



Air Induction System Inlet (Snorkel) Sound Pressure Level (SPL) Evaluation Procedure

1 Introduction

Note: Nothing in this standard supercedes applicable laws and regulations.

Note: In the event of conflict between the English and domestic language, the English language shall take precedence.

1.1 Purpose. To record Air Induction System (AIS) inlet (snorkel) noise for the purpose of validation of the induction system noise performance requirement in the Air Induction System Subsystem Technical System (SSTS) when testing on a full vehicle chassis dynamometer. Provide subsystem data for use in developing a vehicle to meet exterior noise regulations (pass-by). To provide subsystem data for use in developing a vehicle to meet vehicle level interior noise levels during a drive-away wide open throttle event.

1.2 Applicability. This test procedure is appropriate for use with all cars and trucks.

1.3 Remarks. Air induction inlet (snorkel) noise is an important factor in the level of pass-by noise as well as interior noise.

2 References

Note: Only the latest approved standards are applicable unless otherwise specified.

2.1 External Standards/Specifications.

ANSI/ASA S1.4 Part 1

2.2 GM Standards/Specifications.

GMW14007

GMW14225

GMW14227

GMW16178

2.3 Additional References.

- Siemens PLM Software - Global Headquarters, 5800 Granite Parkway, Suite 600, Plano, TX 75024
- Subsystem Technical Specification (SSTS)

3 Resources

3.1 Facilities. Chassis dynamometer test room, see GMW14227.

3.1.1 Calibration. The test facilities and equipment shall be in good working order and shall have a valid calibration label.

3.1.2 Alternatives. Alternative test facilities and equipment may also be used. However, all measuring variables as specified in this standard shall be determined correctly with respect to their physical definition.

3.2 Equipment. A free-field or pressure microphone, with flat response from 3.15 Hz to 10 kHz and appropriate signal conditioning and cables, meeting Class 1 requirements corresponding to ANSI/ASA S1.4 Part 1, or equivalent for the application shall be used.

3.3 Test Vehicle/Test Piece. Fully dressed vehicle, see GMW14227 and GMW16178.

3.4 Test Time.

Calendar time: 1 day

Test time: 8 hours

Coordination time: 2 hours

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3.5 Test Required Information. Not applicable.

3.6 Personnel/Skills. Personnel must be familiar with acoustic measurement and processing techniques, as well as LMS Test.Lab data acquisition software (available from Siemens PLM Software - Global Headquarters, 5800 Granite Parkway, Suite 600, Plano, TX 75024.)

4 Procedure

4.1 Preparation.

4.1.1 Boundary Conditions. For air induction inlet (snorkel) measurement for SSTs validation and for measurement of the snorkel noise for use in developing a vehicle to meet exterior noise regulations (pass-by): pull the snorkel into the free field and remove the engine hood. Support the intake system on bungee cords if necessary. Isolate the engine noise from the intake system with a heavy acoustic material. If it is not possible to pull the snorkel into the free-field and keep the induction system intact, use the in-situ snorkel location isolating the engine noise as much as possible and removing surrounding hardware as necessary. An example would be if the induction system uses a cavity in the hood or a fender cavity. If there are multiple snorkels, measure both at the same time. Note this as a deviation in all reports and database entries.

For interior noise development purposes when the noise path between the snorkel and the interior is also being investigated, use the in-situ boundary condition, see GMW14007, GMW14227 and GMW16178.

4.2 Conditions. See GMW14007, GMW14227 and GMW16178 paragraph 4.2.2.1.3 on AIS.

4.2.1 Environmental Conditions. See GMW14227.

4.2.2 Test Conditions. Deviations from the requirements of this standard shall have been agreed upon. Such requirements shall be specified on component drawings, test certificates, reports, etc.

4.3 Instructions.

4.3.1 Set Up Instrumentation. Set up appropriate instrumentation such as a Tech II to capture:

- Ambient room temperature
- Atmospheric pressure
- Intake air temperature (IAT)
- Engine coolant temperature
- Temperature at an external point on the exhaust pipe rearward of the converter on the hot side of the exhaust system
- The choice of the location to monitor is left to the discretion of the test engineer

4.3.2 Calibration Verification. Verify calibration of the transducers as specified in GMW16178. Record calibration tone prior to and immediately after the test measurement sequence. Record calibration values and gain settings.

4.3.3 Install Data Acquisition Equipment. Set up data acquisition system and engine tachometer probe according to GMW16178. The microphone should be placed 0.1 m away from center of snorkel inlet with the microphone at a 45 degree angle to the inlet flow direction for a pressure type microphone as shown in Figure 1. If using a free field type microphone, orient as shown in Figure 2.

For non-circular snorkels, measure from the center point keeping the same distance as much as possible. Note any deviations in all reports and database entries.

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