

Informal document No. GRB-49-07
(49th GRB, 16-18 February 2009,
agenda item 3(c))

Report GRB ad hoc Working Group ASEP

by the Chairman of the ASEP WG
GRB 49; February 2009

Reminder: why ASEP

- Annex 3 covers the part of the engine map with lower revs
- Decision made to have Additional Sound Emission Provisions to cover a wider part of the engine map (higher revs).

Products to deliver:

A proposal to GRB for the text (test method, data processing to test result, limits and control range) of annex 10,

and proposals for necessary changes in the main body.

Meetings:

1. Amsterdam	2005 November
2. The Hague	2006 January
3. Geneva	2006 February
3a-d Task Force	2006 Feb-Aug
4. Geneva	2006 September
5. The Hague	2006 November
6. Geneva	2007 February
7. The Hague	2007 May
8. The Hague	2007 October
9. Ann Arbor USA	2008 January
10. Geneva	2008 February
11. Tokyo	2008 June
12. Geneva	2008 September
13. Paris	2008 November
13a. Expert group Paris	2008 December
14. Paris	2009 January

Why so long?

Differences with Annex 3:

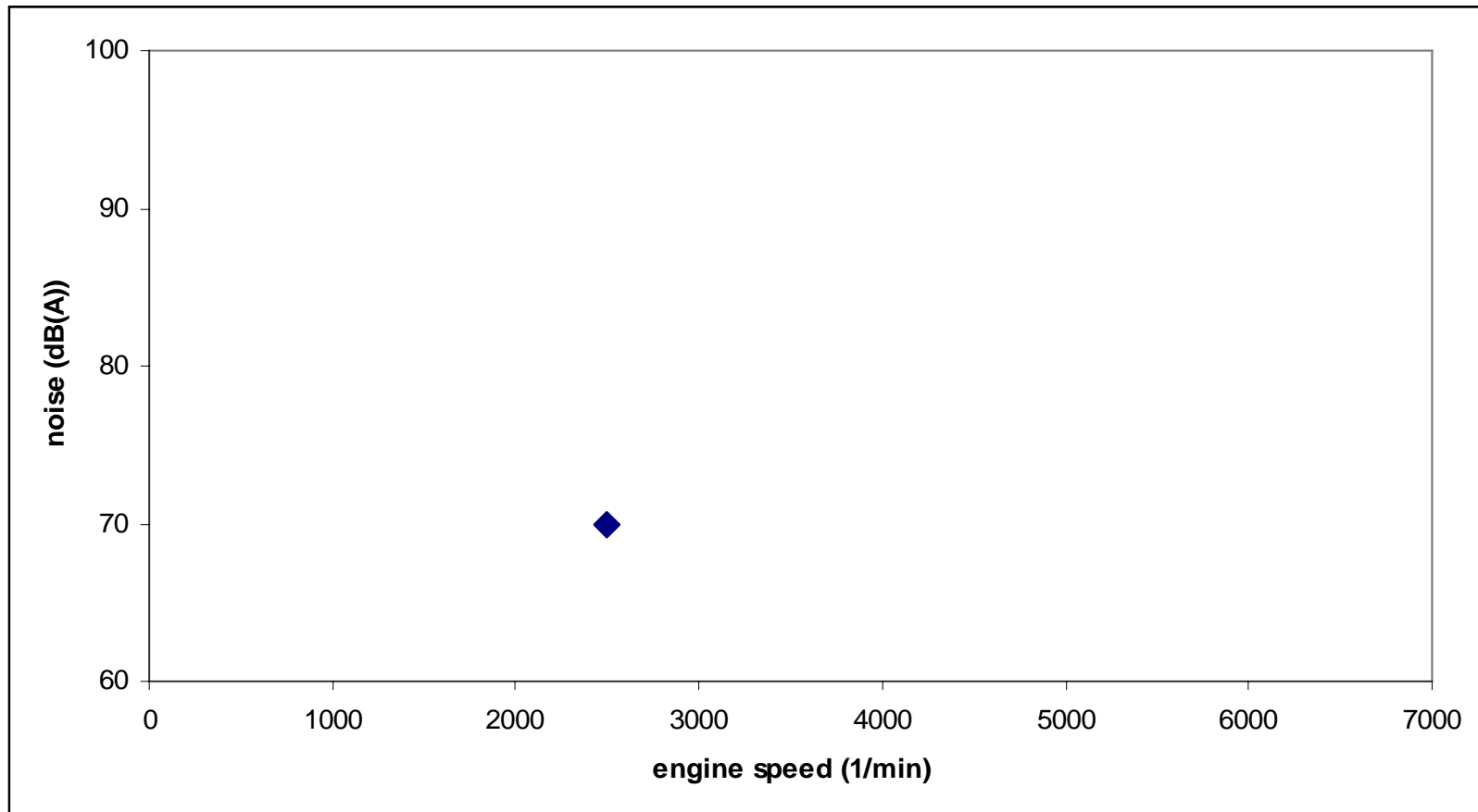
1. Acceptance
2. New Concept (point → range)
3. Limitation discussion

