SAE International™

# SURFACE VEHICLE RECOMMENDED PRACTICE

SAE J2567

ISSUED JAN2004

Issued 2004-01

## Measurement of Exhaust Sound Levels of Stationary Snowmobiles

*1.* ***Scope***—This SAE Recommended Practice establishes the test procedure, environment and instrumentation for determining the sound levels of snowmobiles in the stationary test mode. This test method is intended to provide an accurate measurement of exhaust and other engine noise and may be used to evaluate new and in-use snowmobiles to determine compliance with noise control regulations. Sound level measurements obtained with this test method are not intended as an engineering determination of overall machine noise. For this purpose, the use of SAE J192 is recommended.

*2.* ***References***

**2.1 Applicable Publications**—The following publications form a part of this specification to the extent specified herein. Unless otherwise specified, the latest issue of publication shall apply.

2.1.1 SAE PUBLICATIONS—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE J33—Snowmobile Definitions and Nomenclature—General
SAE J192—Exterior Sound Level for Snowmobiles

2.1.2 ANSI PUBLICATIONS—Available from ANSI, 25 West 43rd Street, New York, NY 10036.

ANSI S1.4 —Specification for Sound Level Meters

**2.2 Related Publication**—The following publication is provided for information purposes only and is not a required part of this specification.

2.2.1 SAE PUBLICATION—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE J47—Maximum Sound Level Potential for Motorcycles

*3.* ***Definitions***

**3.1 Field Calibration**—Calibration of the sound level meter using an external sound level calibrator that will ensure the accuracy of the microphone and sound level meter.

**3.2 Internal Calibration**—Calibration of the sound level meter by an internal oscillator or other means. The sound level meter internal calibration may be used, provided that the overall response of the sound level meter and microphone are evaluated by an external acoustic calibrator meeting the requirements of 3.3, at the start and at the end of each test day.





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**3.3** **Longitudinal Plane of Symmetry—**The plane perpendicular to the horizon with the snowmobile sitting on a level surface which is parallel to the normal direction of travel and equidistant between the skis. See SAE J33.

***4.*** ***Instrumentation—***The following instrumentation shall be used:

**4.1** A sound level meter that conforms to Type 1, Type S1A, Type 2 or Type S2A requirements of ANSI S1.4.

**4.2** A microphone of the free-field type.

**4.3** A sound level calibrator with an accuracy of ±0.1 dB.

**4.4** A windscreen which does not affect microphone response more than ±1.0 dB for the frequency range of 63 to 4000 Hz and ±1.5 dB for frequencies ranging from 4000 to 10000 Hz.

**4.5** An engine speed tachometer or other means of determining engine speed with a steady-state accuracy of ±3% at the prescribed test speed.

***5.*** ***Test Site***

**5.1** The test site shall be a flat, open surface free of large sound-reflecting surfaces (other than the ground) such as parked vehicles, signboards, buildings or hillsides located within 5 m (16 ft) of the snowmobile being tested and the location of the microphone.

**5.2** The surface of the ground within the area described in 5.1 shall be grass or snow.

***6.*** ***Procedure***

**6.1** The snowmobile shall be parked at the test site with an operator seated in the normal operating position, and the forward traveling path of the snowmobile clear of obstructions as required in 5.1.

**6.2** The brake shall be set throughout the test.

**6.3** The engine shall be started and run until reaching normal operating temperature range, as specified by the manufacturer.

**6.4** The operator shall slowly open the throttle until a steady 4 000 rpm ± 250 rpm engine speed is achieved, while holding the snowmobile stationary by applying the brakes.

***7.*** ***Measurements***

**7.1** The sound level meter shall be set for A-weighting network and slow dynamic response.

**7.2** The sound level meter shall be calibrated and adjusted, if necessary, so that the meter reads within 0.1 dB of the true level at the microphone.

**7.3** The microphone shall be located on the side of the snowmobile towards which the exhaust outlet(s) is (are) directed. This is generally on the right side. The longitudinal axis of the microphone shall be in a plane parallel to the ground plane. There shall be no physical attachment between the snowmobile and the microphone/ sound level meter.

**7.4** The microphone shall be located at a distance of 4.00 m / 157.5 in from the longitudinal plane of symmetry and 1.22 m / 48.0 in above the ground plane in line with the exhaust outlet. If there is more than one exhaust outlet it shall be located with reference to the centermost point of the multiple outlets.

