Informal document GRB-56-05
(56th GRB, 3-5 September 2012,
agenda item 3(b))

Japanese proposal on R51 limit values

JASIC

Basic concept of Japanese proposal on limit values with sub-categories

At GRB 55, based on the Monitoring database (856 vehicles) and the Japanese database (184 vehicles), Japan proposed limit values for R51-03 with sub-categories as Inf. Doc. GRB-55-01. In consideration of Inf. Doc. GRB-54-03, proposed by the expert from Germany, Japan has reviewed the original proposal and changed subcategories, limit values and tolerances slightly, which are described in WP.29/GRB/2012/7 and Inf. Doc. GRB-56-01.

Basic concepts of the revised proposal are as follows;

- Stage 1 limit values are chosen from around 10% cut-off levels of the frequency distributions of Monitoring+ Japanese database. Owing to the introduction of the new test method with Stage 1 limit values and ASEP, the reduction of the road traffic noise is expected.

- Stage 2 limit values are chosen from about 30% or more cut-off levels of the frequency distributions of Monitoring+ Japanese database in order to reduce the road traffic noise further.
- The application date of Stage 1 should be 2 years after the entry into force of R51-03, while the application dates of Stage 2 should be basically 4 years after Stage 1 for Non-heavy duty vehicles (M1, M2(GVW$\leq$3.5t) and N1) except Small Low Power trucks, and 6 years after Stage 1 for heavy duty vehicles (M2(3.5t<GVW), M3, N2 and N3). As the development cycle of Small Low Power trucks is similar to Heavy duty vehicles, the application date of Stage 2 of Small Low Power trucks is 6 years after Stage 1.

- “3 stage” approach is very ambitious but has clear message for enforcing the vehicle noise level. Because of the uncertainty of noise reduction technology advance and other regulations that might influence on noise reduction measures (ex. CO2 and pollutant emission regulation) , Japan proposes the temporary limit values and entry-into-force dates of Stage 3, which shall be reviewed and fixed until the entry-into-force date of Stage 2. The limit values are reviewed to be about 70% or more cut-off level, which might be more practical.

Proposal on new limit values

Unit: dB(A)

		Stage 1	Stage 2		Stage 3[3]	
		2 years after entry into force of ECE R51.03	4 years after stage 1	6 years after stage 1	[4] years after stage 2	[6] years after stage 2
M1	PMR ≤ 120 kW/t	72	70	-	[68]	-
	120 < PMR ≤ 160 kW/t	73	-	71	[70]	-
	PMR > 160 kW/t	75	73	-	[72]	-
M2	GVW ≤ 2.5 ton	72	70	-	[69]	-
	2.5 ton < GVW ≤ 3.5 ton	74	72	-	[71]	-
	3.5 ton < GVW	75	-	73	-	[71]
M3	P ≤ 135 kW	76	-	74	-	[73]
	135 < P ≤ 250 kW	79	-	78	-	[76]
	P > 250 kW	80	-	78	-	[76]
N1	GVW ≤ 2.5 ton and PMR(GVW)[1] ≤ 35kW/t	74	-	72	-	[70]
	GVW ≤ 2.5 ton and 35kW/t < PMR(GVW)[1]	72	70	-	[68]	-
	2.5 ton < GVW ≤ 3.5 ton	74	72	-	[71]	-
N2	P ≤ 135 kW	77	-	76	-	[73]
	P > 135 kW	78	-	77	-	[75]
N3	P ≤ 250 kW	80	-	78	-	[76]
	P > 250 kW	82	-	80[2]	-	[78]

1 “PMR(GVW)” means PMR calculated by using the maximum authorized vehicle mass.

2 Entry-into-force date of N3 with an engine power exceeding 250 kW for stage 2 is 8 years after stage 1.

3 Limit values and entry-into-force dates of “Stage 3” shall be reviewed and fixed until the entry-into-force date of “Stage 2”.

Changes from GRB-55-01 (original Japanese proposal)

1) Subcategories

- Thresholds of small M3 and N2 is changed from 125 kW to 135 kW. Germany proposed 180kW for small M3 and 150 kW for N2 but the change of 135 kW seems to have little influence according to Monitoring database.
- A subcategory for small M2 (GVW≤ 2.5t) is added based on German proposal. The limit values are also based on German proposal.