What did we accomplish:

- System
- Legal wording
- Understanding main issue

System: how it works

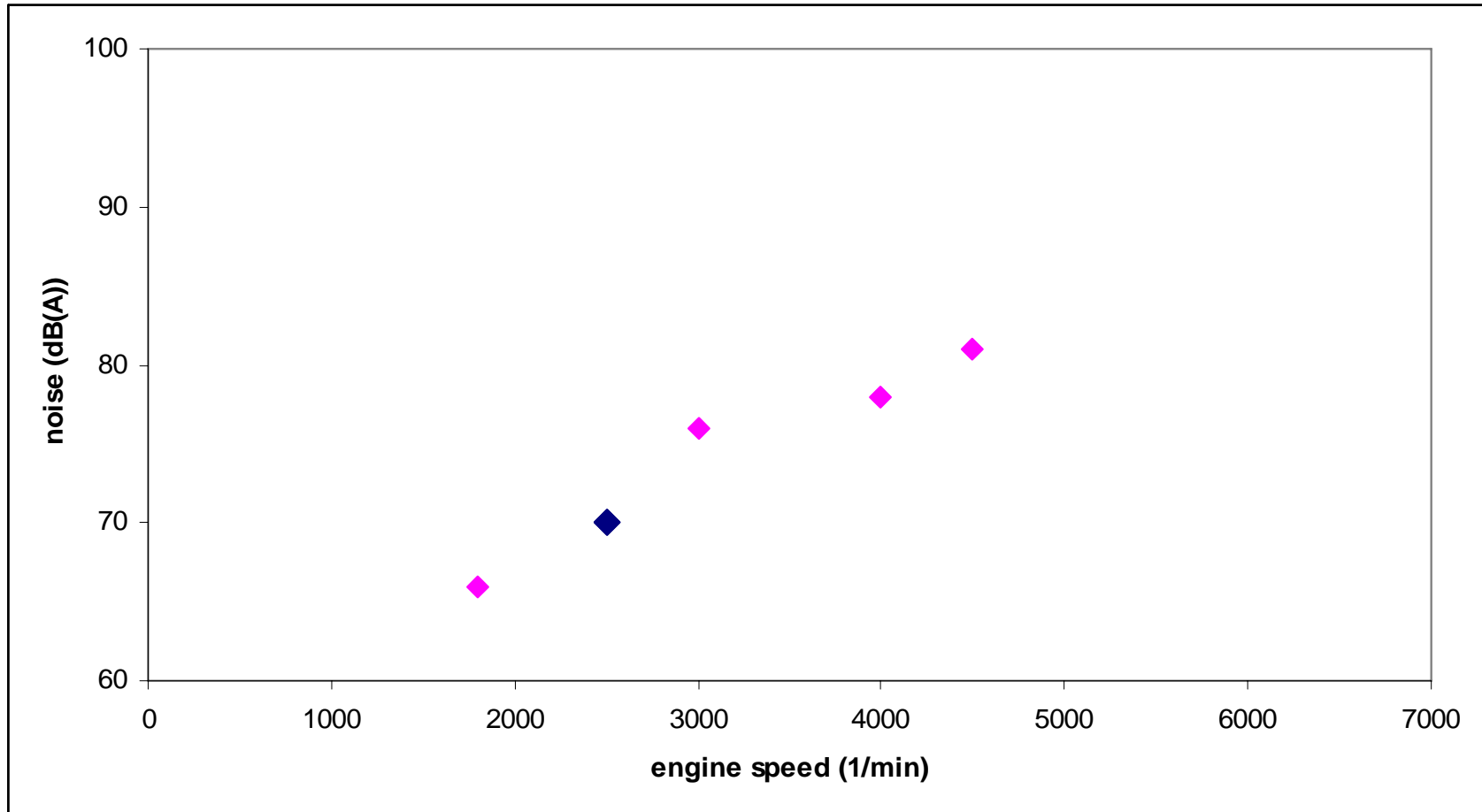
step 1: anchor point



Anchor point in gear i comes from Annex 3 ($L_{wot,i}$, $n_{BB,i}$)

