SAE International™

SURFACE VEHICLE RECOMMENDED PRACTICE

SAE J47

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Maximum Sound Level Potential for Motorcycles

1. Scope

This SAE Recommended Practice establishes the test procedure, environment, and instrumentation for determining the maximum sound level potential for motorcycles under wide open throttle acceleration and closed throttle deceleration.

1.1 Rationale

Changes were made to References, Sections 4.1, 4.2, 5.1, 6.2, 6.2.1, 7.6, and 8.7. Section 9 was added.

2. References

2.1 Applicable Publications

The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

2.1.1 SAE PUBLICATIONS

Available from the Society of Automotive Engineers, Inc., 400 Commonwealth Drive,Warrendale, PA 15096-0001.

SAE J184—Qualifying a Sound Data Acquisition System
SAE J213—Definitions, Motorcycles
SAE J331—Sound Levels for Motorcycles
SAE J1349—Engine Power Test Code—Spark Ignition and Diesel

2.1.2 ANSI PUBLICATION

Available from the American National Standards Institute, 25 West 43rd Street, New York, NY 10036-8002.

ANSI S1.4—Sound Level Meters, Specifications for

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3. Definitions

3.1 Rated Engine Speed

The speed in revolutions per minute at which the engine delivers maximum net brake power output as defined in SAE J1349, as determined by the manufacturer.

3.2 Manual Clutch

A clutch which must be disengaged by the operator to prevent engine stalling when the vehicle's forward motion is stopped.

3.3 Longitudinal Plane of Symmetry

As defined in SAE J213.

4. Instrumentation

The following instrumentation shall be used where applicable.

4.1 A sound level meter which meets the Type 1 or Type S1A requirements of ANSI S1.4. At intervals of not more than 2 years, the sound level meter shall be calibrated for compliance with the Type 1 or Type S1A requirements of ANSI S1.4. As an alternative to making direct measurements using a sound level meter, a sound data acquisition system may be used, provided that the system meets the requirements of SAE J184.

4.2 An acoustic calibrator with accuracy of ±0.5 dB. (See 8.6.4.) At intervals of not more than 2 years, the acoustic calibrator shall be calibrated to its original specifications.

4.3 An engine speed tachometer, or other means of determining engine speed, with steady-state accuracy of ±3% at 60% and 100% of rated engine speed.

4.4 A speedometer with steady-state accuracy of ±3% at a vehicle speed of 100 km/h, or the vehicle maximum speed, whichever is less.

4.5 An anemometer with steady-state accuracy of ±10% at a wind speed of 5.0 m/s.

4.6 An acceptable wind screen may be used with the microphone. To be acceptable, the screen shall not affect the microphone response more than ±1 dB for frequencies of 4000 to 10 000 Hz, taking into account the orientation of the microphone.

5. Test Site

5.1 The test site (Figure 1) shall be a substantially level open space accommodating a straight vehicle path and the following points:

5.1.1 ON THE VEHICLE PATH

A—Microphone target point
B—End point—a point 7.5 m beyond the microphone target point
C—Acceleration point—a point at least 7.5 m before to the microphone target point established by the method described in 6.2 and 6.3.
D—A point 15 m before the microphone target point
E—A point 15 m beyond the microphone target point

5.1.2 OFF THE VEHICLE PATH

F—Microphone point—a point 15 m from the centerline of the vehicle path on the perpendicular line which passes through the microphone target point.

5.2 The measurement area within the test site shall be a triangular area defined by the microphone point (F) and the points D and E. The surface of the ground within at least this area shall be portland cement or bituminous asphalt concrete, dry and free from snow, soil, or other extraneous material.

5.3 The test site shall be free of large sound-reflecting surfaces (other than the ground) such as parked vehicles, signboards, buildings, or hillsides, located within 30 m of the measurement area.

5.4 The vehicle path shall be relatively smooth portland cement or bituminous asphalt concrete, dry and free of extraneous material such as gravel, snow, or ice and of sufficient length for acceleration, deceleration, and stopping of the vehicle.

5.5 The microphone of the sound measurement system shall be located above the microphone point. The microphone shall be positioned 1.2 m ± 0.02 m above the ground plane. The microphone's reference axis shall be perpendicular to the vehicle path. (See 8.6.1.)

5.6 The test site layout in Figure 1, for the purposes of clarity, illustrates an approach from left to right. Sound level measurements are to be made on both sides of the vehicle; therefore, it will be necessary to establish either a second microphone point on the opposite side of the vehicle path with a corresponding measurement and clear area, or use approaches from both directions with corresponding acceleration points and end points.

