



Air Induction System - Radiated 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 radiated noise for the purpose of validation of the induction system radiated noise performance requirement in the GM Air Induction System (AIS) Subsystem Technical Specification (SSTS). Provide subsystem data for use in developing a vehicle to meet exterior noise regulations (passby). To provide subsystem data for use in developing a vehicle to meet vehicle level interior noise levels during a Drive-away Wide Open Throttle (WOT) event.

1.2 Applicability. This test procedure is appropriate for use with all cars and trucks, see GMW14227.

1.3 Remarks. Air induction system radiated noise is an important factor in the level of passby noise as well as interior noise, see GMW14227.

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

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. A chassis dynamometer, 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.

3.2.1 Free-field or pressure microphones with flat response between 3.15 Hz to 10 kHz.

3.2.2 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. Full vehicle, see GMW14007, GMW14227 and GMW16178.

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Documents

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3.4 Test Time.

Calendar time: 1 day
Test time: 8 hours
Coordination time: 2 hours

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 AIS radiated noise measurement for SSTS validation and for measurement of the air induction system radiated noise for use in developing a vehicle to meet exterior noise regulations (passby): pull the airbox or other AIS component into the free field and remove the engine hood. Use a remote silencer to silence the snorkel noise. Support the intake system on bungee cords if necessary. Isolate the engine noise from the intake system by placing a heavy material over the engine. If it is not possible to pull the induction system into the free-field and keep the induction system intact, use the in-situ location isolating the engine noise as much as possible. An example would be if the induction system uses a cavity in the hood or the fender cavity. Note this as a deviation in all reports and database entries.

For interior noise development purposes when the noise path between the airbox 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 paragraphs on Air Induction System.

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 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.

4.3.2 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 the airbox panel of interest in the correct orientation for the microphone type used. See Figure 1 and Figure 2. All airbox panels of interest should be measured. Measure the center point of all ducts and tuning elements of interest. If porous duct materials are used, it may be necessary to measure multiple locations along the duct.

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