collision and serious personal injury.

- Never ignore warning lights or text WARNINGS.

 A Declaration of Compliance with the United States FCC and Industry Canada regulations is on → page 369, *Declaration of Compliance, Telecommunications and Electronic Systems*.

## Driver warnings and Autonomous Emergency Braking

☐ Please read the introductory information and heed the Warnings and Notice  on page 206.



Fig. 128 In the instrument cluster display: Advance warning.

Depending on equipment and system limits, Front Assist can detect the following objects directly in front of your vehicle:

- Pedestrians and vehicles moving in the same direction as your vehicle.
- Pedestrians who are crossing in front of your vehicle.
- Stopped vehicles.

If you are approaching a detected object at a speed which will result in a collision and you do not act immediately, Front Assist can help minimize the effects of a collision. First comes an advanced warning, then an immediate warning, and finally, an automatic braking maneuver.

Front Assist functions in these speed ranges:

	Advance warning	Immediate warning	Automatic braking	Braking support
Stopped vehicle	20 to 53 mph (30 to 85 km/h)	–	3 to 30 mph (5 to 55 km/h)	3 to 53 mph (5 to 85 km/h)
Vehicle moving in the same direction	20 to 155 mph (30 to 250 km/h)	20 to 155 mph (30 to 250 km/h)	3 to 155 mph (5 to 250 km/h)	3 to 155 mph (5 to 250 km/h)
Pedestrian moving in the same direction	20 to 40 mph (30 to 65 km/h)	–	3 to 40 mph (5 to 65 km/h)	3 to 40 mph (5 to 65 km/h)
Pedestrian crossing in front of the vehicle	20 to 40 mph (30 to 65 km/h)	–	3 to 40 mph (5 to 65 km/h)	–

The speed ranges given in the table are only in ideal situations and are approximations.

### Advance warning

The system warns the driver with a warning chime and a message in the instrument cluster display → fig. 128 if it detects a possible collision with a vehicle or a pedestrian.

The warning period varies according to the traffic situation and your driving style.

### Brake or take action to avoid the vehicle ahead!

However, do not rely solely on Front Assist. Under certain conditions, the reactions of Front Assist may be unexpected or delayed from the driver's viewpoint. Always pay attention and take over if necessary →  in Introduction on page 206.

### Immediate warning

If you fail to react accordingly to the advance warning, Front Assist may initiate a short, active braking maneuver. In this case you will notice brief, jerky braking of the vehicle to warn you of an impending collision.

The timing of this alert can vary, depending on the traffic situation and your driving style.

### Automatic braking

If you should also fail to react to the immediate warning, Front Assist can initiate an automatic braking maneuver that will **abruptly decelerate the vehicle** with increased braking force. The emergency braking maneuver occurs shortly before a potential collision to reduce vehicle speed and help to minimize the effects of a collision. ▶

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### Braking support

Front Assist can help to minimize the effects of a collision by providing additional braking force in an emergency braking situation should the system detect that the force applied to the brake pedal by the driver is not sufficient to avoid a collision. In order for Front Assist to provide this additional braking assistance, it must have detected an impending collision with another vehicle ahead of yours and the brake pedal has to be hit hard and suddenly. However, this support only works as long as the brake pedal is depressed.

### Autonomous Emergency Braking

The Autonomous Emergency Braking system is a part of Front Assist. In case of an impending collision, the Autonomous Emergency Braking system can initiate an automatic braking maneuver without the advance or immediate warnings to reduce vehicle speed and help to minimize the effects of a collision →  in *Introduction* on page 206.

The automatic braking maneuver occurs **simultaneously** with a warning in the instrument cluster display → fig. 128.

### System limits

 Please read the introductory information and heed the Warnings and Notice  on page 206.

Front Assist has physical and system-related limits. You should always be prepared to take full control of the vehicle whenever necessary.

#### Delayed response

If the radar sensor is exposed to environmental conditions that impair sensor function, the system may detect this only after a certain delay. For this reason, possible functional restrictions may be displayed only after a delay after you start driving and while driving →  in *Introduction* on page 206.

#### Objects that cannot be detected

Front Assist may react unnecessarily, react with delay, or not react at all in the following situations:

The red warning light  comes on.

#### System deactivated

If the system is switched off, a text message and the yellow symbol  appear in the instrument cluster display. The yellow central caution light  may also light up.

#### Distance warning

If the vehicle is traveling within a speed range of about 40–155 mph (65–250 km/h), the system warns the driver with the  symbol in the instrument cluster display if it detects that your vehicle is driving too close to the vehicle ahead →  in *Introduction* on page 206. No acoustic warning will sound.

The warning period varies according to the traffic situation and your driving style.

**Increase the distance between your vehicle and the vehicle ahead.** 

- When vehicles or motorcycles are traveling slightly offset to the left or right in front of your vehicle.
- When loads or attachment parts on other vehicles in front of your vehicle protrude to the side, rear, or above the normal vehicle dimensions.
- When there is oncoming traffic.
- When vehicles are crossing in front of your vehicle.
- When pedestrians are standing or moving toward you.

#### System limitations

Front Assist may react unnecessarily, react with delay, or not react at all in the following situations:

- When driving in tight curves.
- When weather conditions are poor.
- When driving in parking garages.
- When there are metal objects, for example, tracks or metal plates in the road.
- When the vehicle is in Reverse (R).
- When the ASR is manually switched off. 

- When the ESC is taking corrective action.
- When the **off-road** driving mode is switched on.
- When the radar sensor is dirty or covered.
- When several brake lights on the vehicle or on a trailer connected to the vehicle electrical system are not working.
- When the vehicle is accelerating quickly.
- When the accelerator pedal is completely depressed.
- When the system cannot detect the traffic situation clearly.
- When there is a fault in the Front Assist system.

#### When to switch off Front Assist

Front Assist should be switched off in the following situations due to system limitations → ⚠️

- If the vehicle is not being driven on public roads, for example, off-road or on a track.
- If the vehicle is being towed.
- If the vehicle is being loaded onto a truck, ferry, or train.
- If the radar sensor is covered (even temporarily) by any accessories or other equipment, for example, auxiliary headlights.
- If the radar sensor malfunctions.
- If an external force has affected the radar sensor, for example, after a collision.
- If the vehicle is on a dynamometer test bed.

#### ⚠️ WARNING

Failure to switch off Front Assist in the situations mentioned can cause accidents and serious personal injury.

### Pedestrian Monitoring

📖 Please read the introductory information and heed the Warnings and Notice ⚠️ on page 206.

The Forward Collision Warning system includes a Pedestrian Monitoring feature that can help prevent accidents with pedestrians crossing the street or help minimize the outcome of an accident.

The system alerts you of an impending collision, prepares the vehicle for emergency braking, provides support when braking, or performs an automatic braking maneuver.

If the system gives the driver an advanced warning, a message appears and the red warning light

 comes on in the instrument cluster to warn the driver of an impending collision → page 207, *Driver warnings and Autonomous Emergency Braking*.

If the Front Assist system is switched on → page 210, *Using Front Assist*, then Pedestrian Monitoring is also active within a speed range of about 3–40 mph (5–65 km/h).

#### ⚠️ WARNING

The Pedestrian Monitoring technology cannot overcome the laws of physics and system-related limits. Never let the increased convenience provided by the Pedestrian Monitoring system tempt you into taking extra risks. The driver is always responsible for braking in time. If the Pedestrian Monitoring system issues a warning, immediately apply the brakes to slow the vehicle down or avoid the pedestrian, depending on the traffic situation.

- Always adjust your speed, driving style, and the distance you keep between you and the vehicles ahead of you to the road, traffic, weather, and visibility conditions.
- The Pedestrian Monitoring system cannot prevent accidents and serious injuries on its own.
- The Pedestrian Monitoring system can issue unnecessary warnings in certain complex driving situations, for example, when driving in tight curves.
- The Pedestrian Monitoring system can issue unnecessary warnings or braking maneuvers when its function is impaired, for example, if the radar sensor is dirty or if the position of the radar sensor has been changed.
- The Pedestrian Monitoring system does not react to animals.
- The Pedestrian Monitoring system does not react to pedestrians who are standing still or moving toward you.
- Always be prepared to take full control of the vehicle at all times.

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## Using Front Assist

📖 Please read the introductory information and heed the Warnings and Notice ⚠ on page 206.

The Front Assist system and the advance warning are automatically active once the ignition is switched on → page 164, *Starting and stopping the engine*.

Volkswagen recommends that the Front Assist system be switched on at all times, except in the specific situations described in this Manual → page 208, *System limits*.

### Turning Front Assist on or off

- You can turn Front Assist on or off in the **Vehicle settings** menu in the Infotainment system → page 29, *Infotainment system operation and displays*.
- **OR:** In the **Assist systems** menu in the instrument cluster display → page 20, *Instrument cluster menus*.
- **OR:** Press the driver assistance systems button on the multi-function steering wheel to open the **Assist systems** menu → page 29, *Driver assistance systems button*.

If the system is switched off, the advance warning and distance warning are also automatically switched off. A text message and the yellow

symbol  appear in the instrument cluster display → page 207, *Driver warnings and Autonomous Emergency Braking*. The yellow central caution light  may also light up.

### Adjusting settings for the distance and advance warnings

- You can turn the distance warning and the advance warning on or off in the **Vehicle settings** menu in the Infotainment system → page 29, *Infotainment system operation and displays*.
- You can also adjust the warning period for the advance warning.

Volkswagen recommends that the distance and advance warnings be switched on at all times.

 Certain settings are automatically saved by the driver personalization feature → page 30, *Driver personalization*.

## Tips and troubleshooting

📖 Please read the introductory information and heed the Warnings and Notice ⚠ on page 206.

### If Front Assist is unavailable or radar sensor visibility is insufficient

Possible causes:

- The radar sensor is dirty. Clean the radar sensor → page 356, *Exterior care and cleaning*.
- Radar sensor visibility is impaired by weather conditions such as snow, or residue from abrasive cleaning agents or coatings. Clean the radar sensor → page 356, *Exterior care and cleaning*.
- Radar sensor visibility is impaired by aftermarket components, stickers, or accessories.
- The radar sensor has been damaged or misaligned in low speed impacts or parking maneuvers at the front of the vehicle. Have the sensor checked for damage → page 363, *Repairs and technical modifications*.
- Paint work or structural modifications have been made at the front of the vehicle.
- The original Volkswagen emblem is not being used.
- When the ASR is manually switched off or ESC Sport is switched on → page 234, *Switching Anti-Slip Regulation (ASR) and ESC Sport mode on and off*.
- If the problem persists, see an authorized Volkswagen dealer or authorized Volkswagen Service Facility.

### If the system is not responding as expected

Possible causes:

- The radar sensor is dirty. Clean the radar sensor → page 356, *Exterior care and cleaning*.
- Front Assist is functioning in a situation in which it should be deactivated due to system limitations → page 202, *Limits of ACC*.
- If the problem persists, switch off Front Assist see an authorized Volkswagen dealer or authorized Volkswagen Service Facility.

### ! NOTICE

◀ If you notice that Front Assist doesn't work properly or the sensor is damaged, switch off Front Assist immediately. ▶

- See an authorized Volkswagen dealer or authorized Volkswagen Service Facility for assistance and have the Front Assist system checked.

## Lane Keeping system (Lane Assist)

### Introduction

Your vehicle may be equipped with a Lane Assist system, which can warn you if your vehicle unintentionally leaves the current drive lane.

With the help of a camera → page 5, *Front view*, Lane Assist can recognize certain lane markings for the lane in which the vehicle is moving. Should the vehicle leave this area unintentionally, for example, when leaving the lane without activating a turn signal, the system will warn you with a *steering correction*. The driver can override the steering correction at any time.

*Vehicles without Blind Spot Monitor:* Lane Assist will not warn you of a lane change if you activate the turn signal, because the system will assume that the lane change is intended.

### System limits

Only use Lane Assist on highways and well-maintained roads.

Lane Assist may deactivate temporarily under certain circumstances:

- When the speed of your vehicle is less than about 40 mph (65 km/h).
- If the system cannot recognize lane markings correctly, for example, in construction zones, on bad roads, when visibility is bad, or when the camera area is covered.
- When ESC is switched off or when ESC Sport mode is switched on → page 234, *Switching Anti-Slip Regulation (ASR) and ESC Sport mode on and off*.

### WARNING

Always remember that Lane Assist has limits – using Lane Assist when it is not possible to drive safely can be dangerous and can lead to an accident and serious personal injury.

- Always adjust your speed and the distance you keep between you and the vehicles ahead of you to the road, traffic, weather, and visibility conditions.
- Always keep both hands on the steering wheel so that you are prepared to steer at any time. The driver is always responsible for controlling the vehicle.
- Always pay attention to the messages in the instrument cluster display and act accordingly.
- Always pay close attention to what is happening around your vehicle.

### WARNING

Not deactivating Lane Assist in the situations mentioned above can cause collisions, other accidents and serious personal injury.

Some settings are automatically saved by the driver personalization feature → page 30, *Driver personalization*.

### Driving with Lane Assist

Please read the introductory information and heed the Warnings and Notice on page 211.

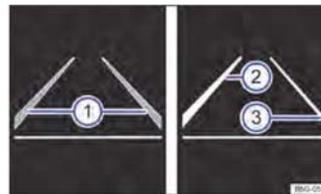


Fig. 129 In the instrument cluster display: Lane Assist display (displayed in color on an instrument cluster with color display).

5NMQ012723AD

APPENDIX C

Run Log

Subject Vehicle: 2019 Volkswagen TiguanTest Date: 5/13/2019Principal Other Vehicle: 2006 Acura RL

Run	Test Type	Valid Run?	TTCW Sound (sec)	TTCW Light (sec)	TTCW Margin (sec)	Pass/Fail	Notes
1	<b>Stopped POV</b>	Y	2.96	2.86	0.86	Pass	
2		Y	2.97	2.88	0.87	Pass	
3		Y	2.95	2.88	0.85	Pass	
4		Y	3.03	2.95	0.93	Pass	
5		Y	3.01	2.93	0.91	Pass	
6		Y	2.97	2.88	0.87	Pass	
7		Y	2.94	2.84	0.84	Pass	
8	<b>Slower POV, 45 vs 20</b>	Y	2.72	2.64	0.72	Pass	
9		Y			-2.00	Fail	No FCW Warning
10		Y	2.76	2.67	0.76	Pass	
11		Y	2.70	2.57	0.70	Pass	
12		Y	2.72	2.61	0.72	Pass	
13		Y	2.63	2.52	0.63	Pass	
14		Y	2.75	2.68	0.75	Pass	
15	<b>Braking POV, 45</b>	Y	2.86	2.76	0.46	Pass	
16		Y	2.83	2.75	0.43	Pass	
17		Y	2.73	2.65	0.33	Pass	
18		Y	2.81	2.72	0.41	Pass	
19		Y	2.76	2.68	0.36	Pass	

Subject Vehicle: 2019 Volkswagen Tiguan

Test Date: 5/13/2019

Principal Other Vehicle: 2006 Acura RL

Run	Test Type	Valid Run?	TTCW Sound (sec)	TTCW Light (sec)	TTCW Margin (sec)	Pass/Fail	Notes
20		Y	2.78	2.69	0.38	Pass	
21		Y	2.82	2.74	0.42	Pass	

## APPENDIX D

### Time History Plots

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## Description of Time History Plots

A set of time history plots is provided for each valid run in the test series. Each set of plots comprises time varying data from both the Subject Vehicle (SV) and the Principal Other Vehicle (POV), as well as pass/fail envelopes and thresholds. The following is a description of data types shown in the time history plots, as well as a description of the color code indicating to which vehicle the data pertain.

### Time History Plot Description

Each time history plot consists of data pertinent to the test type under consideration, and therefore the data channels plotted vary according to test type. The test types (shown in the plot titles) include:

- FCW Test 1 – Stopped POV (SV at 45 mph)
- FCW Test 2 – Braking POV (Both vehicles at 45 mph with a 30 m gap, POV brakes at 0.3 g)
- FCW Test 3 – Slower Moving POV (SV at 45 mph, POV at 20 mph)

Time history figures include the following sub-plots:

- Warning – Displays the Forward Collision Warning Alert (which can be audible, visual, or haptic). Depending on the type of FCW alert or instrumentation used to measure the alert, this can be any of the following:
  - Filtered, rectified, and normalized sound signal. The vertical scale is 0 to 1.
  - Filtered, rectified, and normalized acceleration (e.g., haptic alert, such as steering wheel vibration). The vertical scale is 0 to 1.
  - Light sensor signal
- TTC (sec) – Indicates the Time to Collision as calculated up to the point of FCW alert issuance. The value of TTCW (Time to Collision at Warning) is given numerically on the right side of the figure. A passing value is indicated in green, while a failing value is indicated in red.
- SV Speed (mph) – Speed of the Subject Vehicle

- POV Speed (mph) – Speed of the Principal Other Vehicle
- Yaw Rate (deg/sec) – Yaw rate of both the Subject Vehicle and Principal Other Vehicle
- Lateral Offset (ft) – Lateral offset within the lane from the Subject Vehicle to the Principal Other Vehicle
- Ax (g) – Longitudinal acceleration of both the Subject Vehicle and Principal Other Vehicle
- Headway (ft) – Longitudinal separation between front of Subject Vehicle to rear of Principal Other Vehicle (Exclusive to test type 2)

Note that the minimum (worst) GPS fix type is displayed in the lower right corner of each page. The only valid fix type is RTK fixed (displayed in green). If the fix type during any portion of the test was anything other than RTK fixed, then “RTK Fixed OR LESS!!” is displayed in red.

### **Envelopes and Thresholds**

Each of the time history plot figures can contain either green or yellow envelopes and/or black threshold lines. These envelopes and thresholds are used to programmatically and visually determine the validity of a given test run. Envelope and threshold exceedances are indicated with either red shading or red asterisks, and red text is placed to the right side of the plot indicating the type of exceedance.

Green envelopes indicate that the time-varying data should not exceed the envelope boundaries at any time within the envelope. Exceedances of a green envelope are indicated by red shading in the area between the measured time-varying data and the envelope boundaries.

Yellow envelopes indicate that the time-varying data should not exceed the envelope only at the left and/or right ends. Exceedances at the left or right extent of a yellow envelope are indicated by red asterisks.

For the warning plot, a dashed black threshold line indicates the threshold used to determine the onset of the FCW alert. The alert is considered on the first time the alert signal crosses this threshold line.

For the TTC plot, a dashed black threshold line indicates the minimum allowable TTC for the given test scenario. If the FCW alert occurs before this minimum allowable TTC, a green dot appears. However, if there is no alert or the alert occurs after the minimum allowable TTC, a red asterisk is shown on the plot.

For the Ax plot, a dashed black threshold line is given for at a value of  $-0.05$  g. For a test run to be valid, the longitudinal acceleration of the Subject Vehicle must not fall below this threshold (i.e. the driver cannot apply any brakes). Additionally, for test type 2, the plot indicating the longitudinal acceleration of the Principal Other Vehicle includes a yellow envelope indicating the deceleration ( $0.3 \text{ g} \pm 0.03 \text{ g}$ ) allowed while braking. Exceedance of this threshold is indicated with red asterisks at the beginning and/or end of the threshold boundary.

### Color Codes

Color codes have been adopted to easily identify which data correspond to which vehicle, as well as to indicate the types of envelopes and thresholds used in the plots.

Color codes can be broken into four categories:

1. Time-varying data
2. Validation envelopes and thresholds
3. Instantaneous samplings
4. Text

1. Time-varying data color codes:

- Blue = Subject Vehicle data
- Magenta = Principal Other Vehicle data
- Brown = Relative data between SV and POV (i.e., TTC, lateral offset and headway distance)

2. Validation envelope and threshold color codes:

- Green envelope = time varying data must be within the envelope at all times in order to be valid
- Yellow envelope = time varying data must be within limits at left and/or right ends
- Black threshold (Solid) = time varying data must not exceed this threshold in order to be valid
- Black threshold (Dashed) = for reference only – this can include warning level thresholds, TTC thresholds, and acceleration thresholds

3. Instantaneous sampling color codes:

- Green circle = passing or valid value at a given moment in time
- Red asterisk = failing or invalid value at a given moment in time

4. Text color codes:

- Green = passing or valid value
- Red = failing or invalid value

Examples of time history plots for each test type (including passing, failing and invalid runs) are shown in Figure D1 through Figure D6. Actual time history data plots for the vehicle under consideration are provided subsequently.

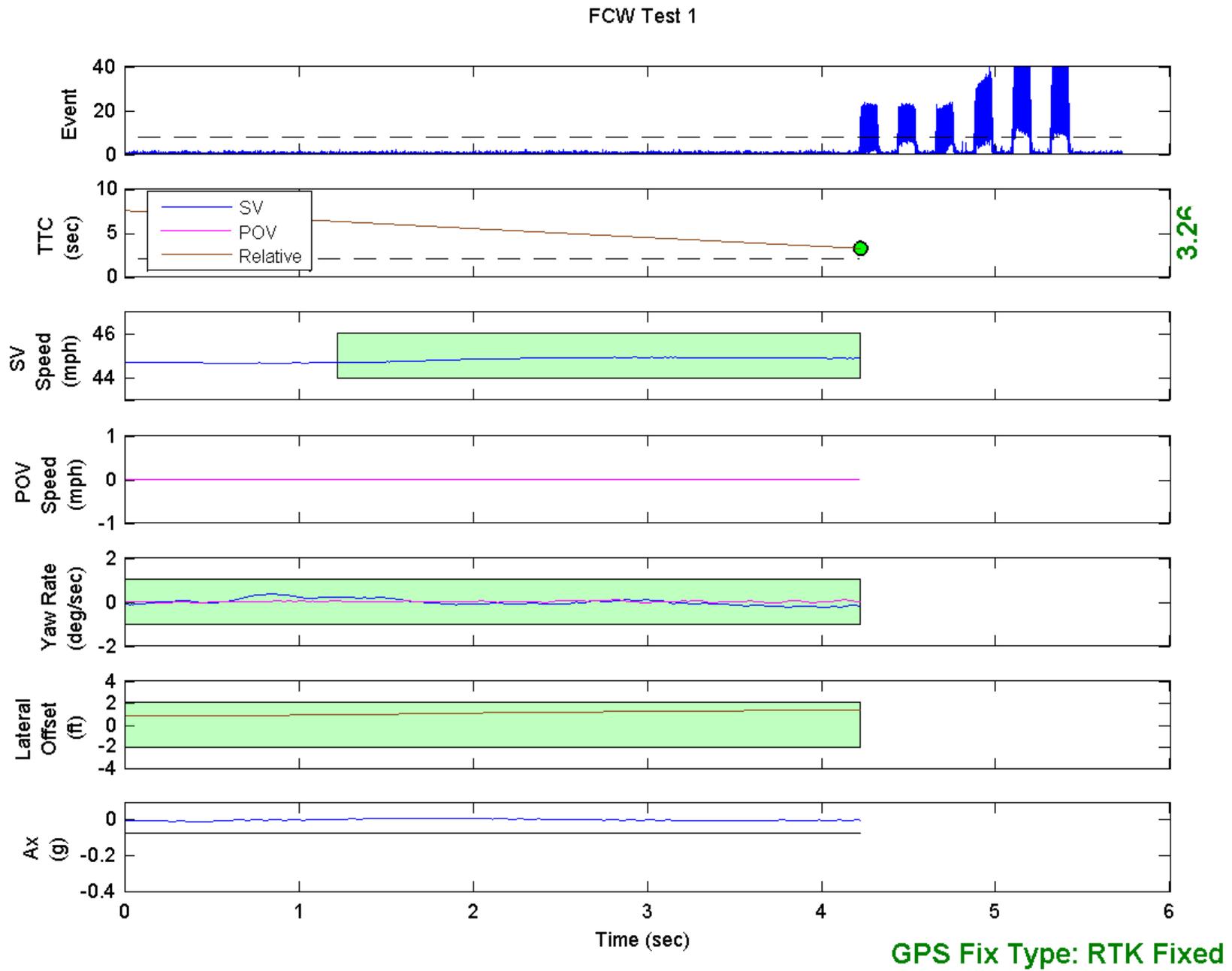
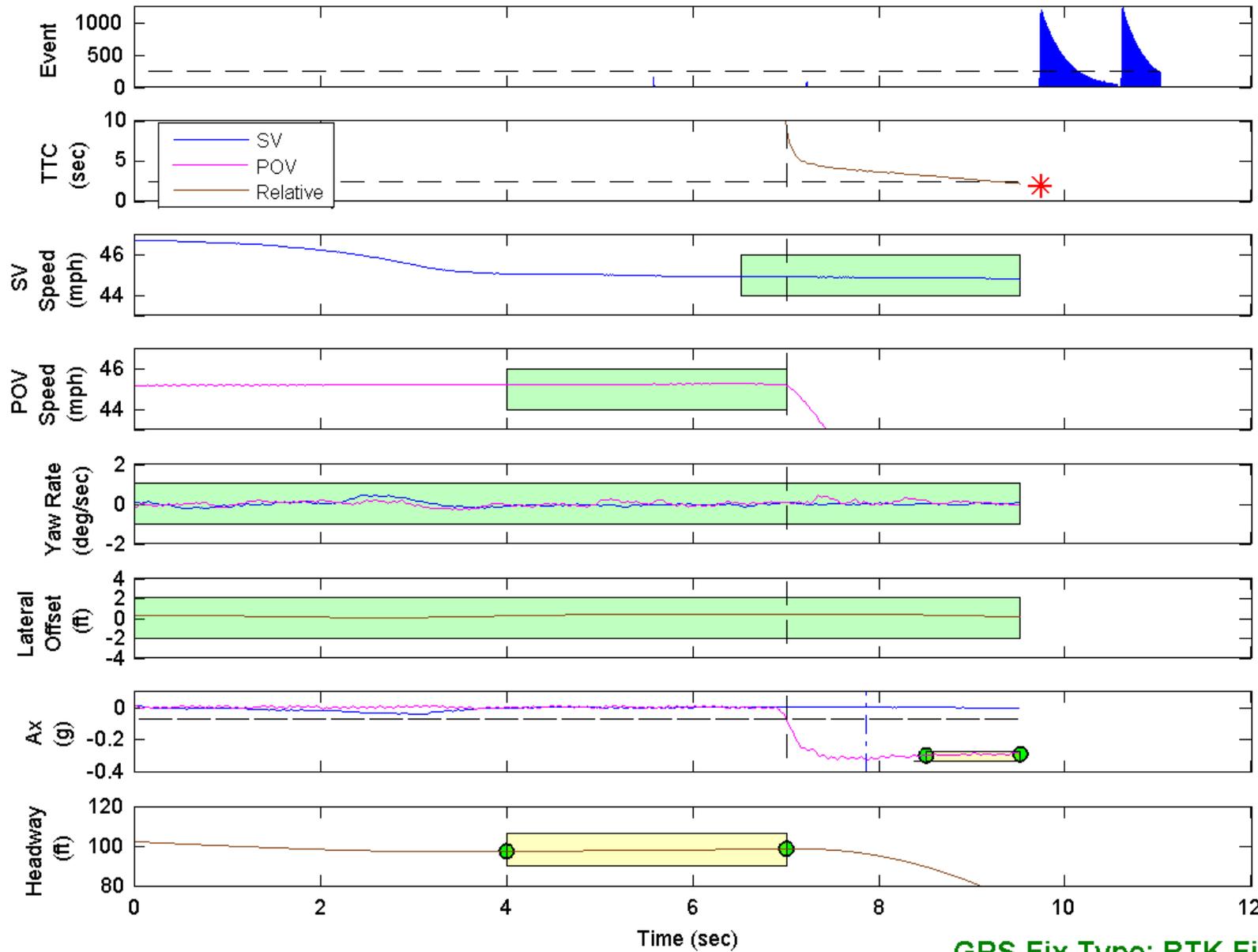