**7.5** It is recommended that no persons other than the snowmobile operator and the person performing the sound level measurements shall be within 3 m (10 ft) of the snowmobile or the microphone. If another observer is present, he shall remain in a fixed position behind the sound level meter so as to minimize his effect on the measurements.

**7.6** With the snowmobile engine shut off, observe the overall ambient sound level at the measurement location. Record this level, including wind effects. In order for a test to be valid, the measured sound level of the snowmobile shall be at least 10 dB higher than the recorded ambient sound level.

**7.7** Operate the snowmobile as specified in Section 6. Measure the sound level observed during steady-state operation at 4000 rpm ± 250 rpm over a period of not less than 4 seconds. Record the average reading. Immediately following the first test, repeat the test in an identical manner and record the reading.

**7.8** For the test to be valid, the two readings shall be within 2dB of one another. Report sound level as the average of the two readings. If the two readings are not within 2dB, repeat the test procedure of 7.7 until two readings within 2dB are obtained.

**7.9** Repeat the ambient sound level measurement of 7.6.

**7.10** Repeat the calibration procedure of 7.2. If calibration has shifted more than 0.2 dB, the test shall be invalid.

## *8. General Comments*

**8.1** It is essential that persons conducting the test be knowledgeable of the test procedure and use of the instrumentation.

**8.2** Proper use of all test instruments is essential to obtain valid measurements. Operating manuals or other literature furnished by the instrument manufacturer should be referred to for both recommended operation of the instruments and precautions to be observed.

### 8.3 Specific Items for Consideration

8.3.1 The type of microphone, its directional response characteristics, and its orientation relative to the source of sound.

8.3.2 The effects of ambient weather conditions on the performance of all instruments (that is, temperature, humidity and barometric pressure.)

8.3.3 Proper acoustical calibration procedures.

**8.4** The use of the word “shall” in the procedure is to be understood as obligatory. The use of the word “should” is to be understood as advisory. The use of the word “may” is to be understood as permissive.



PREPARED BY THE SAE SNOWMOBILE COMMITTEE

**SAE J2567 Issued JAN2004**

**Rationale—**This is a new test method, intended primarily to provide an accurate, repeatable, unbiased test methodology to assist in the enforcement of snowmobile noise regulations. It is emphasized that this test is a field type check, designed to assess only engine and exhaust noise, and does not purport to assess total snowmobile noise. For this purpose, SAE J192 should be used. Although many snowmobile regulations are written in terms of total snowmobile sound levels, i.e., SAE J192 sound emissions, long experience has shown that SAE J192 is impractical for field use. The intent of this document is to provide a go/no-go single number kind of test. A 1-to-1 correlation between total snowmobile noise, i.e., SAE J192 level, and stationary test sound, i.e., as measured by this methodology, is not expected. However, extensive testing has shown that if this procedure is followed, it can effectively identify vehicles whose noise level exceeds the regulatory level.

Because of this, it has been suggested that a 2 dB “tolerance” be added to any level selected as the cutoff sound regulation, when such level is evaluated by this methodology. This approach misconstrues the meaning of precision, as a range of precision is given by this, and other, SAE sound test documents. The 2dB range of precision, i.e., ±1 dB from the expected mean test

Sections 6.4 and 6.7 call for the test to be done at a steady 4 000 rpm ± 250 rpm, over a period of not less than 4 seconds. Some concern has been expressed that this period is long enough to cause damage to the snowmobile transmission belt. Section 6.4 requires that the microphone shall be located a distance of 4 m from the longitudinal plane of symmetry. Some authorities believe that 4 m is unnecessarily distant from the snowmobile, and introduces potential error from extraneous sources, ground plane reflection, etc. These authorities suggest measurements be made at a distance of 2 m. The task force solicits input on these two points, in particular.

**Relationship of SAE Standard to ISO Standard—**Not applicable.

**Application—**This SAE Recommended Practice establishes the test procedure, environment and instrumentation for determining the sound levels of snowmobiles in the stationary test mode. This test method is intended to provide an accurate measurement of exhaust and other engine noise and may be used to evaluate new and in-use snowmobiles to determine compliance with noise control regulations. Sound level measurements obtained with this test method are not intended as an engineering determination of overall machine noise. For this purpose, the use of SAE J192 is recommended.