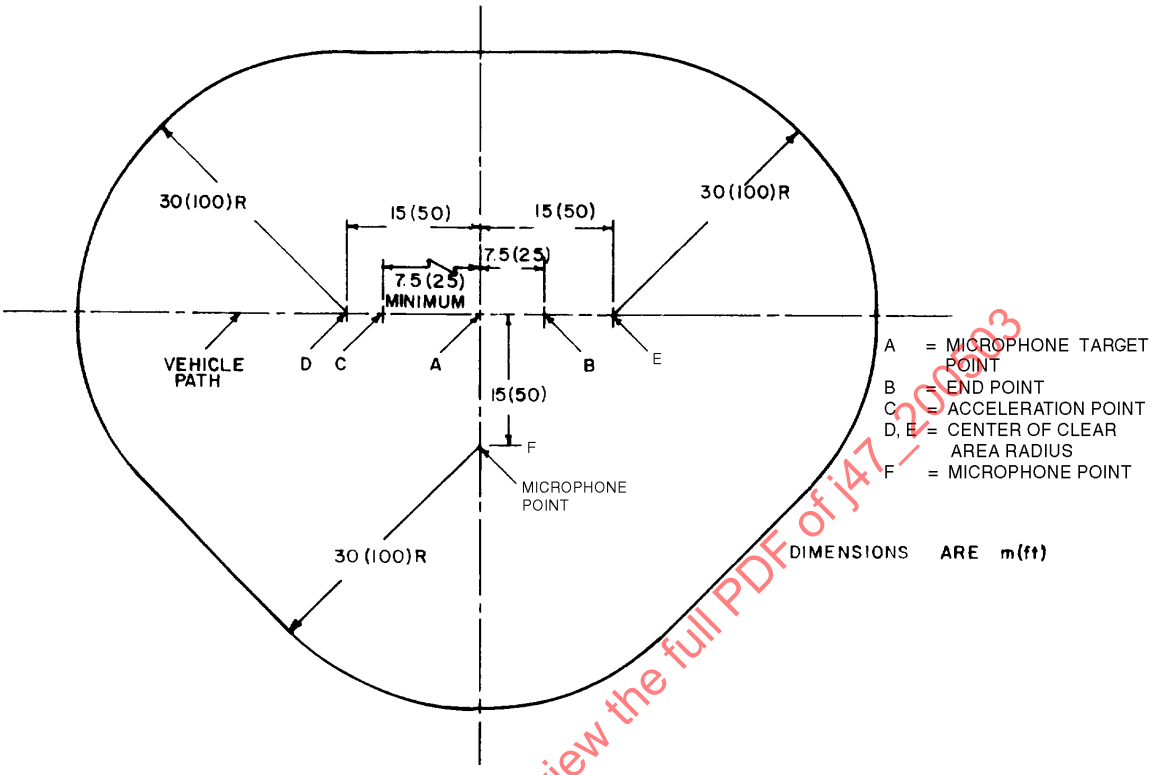

FIGURE 1—TEST SITE

6. *Procedure*

6.1 Overview

The intention of this test is to have the vehicle under test reach the end point under its maximum noise conditions—at wide open throttle and at rated engine speed, or as close to rated engine speed as the powertrain and conditions permit. Vehicles with a manual clutch approach the acceleration point at a steady engine speed. All other vehicles begin accelerating from the acceleration point using a standing start procedure. Each vehicle uses a different acceleration point in the test. The acceleration point for each vehicle is established by, basically, running the test procedure in the reverse direction in order to determine how to run the test in the normal direction.

6.2 To establish the acceleration point for vehicles with a manual clutch—the end point shall be approached in first gear from the direction opposite to the direction of the test run at a constant speed corresponding to 60% of rated engine speed. When the front of the vehicle reaches the end point, with the clutch fully engaged the throttle shall be rapidly and fully opened to accelerate the motorcycle past the microphone target point under wide open throttle. By trial, the lowest transmission gear shall be selected that will result in the vehicle traveling the shortest distance from the end point to the place where rated engine speed is reached, but which is not less than 7.5 m past the microphone target point. The location of the front of the vehicle on the vehicle path when rated engine speed is attained shall be the acceleration point for test runs to be made in the opposite direction.

6.2.1 When the procedure described in 6.1 results in an unusual operating condition such as wheel spin, the next higher gear shall be selected for the test, and the procedure rerun to establish the new acceleration point. In any event, the procedure shall result in the vehicle being at the end point when rated engine speed is attained without wheelspin or clutch slippage.

