GM	WORLDWIDE ENGINEERING STANDARDS	Test Procedure	GMW15666

Charge Air Cooler - 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 Charge Air Cooler (CAC) radiated noise for the purpose of validation of the charge air cooler system radiated noise performance requirement in the GM Combined Radiator Fan Module (CRFM) Subsystem Technical Specification (SSTS). To 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. Charge air cooler 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 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.

3.2.1 Free-field or pressure microphones, with flat response between 3.15 Hz and 10 kHz and appropriate signal conditioning.

3.2.2 Cables meeting Class 1 accuracy corresponding to ANSI/ASA S1.4 Part 1.

3.2.3 Electroacoustics – Sound level meters – Part 1: Specification (or equivalent).

3.3 Test Vehicle/Test Piece. Full vehicle, see GMW14007, GMW14227 and GMW16178.

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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 charge air cooler radiated noise measurement for SSTS validation and for measurement of the charge air cooler radiated noise for use in developing a vehicle to meet exterior noise regulations (passby): pull the charge air cooler into the free field and remove the bumper. Use a remote silencer with an appropriate volume and diameter to silence the snorkel noise. This applies to the tail pipe noise also. Isolate the engine noise from the charge air cooler radiated noise by placing a heavy mat over the engine. If it is not possible to pull the charge air cooler into the free-field and keep the cooling system intact, use the in-situ location isolating the engine noise as much as possible. An example would be if the charge air cooler system is fixed to the whole CRFM module. Note this as a deviation in all reports and database entries.

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

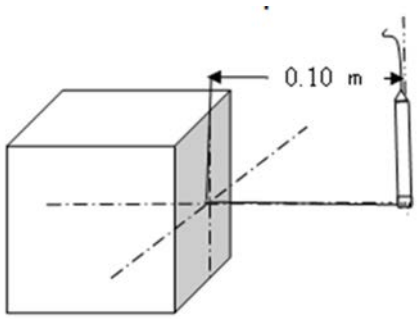
4.2 Conditions.

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. The microphone should be placed 0.10 m away from center of the charge air cooler in-/outlet box-section panel of interest in the correct orientation for the microphone type used. Should it be not possible to use the recommended distance, shorter distances can be used for a better access (especially in-situ measurements). The measured and/or reported data should be corrected to its standard measurement distance and has to be noted in the report. See Figures 1 and 2. All panels of interest should be measured.

Figure 1: Microphone Location for Pressure Microphone



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