Figure D1. Example Time History for Test Type 1, Passing

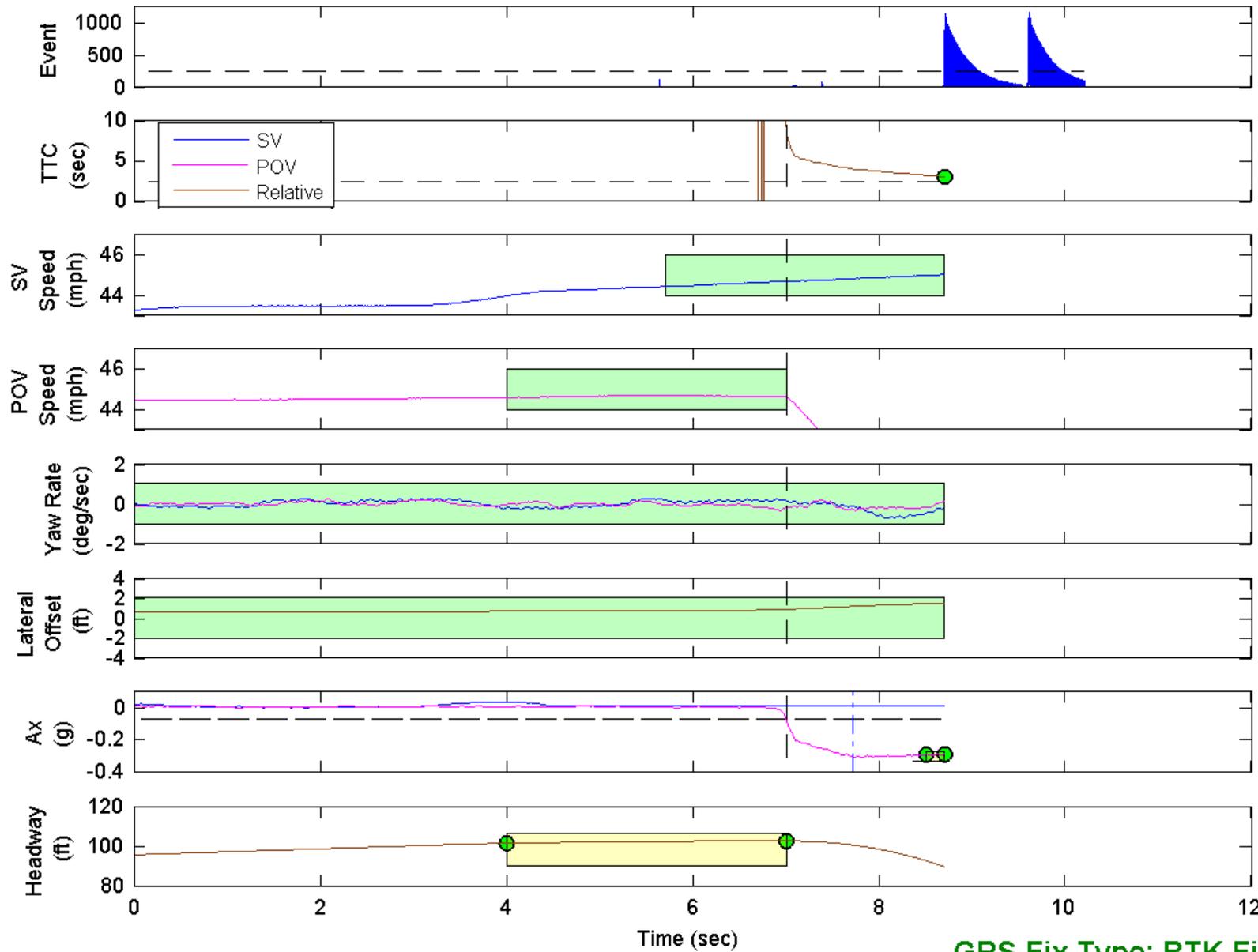
### FCW Test 2



GPS Fix Type: RTK Fixed

Figure D2. Example Time History for Test Type 2, Failing

FCW Test 2



GPS Fix Type: RTK Fixed

Figure D3. Example Time History for Test Type 2, Passing

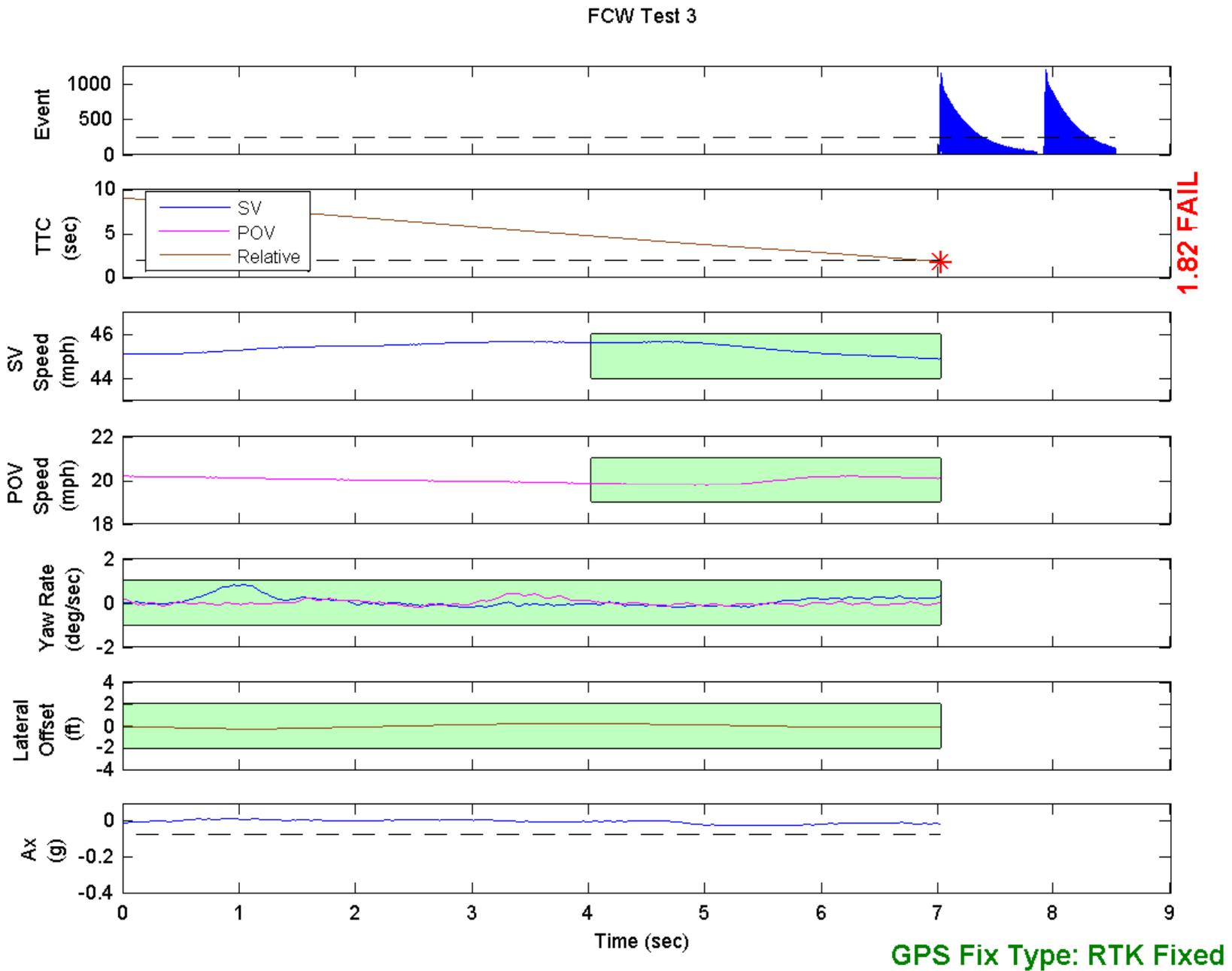


Figure D4. Example Time History for Test Type 3, Failing

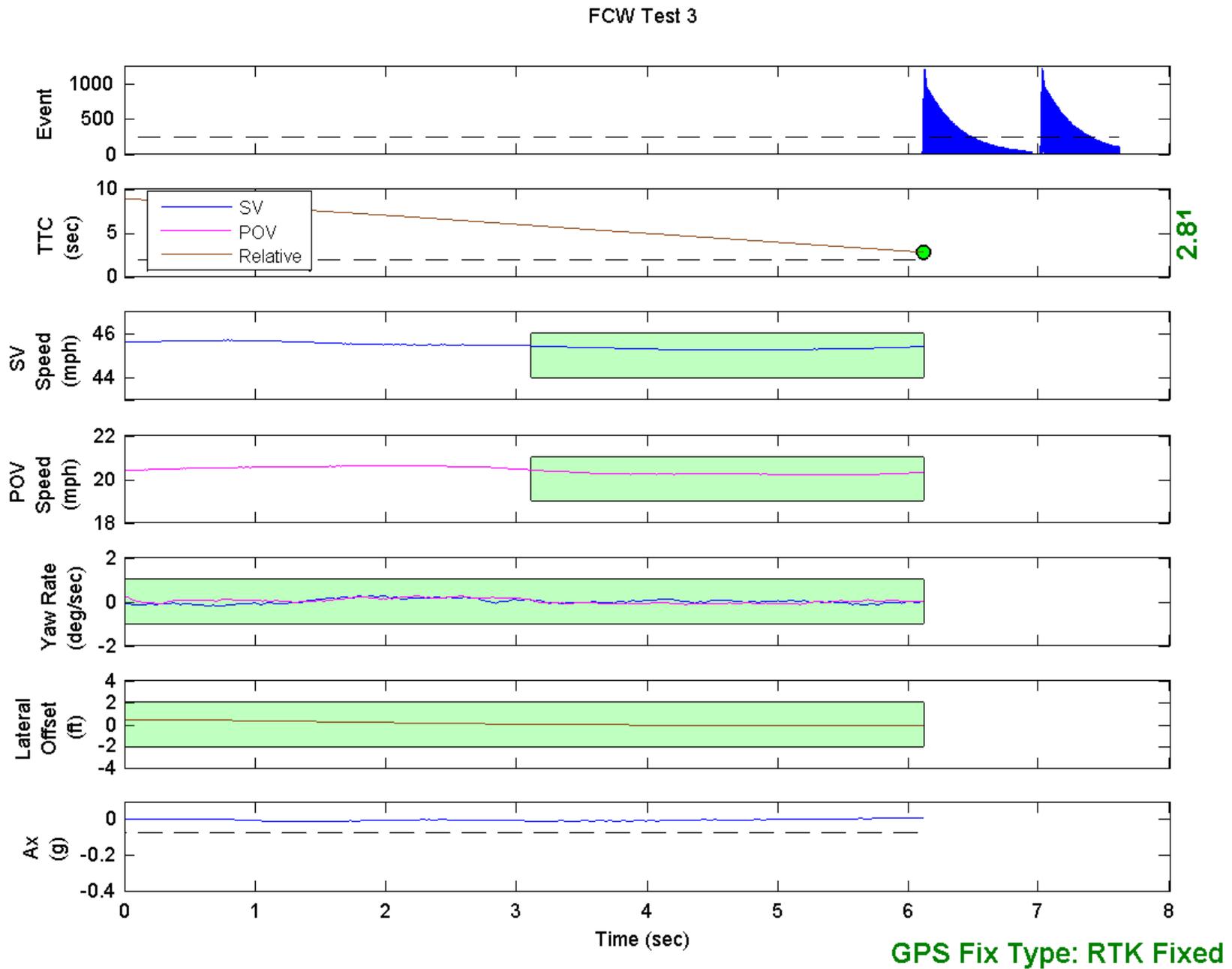


Figure D5. Example Time History for Test Type 3, Passing

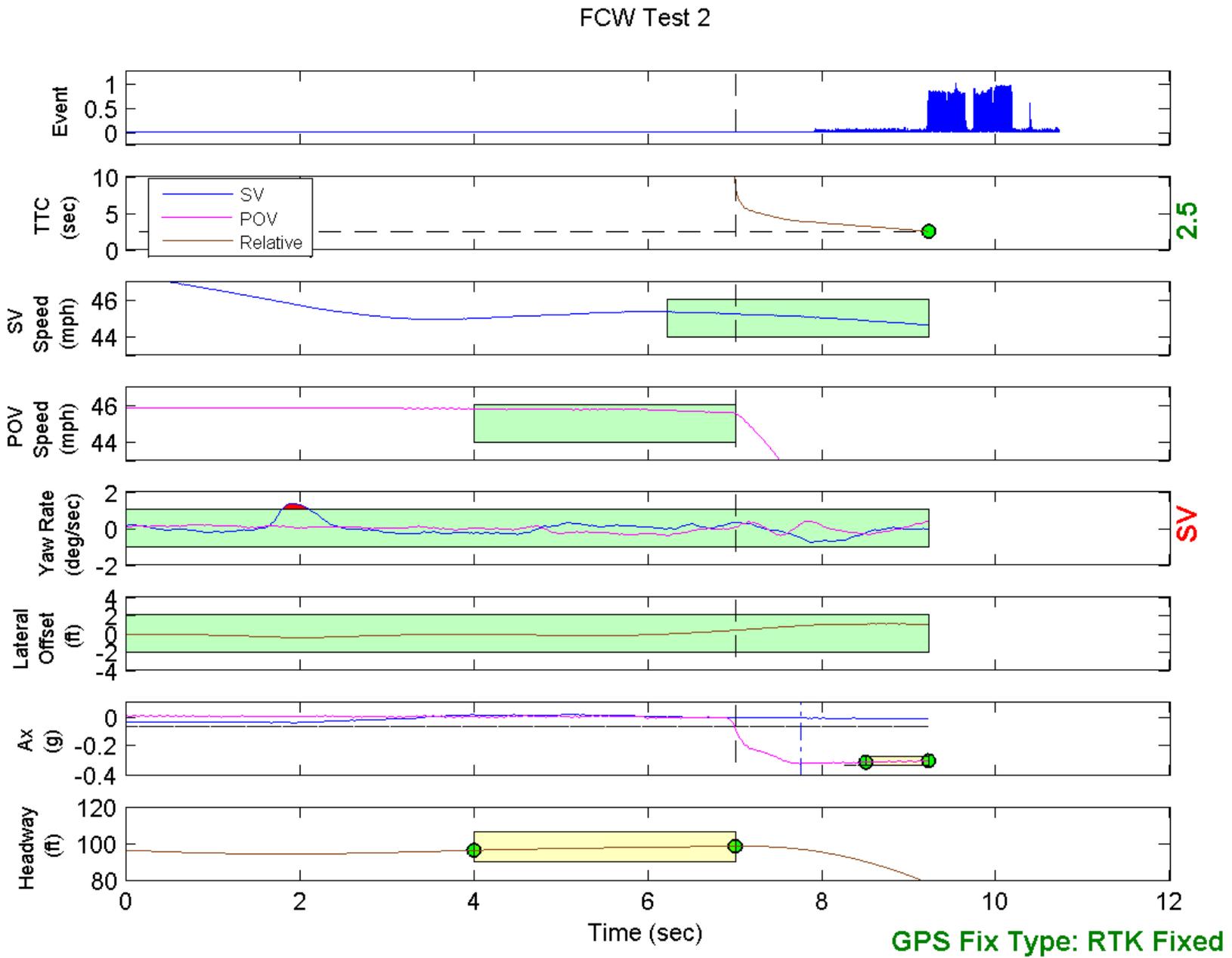


Figure D6. Example Time History for Test Type 2, Invalid Run Due to Subject Vehicle Yaw Rate

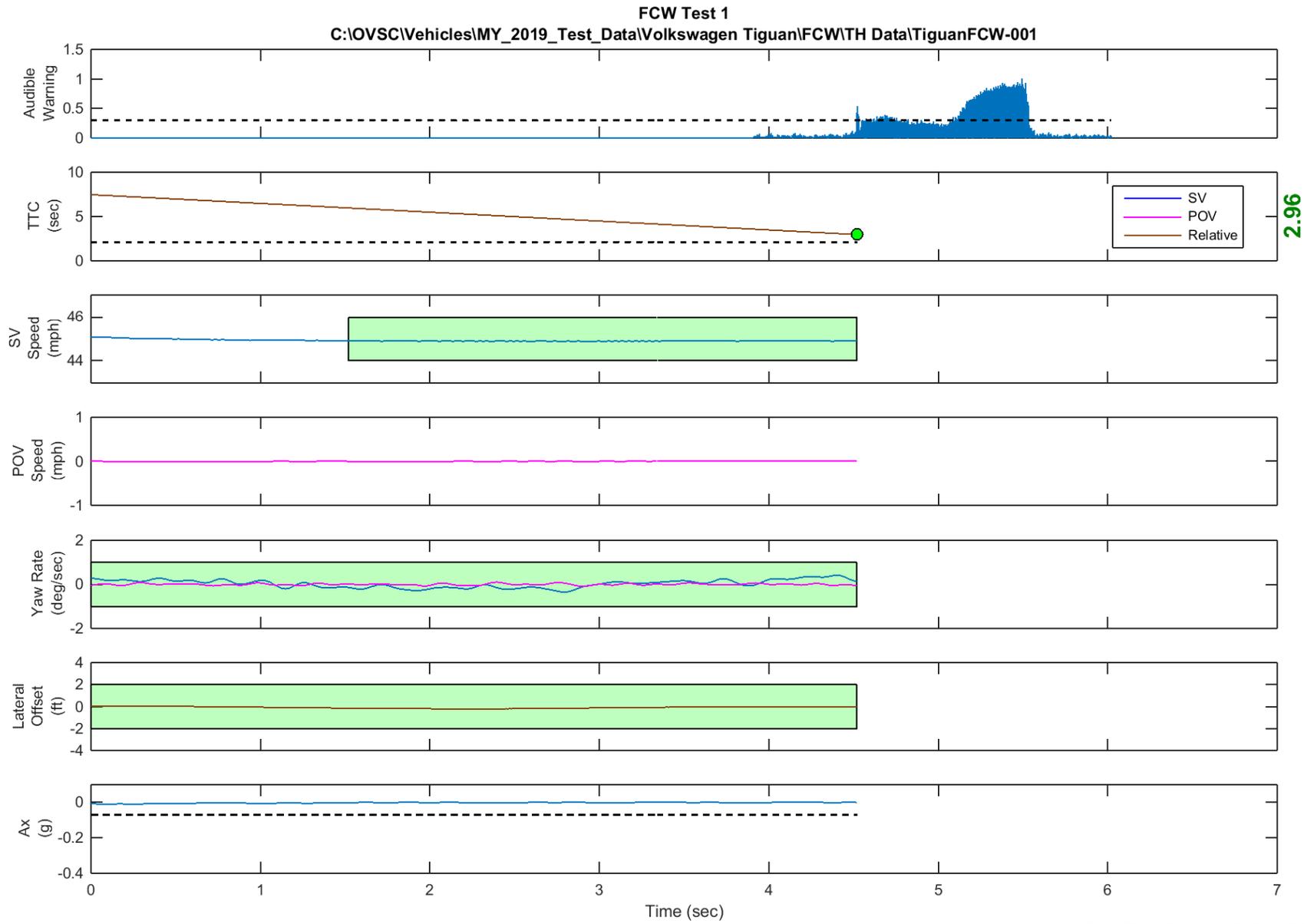
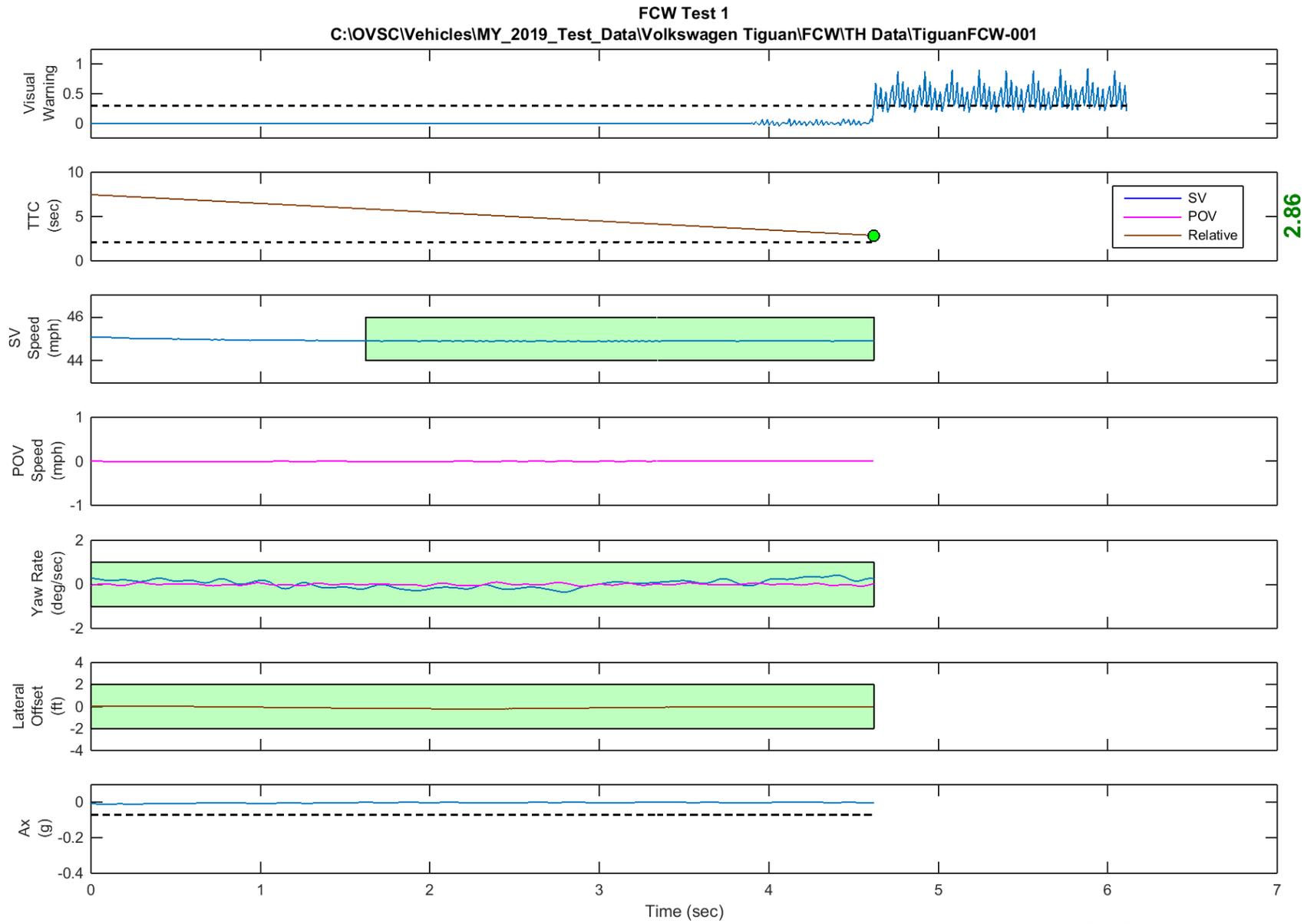