6.3 Vehicles without a manual clutch shall use a standing start acceleration, starting from the end point, to establish the acceleration point. With the front of the vehicle at the end point and with the transmission in the lowest selectable range, the throttle shall be rapidly and fully opened to accelerate the motorcycle past the microphone target point under wide open throttle.

6.3.1 For vehicles that allow for operator selection of transmission gear ratio, the lowest transmission gear shall be selected, by trial, that will result in the vehicle traveling the shortest distance from the end point to the place where rated engine speed is reached, but which is not less than 7.5 m past the microphone target point. The location of the front of the vehicle on the vehicle path when rated engine speed is attained shall be the acceleration point for test runs to be made in the opposite direction.

6.3.2 For vehicles that do not allow for operator selection of transmission gear ratio, the location of the front of the vehicle on the vehicle path immediately before the place where the first transmission upshift occurs which is not less than 7.5 m past the microphone target point, shall be the acceleration point for the test runs to be made in the opposite direction.

6.3.2.1 For vehicles with continuously variable transmissions, the location of the front of the vehicle on the vehicle path where the vehicle speed reaches its maximum or 100 km/h, whichever is lower, shall be the acceleration point for test runs to be made in the opposite direction.

6.3.3 If the speed at the acceleration point established in 6.3.1 or 6.3.2 is over 100 km/h, then the procedure to establish the acceleration point shall be rerun and the location of the front of the vehicle on the vehicle path where the vehicle speed reaches 100 km/h, shall be the acceleration point for test runs to be made in the opposite direction.

6.4 For the test under acceleration, the same basic procedure shall be used as was used in establishing the acceleration point, except that test runs shall be made in the opposite direction. The rider shall rapidly and fully open the throttle when the front of the vehicle reaches the acceleration point to accelerate the motorcycle past the microphone target point under wide open throttle. Full acceleration shall continue until the applicable ending conditions determined according to 6.2 or 6.3 are achieved, which should be the end point, at which time the throttle shall be rapidly and fully closed.

6.5 Sufficient preliminary runs shall be made before measurements begin to familiarize the rider with the motorcycle under test and to establish the engine operating conditions. The engine temperature shall be within the normal operating range prior to each run.

6.6 The longitudinal plane of symmetry of the test vehicle shall be on the vehicle path for all test runs.

6.7 Unless it is apparent that maximum noise occurs under acceleration, the following test shall be performed to establish maximum sound levels under deceleration.

6.7.1 For the test under deceleration for vehicles tested under 6.2, the vehicle shall approach the end point from the reverse direction at rated engine speed in the gear selected for the test under acceleration. At the end point, the throttle shall be rapidly and fully closed and the vehicle shall be allowed to decelerate to an engine speed of one half of rated engine speed.

6.7.2 For the test under deceleration for vehicles tested under 6.3, a standing start procedure shall be used. The starting point shall be a point on the vehicle path which is the same distance from the end point as the acceleration point, except in the opposite direction. With the front of the vehicle at this point, the throttle shall be rapidly and fully opened to accelerate the motorcycle to the end point under wide open throttle. When the front of the vehicle reaches the end point, the throttle shall be rapidly and fully closed and the vehicle shall be allowed to decelerate to a vehicle speed which is one-half that achieved at the end point.

7. Measurements

7.1 The sound level meter shall be set for fast response and for the A-weighting network.

7.2 The ambient sound level (including wind effects) at the test site, due to sources other than the vehicle being measured, shall be at least 10 dB lower than the peak sound level produced by the vehicle under test.

7.3 Measurements shall be made only when the wind speed is below 5.0 m/s.

7.4 The following measurements shall be made for both the acceleration and, if conducted, deceleration test modes:

7.4.1 Measurements shall be taken for both sides of the vehicle.

7.4.2 The meter shall be observed during each test as the vehicle is accelerating or decelerating. The highest sound level observed for each side during each test run shall be recorded.

7.4.3 Sufficient test runs shall be made until at least four recorded measurements for each test mode and each side of the vehicle are within a 2 dB range. The sound level for that side and test mode shall be the arithmetic average of the first four measurements within a 2 dB range.

7.5 The sound level reported for the vehicle shall be the sound level of the side and test mode with the highest average sound level.

7.6 Measurements shall be made on vehicles unladen except for the rider. The tires of the vehicle shall be inflated to the pressure recommended by the manufacturer for the vehicle in its unladen condition. Before the measurements are started, the vehicle shall be brought to its normal operating conditions with respect to temperature and tuning.

8. General Comments

8.1 Technically competent personnel should select equipment, and the test should be conducted only by trained and experienced persons familiar with the current techniques of sound measurement.