System: how it works

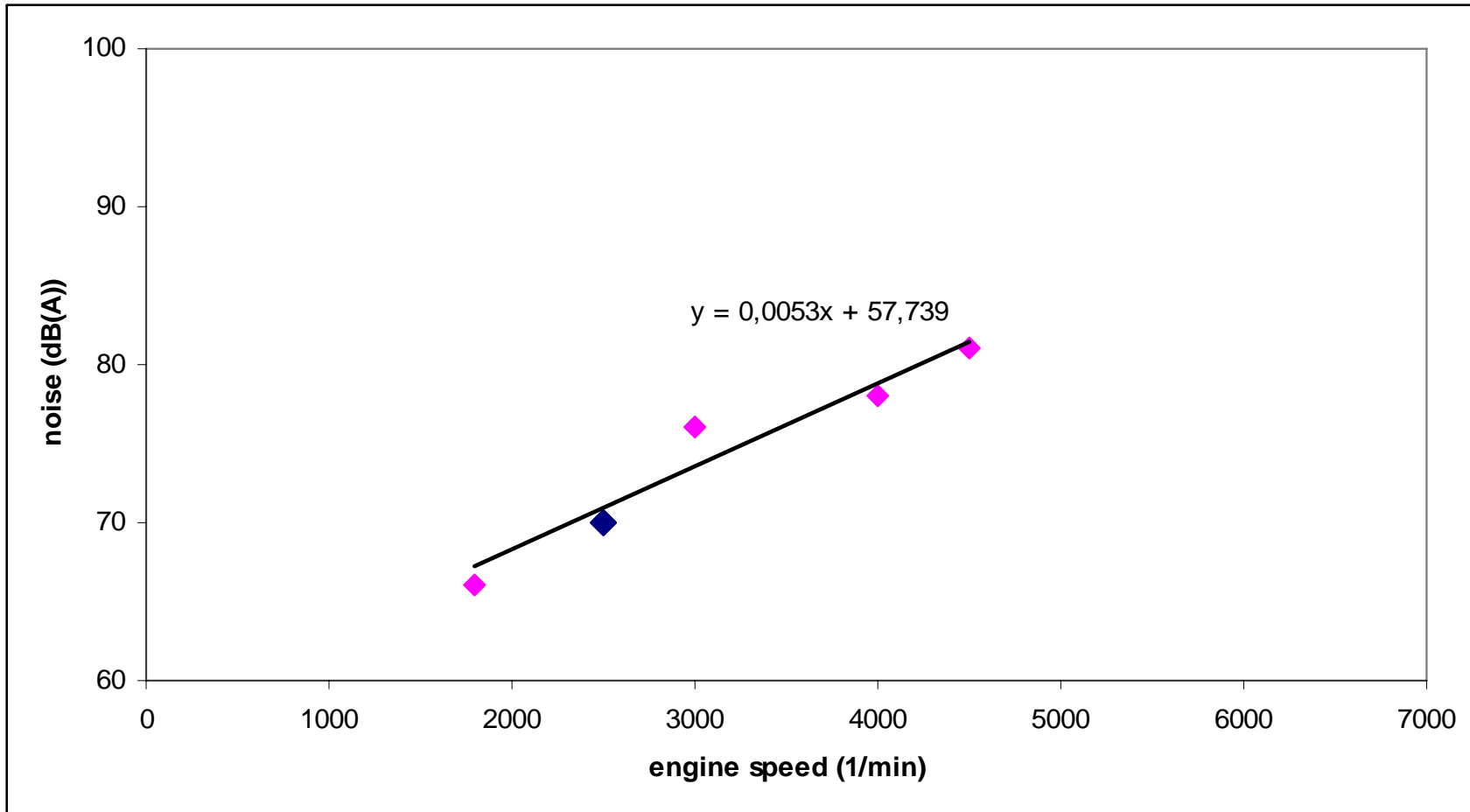
step 2: ASEP measurements



4 additional measurements in gear i within boundaries

System: how it works