Figure D7. Time History for Run 1, FCW Test 1, Audible Warning



GPS Fix Type: RTK Fixed

Figure D8. Time History for Run 1, FCW Test 1, Visual Warning

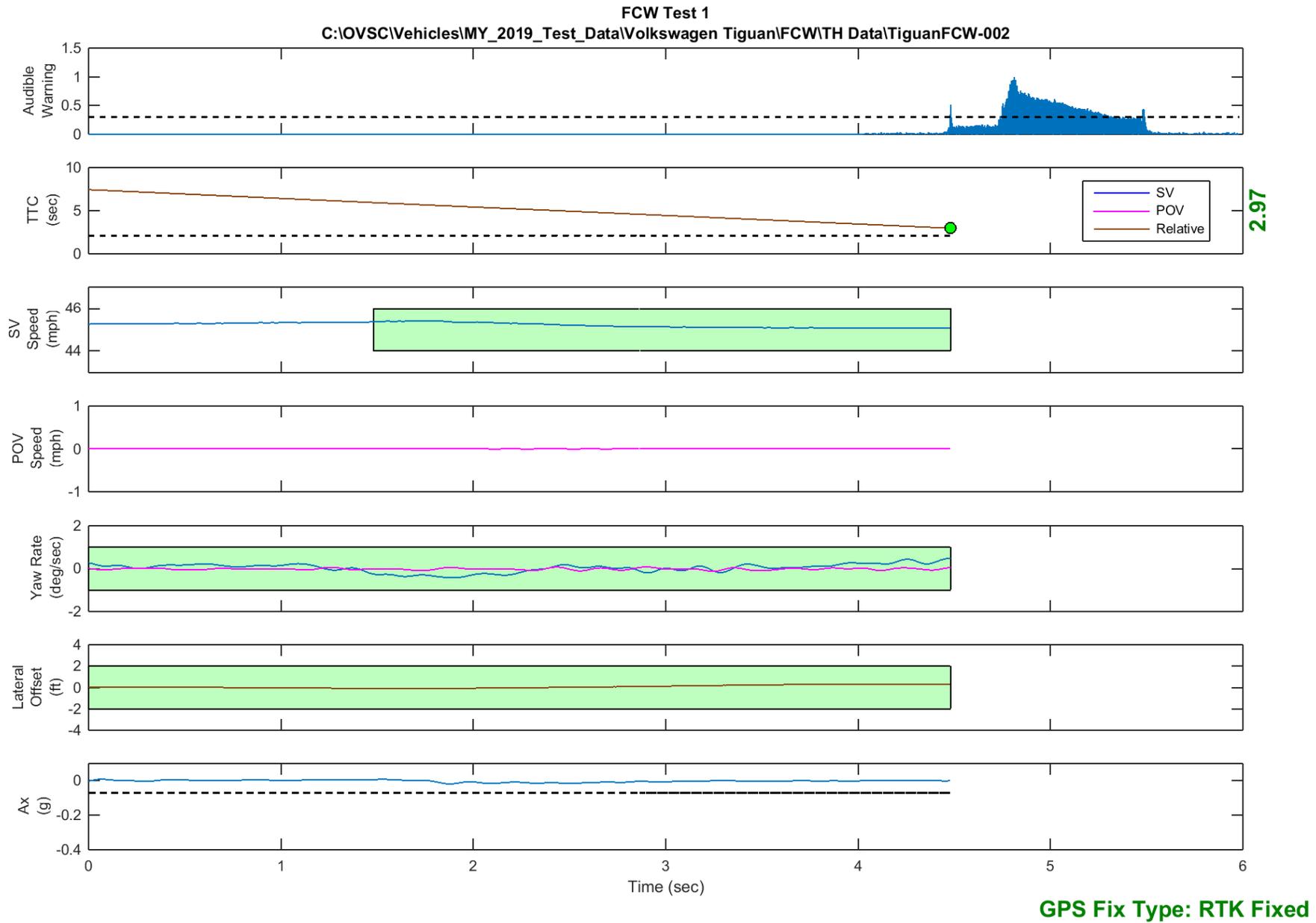
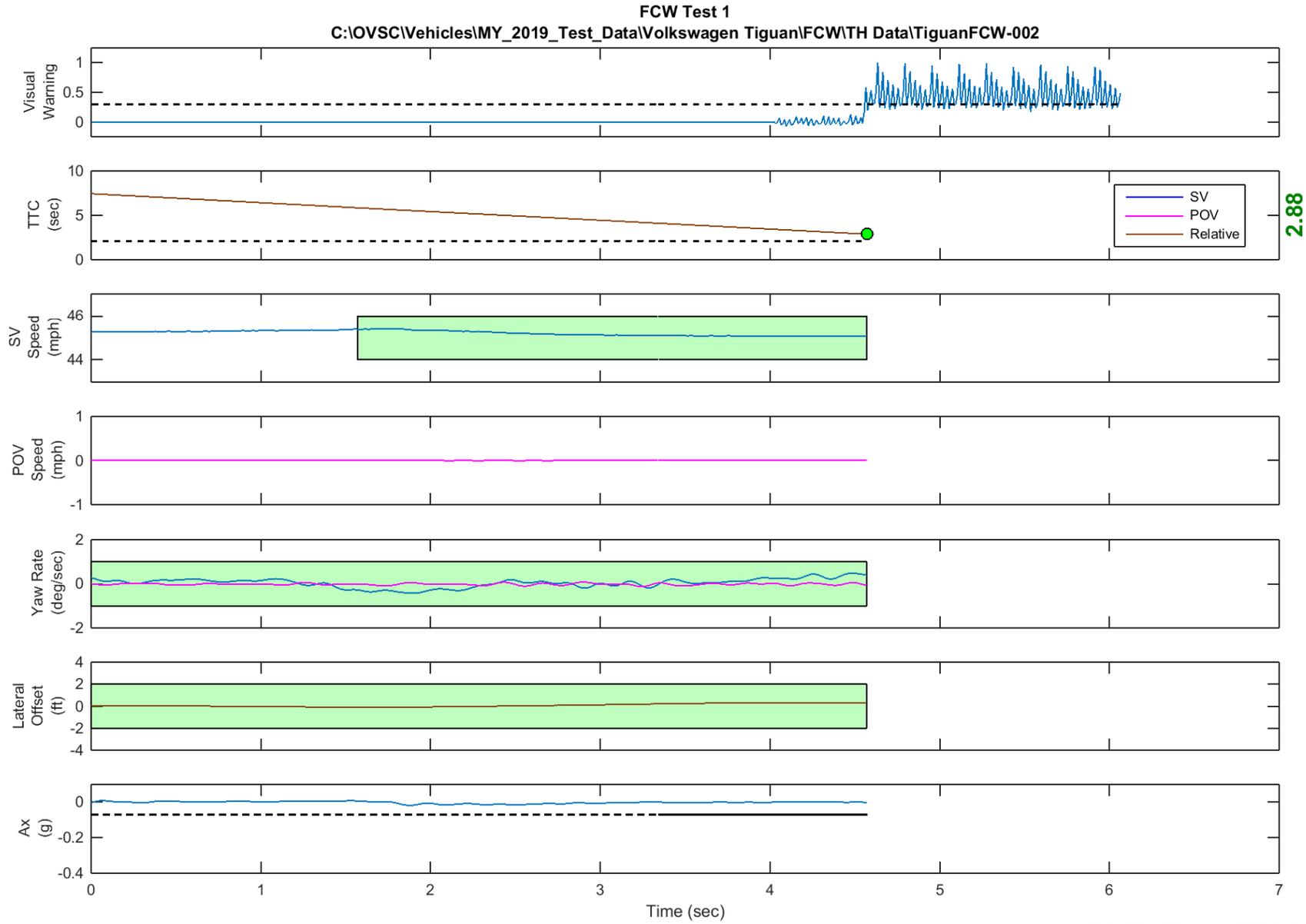


Figure D9. Time History for Run 2, FCW Test 1, Audible Warning



GPS Fix Type: RTK Fixed

Figure D10. Time History for Run 2, FCW Test 1, Visual Warning

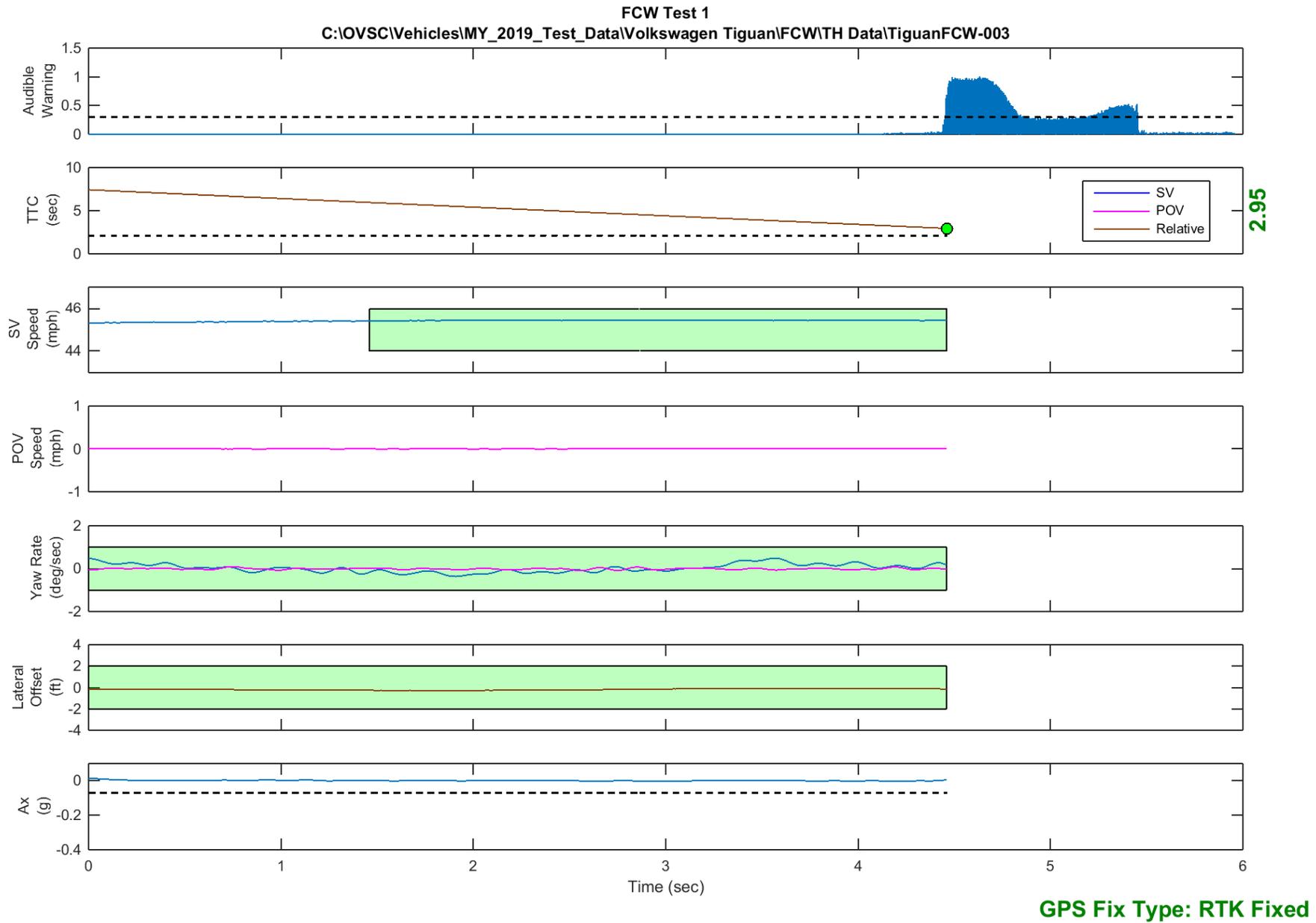
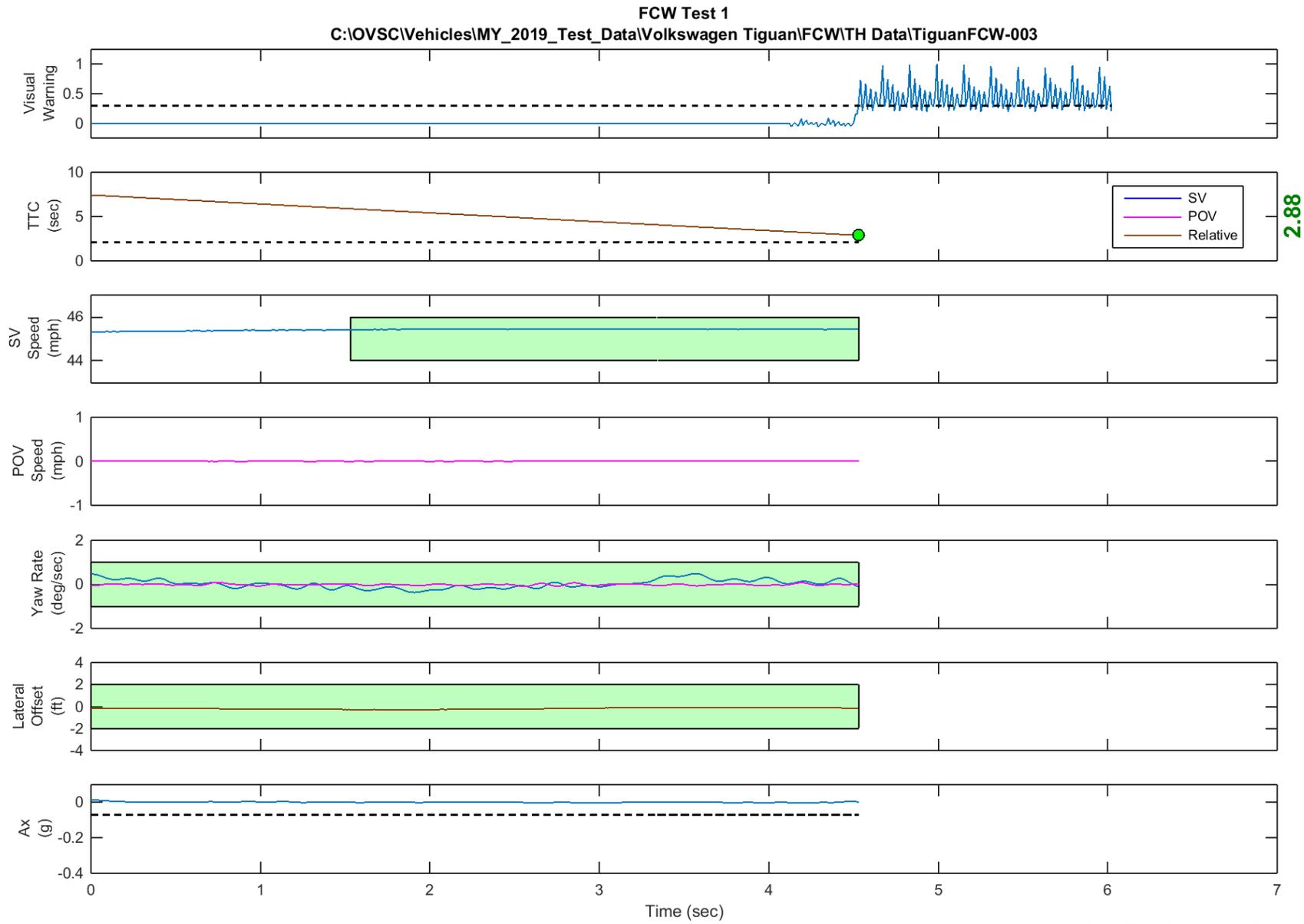


Figure D11. Time History for Run 3, FCW Test 1, Audible Warning



2.88

GPS Fix Type: RTK Fixed

Figure D12. Time History for Run 3, FCW Test 1, Visual Warning

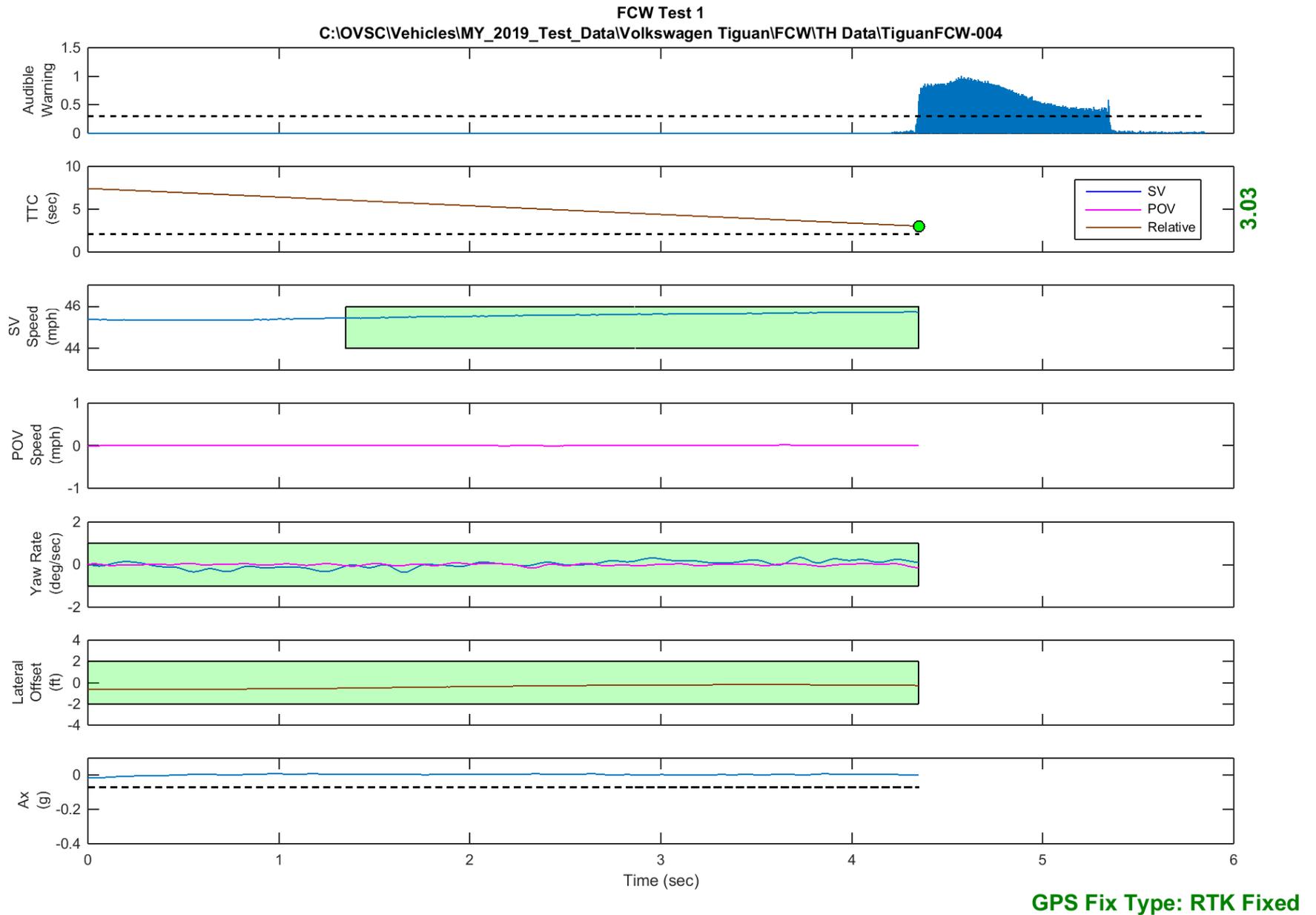


Figure D13. Time History for Run 4, FCW Test 1, Audible Warning

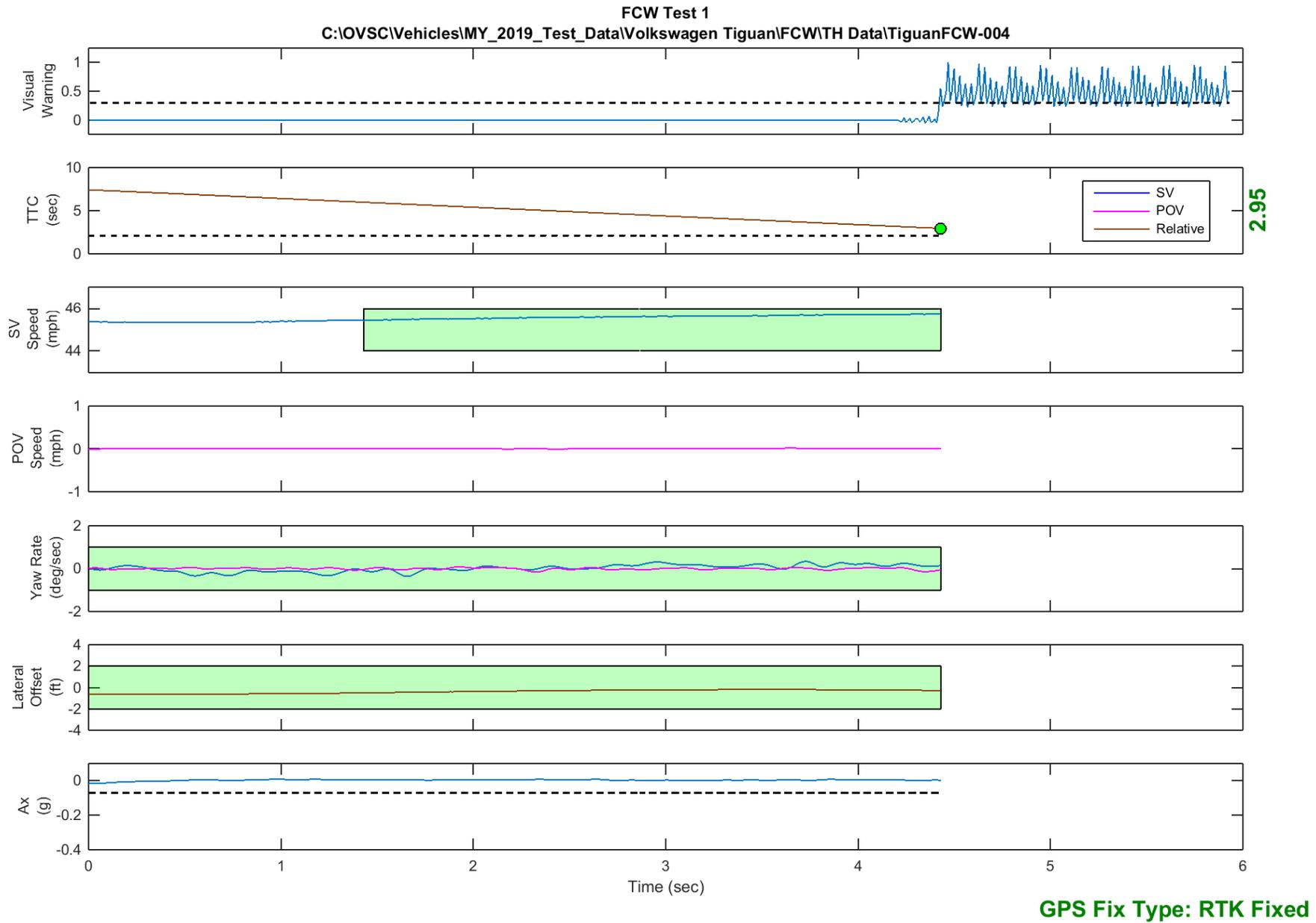
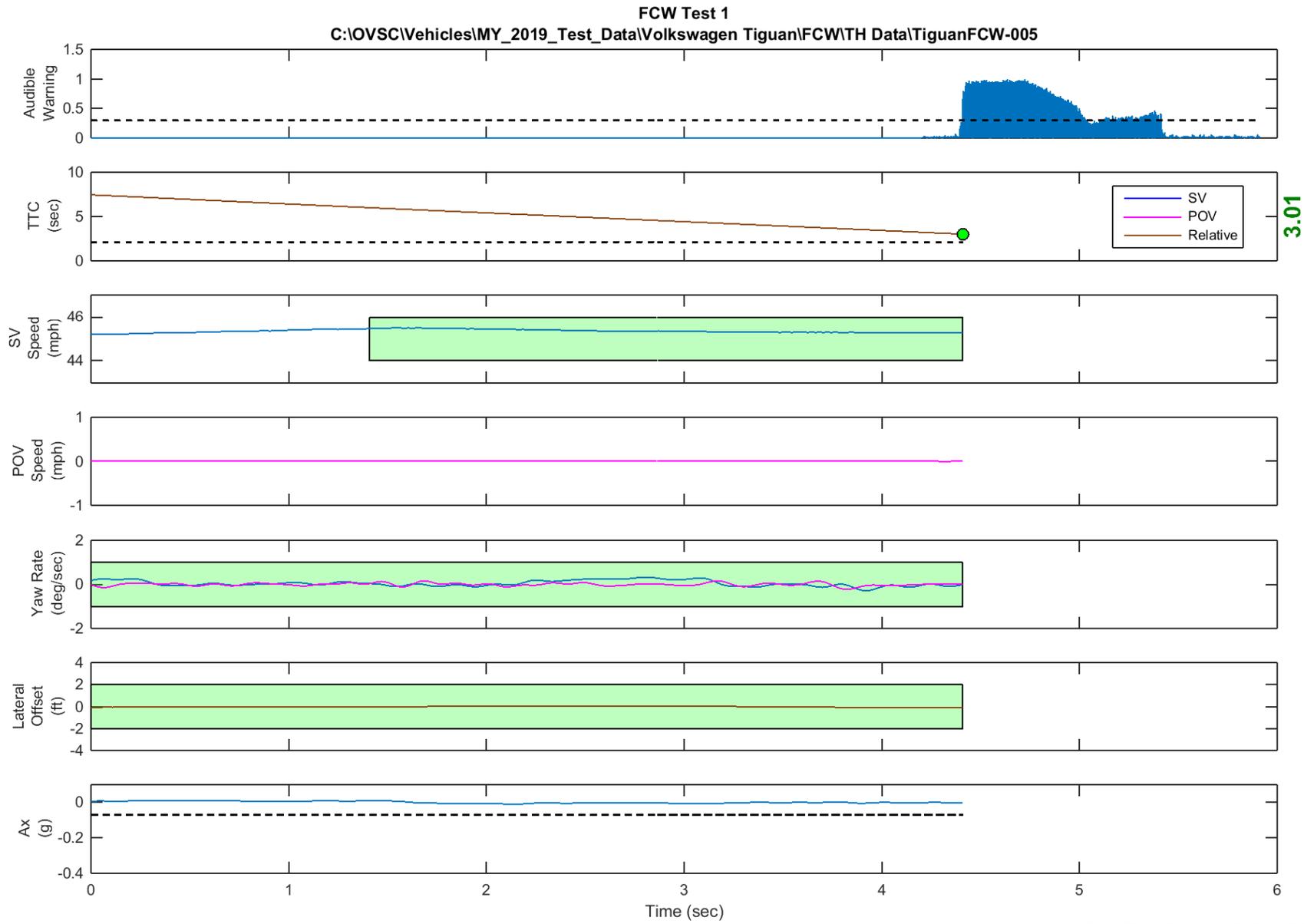