2) Limit Values

- For stage1
  - N2 : The limit value for N2 not exceeding 135 kW is reinforced to 77 dB(A) while the limit value for N2 exceeding 135 kW is reinforced to 78 dB(A) in reference to German proposal.
  - N3: The limit value for N3 exceeding 250 kW is changed to 82 dB(A), in consideration of the difficulty of the noise reduction in this subcategory. (1/4 of data exceed 81 dB(A) in Monitoring and Japanese database)

2) Limit Values (Cont.)

- For Stage 2
  - M1: The limit value for M1 with between 120 and 160 kW/t PMR is remained but the transition period is changed to 6 years after Stage 1. Two year extension is required for the correspondence to the change of the maximum acceleration (3.0 m/s2 instead of 2.0 m/s2)
  - N3: The limit value for N3 exceeding 250 kW is changed to 80 dB(A) with 8-year transition period, in consideration of the difficulty of the noise reduction in this subcategory. (3/4 of data exceed 79 dB(A) in Monitoring and Japanese database)
- For stage 3, in consideration of GRB-54-03, the limit values are reviewed and set as more practical levels

Table of Limit values proposed by GRB-55-01 (Japan), GRB-54-03 (Germany) and WP.29/GRB/2012/07 & GRB-56-01 (Japan)

			Stage 1			Stage 2			Stage 3		
			GRB-55-01 Japan	GRB-54-03 Germany	**2012/07 GRB-56-01**	GRB-55-01 Japan	GRB-54-03 Germany	**2012/07 GRB-56-01**	GRB-55-01 Japan	GRB-54-03 Germany	**2012/07 GRB-56-01**
M1	PMR≤120kW/t		72	72	72	70	70	70	[68]	68	[68]
	120<PMR≤160kW/t		73	73	73	71	71※	**71※**	[69]	70	[70]
	160kW/t<PMR		75	75	75	73	74	73	[71]	73	[72]
M2	GVW≤2.5t		74	72	**72**	72	70	**70**	[70]	69	**[69]**
	2.5t<GVW≤3.5t			74	74		72	72		71	**[71]**
	3.5t<GVW		75	75	75	73	73	73	[71]	71	[71]
M3	P≤125kW		76	76	76	74	74	74	[72]	73	**[73]**
	125<P≤135kW		79			78			[76]		
	135<P≤180kW				79			78			[76]
	180<P≤250kW			78			78			76	
	250kW≤P		80	80	80	78	78	78	[76]	76	[76]
N1	GVW≤2.5t	PMR≤35kW/t	74	72	74	72	70	72	[70]	68	[70]
		35kW/t<PMR	72		72	70		70	[68]		[68]
	2.5t<GVW		74	74	74	72	72	72	[70]	71	**[71]**
N2	P≤75kW		78	77	**77**	76	75	76	[74]	72	**[73]**
	125<P≤135kW		79			77			[75]		
	135kW<P≤150kW				**78**			77			[75]
	150kW<P			78			77			75	
N3	P≤250kW		80	81	80	78	79	78	[76]	77	[76]
	250kW<P		81	82	**82**	79	81	**80※**	[77]	79	**[78]**