step 3: construction of slope

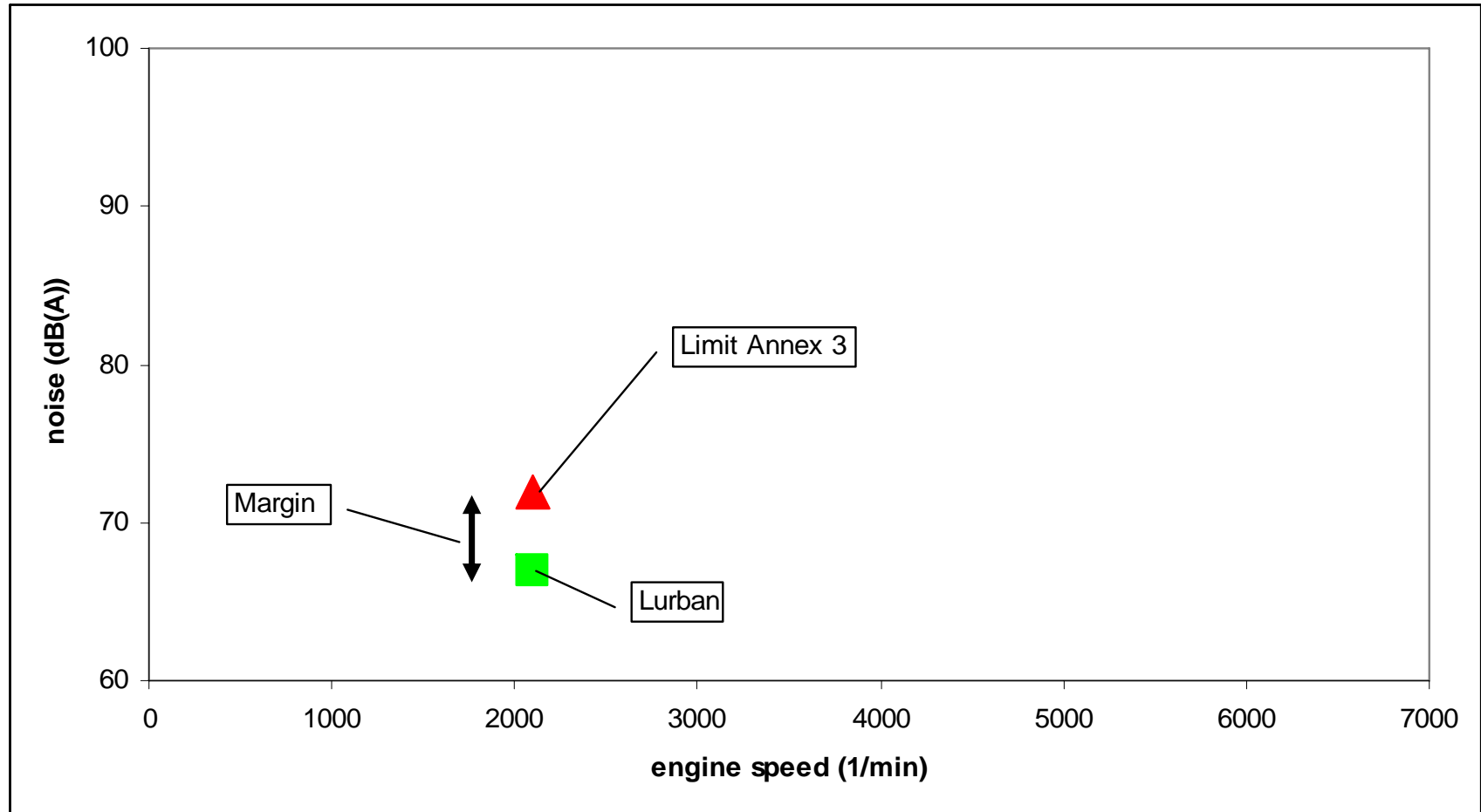


Calculate slope trough measurements

Slope is maximized to X dB/1000 rpm; X determines stringency (to be agreed on)

