

Estimation of the Motor Vehicle Noise Emission based on Amendments of European Regulation R51

† . * . **

Jin-Woo Park, Sang-Soo Cho and Jae-Seung Shin

Key Words : Pass-by noise test(가), Urban Traffic(), Power-to-mass ratio(), ECE R51(가)

ABSTRACT

Nowadays, vehicle becoming necessity is increasing gradually and is main cause of environmental problem. The current automobile noise measurement test method such as ISO 362 which have been used many countries contribute seriously to enforce the regulation of the noise rigidly and actively study vehicle's noise, using that method. However, the amendment of ISO 362 was completed under the international agreement due to the changes in vehicle's techniques and road conditions. In this study, the difference between the current ISO 362(or ECE R51) and new ISO 362(or new ECE R51) is estimated by the test using the practical car producing domestically because the Korean manufacturer have to be interested in new test method.

가 , 가 가 가
a_urban : 가
a_wot_ref : PMR 가 가 (1)
a_wot_test : 가 가
k : ,
k_p : 가
L_urban : 가
PMR : 가
ISO 362
1. ISO 362(2)
(3) 가
(4), 가
(5) (6)
† ; , 가
E-mail : truehelp@kotsa.or.kr
Tel : (031) 369-0422, Fax : (031) 369-0366
* ,
**

ISO 362⁽⁷⁾가
 가
 ECE R51
 가
 1958 1998
 (Harmonization)
 -EU FTA
 (1)
 ISO 362 ISO 362 가
 ISO 362
 data

Table 1 Used instruments of the new pass-by test and constant-speed test

Microphone/Pre-amp.	B&K 4190/ B&K 2669
Analyser	B&K 2145
Calibrator	B&K 4231
Speed sensor	Radar CAPT 208 DTX
Meteorological instrument	TESTO 445

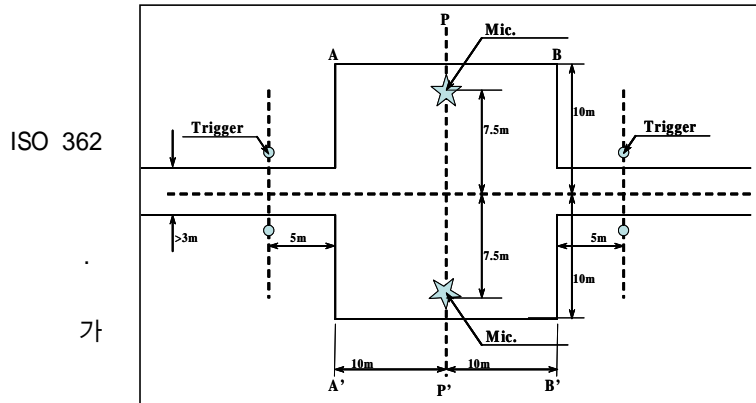


Fig. 1 ISO 10844 Test site

2. ISO 362(or ECE R51)

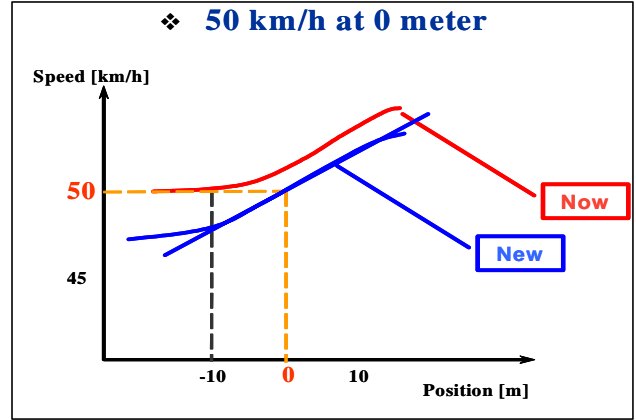
(3)
 2002 1 ISO 362
 가
 20 82dB(A) 74dB(A)
 (7) 가
 ISO 1958
 ISO 362
 ISO 362
 2.1 ISO 362 ISO 362
 Fig. 1 ISO 10844
 ISO 362
 가
 가

가 3
 SUV 3
 Fig. 1 20m
 (AA'-BB') 7.5m,
 1.2m (PP') AA' BB' 가
 5m 가
 Trigger 가
 ISO 362 가
 50±1km/h 가 가 (AA') 가
 ISO 362 가 PP' 50±1km/h가
 20m 가
 가
 50±1km/h
 40~45dB(A)
 가 (7)

