

Informal document **VIAQ-02-07**

Proposal on Test modes for VIAQ measurements

Hyunwoo Lee
KATRI
peterlee@ts2020.kr

◆ Examples of Indoor Air Quality Measurements in House and Vehicles

- ✓ Indoor Air Quality Control In Publicly Used Facilities, etc. ACT
- Ministry of Environment Notification No. 2014-24

Time	Ventilation 30min	Close all windows and doors in contact with external air for 5 hours	sampling 30min
House Temp	more than 20°C	more than 20°C	Sample 1,2

Fig. 1 Test procedures for New House Indoor Air

- ✓ Motor Vehicle Management Act (33-3)

- Ministry of Land, Infrastructure and Transport Notification No. 2013-549

Time	Temp Stabilization Min. 12 hours	Ventilation 30 min	Doors Closed 2 hours	sampling 15min
Cabin Temp	25 ± 2 °C	25 ± 2 °C	25 ± 2 °C	Day 1 : Sample 1,2,3 Day 2 : Sample 4,5,6

Fig. 2 The Management Standards of the Interior Air Quality of Newly Manufactured Vehicles

◆ Examples of Interior Air Quality Measurements in Vehicles

✓ CHINA Vehicle Interior Air Quality

- HJ/T 400-07 December 2007 "Determination of Volatile Organic Compounds and Carbonyl Compounds in Cabins of Vehicles"

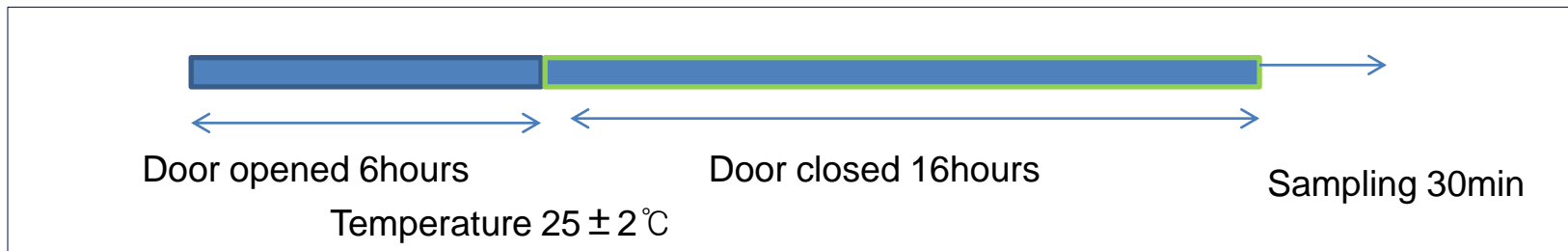


Fig. 3 Test procedures for Vehicle interior Air Quality in China

✓ Study on vehicles from Australian government research organization

- Commonwealth Scientific and Industrial Research Organization(CISRO)