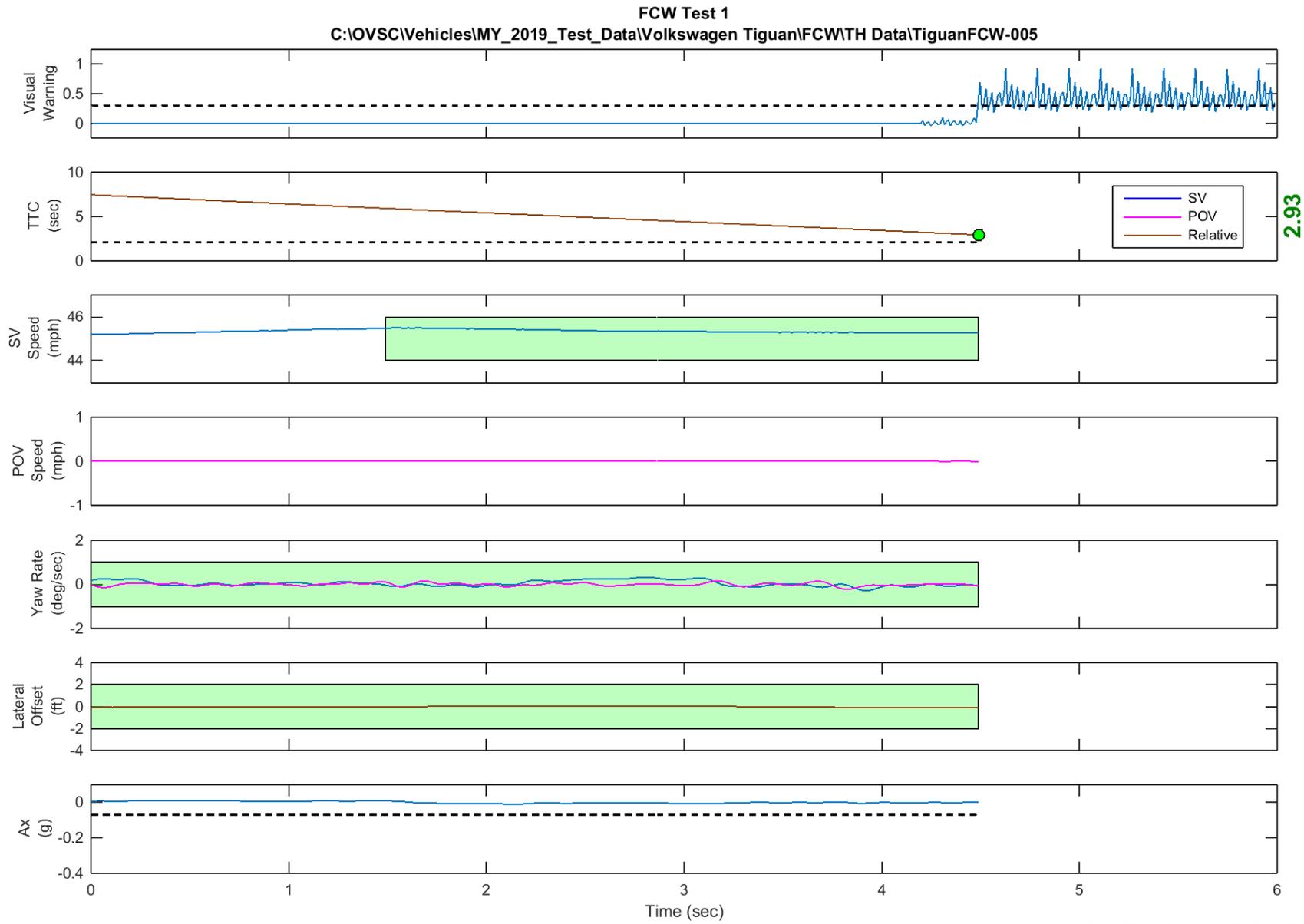
Figure D14. Time History for Run 4, FCW Test 1, Visual Warning



3.01

GPS Fix Type: RTK Fixed

Figure D15. Time History for Run 5, FCW Test 1, Audible Warning



2.93

GPS Fix Type: RTK Fixed

Figure D16. Time History for Run 5, FCW Test 1, Visual Warning

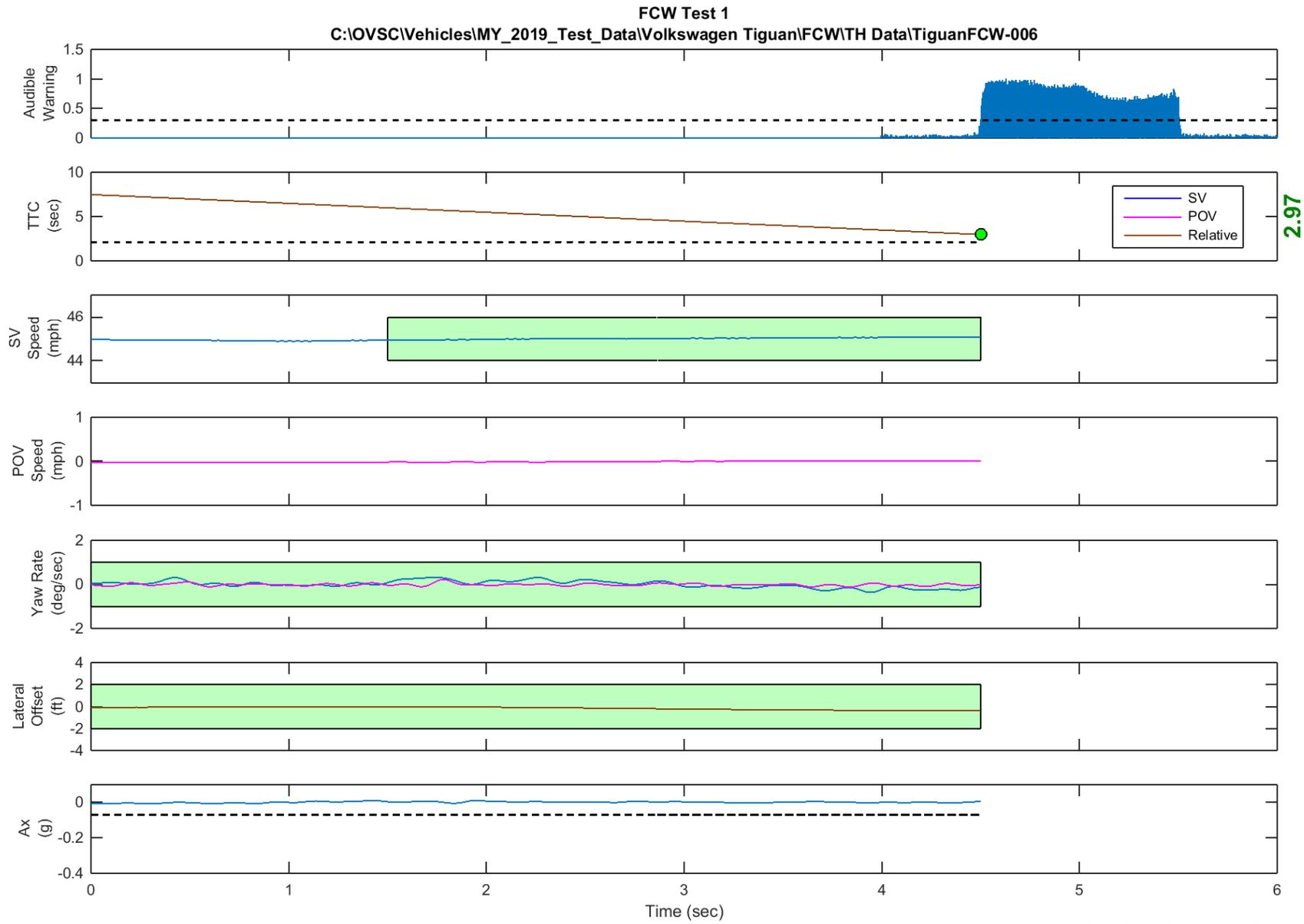


Figure D17. Time History for Run 6, FCW Test 1, Audible Warning

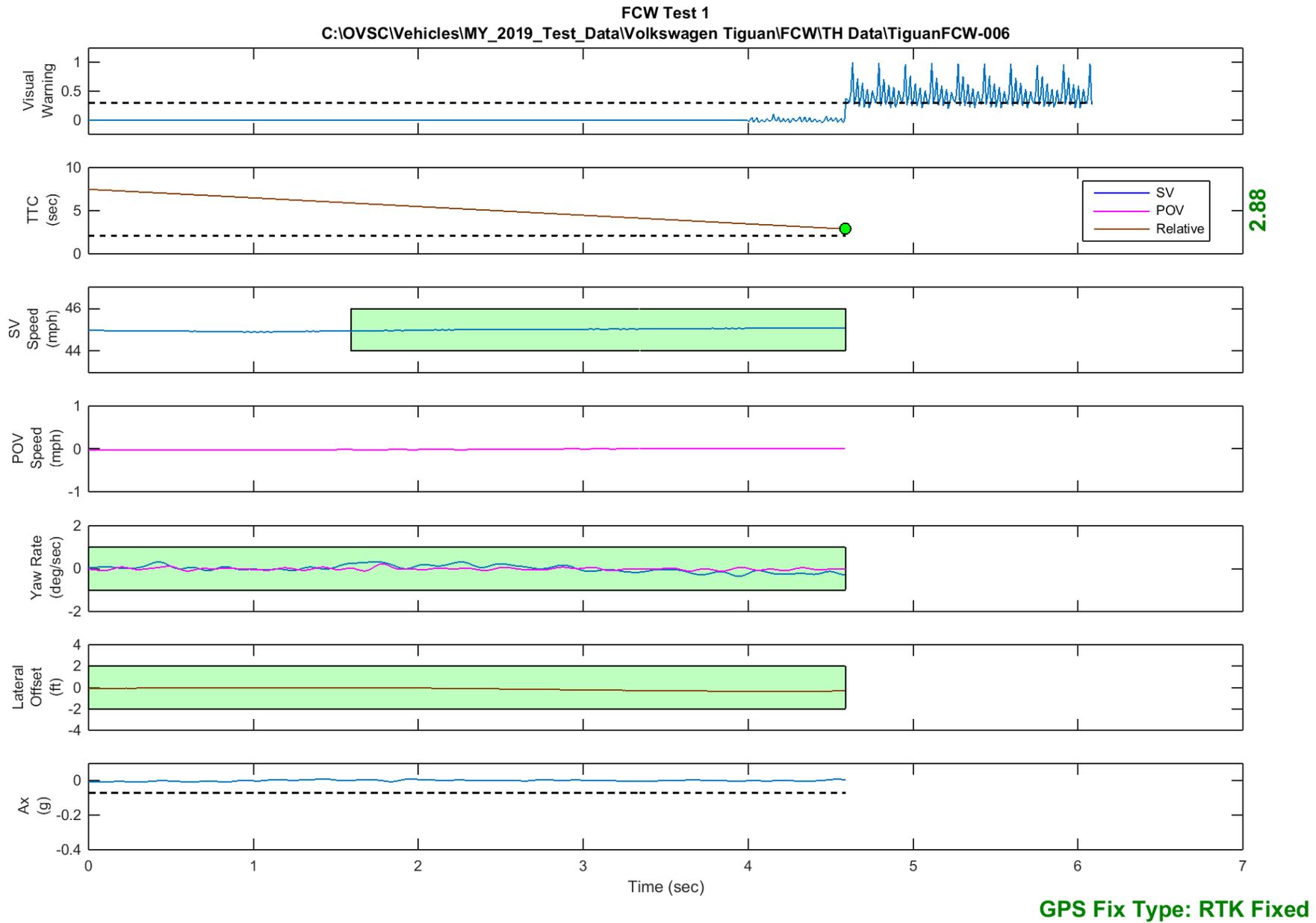


Figure D18. Time History for Run 6, FCW Test 1, Visual Warning

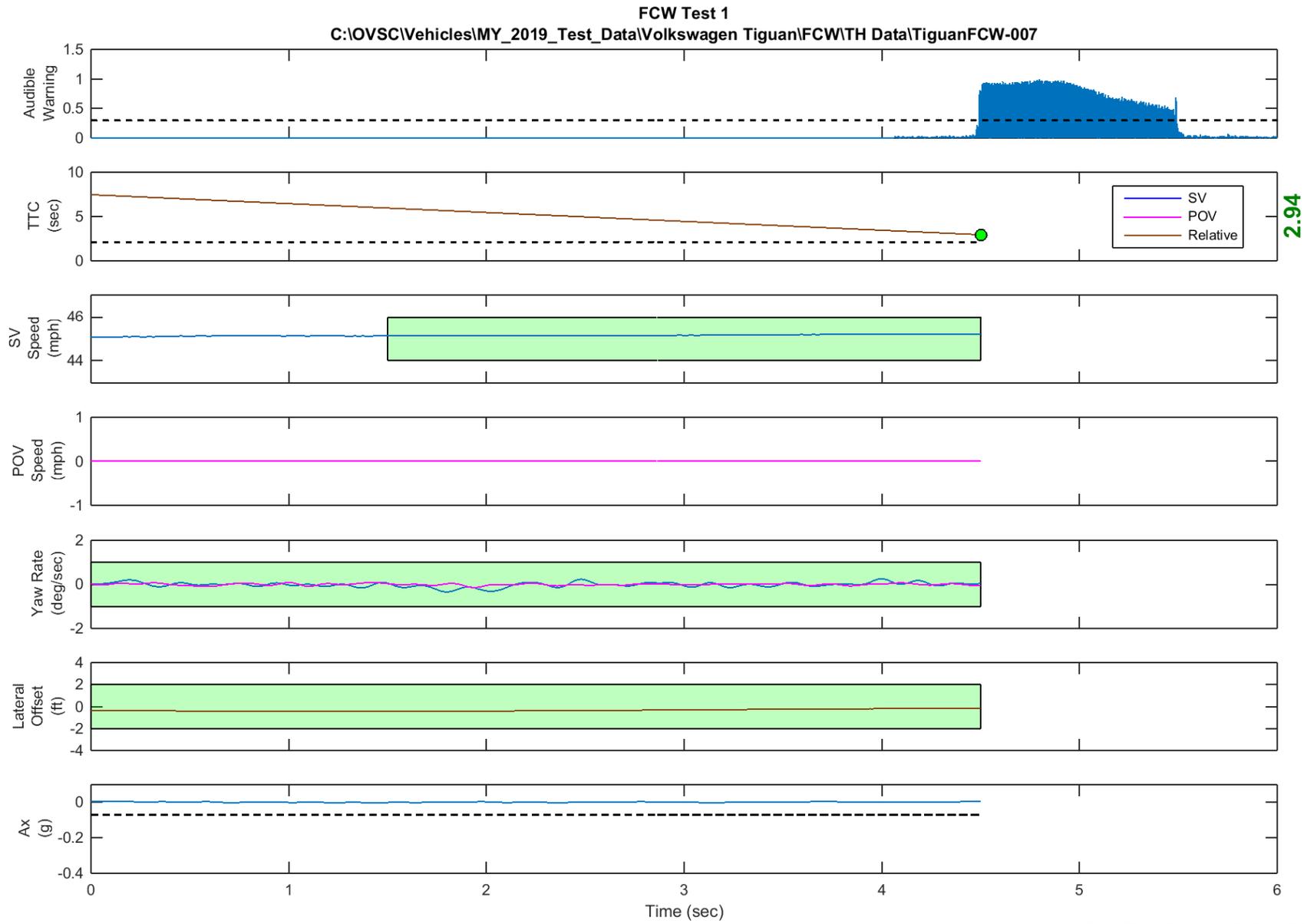
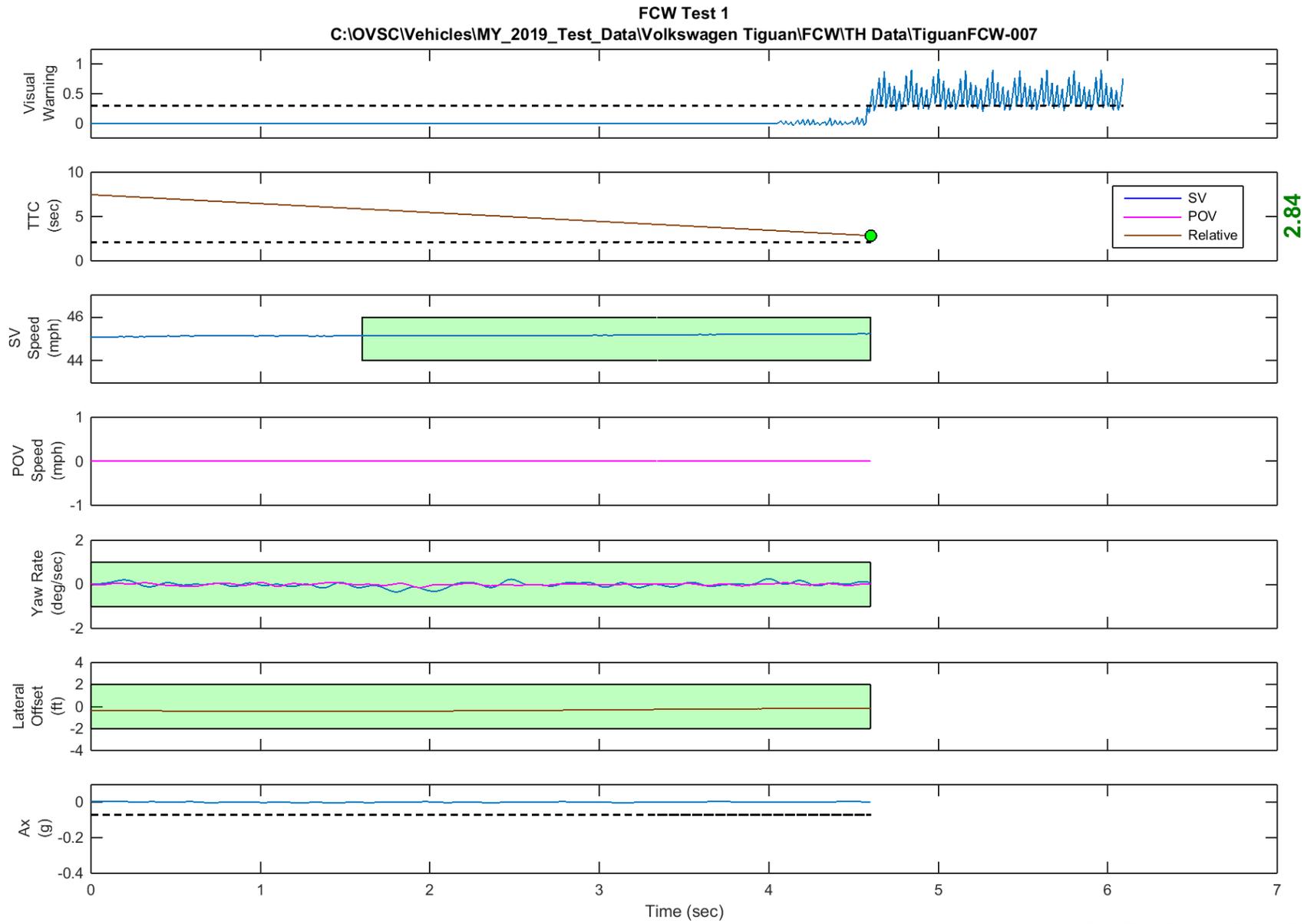