※ +2 years for the entry-into-force

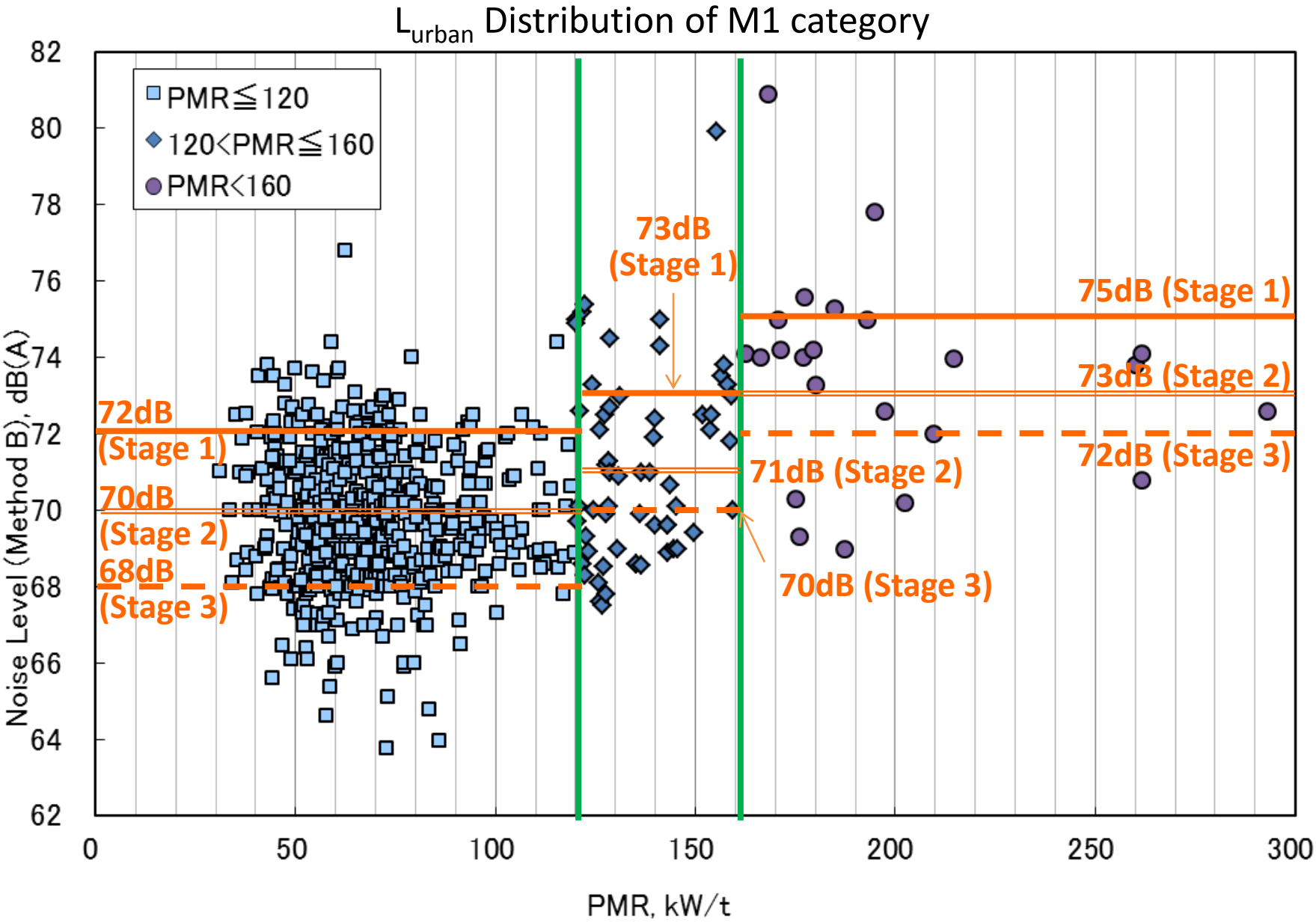
3) Tolerance

- Tolerance for off-road vehicles are changed to the German proposal. The determination of wading depth is quoted from WP29/GRB/2005/5.
- Tolerance for M3 with PI engine is added owing to the threshold change to 135kW from 125kW. The rated engine speed of PI engine (ex. 4400 rpm) is higher than CI engine (ex.3400 rpm) and the noise level of PI engine is higher than CI engine consequently. The actual use engine speed of PI M3 is not so high as 0.85 to 0.89 S. Therefore the tolerance of M3 with PI engine is set only for the stage 1 with the condition that the test condition for M3 with PI engines should be reviewed until the entry into force of Stage 2.