Table 1

2.2

throttle valve가
 가
 가
 ISO 362
 가
 가
 Fig. 2
 가
 가
 PMR



(1) Fig. 2 New Pass-by test condition of vehicle speed⁽¹⁾

$$PMR = \frac{P_n}{m_t} \times 1000$$

P_n [kW]
 m_t (75kg)
 [kg]

가 ($a_{wot\ test}$) , 가
 20m 가 , 가
 $a_{wot\ test} = [(\frac{v_{BB'}}{3.6})^2 - (\frac{v_{AA'}}{3.6})^2] / 2(l_{20} + l_{ref})$ (2)

20m 가 ,
 $a_{wot\ test} = [(\frac{v_{BB'}}{3.6})^2 - (\frac{v_{PP'}}{3.6})^2] / 2(l_{10} + l_{ref})$ (3)

ISO 362

(2), (3)

l_{ref} ,
 $l_{ref} = 0$,

$v_{AA'}$, $v_{BB'}$, $v_{PP'}$ 가
 가 (a_{urban})

$$a_{urban} = 0.63 \log(PMR) - 0.09 \quad [m/s^2] \quad (4)$$

, PMR
 가

$PMR \geq 25$,
 $a_{wot\ ref} = 1.59 \log(PMR) - 1.41$ (5)

$PMR < 25$,
 $a_{wot\ ref} = a_{urban} = 0.63 \log(PMR) - 0.09$ (6)

(7), (8)
 가
 $L_{wot\ rep} = L_{wot(i+1)} - k(L_{wot\ i} - L_{wot(i+1)})$ (7)

$$L_{crs\ rep} = L_{crs(i+1)} - k(L_{crs\ i} - L_{crs(i+1)}) \quad (8)$$

k 가
 a_{urban} 가 가
 (i) (i+1)

$$k = (a_{wot\ ref} - a_{wot(i+1)}) / (a_{wot\ i} - a_{wot(i+1)}) \quad (9)$$

$k = 1$
 $L_{wot\ rep} = L_{wot\ i}$, $L_{crs\ rep} = L_{crs\ i}$
 ISO 362

$$L_{urban} = L_{wot\ rep} - k_p(L_{wot\ rep} - L_{crs\ rep}) \quad (10)$$

k_p (Partial power factor) 가
 (4), (5), (6)

$$k_p = 1 - (a_{urban}/a_{wot ref}) \quad (11)$$

$$k_p = 1 - (a_{urban}/a_{wot test}) \quad (12)$$

$$a_{wot test} \text{가 } a_{urban} \text{ 가 } k_p = 0 \quad (13)$$

3.

3.1 ISO 362

50km±1km/h

가 가

4
Table 2

3.2 ISO 362

가

가
Fig. 4 가 SUV
가

Table 3

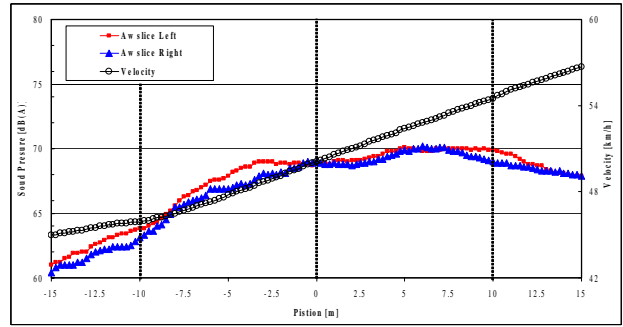
Fig. 3

Table 2 Now ISO 362 Pass-by test result

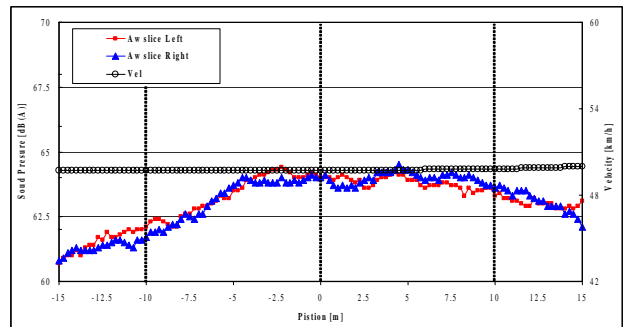
		Left [dB(A)]	Right [dB(A)]	[km/h]	[km/h]
	A	70.2	71.6	50.1	56.8
	B	69.5	70.3	50.1	56.1
	C	71.3	72.6	50.4	58.1
SUV	D	71.3	71.0	50.0	54.3
	E	71.7	71.9	49.9	57.6
	F	74.7	74.7	50.3	59.3