Figure D19. Time History for Run 7, FCW Test 1, Audible Warning



2.84

GPS Fix Type: RTK Fixed

Figure D20. Time History for Run 7, FCW Test 1, Visual Warning

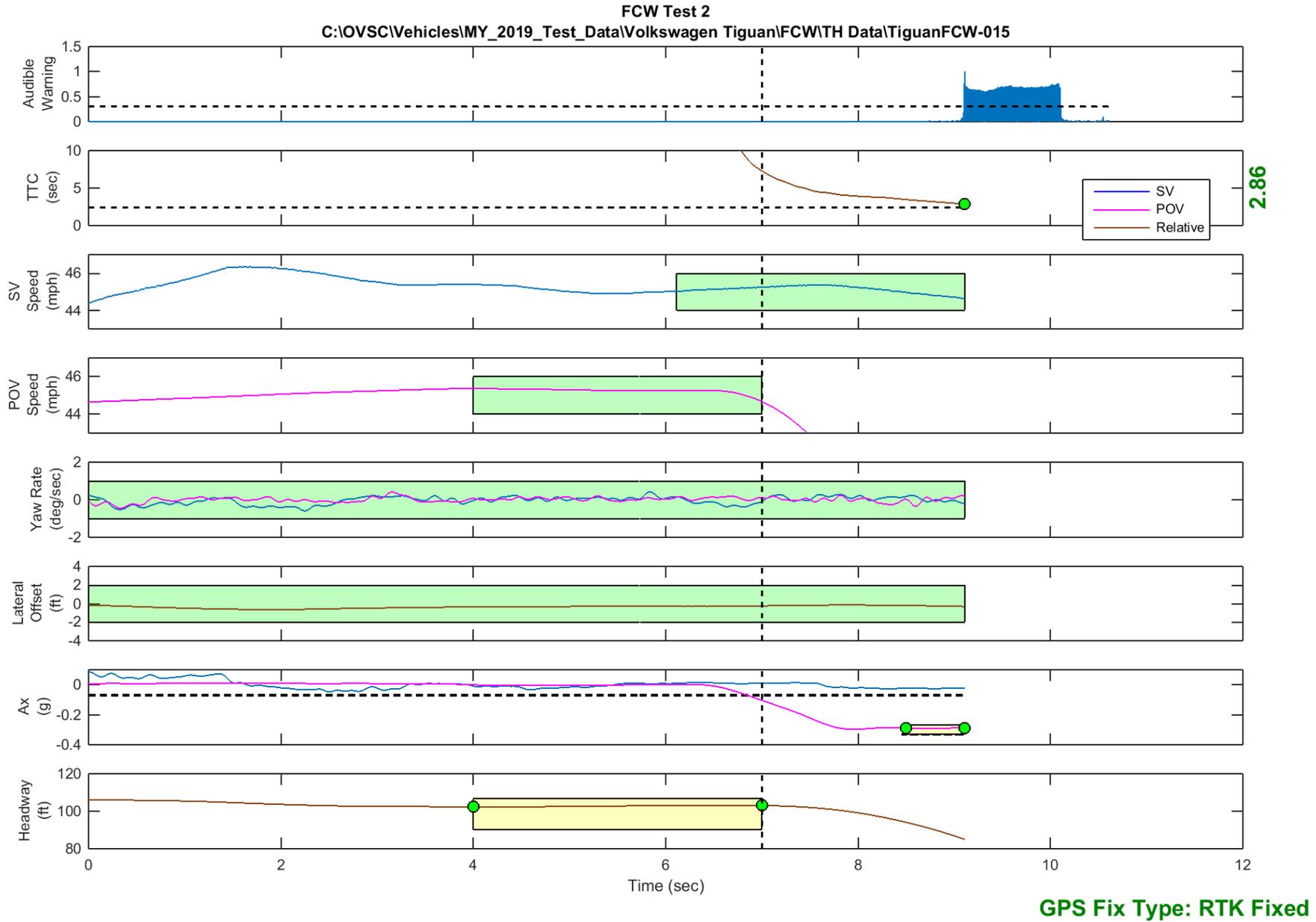


Figure D21. Time History for Run 15, FCW Test 2, Audible Warning

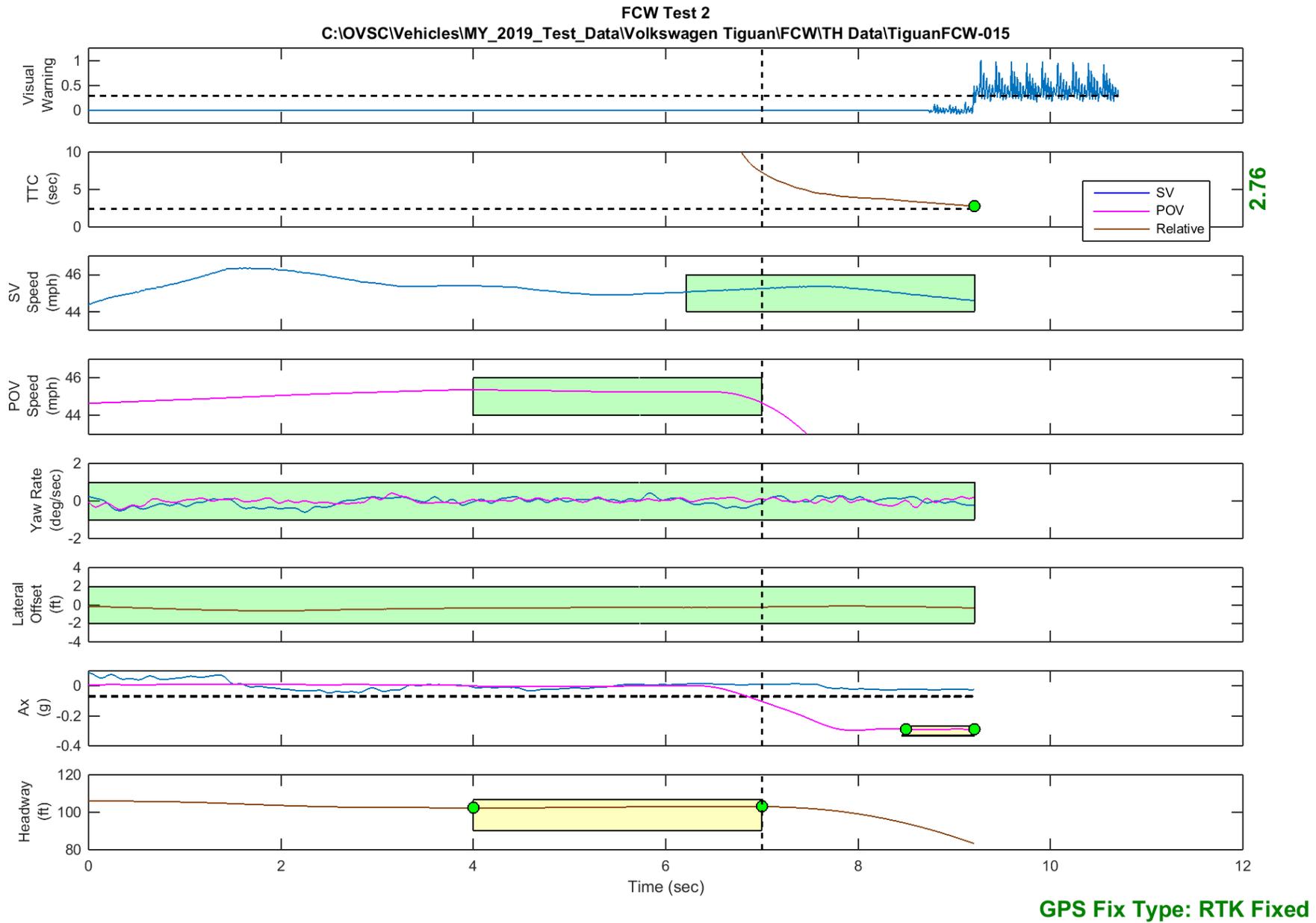


Figure D22. Time History for Run 15, FCW Test 2, Visual Warning

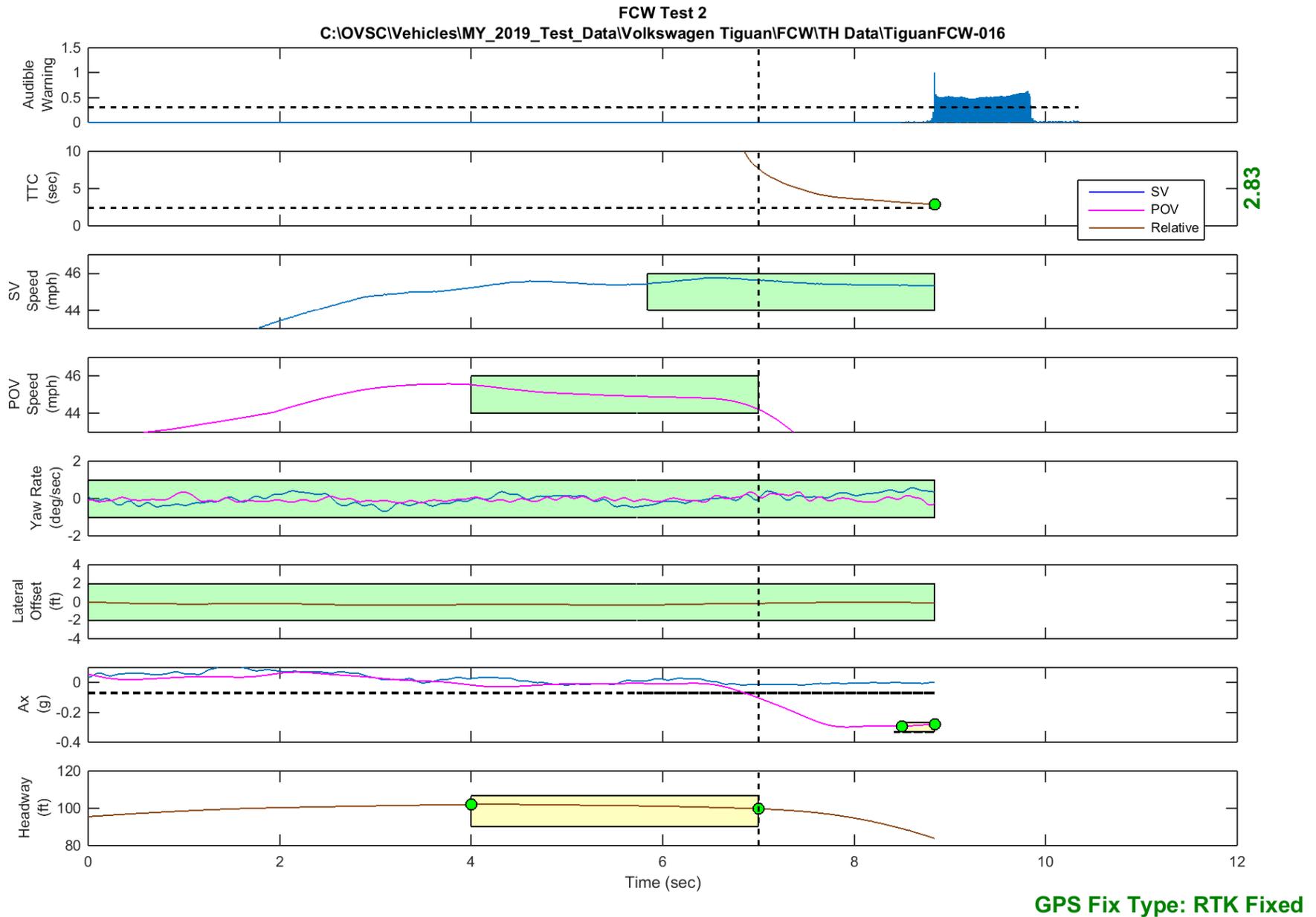
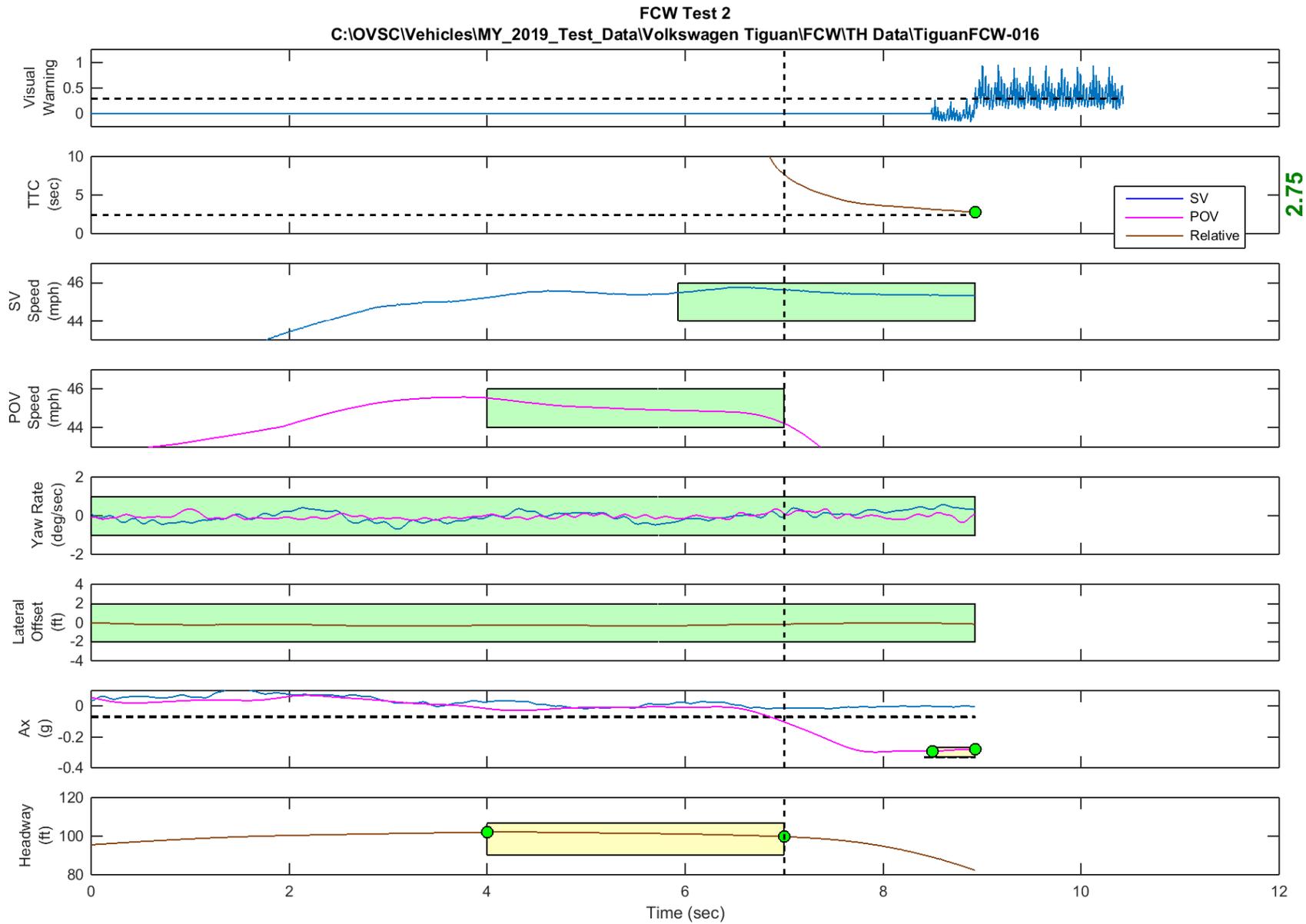
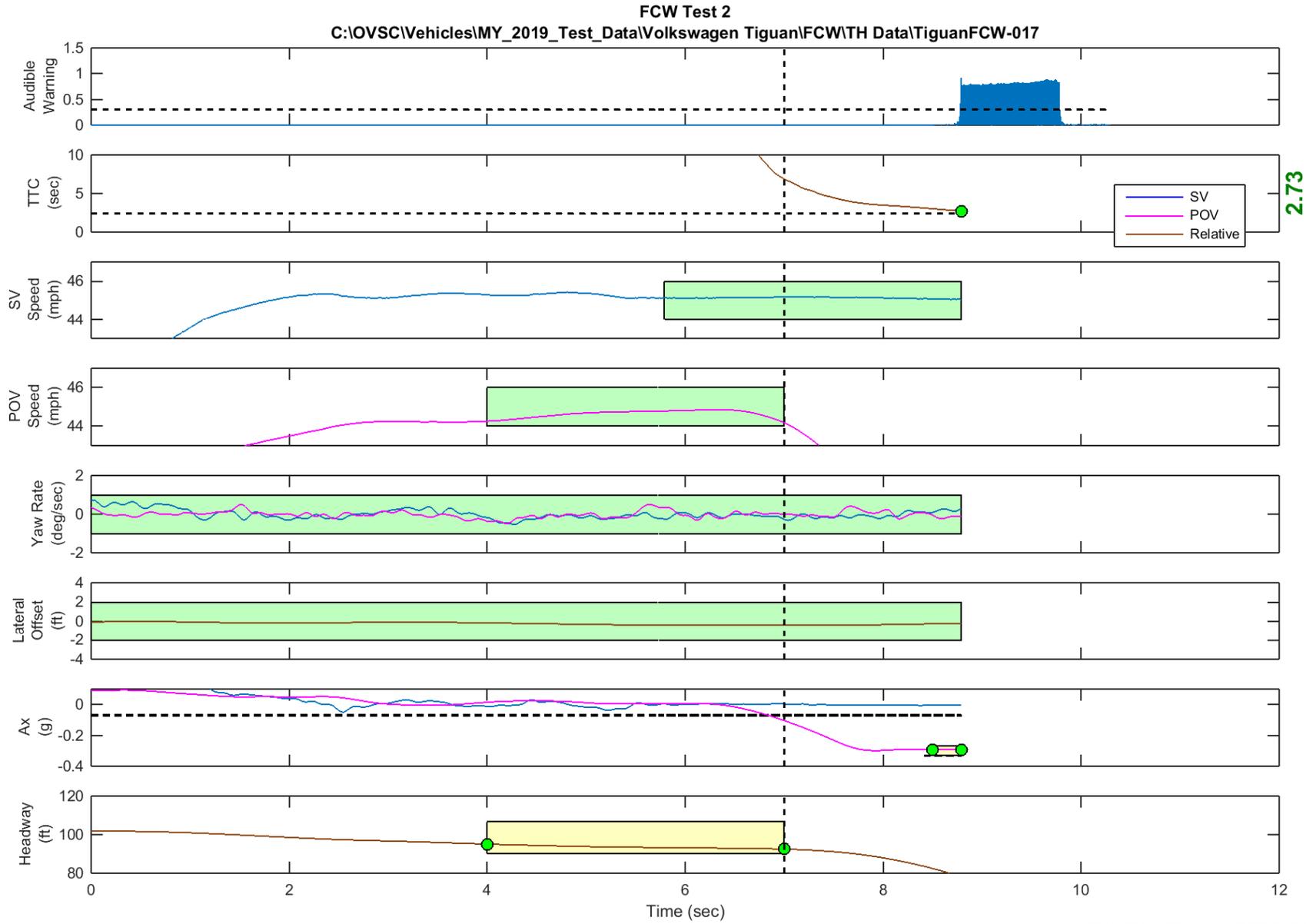


Figure D23. Time History for Run 16, FCW Test 2, Audible Warning



GPS Fix Type: RTK Fixed

Figure D24. Time History for Run 16, FCW Test 2, Visual Warning



GPS Fix Type: RTK Fixed

Figure D25. Time History for Run 17, FCW Test 2, Audible Warning

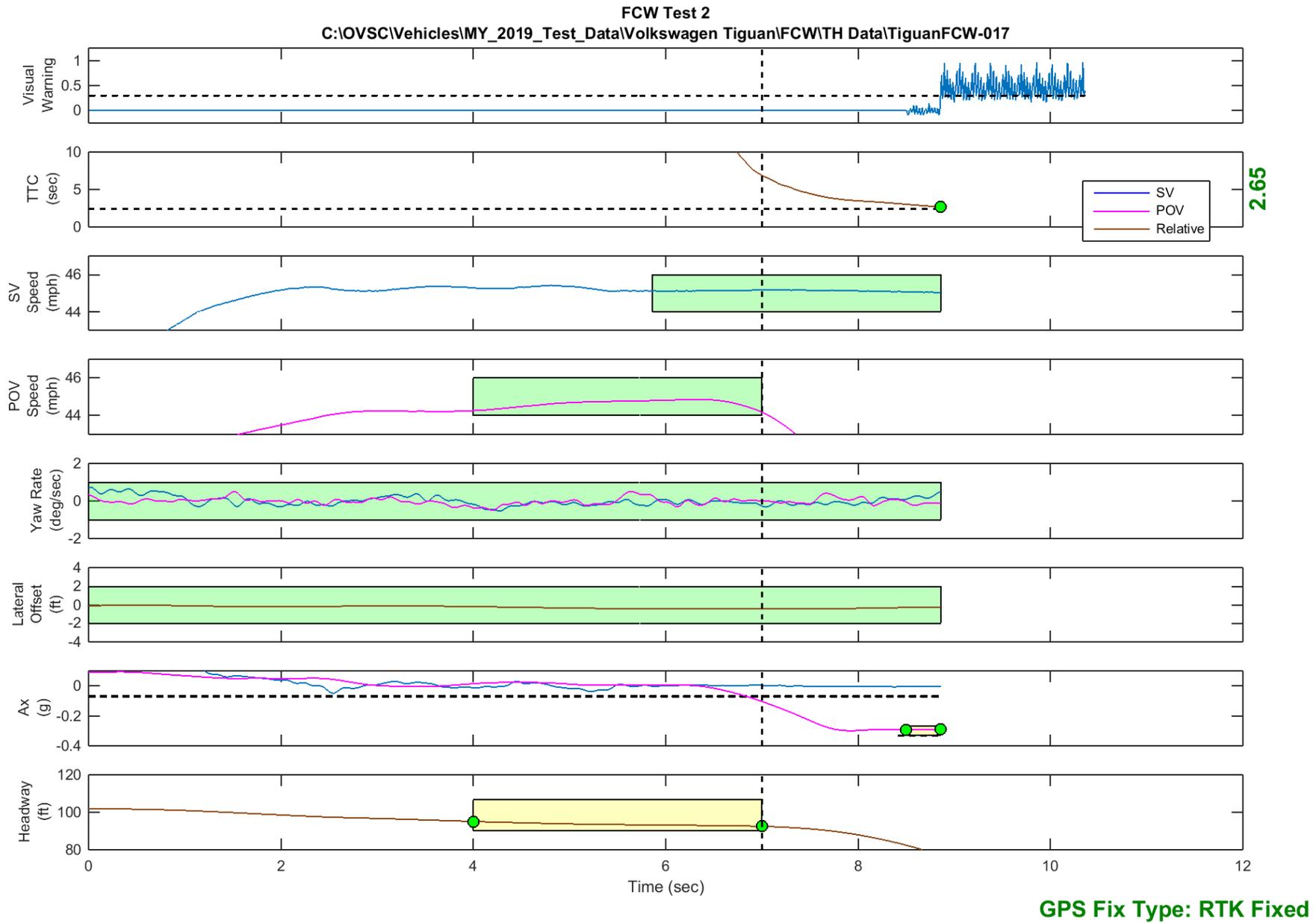
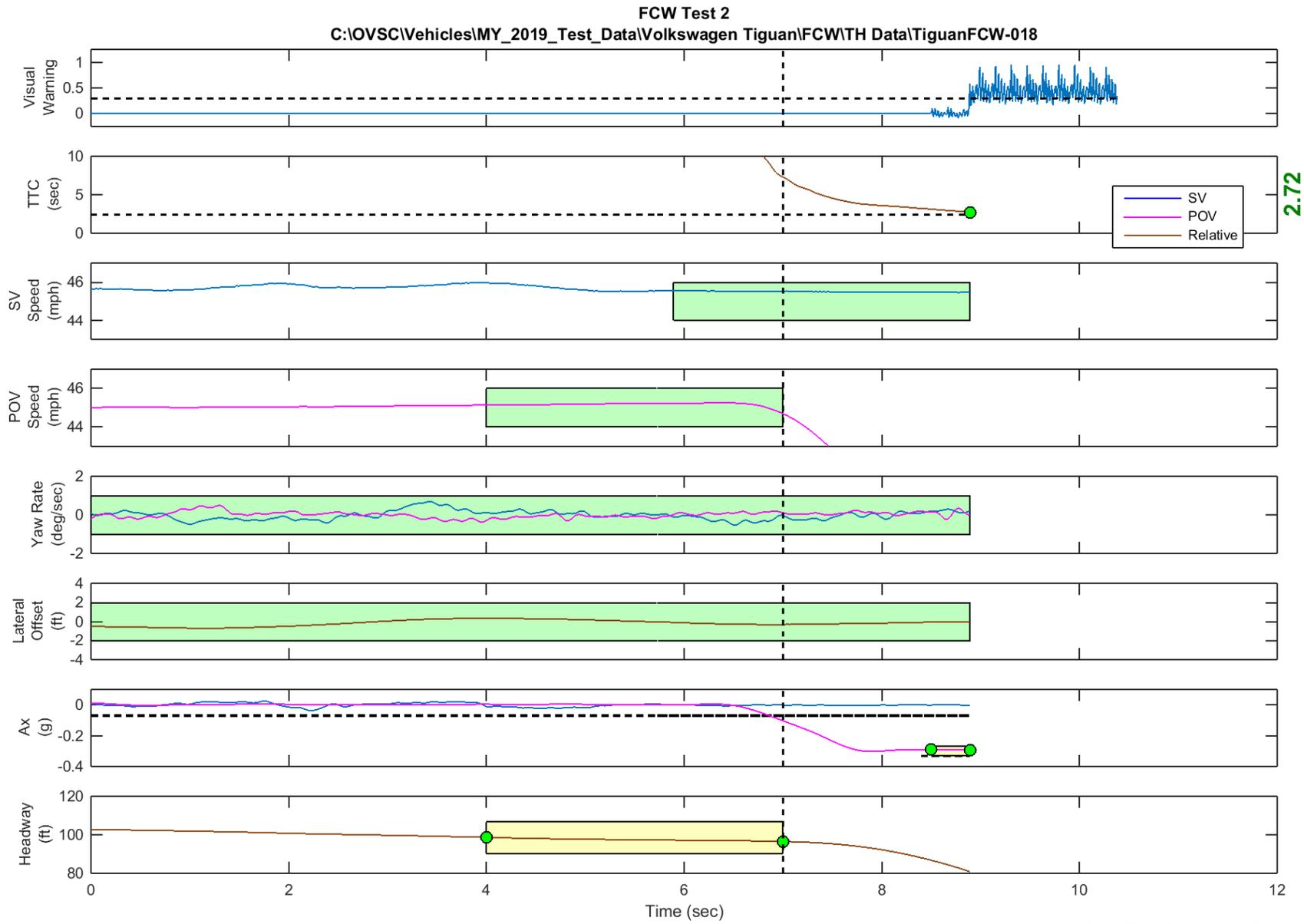