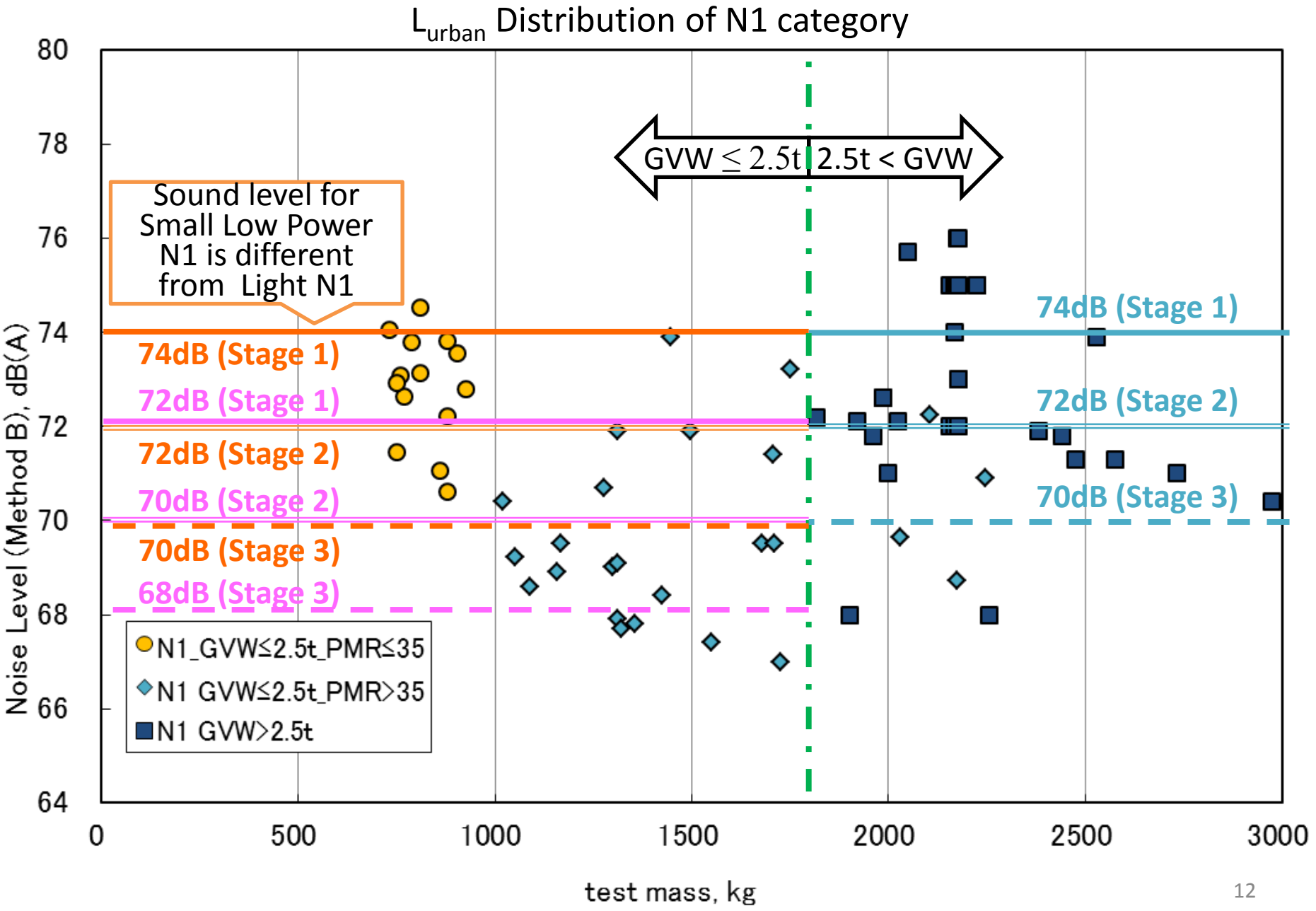
Analysis of the proposed limit values

- Using Monitoring and Japanese database, the proposed limit values and subcategories are analyzed as the following slides.
- In Japan, M2 buses are N1 derivatives or M3 derivatives (downsizing) and Japanese database doesn't include M2 data. Therefore, the analysis of M2 is not conducted.

☐ Analysis of M1



Analysis of N1



● Noise measures of Small Low Power trucks

In order to reduce noise level of Small Low Power trucks by 2-3 dB, an engine and a transmission have to be covered.

For keeping a space between an engine and covers, the gap between the ground and the under cover will be smaller than the present gap.

▼It is difficult to reduce the gap because of the usage condition especially for agricultural fields.