System: how it works

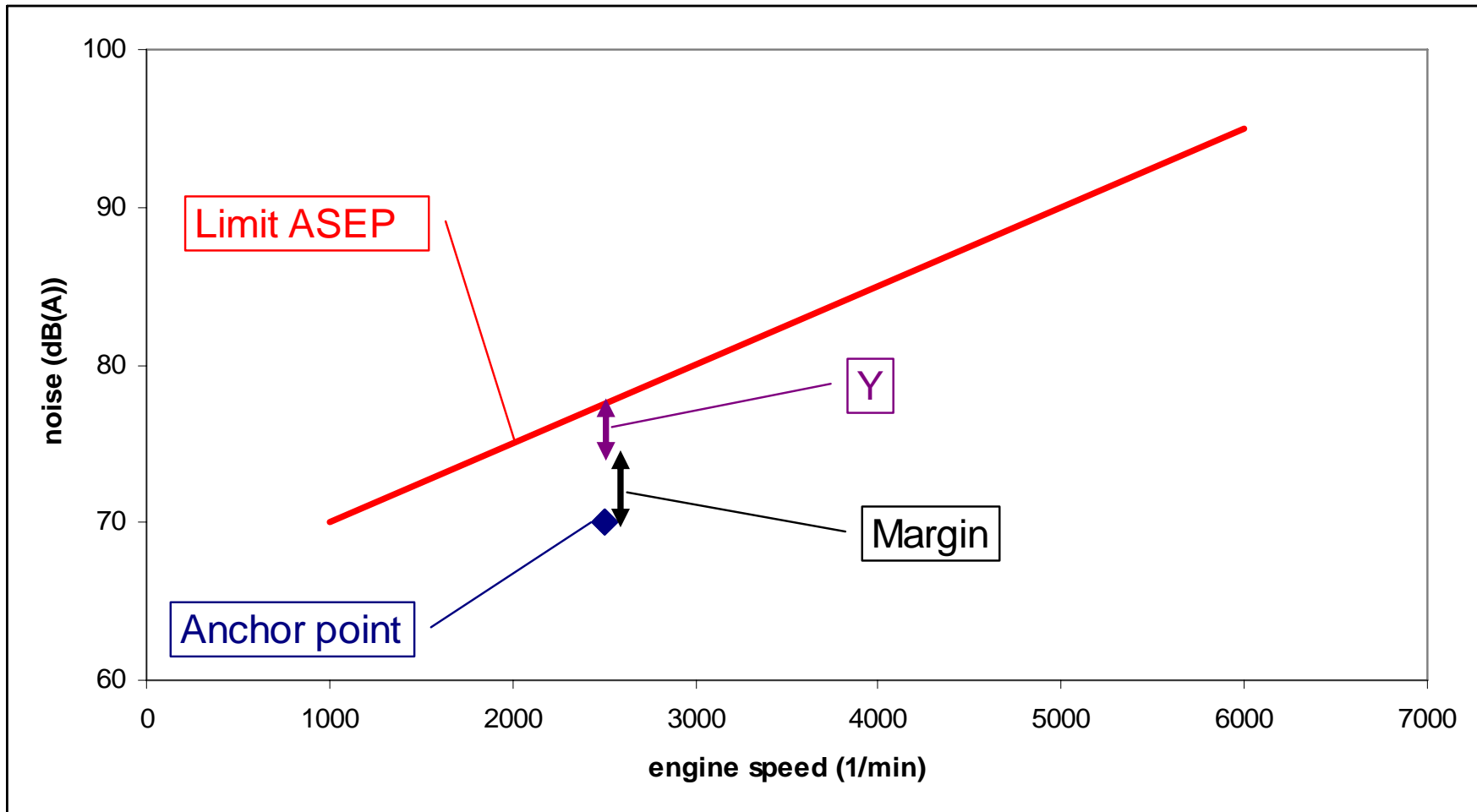
step 4: add margin



$$\text{Margin} = \text{Limit}_{A3} - L_{\text{urban},A3} \quad (\text{bigger for silent vehicles})$$