Figure D26. Time History for Run 17, FCW Test 2, Visual Warning





GPS Fix Type: RTK Fixed

Figure D28. Time History for Run 18, FCW Test 2, Visual Warning

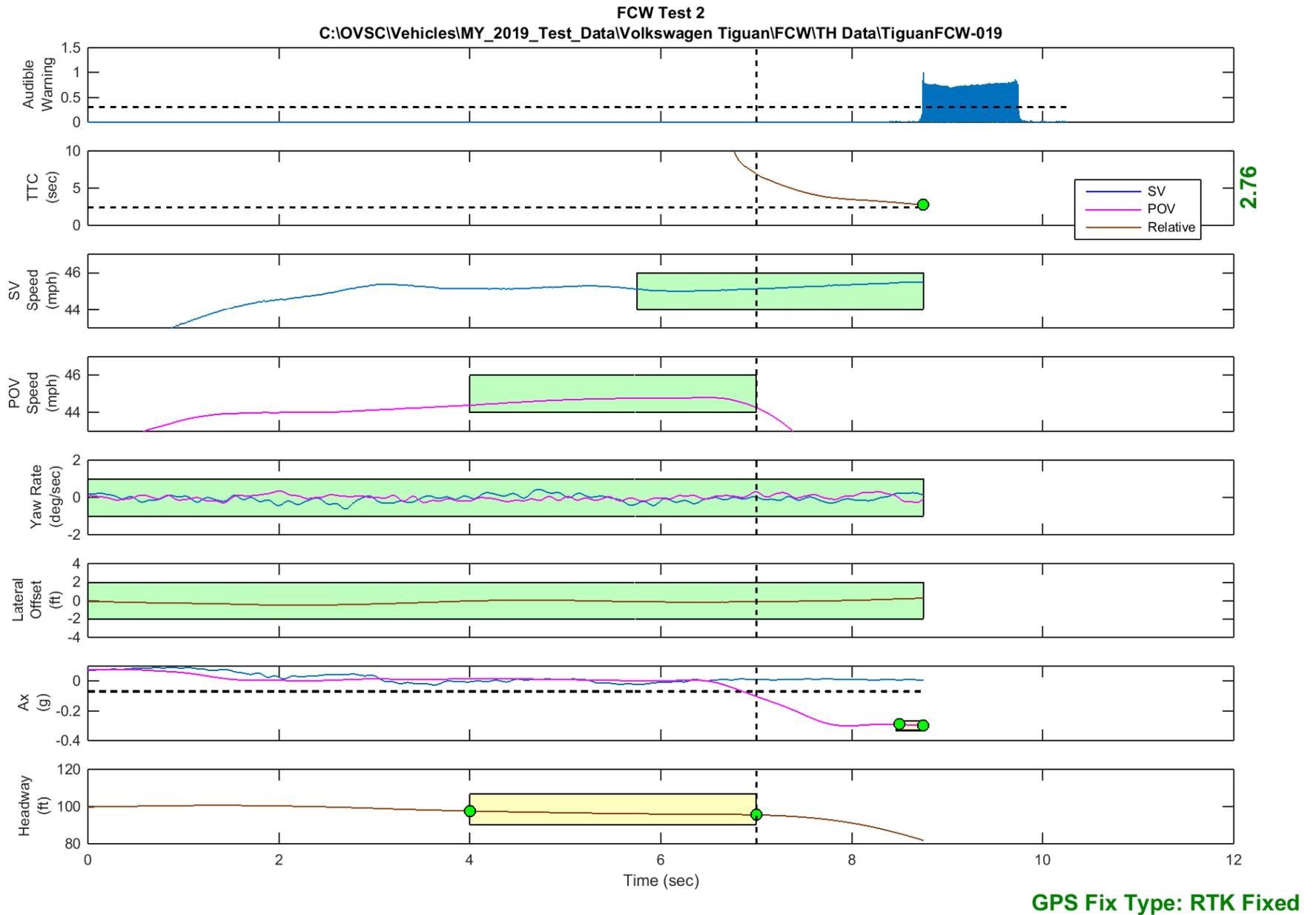


Figure D29. Time History for Run 19, FCW Test 2, Audible Warning

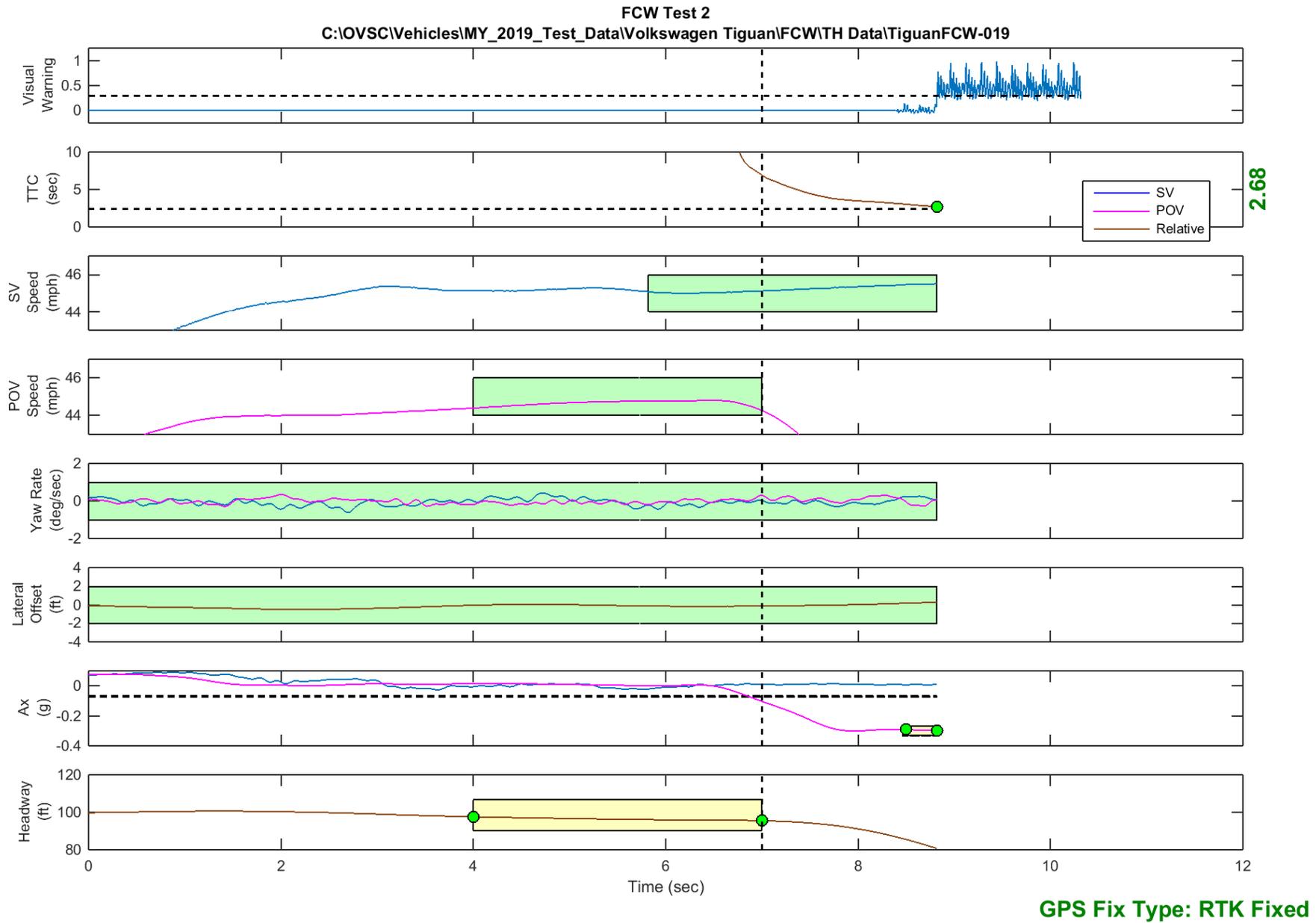


Figure D30. Time History for Run 19, FCW Test 2, Visual Warning

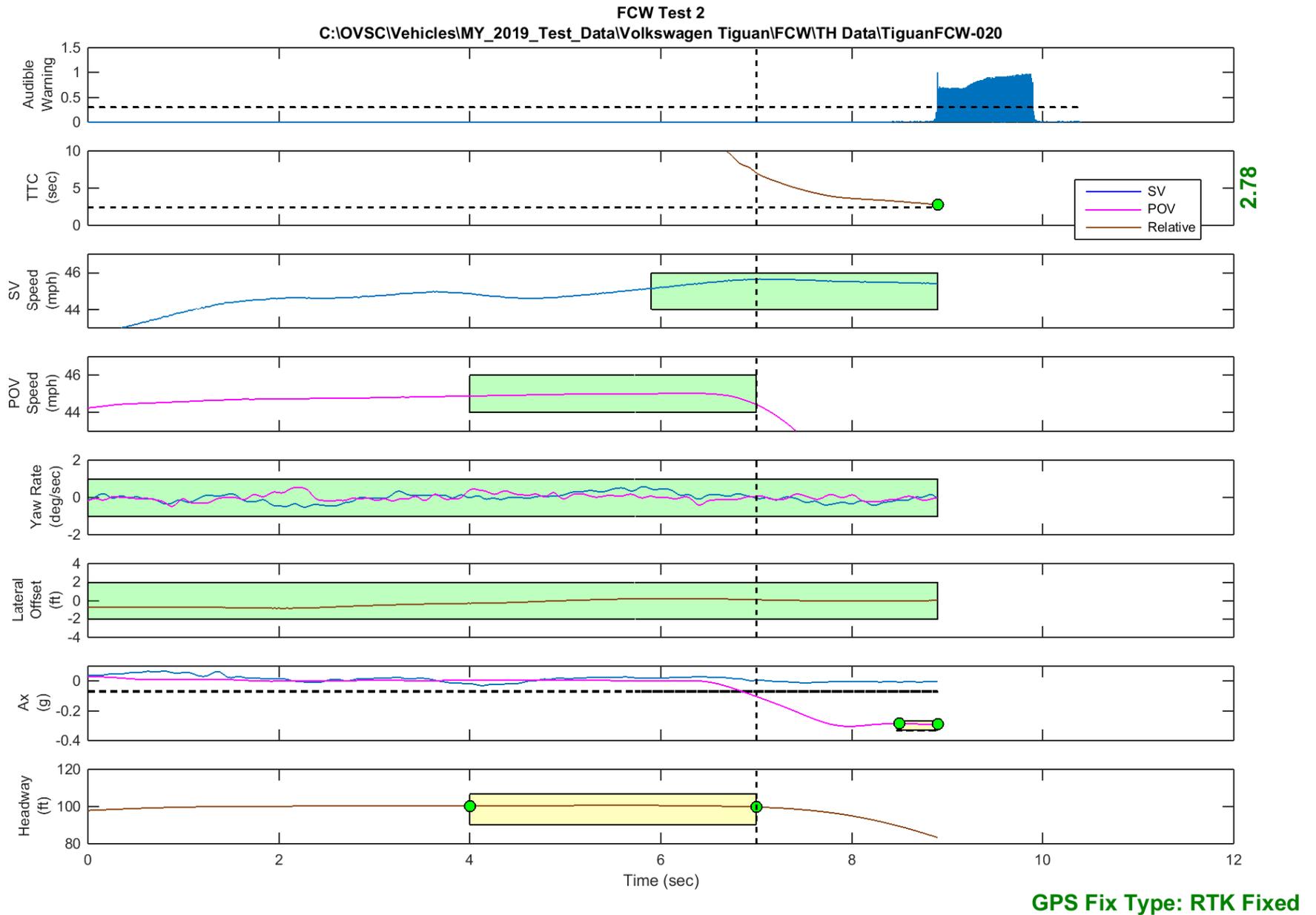


Figure D31. Time History for Run 20, FCW Test 2, Audible Warning

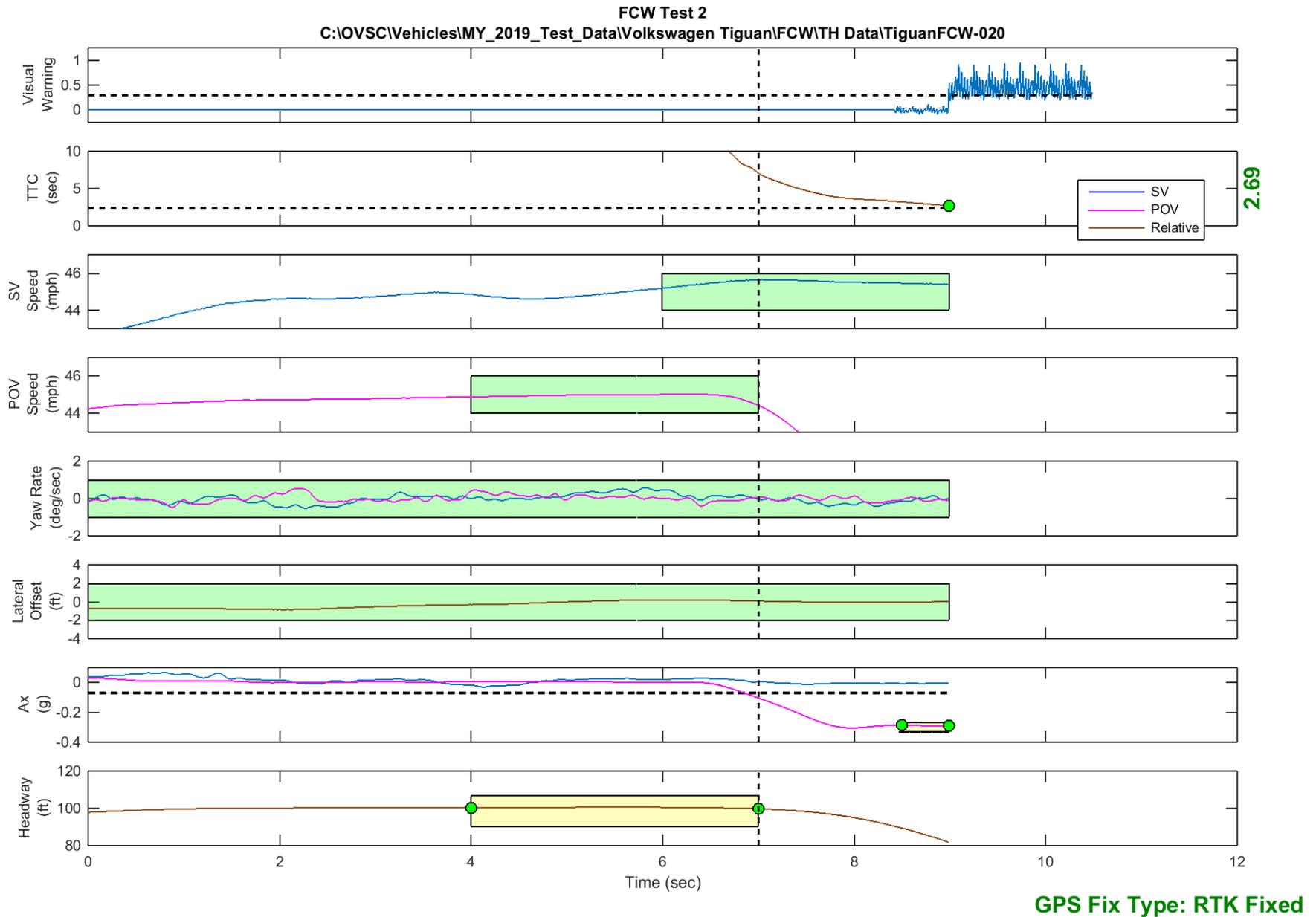


Figure D32. Time History for Run 20, FCW Test 2, Visual Warning

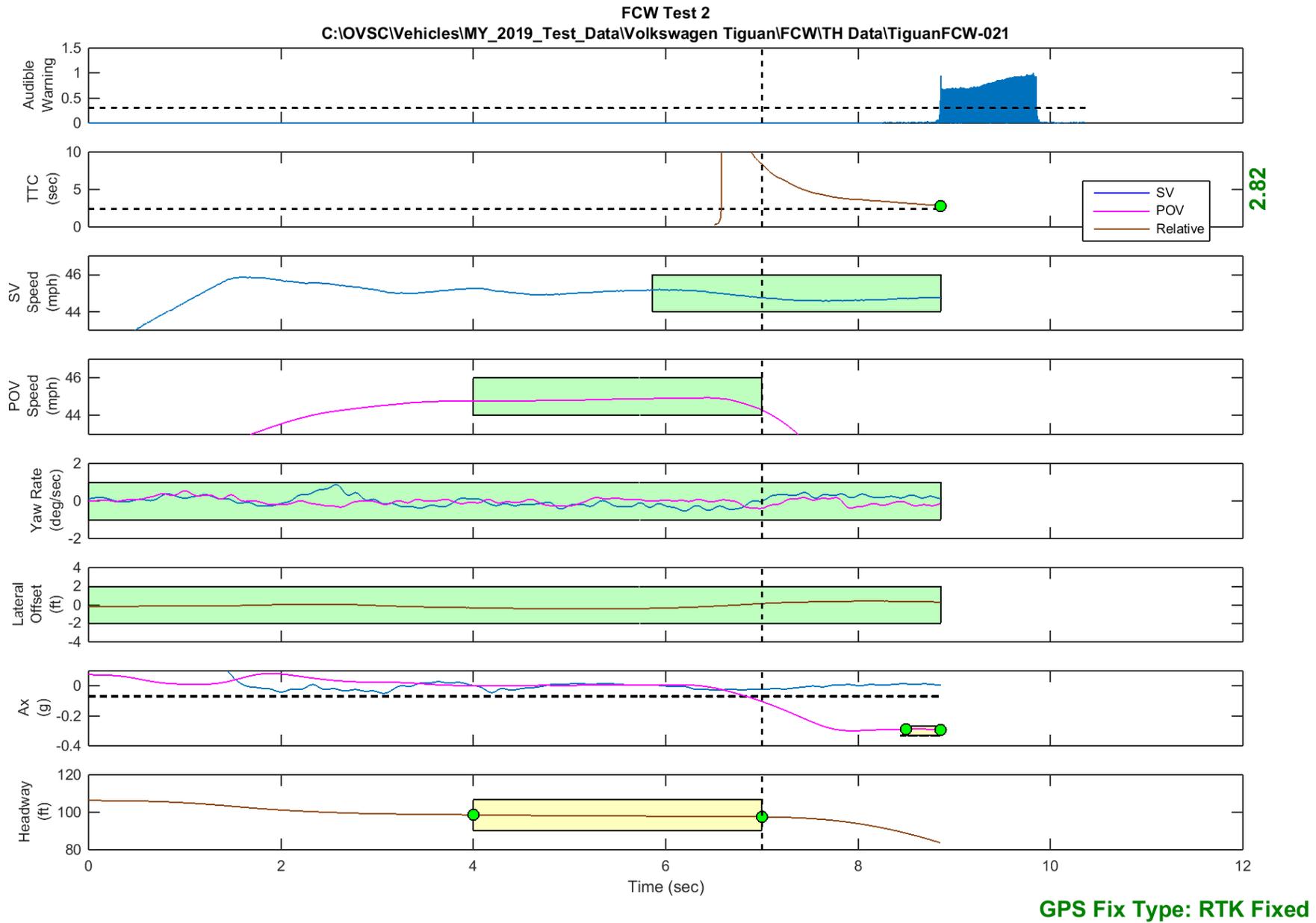
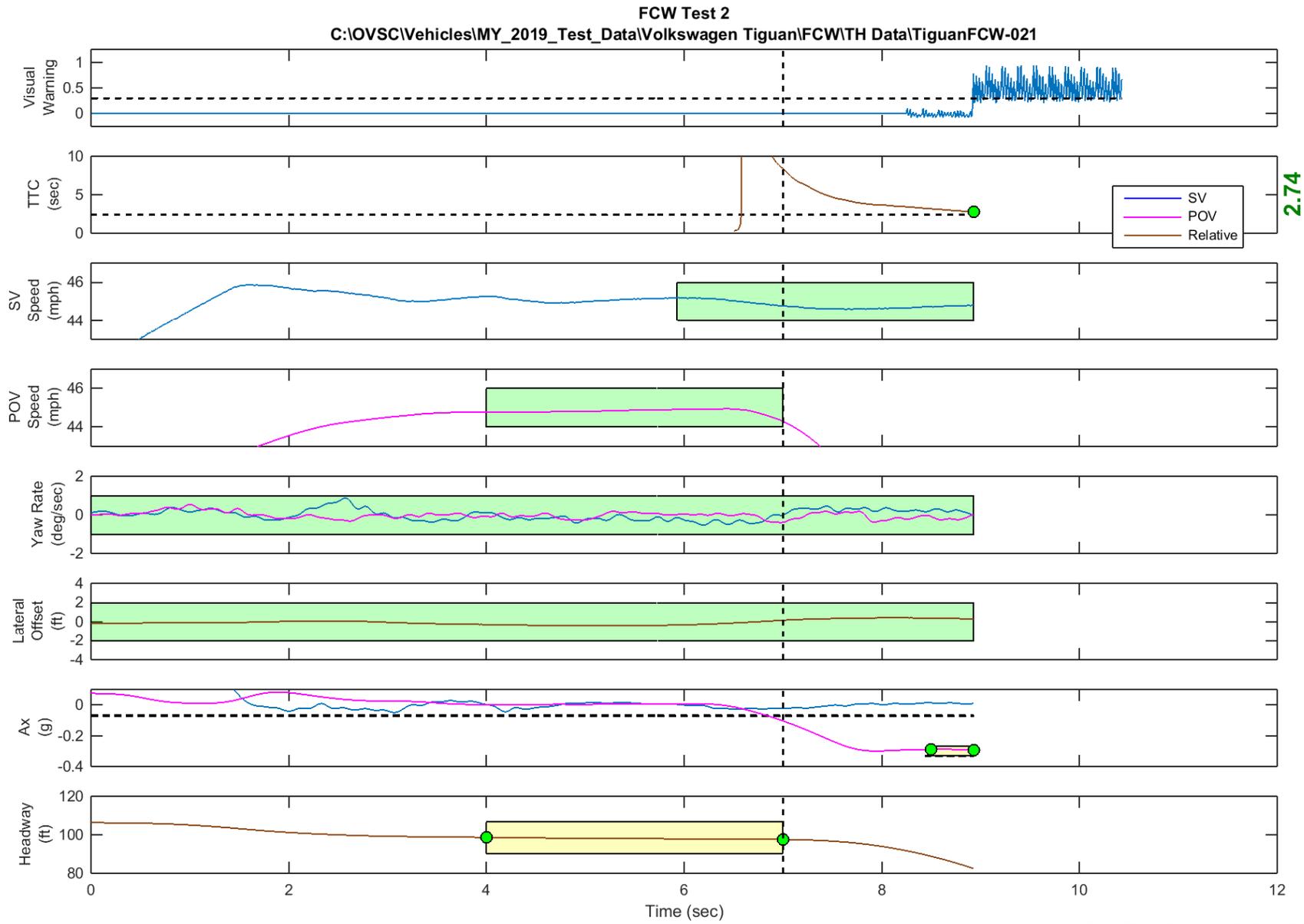
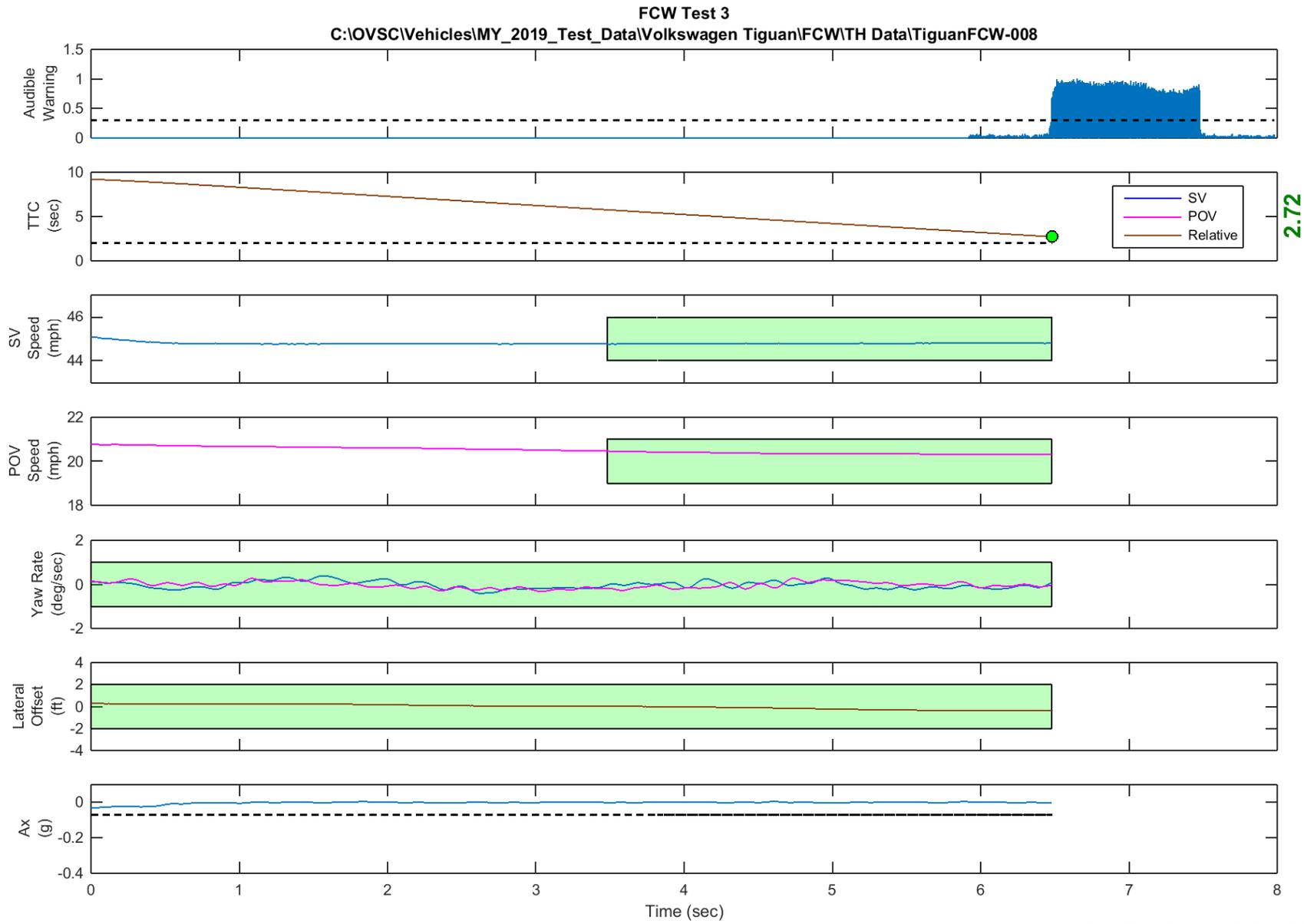