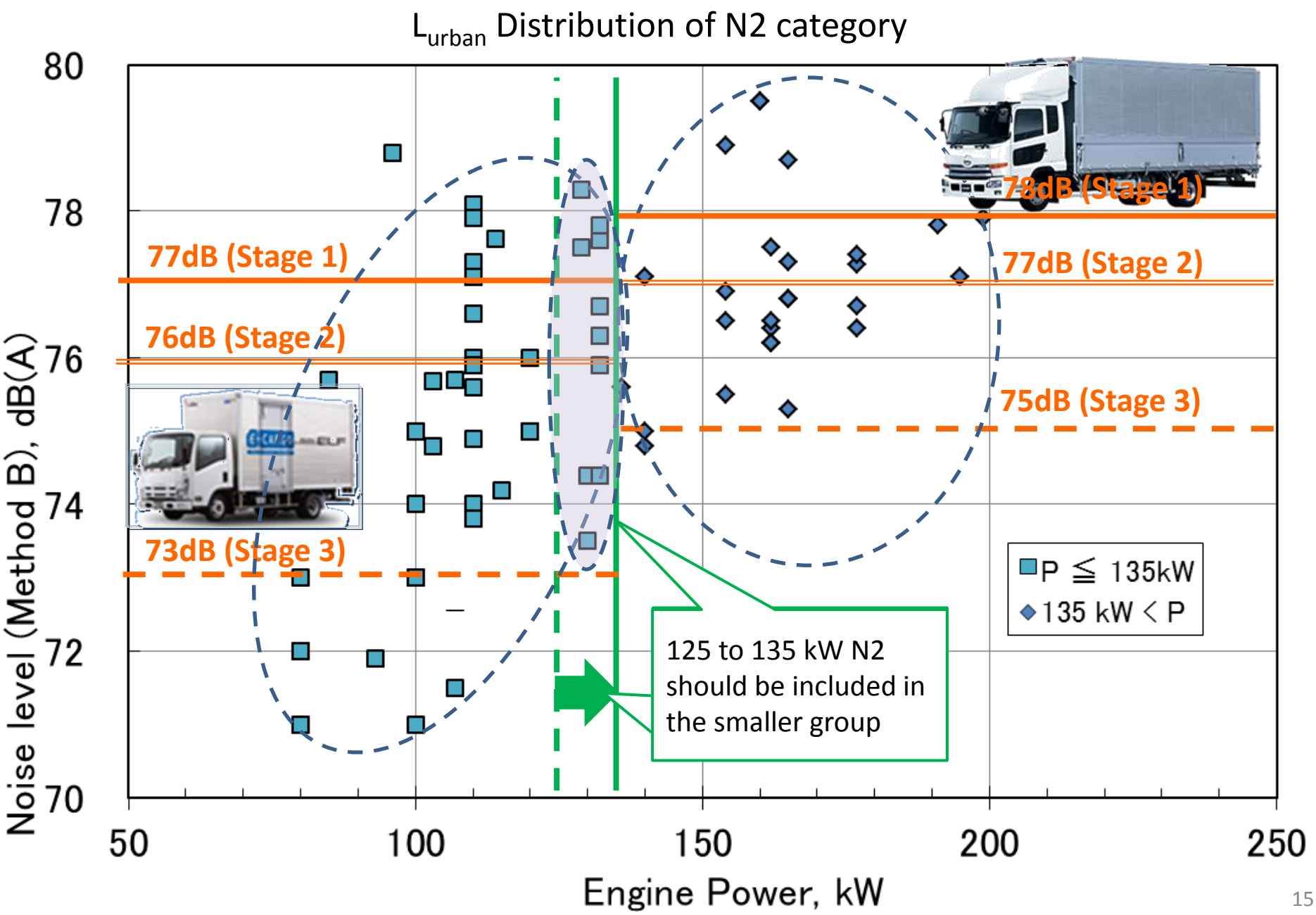
⇒No space for noise cover

For N1 category

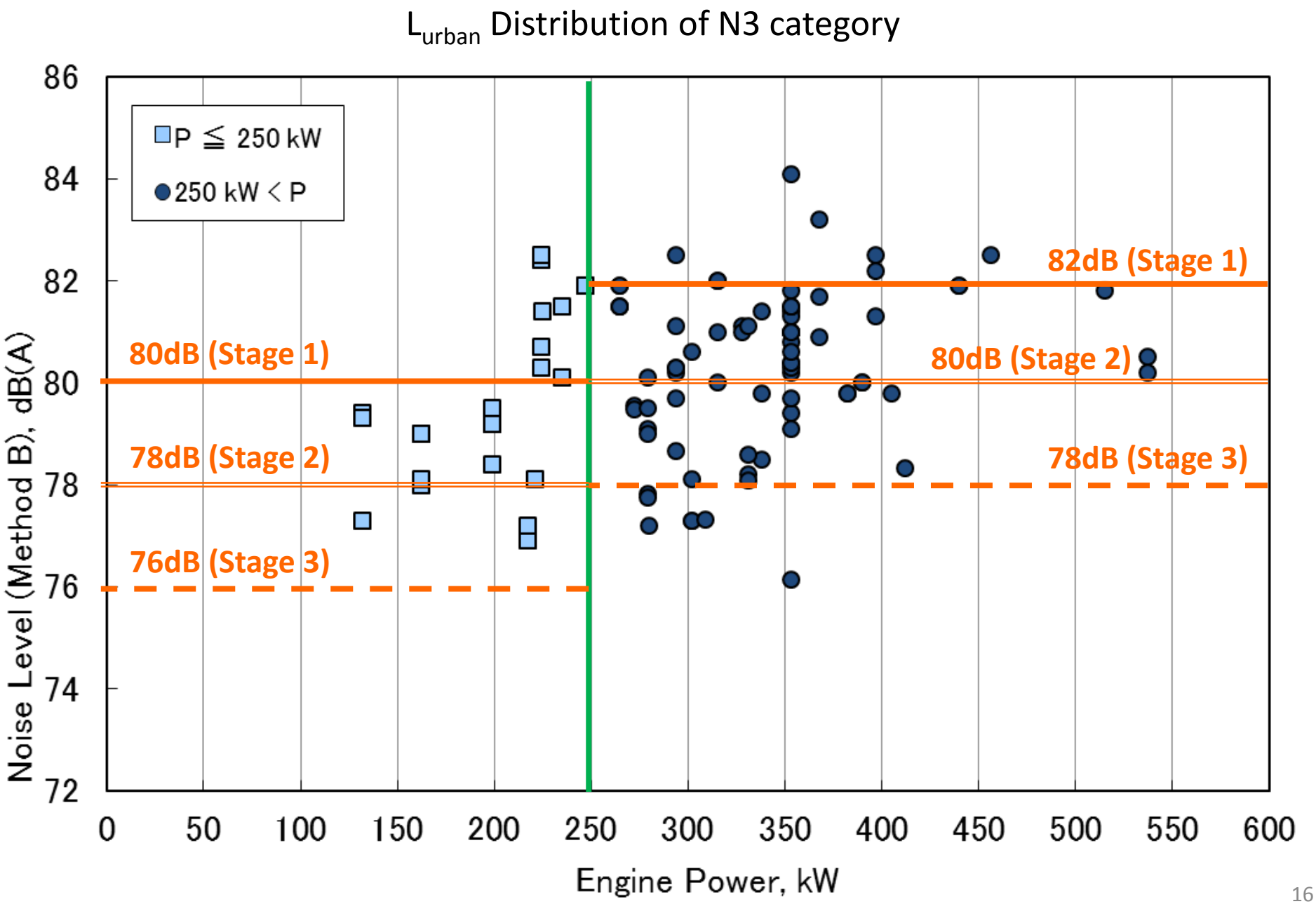
- Our suggestion is the mini-truck（similar to the K-truck of Japan）should not been treated as the normal N1 category.

From GRB-55-5Rev1 (informal document from China)

