

**METHOD FOR EVALUATION OF INFRASOUND LEVEL  
AT THE DRIVER'S WORKING PLACE  
APPLIED IN RUSSIAN FEDERATION**

1. SCOPE

This method is applied for road vehicles of M (including trolleybuses) and N for evaluation of infrasound level at the driver's working place.

2. DEFINITION

For the purpose of this method the following term is applied:

**"Infrasound"** means fluctuations of air with the frequency range below 20 Hz.

3. SPECIFICATIONS

3.1. The levels of sound pressure in dB in octave bands 2, 4, 8 and 16 Hz and the overall level of sound pressure in dB Lin are considered as the evaluation criterions of infrasound level.

3.2. Measuring instruments.

3.2.1. For measurements of infrasound level at the driver's working place the following instruments are used:

3.2.1.1. Spectrum analyzer with octave filters having compound frequencies of 2, 4, 8 and 16 Hz.

3.2.1.2. Microphone having omnidirectional performance and frequency range from 2 Hz.

3.2.1.3. Magnitograph having the similar frequency range can be used as the auxiliary equipment.

3.2.1.4. Speed measuring instrument with error of measurements  $\pm 3\%$ .

3.2.1.5. Instrument for ambient temperature measurements with error of measurements  $\pm 1^\circ\text{C}$ .

3.2.1.6. Instrument for atmospheric pressure measurements with error of measurements  $\pm 2.6\text{ hPa}$ .

3.2.1.7. Measuring tape or ruler with accuracy of not less than 2 mm.

3.2.2. At the beginning and the end of each set of measurements the spectrum analyzer must be calibrated by means of appropriate sound source. The test must be considered invalid if the sound level meter errors registered during this calibration exceed 1 dB.

3.2.3. The accuracy of the measuring instruments shall be verified annually.

3.3. Vehicle preparation for tests.

3.3.1. The vehicle designated for tests shall be in compliance with the manufacturer's specifications, which shall be verified by the vehicle identification procedure.

3.3.2. The tires of vehicles designated for off-road conditions may be changed for normal use tires as specified in the manufacturer's documentation. The allowable wear shall not exceed 30% of the initial height of the tread.

3.3.3. The vehicle is tested without payload. In case of articulated vehicles tractor is tested without trailer. The tests are performed with two people in a cab: a driver and an operator. For vehicle with the number of seats exceeding 9 ( $M_2$  and  $M_3$  categories) the second operator is allowed in the passenger compartment. No extraneous subject is allowed.

3.3.4. The adjustable seat, at which the measurements are taken, shall be set in medium position. The adjustable seat back shall be set in the position convenient for driver. The adjustable headrests shall be set in the medium position.

- 3.3.5. Before the tests the engine and other vehicle components shall be heated up to the temperature of their normal operation.
- 3.3.6. At the time of measurements the vehicle auxiliary equipment such as windscreen wipers and washers, audio equipment shall be switched off. If the engine cooling system is equipped with an automatic fan and/or radiator blind, the tests shall be performed with automatic operation of those devices.
- 3.4. Test conditions.
- 3.4.1. Ambient conditions:
- No precipitations;
  - Atmospheric pressure 1013 hPa (760 mm Hg)  $\pm$  5%;
  - Temperature from  $-10$  to  $+30$  °C;
  - The wind speed measured at the test site at the height of about 1.2 m shall not be more than 5 m/s.
- 3.4.2. Test site.
- 3.4.2.1. The test road shall be straight, dry, even and clean, covered by asphalt-concrete in good condition.
- 3.4.2.2. The longitudinal slope of the test road shall not exceed 1%.
- 3.4.2.3. The large sound-reflecting objects such as fences, rocks, bridges or buildings shall not be located closer than 20 m from the longitudinal axis of the test road.
- 3.4.2.4. The level of noise disturbances shall be at least 15 dB below the level of measured sound. If such condition is not met, the necessary corrections shall be applied.
- 3.4.3. Microphone setting.
- For all vehicle categories the measurements are taken at the driver's seat. The microphone is positioned near the driver's seat at the height of 0.7 m and displaced from the longitudinal axis of the seat at the distance of  $(0.20 \pm 0.02)$  m to the direction of vehicle center.
- The microphone shall have horizontal orientation. The axis of its maximum sensitivity (according to the operation manual) shall be directed straight similar to the direction of sight of seated driver.
- 3.5. Measurements.
- 3.5.1. The measurements of infrasound shall be carried out when the vehicle is driven at a steady speeds with the highest gear at the gear box at two conditions:
- opened windows and hatches;
  - closed windows and hatches.
- 3.5.2. The measurements shall be carried out at the vehicle speed range from 60 km/h or 40% of the vehicle maximum speed to 80% of the vehicle maximum speed but not more than 120 km/h (whichever is less). The interval between the test speeds within the range shall be 10 km/h.
- 3.5.3. At each test speed the sound pressure measurements shall be taken not less than 3 times and duration of each measurement shall be not less than 40 seconds.
- 3.5.4. The linear method of averaging shall be used in the spectrum analyzer.
- 3.5.5. The mean of three measurements rounded to integer value is considered as the result of the measurements.
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