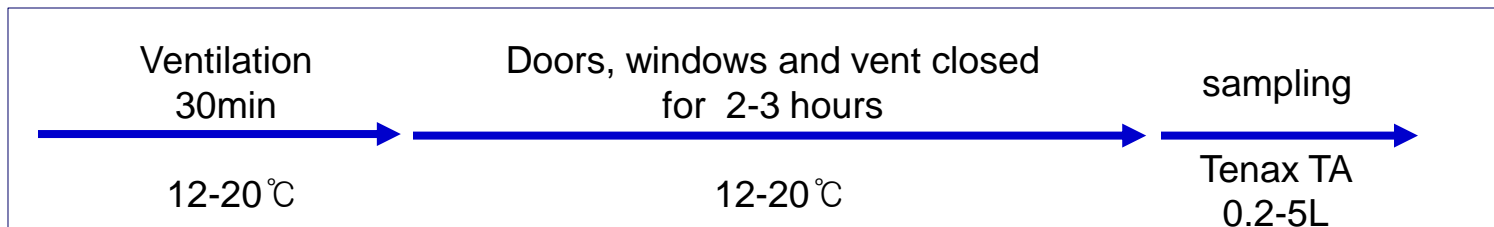


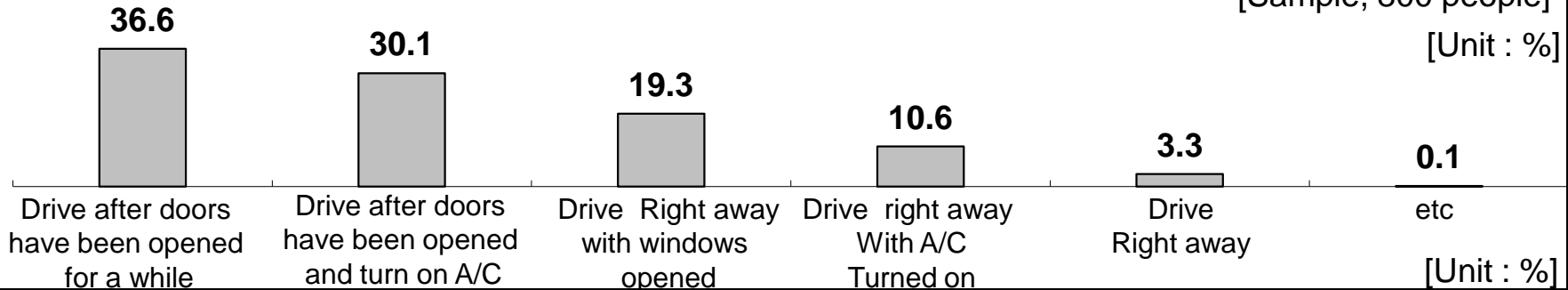
Fig. 4 15th International Clean Air & Environment Conference, Nov 26-30, 2000, Sydney, CASANZ, 464-8

◆ Survey Results on Summer Conditions

‘Q. What do you do if interior air is hot from being parked in the sun on a summer day?’

[Sample, 800 people]

[Unit : %]



[Unit : %]

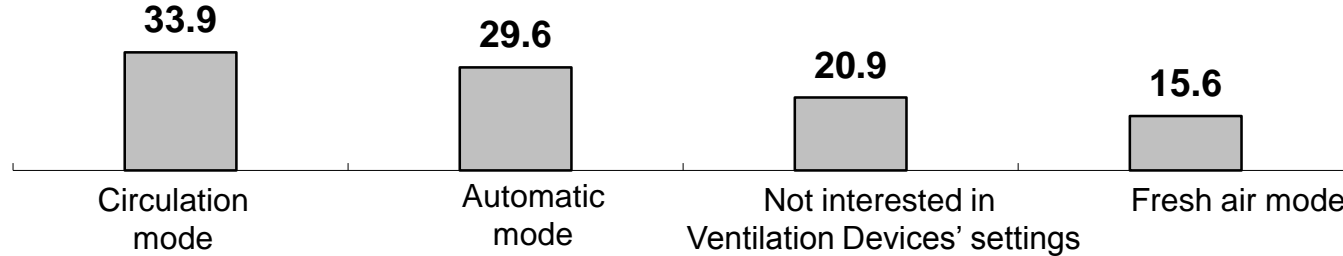
Ventilation Method	total	Gender		Age				new car purchased		Health condition			Sensitive for chemicals		
		male	female	20's	30's	40's	50's	within 6 month	6 - 12 month	Good	Normal	Bad	High	Normal	Low
(people number)	(800)	(401)	(399)	(210)	(231)	(218)	(141)	(258)	(542)	(662)	(128)	(10)	(241)	(317)	(242)
Drive after doors have been opened for a while	36.6	32.7	40.6	31.0	32.9	40.8	44.7	30.2	39.7	35.5	41.4	50.0	34.9	33.4	42.6
Drive after doors have been opened and turn on A/C	30.1	31.7	28.6	30.0	27.7	28.9	36.2	35.7	27.5	29.9	31.3	30.0	35.3	30.0	25.2
Drive right away with windows opened	19.3	17.5	21.1	21.9	21.2	20.2	10.6	17.8	19.9	19.8	17.2	10.0	18.3	19.6	19.8
Drive right away A/C turned on	10.6	13.7	7.5	11.9	13.0	9.2	7.1	13.2	9.4	11.3	7.8	-	9.1	12.0	10.3
Drive right away	3.3	4.2	2.3	5.2	5.2	0.5	1.4	3.1	3.3	3.3	2.3	10.0	2.1	5.0	2.1
etc	0.1	0.2	-	-	-	-	-	-	0.2	0.2	-	-	0.4	-	-