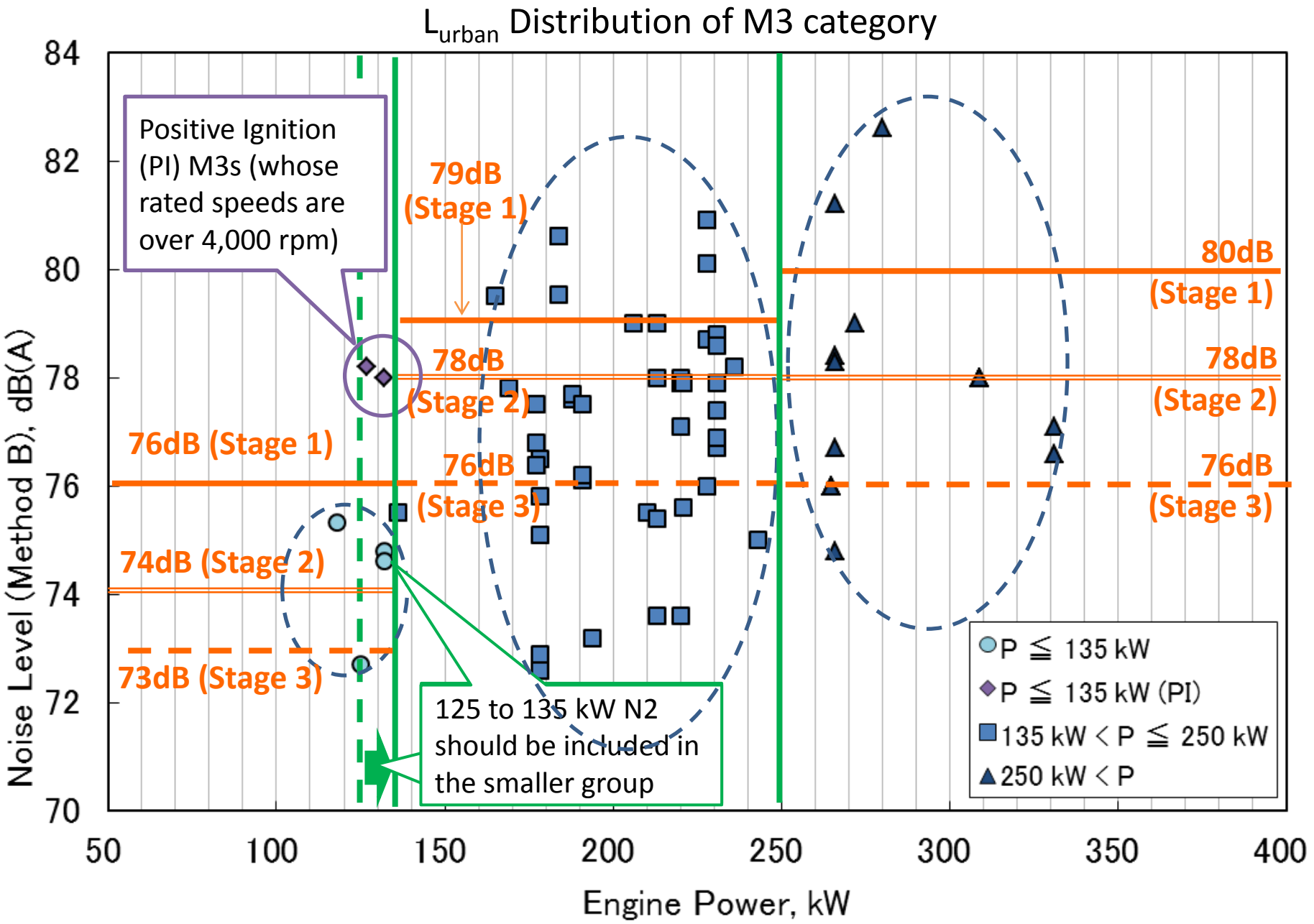
Analysis of N2



☐ Analysis of N3



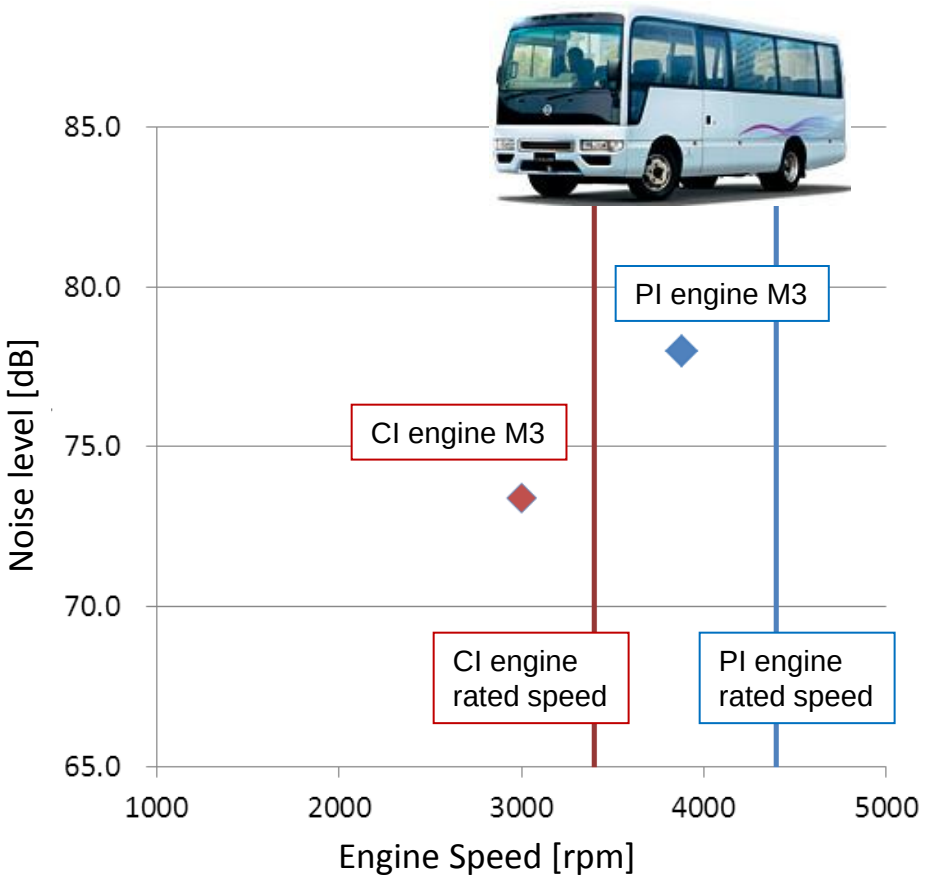
☐ Analysis of M3



- Difference between PI and CI engines in M3

  Difference between PI and CI engines are due to the difference of engine rotating speeds.