Table 3 New ISO 362 Pass-by test result

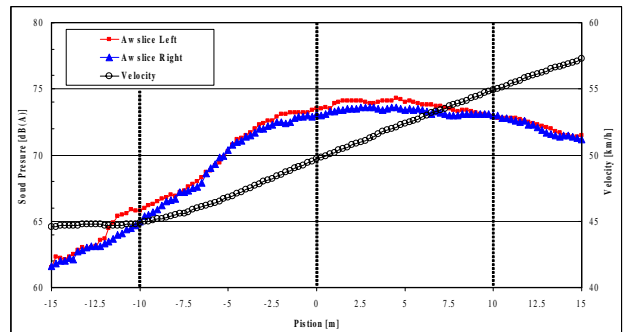
		Left [dB(A)]	Right [dB(A)]	[km/h]	[km/h]
	A	68.5	68.1	46.0	56.5
	B	68.3	68.0	45.4	56.7
	C	67.9	68.4	45.6	56.2
SUV	D	70.4	70.6	43.3	58.7
	E	71.2	70.4	45.5	57.6
	F	70.6	70.4	43.1	58.0



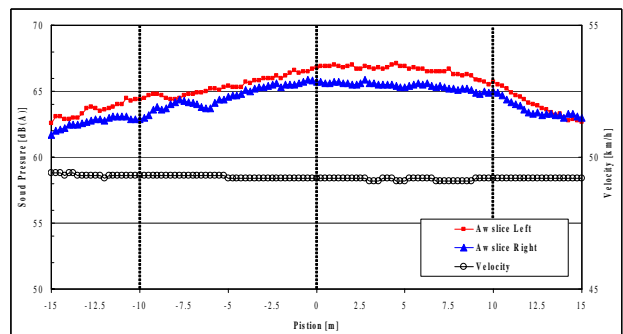
(a) "A" Type Acceleration test



(b) "A" Type Constant-speed test
Fig. 3 Sedan "A" Type New ISO 362 test



(a) "E" Type Acceleration test



(b) "E" Type Constant-speed test
Fig. 4 SUV "E" Type New ISO 362 test

Table 2

ISO 362
50±1 km/h

가

(2).

Table 3

ISO 362

, 가

Table 3

가
가

, Table 2

Table 2

ISO 362

가

(1)

,
mapping

,

.

4.

ISO 362

ISO 362

가

가

가

가가

, ISO 362

(1) Bae, J. H., Young, G. J., Shin, J. S. and Lee, G. B., 2006, "A Study on Pass-by Noise Test Method of a Road Vehicle", Proceedings of the KSNVE Annual Spring Conference, pp. 447~451.

(2) ISO 362, 1998, "Acoustic-Measurement of noise emitted by accelerating road vehicle-Engineering method".

(3) , 1991~2005, "
".

(4) Kang, D. J., Kim, J. M. and Park, J. C., 2004, "Road Traffic Noise Status and Prediction", KSNVE. Vol. 14, No. 10, pp. 1015~1020.

(5) Kim, J. B., 1995, "Vehicle Pass-by Noise Regulations and the Control Strategies", Proceedings of the KSNVE Annual Spring Conference, pp. 1~7.

(6) Kang, D. J., Lee, J. W and Park, J. C., 2004, "Vehicle Noise Status and Characteristics", KSNVE. Vol. 14, No. 12, pp. 1249~1254.

(7) ISO/FDIS 362-1, 2007, "Measurement of noise emitted by accelerating road vehicle-Engineering method-Part 1: M and N categories".

(8) , 2003, "
".

(9) UNECE/WP29/GRB informal group ASEP R51, 2005, "Informal document GRBIG-ASEP-01-008".

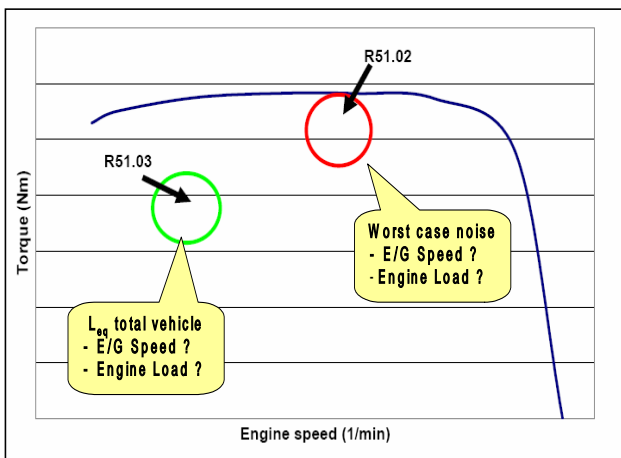


Fig. 5 New test method of operation condition in engine map⁽⁹⁾