System: how it works

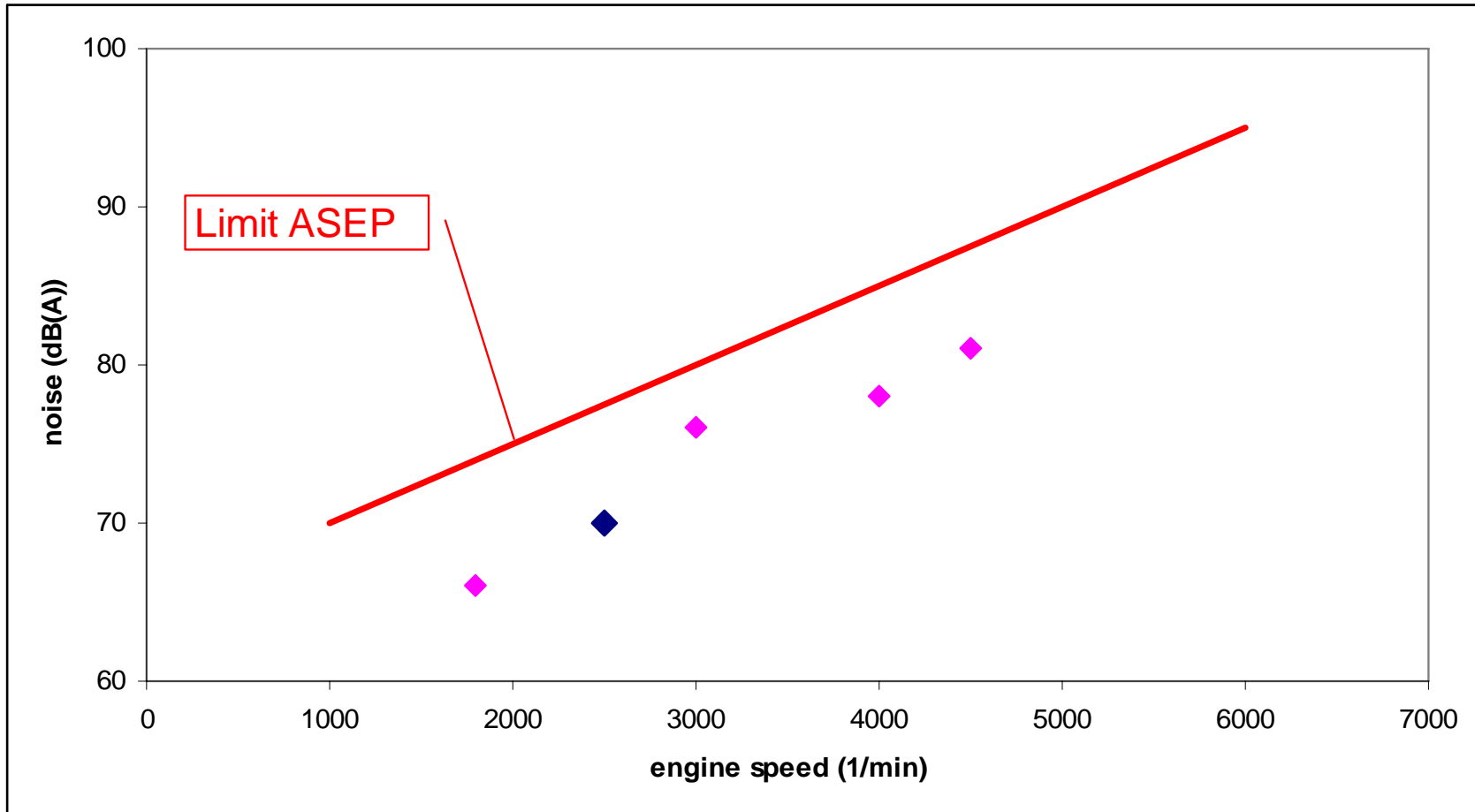
step 5: limit line



Limit = anchor point + margin + Y + slope
Y determines stringency (to be agreed on)

System: how it works

step 6: compare measurements to limit



Every measurement from step 2 is checked against limit

System: how it works

step 7: repeat in other gears

- Other gears than gear i are corrected for different tyre noise contribution
- In principle all gears and modes have to fulfill ASEP, however
 - Gears higher than $i+1$ may be exempted
 - Gear 1 likely to be skipped due to engine speed overrun within test track
 - In practice mostly only gear 2 and 3

Legal wording

See informal document no 3

Agreement on many issues

Some technical issues to be dealt with
(like CVT's)

Main Issue

It's all about

STRINGENCY

ISSUE RAISED: TNO

“the present proposal will result in a very undesirable situation: compared to the R51.02 regulation that is currently in use and also is based on an acceleration test, the OICA proposal will result in an extra driveline noise allowance for most vehicles, which can reach up to 10 dB with an average of about 3 dB.”

Expert Group

Looked to it in details

Came up with analyses

Stringency :

Two aspects

- limit
- area of control (boundary conditions)

Factors influencing stringency

- A table has been made summing up the most important factors. In rank order
 - Limit annex 3
 - Boundary conditions annex 3
 - Limit of annex 10 (anchor point, slope and margin)
 - Boundary conditions annex 10
- So: annex 3 has more influence on stringency than annex 10 itself