	PI	CI
Engine Type	TB45E	ZD30DDTi
Cylinder layout	Linear 6	Linear 4
Cylinder Capacity	4.478 L	2.953 L
Rated Power kW(PS)/rpm	127(173) /4400	110(150) /3400
Transmission	5MT	5MT
Driving type	2WD	2WD
GVW	5315 kg	5405k g
Passenger	29名	29名
Max engine speed in R51 test	3880rpm	3000rpm
Noise level(dBA)	78.0	73.4



(Reference) Database

		Japanese + Monitoring		
			Japanese	Monitoring
M1	PMR≤120kW/t	575	52	523
	120<PMR≤160kW/t	60	5	55
	160kW/t<PMR	23	0	23
	M1G	28	4	24
M2	GVW≤3.5t	-	-	-
	3.5t<GVW	-	-	-
M3	P≤125kW	2	1	1
	125<P≤250kW	53	15	38
	250kW<P	18	2	16
N1	GVW≤2.5t & PMR≤35kW/t	14	14	-
	GVW≤2.5t & 35kW/t<PMR	25	7	18
	2.5t<GVW	51	10	41
N2	P≤125kW	41	14	27
	125kW<P	38	24	14
N3	P≤250kW	35	12	23
	250kW<P	77	24	53
Total		1040	184	856

Conclusion

Transmitted by the expert from Japan

Informal document GRB-56-01
(56th GRB, 3-5 September 2012,
agenda item 3(b))

REGULATION No. 51
(Noise of M and N categories of vehicles)

Japanese Position on new limit values for 03 series of amendments to Regulation No. 51

Submitted by the experts from Japan

The following table shows the proposal on new limit values for 03 series of amendments to Regulation No.51 in the formal document submitted by the expert from Japan.

Japanese position on limit values, sub-categories and transitional provisions for ECE R51.03, new vehicle types

		Stage 1	Stage 2		Stage 3[3]	
		2 years after entry into force of ECE R51.03	4 years after stage 1	6 years after stage 1	[4] years after stage 2	[6] years after stage 2
		Limit [dB(A)]	Limit [dB(A)]	Limit [dB(A)]	Limit [dB(A)]	Limit [dB(A)]
M1	PMR ≤ 120 kW/t	72	70	-	[68]	-
	120 < PMR ≤ 160 kW/t	73	-	71	[70]	-
	PMR > 160 kW/t	75	73	-	[72]	-
M2	GVW ≤ 2.5 ton	72	70	-	[69]	-
	2.5 ton < GVW ≤ 3.5 ton	74	72	-	[71]	-
	3.5 ton < GVW	75	-	73	-	[71]
M3	P ≤ 135 kW	76	-	74	-	[73]
	135 < P ≤ 250 kW	79	-	78	-	[76]
	P > 250 kW	80	-	78	-	[76]
N1	GVW ≤ 2.5 ton and PMR(GVW)[1] ≤ 35kW/t	74	-	72	-	[70]
	GVW ≤ 2.5 ton and 35kW/t < PMR(GVW)[1]	72	70	-	[68]	-
	2.5 ton < GVW ≤ 3.5 ton	74	72	-	[71]	-
N2	P ≤ 135 kW	77	-	76	-	[73]
	P > 135 kW	78	-	77	-	[75]
N3	P ≤ 250 kW	80	-	78	-	[76]
	P > 250 kW	82	-	80[2]	-	[78]

Off-Road vehicles "G" for all categories +1 dB(A) for stage 1, wading depth 50 cm, hill climbing ability 30% as additional requirement for M1G

Off-Road vehicles "G" for N3, M3 +2 dB(A) for stage 2 and later, all other categories +1 dB(A) for stage 2 and later

M3 with an engine having rated engine speed exceeding 4000rpm +2 dB(A) for Stage 1

- Japan proposes limit values and subcategories for R51-03 based on EU and Japanese database.
- "3 Stage" approach is practical as well as ambitious. Flexibility of "Stage 3" limit values leads the whole environmental benefit, including noise, CO2 and pollutant emissions.
- This proposal could be the basis of the common position for stakeholders.