Figure D33. Time History for Run 21, FCW Test 2, Audible Warning



GPS Fix Type: RTK Fixed

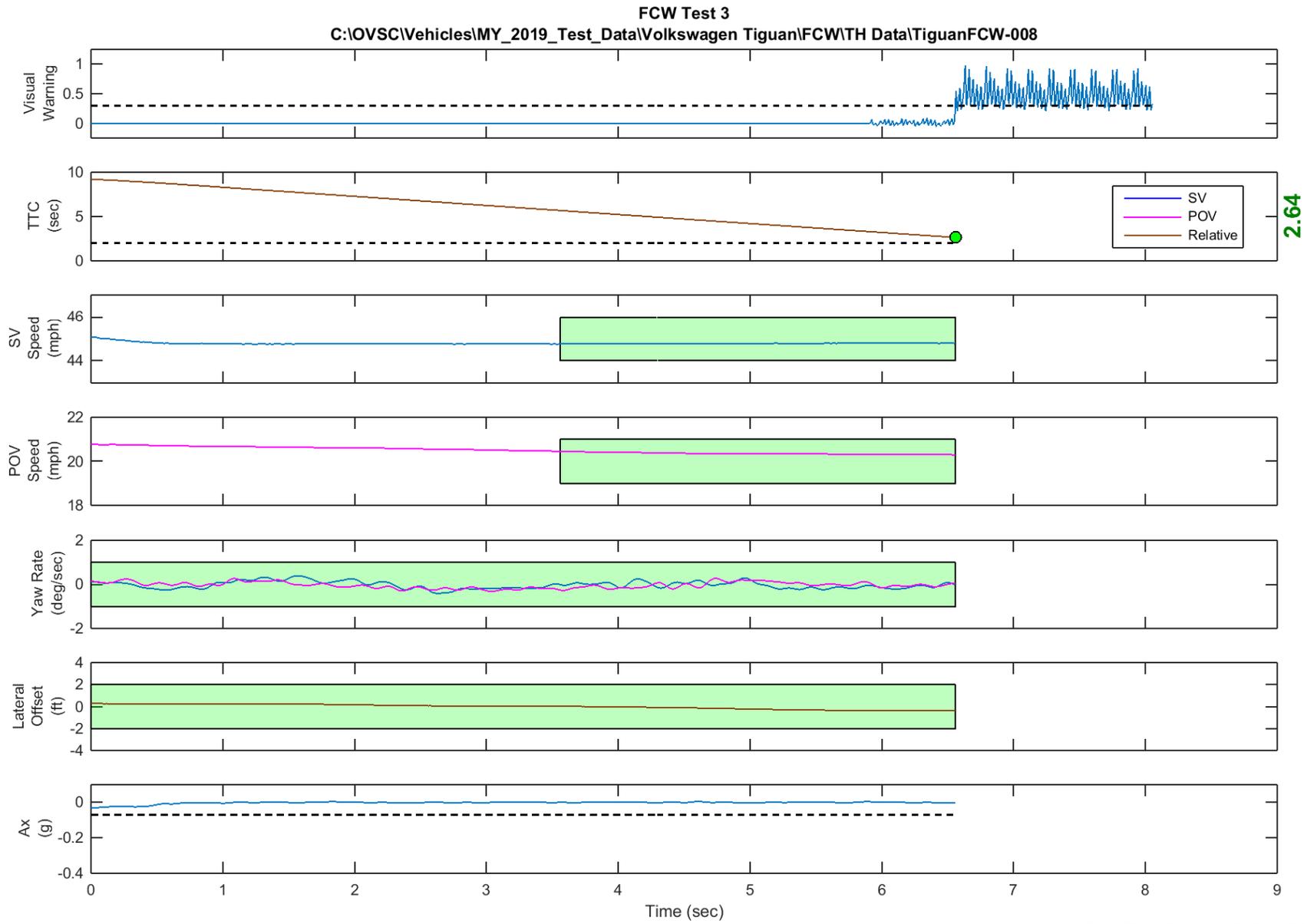
Figure D34. Time History for Run 21, FCW Test 2, Visual Warning



2.72

GPS Fix Type: RTK Fixed

Figure D35. Time History for Run 8, FCW Test 3, Audible Warning



GPS Fix Type: RTK Fixed

Figure D36. Time History for Run 8, FCW Test 3, Visual Warning

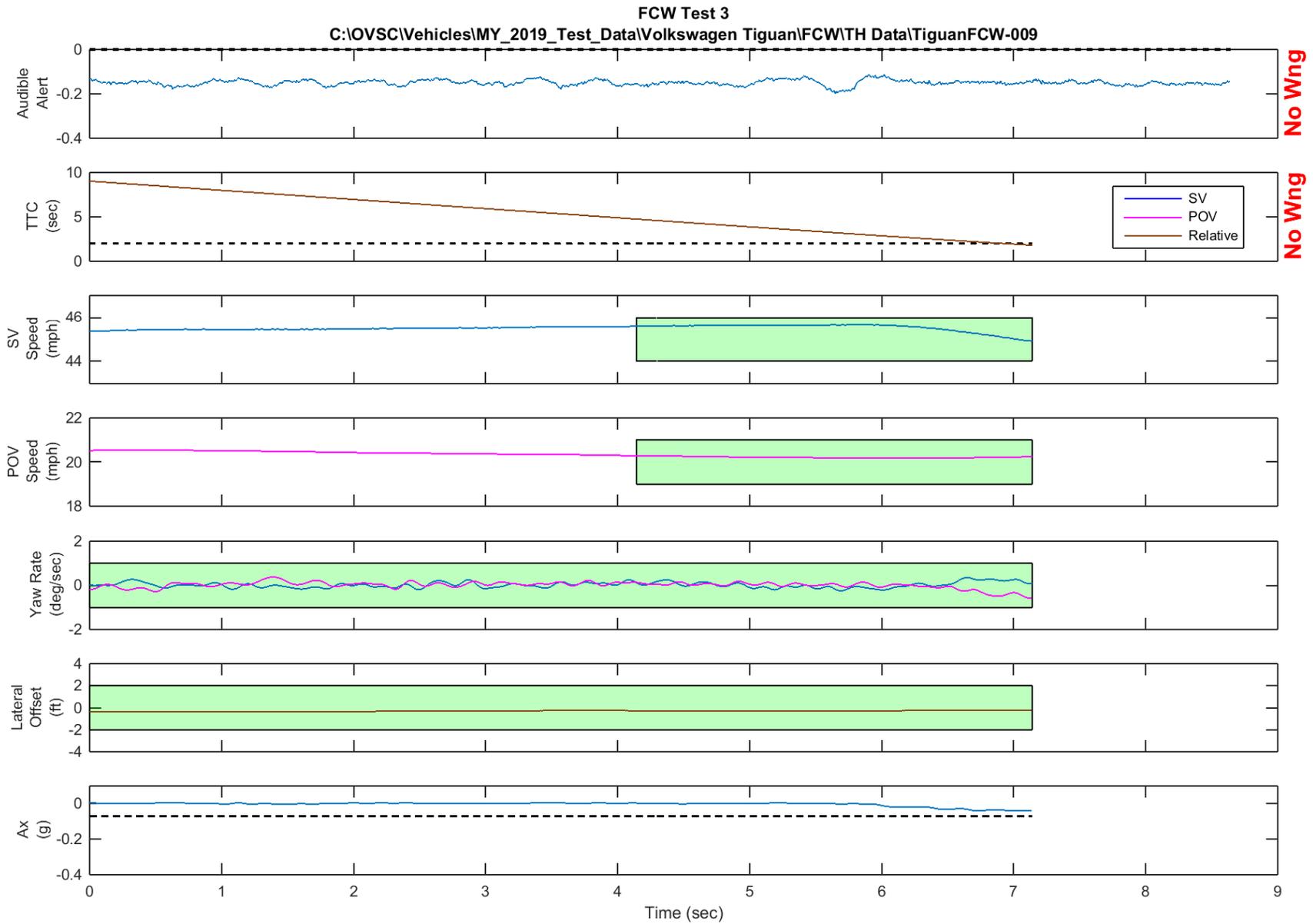
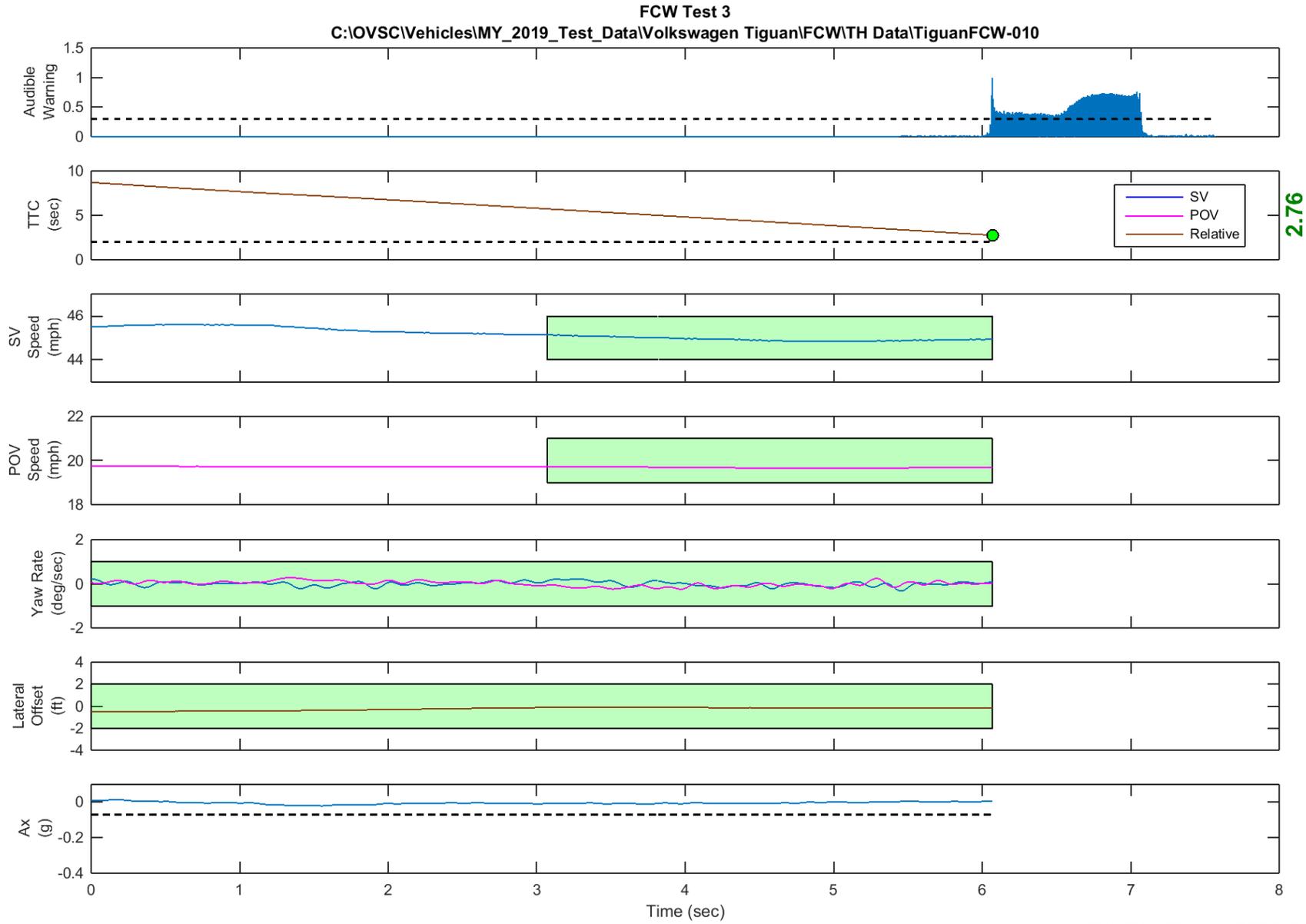