◆ Survey Results on Ventilation Devices Setting

‘Q. Which ventilation devices setting do you use when driving a car?’

[Sample, 800 people]

[Unit : %]



[Unit : %]

Preferred Ventilation Setting	total	gender		Age				new car purchased		Health condition			Sensitive for chemical		
		male	female	20's	30's	40's	50's	within 6	6 - 12 mont	Good	Normal	Bad	High	Normal	Low
(people number)	(800)	(401)	(399)	(210)	(231)	(218)	(141)	(258)	(542)	(662)	(128)	(10)	(241)	(317)	(242)
Circulation mode	33.9	37.2	30.6	31.4	35.1	38.5	28.4	29.8	35.8	33.1	36.7	50.0	35.7	39.1	25.2
Automatic mode	29.6	29.9	29.3	35.2	27.3	23.4	34.8	35.7	26.8	30.1	27.3	30.0	35.3	26.5	28.1
Not interested in ventilation devices' settings	20.9	17.2	24.6	22.9	20.3	18.8	22.0	19.0	21.8	22.1	15.6	10.0	16.6	15.5	32.2
Fresh air mode	15.6	15.7	15.5	10.5	17.3	19.3	14.9	15.5	15.7	14.8	20.3	10.0	12.4	18.9	14.5

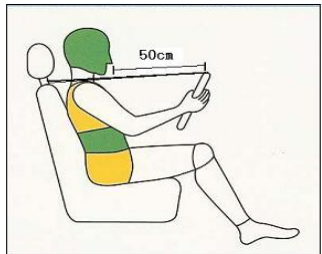
◆ The test on VIAQ Standard

✓ Scope of Application

- Passenger vehicles, vans and buses(Light Duty)
- 4 weeks(14-28 days) from the date of manufacture

✓ Measurement Substances

- Formaldehyde, Benzene, Toluene, Xylene, Ethylbenzene, Styrene, and Acrolein (7 substances)