Limit A3 → Limit A10

Multiplier effect (kp factor): up to 1.7

1 dB lack of stringency in Annex3 means:
Up to 1.7 dB less stringent in Annex 10

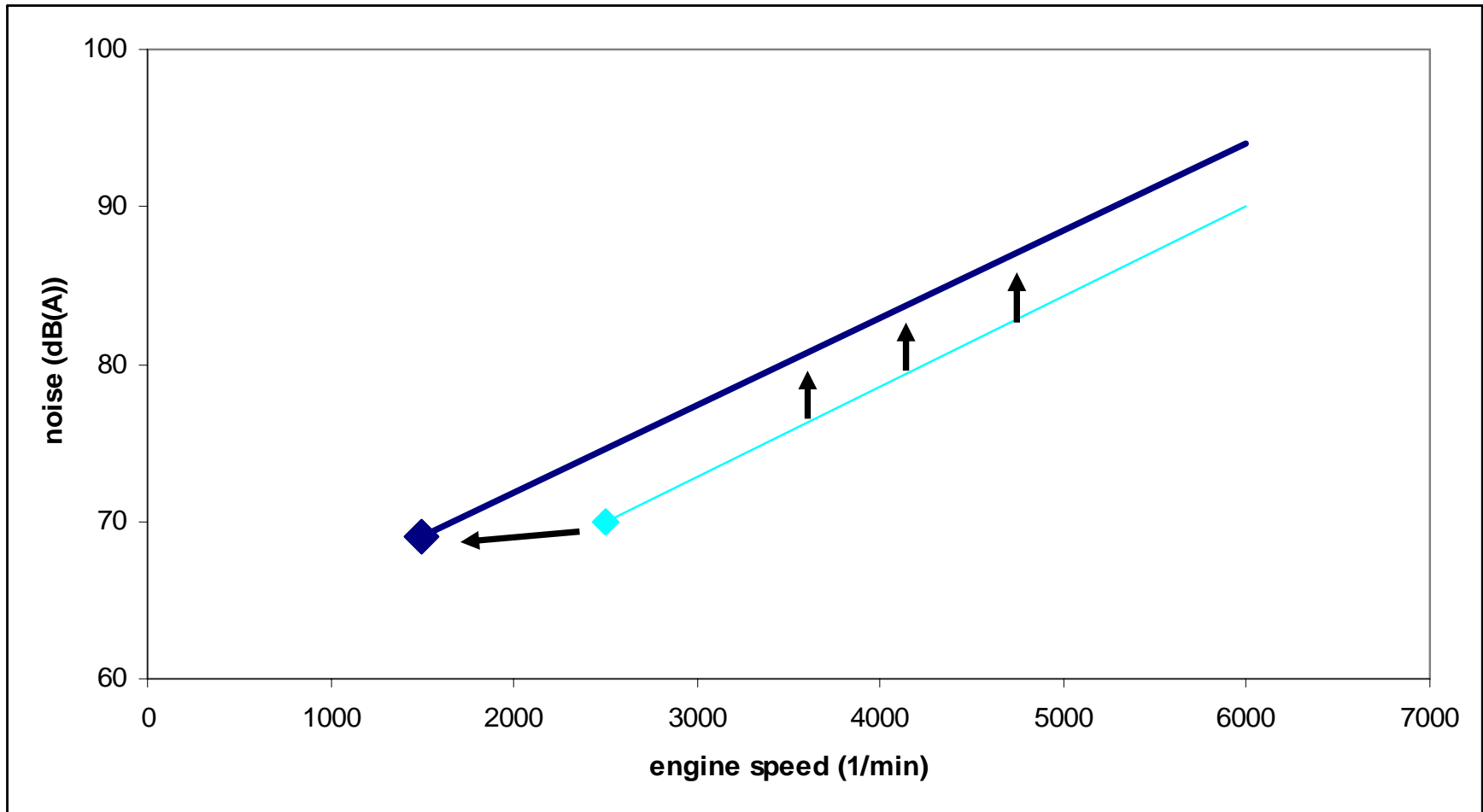
PM: higher PMR → less stringent limit

Boundary Condition Acceleration

Annex 3

- Boundary condition $a_{\max}=2 \text{ m/s}^2$ forces vehicles to higher gear/lower revs
- Means: anchor point annex 10 is going left
- Means: Annex 10 limitation weaker
- For Annex 3 little effect due to k_p compensation

Anchor point Annex 10 to the left



Results in higher limit curve annex 10

Advise of ASEP Group to GRB

Annex 3:

Reconsider 2 m/s^2 boundary condition

- little effect on annex 3 result
- increases significantly effectiveness Annex 10

Limitation Annex 10

Anchor Point, Slope, Margin

That's our job, so we are dealing only with
a part of the stringency issue

Area of control due to boundary conditions Annex 10

General: 3 forces to lower the engine speed

Engine speed: boundary means direct limitation

Vehicle speed: (related to test tracks lay out)
Lower speed → lower revs

Acceleration: → skipping low gears
→ high revs not covered

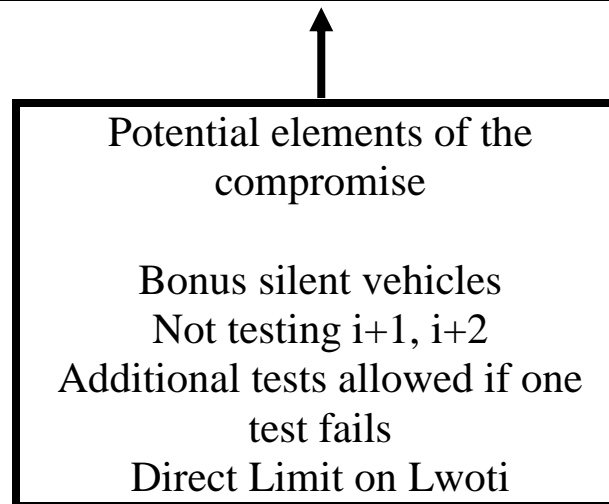
By the way

Learned from R41 ad hoc Motorcycle group:

