



Dynamometer Road Noise 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. The purpose of this procedure is to measure a vehicle's approximate road noise in a laboratory environment. The road noise dynamometer is a tool that can be used to aid in the development of a vehicle to meet its Vehicle Technical Specification (VTS).

1.2 Applicability. This procedure applies to all fully trimmed vehicles.

1.3 Remarks. The strength of this procedure is its repeatability, since the test environment is not subject to weather or variation due to vehicle speed, acceleration, steering corrections, or the path traveled by the tire patch.

A Road Noise Dynamometer is a dynamometer with an epoxy molded road surface (i.e., roll caps) bolted on the rolling drum(s). The surfaces are made from castings of the targeted road surfaces (i.e., smooth asphalt and stud damaged concrete). The input to the vehicle running on the dynamometer should be considered periodic random compared to the truly random road surface, since the road surface covers are divided into equal length sections.

To take full advantage of the procedure and relate the results to the on road VTS, the vehicle must first be run on road per GMW8460, then on the dynamometer per this procedure. A road-lab correction factor can be calculated from the difference in the spectral results (in each $\frac{1}{3}$ octave band at each microphone position) and applied to future dynamometer testing results to estimate on-road noise performance. Final VTS validation must be performed using GMW8460.

The road noise dynamometer can also be utilized to perform a variation of the on-road spindle sensitivity measurement documented in GMW15413.

2 References

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

2.1 External Standards/Specifications.

IEC 651

2.2 GM Standards/Specifications.

GMW8460 GMW15413

2.3 Additional References.

- Vehicle Technical Specification

3 Resources

3.1 Facilities. A Road Noise Chassis Dynamometer in a hemi-anechoic chamber.

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.

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3.2 Equipment.

3.2.1 Data Acquisition Equipment. The preferred digital data acquisition system is a computer running Leuven Measurement Systems (LMS) Test Lab software connected to an LMS Scadas III front end, or equivalent as approved by the Global Noise and Vibration Center (GNVC) Infrastructure Team. This setup allows simultaneous digital recording of time domain data and online or post-processing of frequency.

3.2.2 Microphones. Random incidence microphones are preferred for vehicle interior locations. Free-field microphones may be used if random incidence microphones are not available. All devices shall meet class 1 accuracy corresponding to IEC 651 or be equivalent for the application (precision ± 0.7 dB or $\pm 8\%$).

3.3 Test Vehicle/Test Piece. The test will be performed on a vehicle that represents the current release status. Other configurations appropriate to particular development tests are allowable (e.g., non-running engine, modified suspension, tires, etc.) Record the following information:

- Vehicle Number - VIN and/or GM Fleet Number
- Vehicle Make
- Vehicle Model
- Vehicle Year
- Prototype Level if appropriate
- Vehicle Configuration – 2Door/4Door/Wagon/Crossover/etc.
- Roof Type – Standard/Sunroof/Panoramic
- Tire Make
- Tire Model
- Tire Size
- The air pressure in each tire
- Wheel Material – Steel/Aluminum/Other

3.4 Test Time.

Calendar time: 2 d

Test time: 2 h

Loading and Unloading the vehicle on the rolls twice: 4 h

Coordination time: 2 h to 4 h

- Does not include 8 h to install roll caps.
- Does not include time for any component changes.

3.5 Test Required Information. Not applicable.

3.6 Personnel/Skills. One (1) qualified engineer or technician trained in the use of data acquisition equipment and having basic knowledge of acoustic and vibration signal processing. One (1) qualified chassis dynamometer operator. Dynamometer operation may be conducted by a test engineer or technician if approved by local management.

4 Procedure

4.1 Preparation.

4.1.1 Vehicle Preparation.

4.1.1.1 Fuel Level. The vehicle shall begin the test with a full tank. No measurements shall be taken with a fuel level of less than $\frac{3}{4}$ full.

4.1.1.2 Tire Tread. Prior to installation on the dynamometer, place the vehicle on a hoist and remove any stones embedded in the tire tread.

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