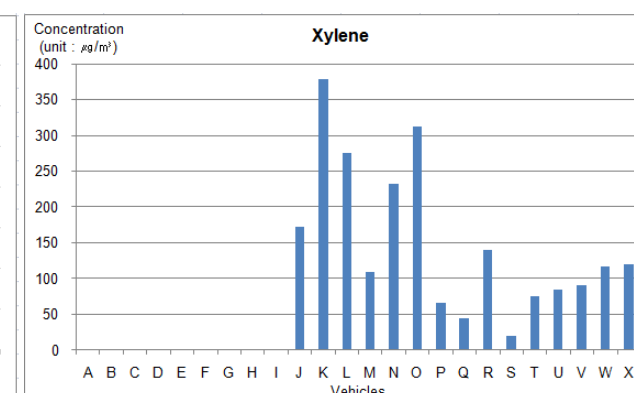
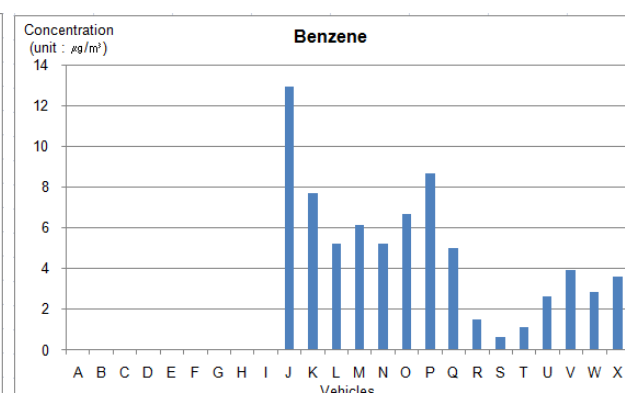
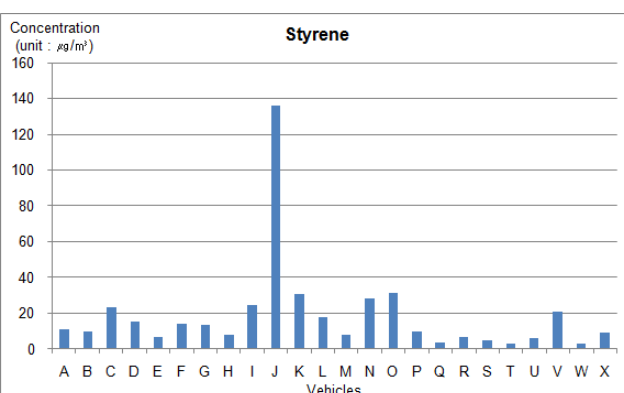
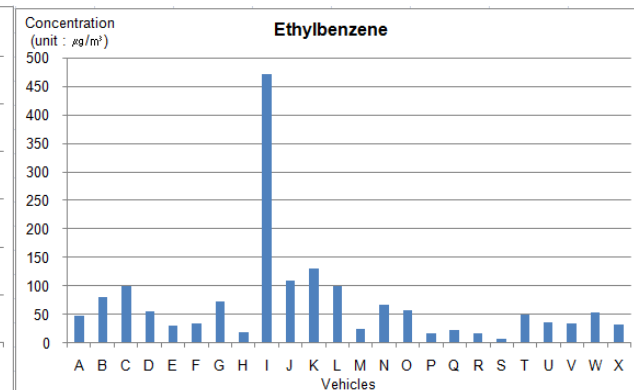
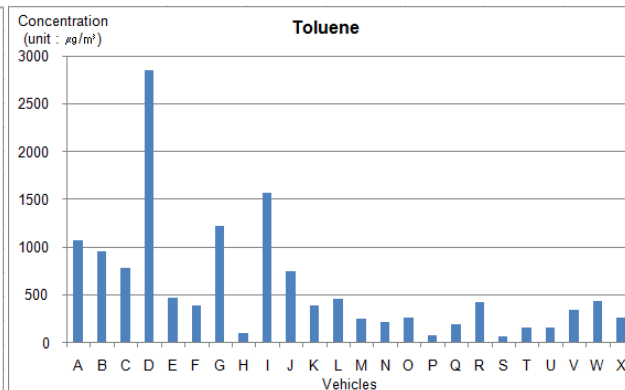
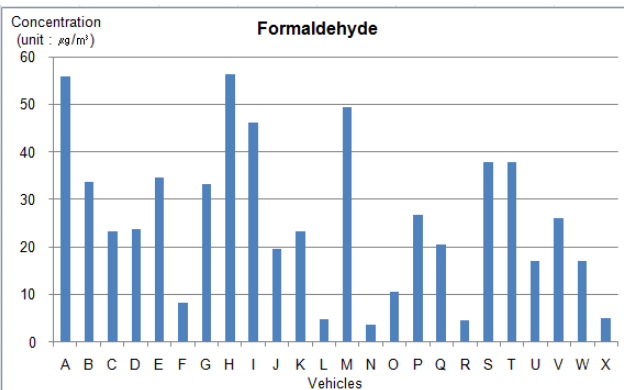


Time	Temp Stabilization Min. 12 hours	Ventilation 30 min	Doors Closed 2 hours	sampling 15min
Cabin Temp	25 ± 2 °C	25 ± 2 °C	25 ± 2 °C	Day 1 : Sample 1,2,3 Day 2 : Sample 4,5,6

Korea VIAQ Introduction

◆ Test data of Korean test procedures for VIAQ

- Ambient mode is already used for measuring VOCs emitted by interior materials used in the construction of vehicles.