Figure D37. Time History for Run 9, FCW Test 3, No Warning



GPS Fix Type: RTK Fixed

Figure D38. Time History for Run 10, FCW Test 3, Audible Warning

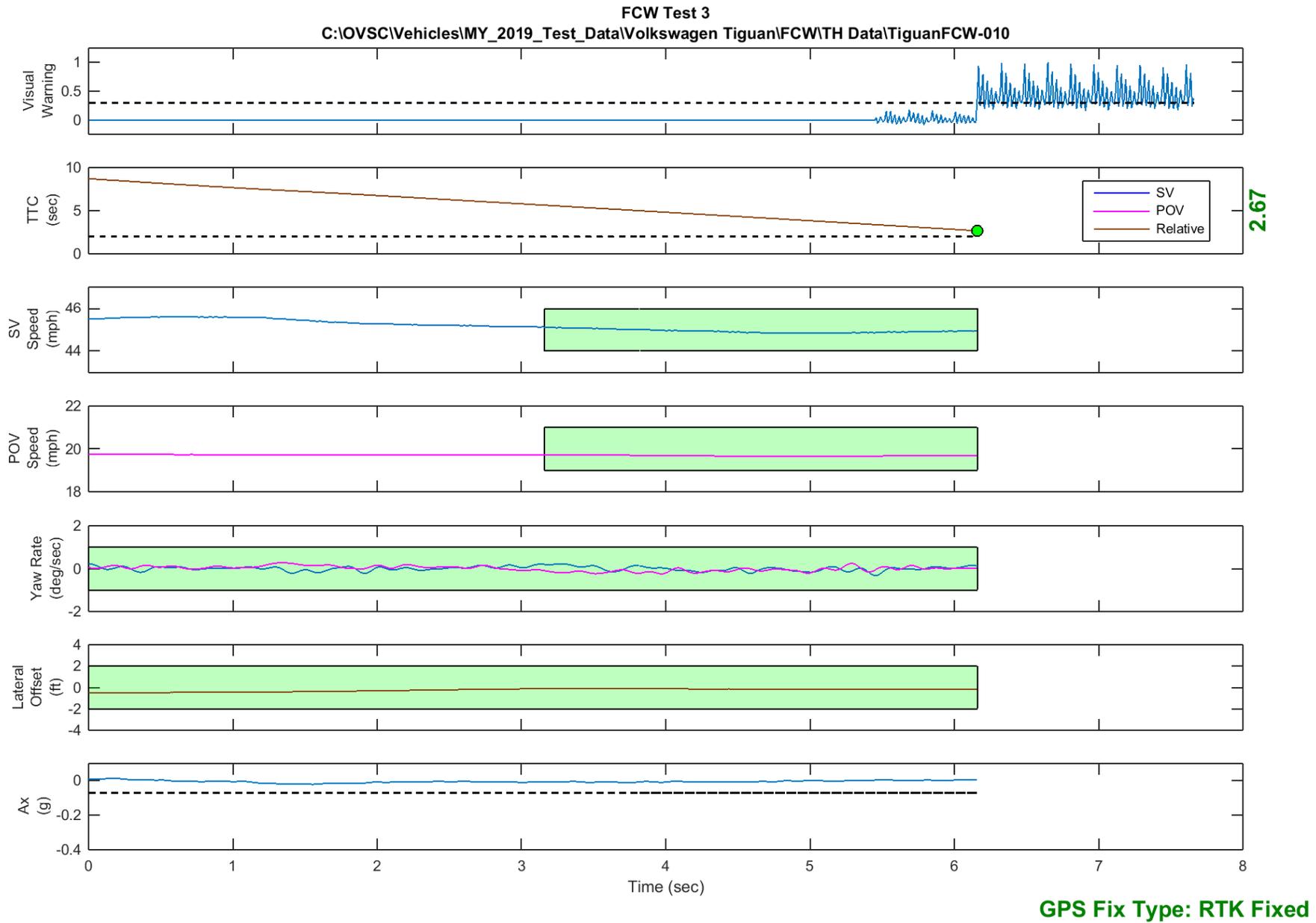


Figure D39. Time History for Run 10, FCW Test 3, Visual Warning

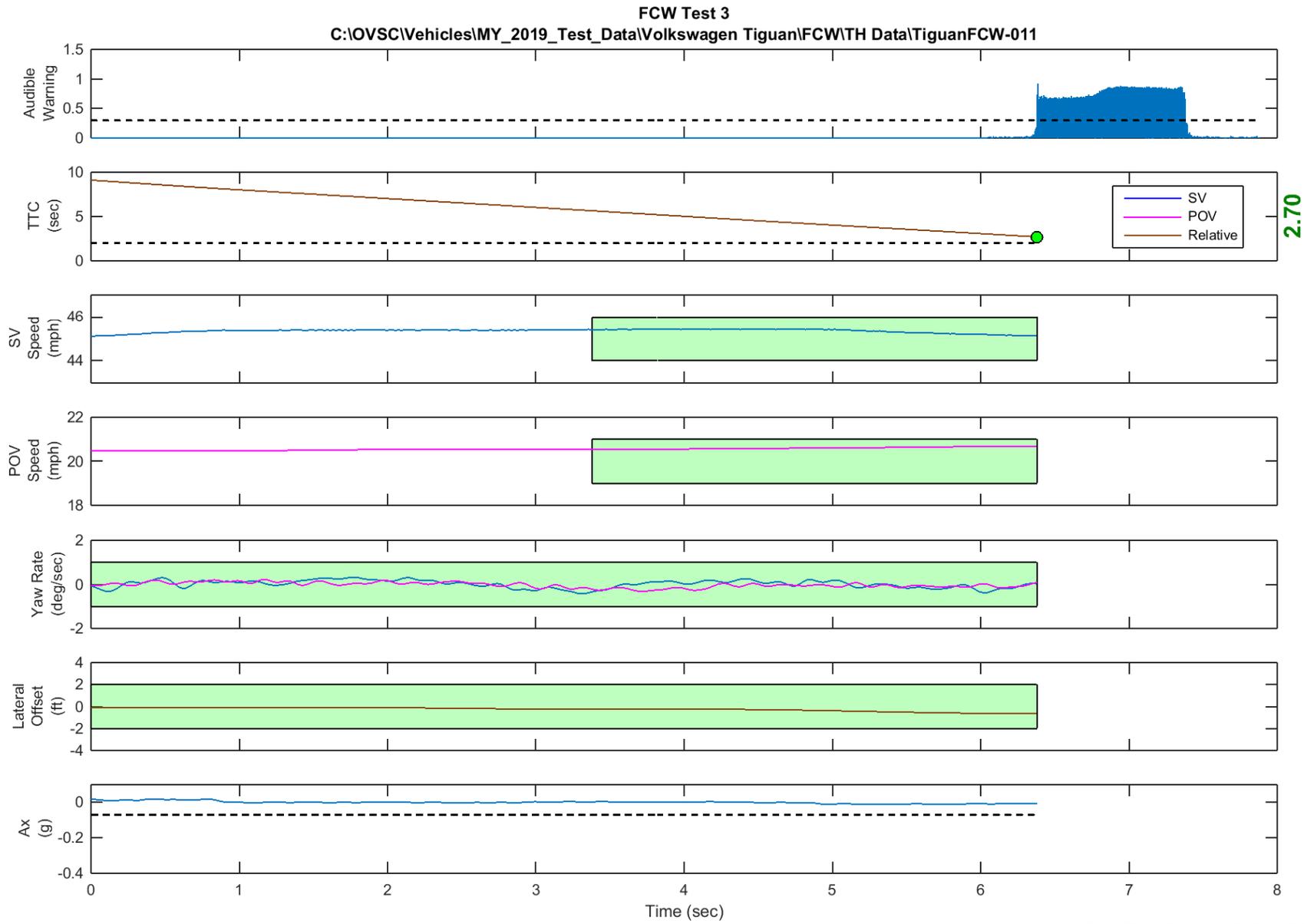


Figure D40. Time History for Run 11, FCW Test 3, Audible Warning

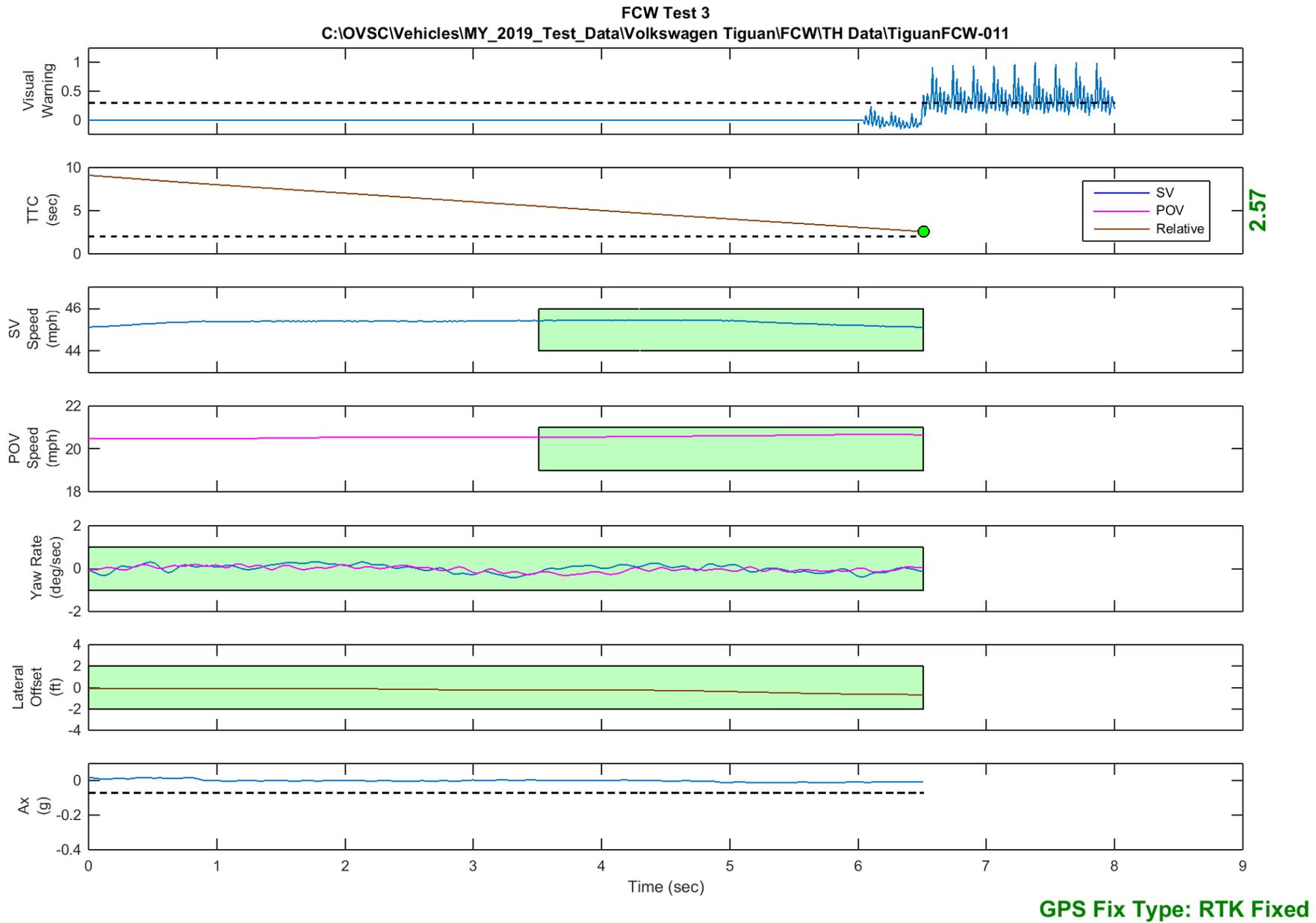
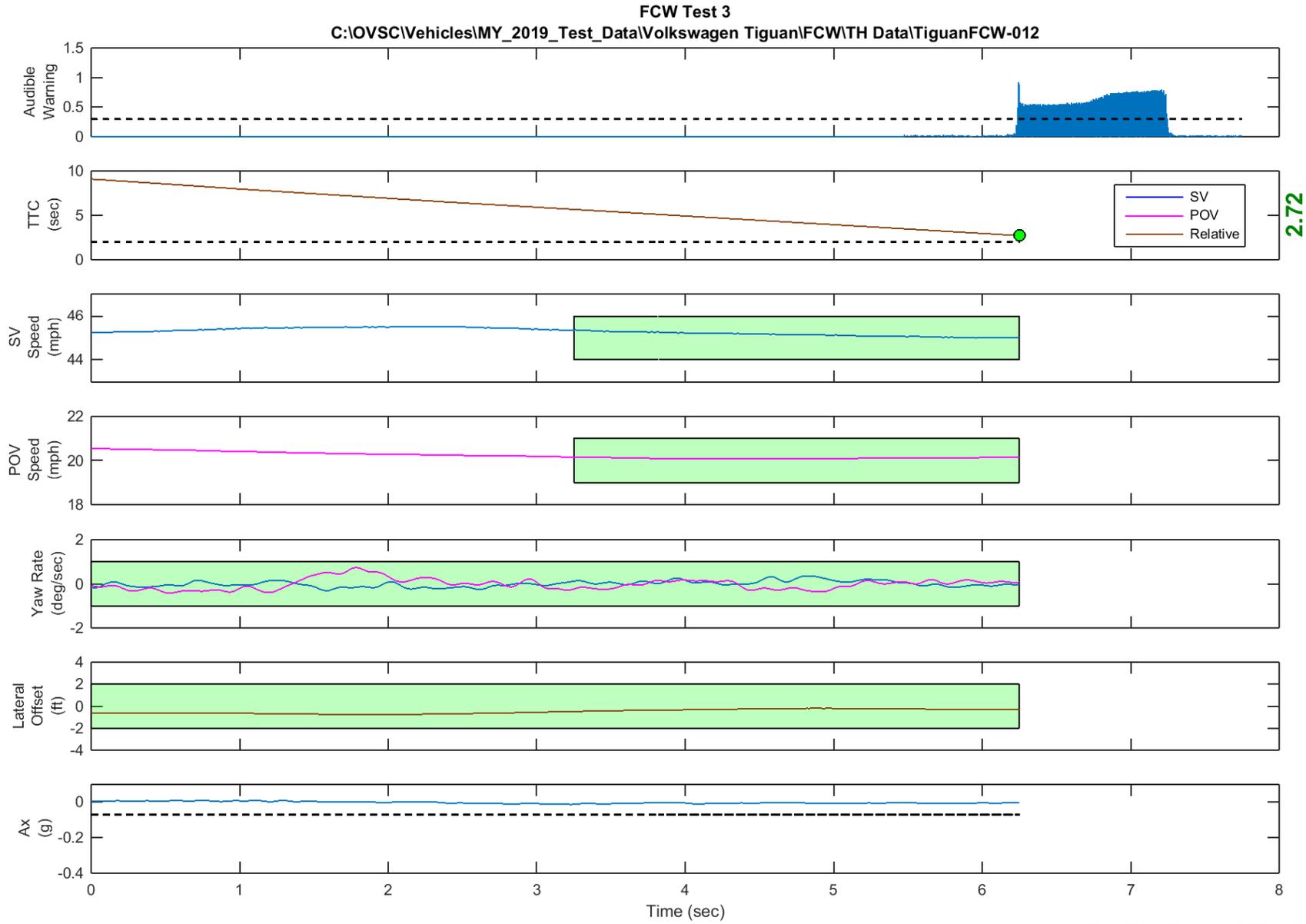


Figure D41. Time History for Run 11, FCW Test 3, Visual Warning



GPS Fix Type: RTK Fixed

Figure D42. Time History for Run 12, FCW Test 3, Audible Warning

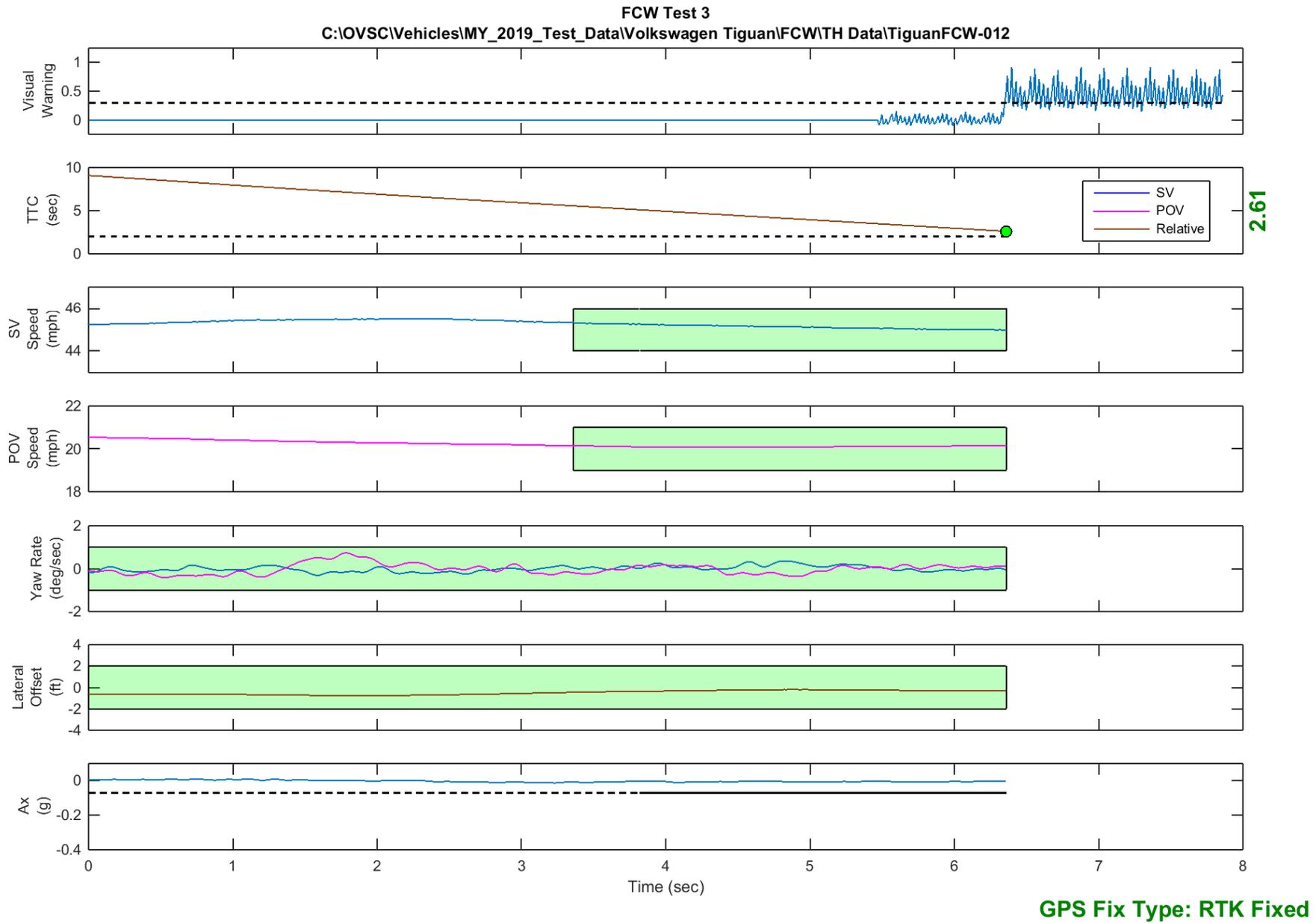
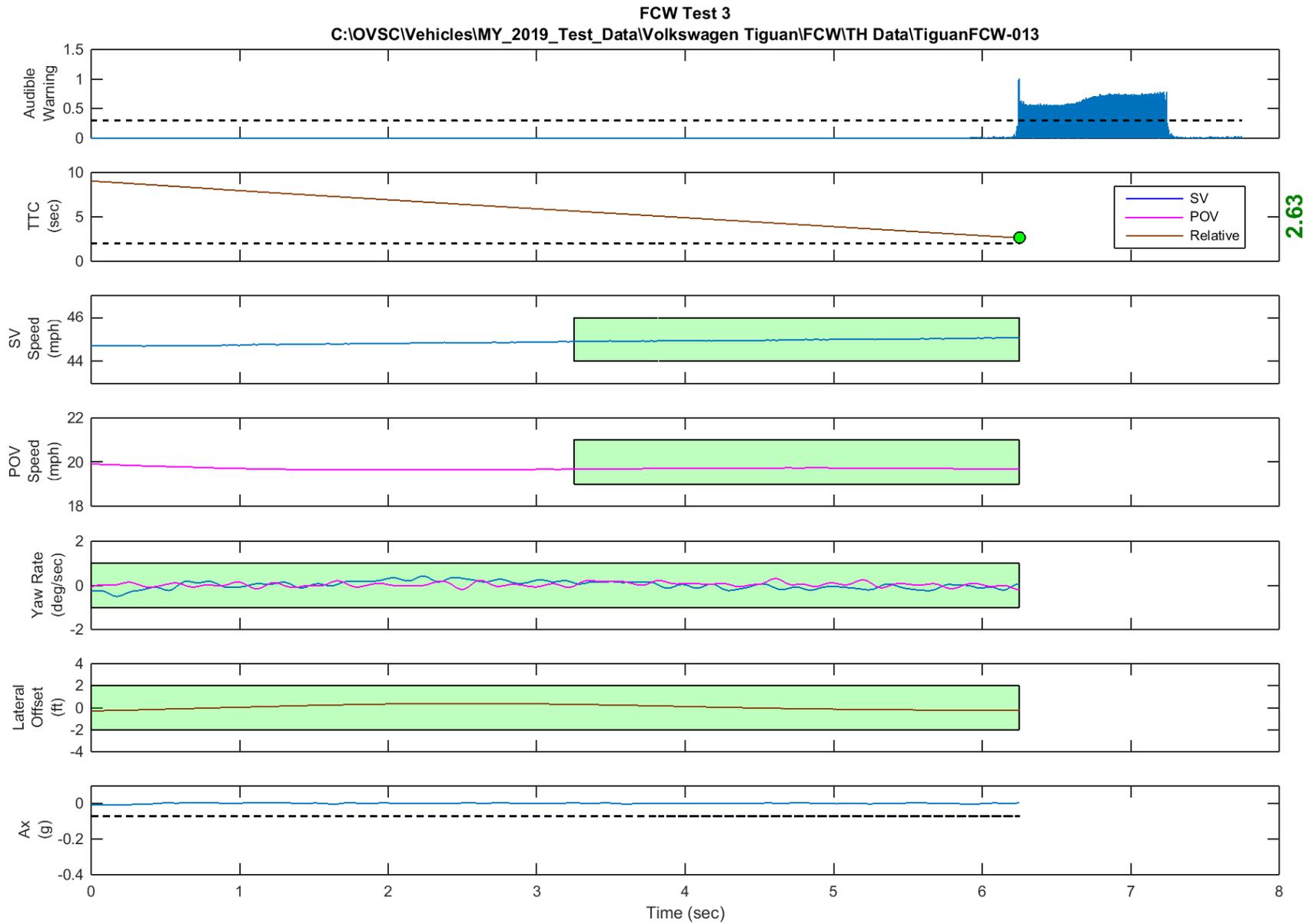


Figure D43. Time History for Run 12, FCW Test 3, Visual Warning



2.63

GPS Fix Type: RTK Fixed

Figure D44. Time History for Run 13, FCW Test 3, Audible Warning

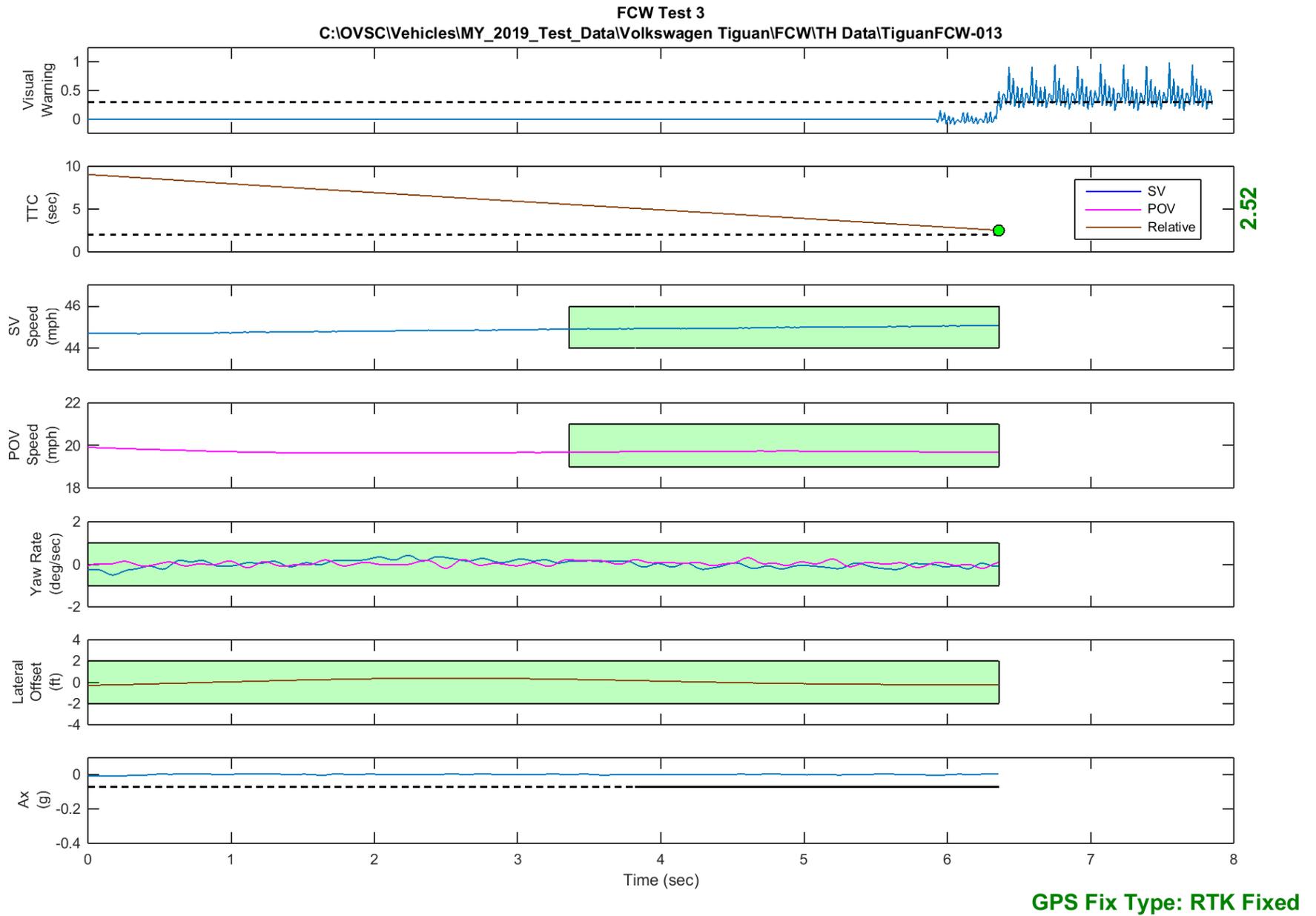
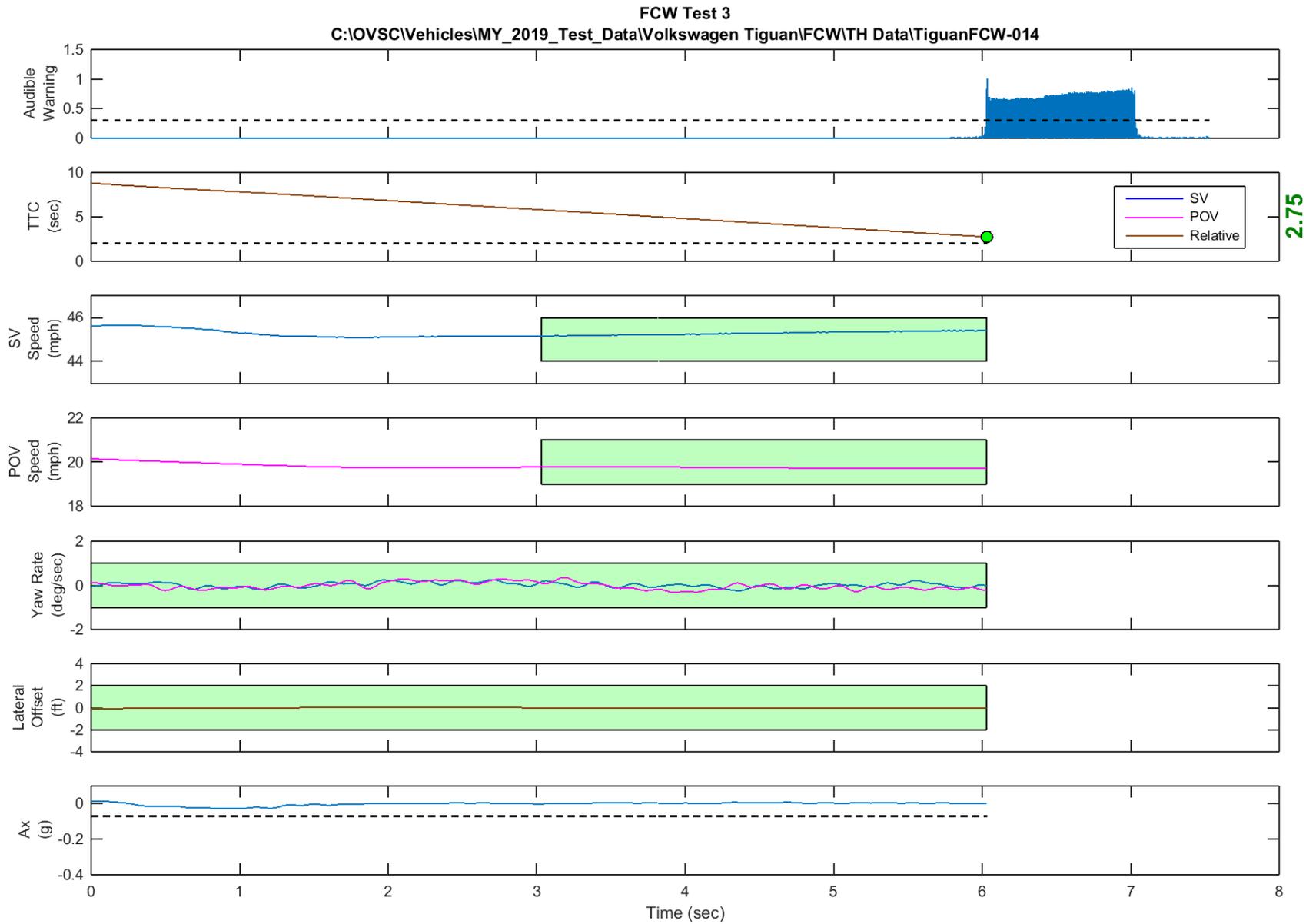


Figure D45. Time History for Run 13, FCW Test 3, Visual Warning



GPS Fix Type: RTK Fixed

Figure D46. Time History for Run 14, FCW Test 3, Audible Warning

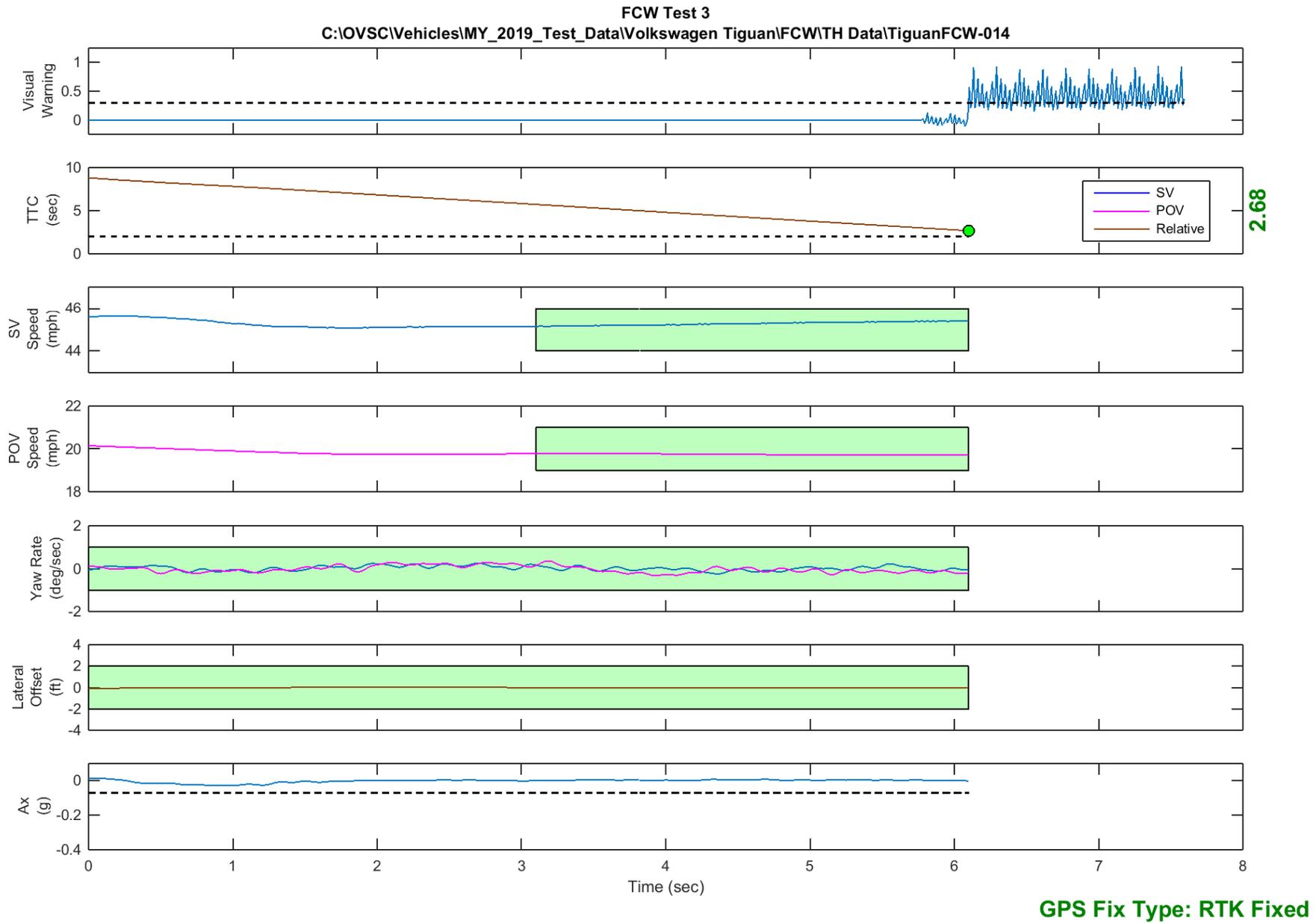


Figure D47. Time History for Run 14, FCW Test 3, Visual Warning