◆ Example of Test data for Korean test procedures for VIAQ

(unit : $\mu\text{g}/\text{m}^3$)

Vehicles	Production Date	Age(Day)	Formaldehyde	Toluene	Ethylbenzene	Styrene	Benzene	Xylene
A	'11.03.12	+26, 27	55.8	1073.2	48.6	11.2	-	-
B	'11.03.28	+22, 23	33.7	954.8	81.1	9.7	-	-
C	'11.04.03	+22, 23	23.2	789.2	100.6	23.6	-	-
D	'11.04.04	+23, 24	23.8	2845.8	55.5	15.5	-	-
E	'11.04.06	+23, 24	34.6	468.2	30.4	6.6	-	-
F	'11.04.12	+21, 22	8.4	388.2	35.1	14.2	-	-
G	'11.04.27	+20, 21	33.3	1222.3	72.8	13.8	-	-
H	'11.05.16	+23, 24	56.4	107.8	20.2	7.9	-	-
I	'11.06.02	+21, 22	46.3	1563.5	470.3	24.5	-	-
J	'12.03.22	+22, 23	19.5	753.0	109.6	136.1	12.9	172.8
K	'12.04.02	+22, 23	23.3	388.9	130.7	30.6	7.7	378.7
L	'12.04.10	+22, 23	4.9	460.1	100.5	17.9	5.2	275.6
M	'12.04.13	+21, 22	49.3	248.2	24.8	8.2	6.1	109.2
N	'12.04.15	+22, 23	3.7	223.7	68.0	28.4	5.3	231.8
O	'12.04.17	+22, 23	10.7	262.5	57.2	31.7	6.7	312.6
P	'12.05.22	+21, 22	26.9	85.1	18.2	9.7	8.7	66.5
Q	'12.06.21	+21, 22	20.5	200.5	22.4	3.9	5.0	45.1
R	'13.04.02	+21, 22	4.7	429.8	18.3	6.7	1.5	139.6
S	'13.05.10	+20, 21	37.9	64.6	8.3	5.1	0.6	20.7
T	'13.06.06	+21, 22	37.9	163.5	50.9	2.9	1.1	75.9
U	'13.07.10	+21, 22	17.1	166.4	36.3	6.4	2.7	83.8
V	'14.04.30	+21, 22	26.2	342.9	34.4	20.7	3.9	91.3
W	'14.05.12	+21, 22	17.1	435.7	54.4	2.9	2.9	116.7
X	'14.05.28	+21, 22	5.0	269.0	32.4	9.2	3.6	119.5

◆ Current Text of VIAQ TOR(GRPE-70-09-rev.1):

3. Terms of reference

3.1 The following terms of reference describe the main tasks of the new IWG.

(c) Identify, review and assess **existing test procedures suitable for the measurement of emissions of vehicle interior air pollutants** (including sample collection methods and analysis methods, etc.)

(e) Draft a new recommendation (R.E.3 under the 1958 Agreement, S.R.1 under the 1998 Agreement or a new Mutual Resolution under both Agreements) concerning the protection of drivers and passengers from **VOCs emitted by interior materials used in the construction of vehicles,** including provisions and harmonized test procedures.

➤ Proposal : Ambient mode

➤ Rationale :

- According to the TOR document(3.1.e), the work scope is VOCs emitted by interior materials used in the construction of vehicles.
- According to the survey results, most people use ventilation in the car in summer and there are many use cases of a vehicle ventilation devices' setting. It is hard to consider “use cases of a vehicle” rather than “material properties”
- With normal test conditions, the so called the ambient mode, is widely used in building and vehicles areas for indoor air quality, so it is the most suitable for “interior emissions”.