Direct limit on the $L_{wot,i}$

Results Limitation Discussion

	Chairman Stringent	Compromise To be found	OICA Lenient
Ann 10 boundary acceleration	No limit	?	4.0 m/s ²
Ann 10 boundary Engine speed	90% of max	?	60-90% of max (dep PMR)
Anchor point*		?	
Maximum slope	5	?	6-7
Margin	1	?	3



* in relation to discussion about Annex 3 Boundary Condition $Acc < 2 \text{ m/s}^2$

Other Issues

- Treatment CVT's (raised by Japan)
- Replacement Silencers: workload and practical problems (raised by Clepa)

Remaining work to be done:

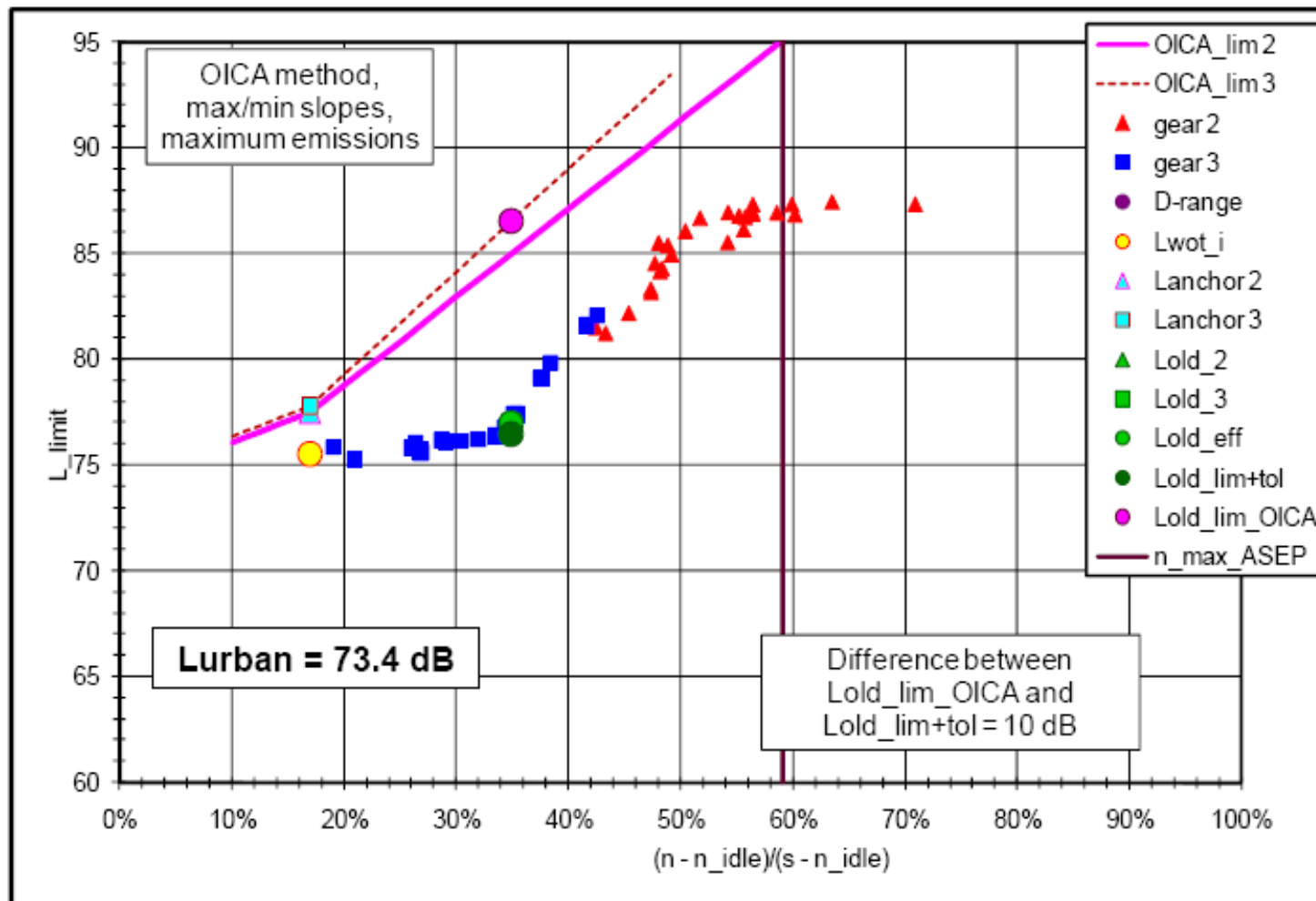
Fine tuning method (CVT's)

Finalize Wording

Stringency

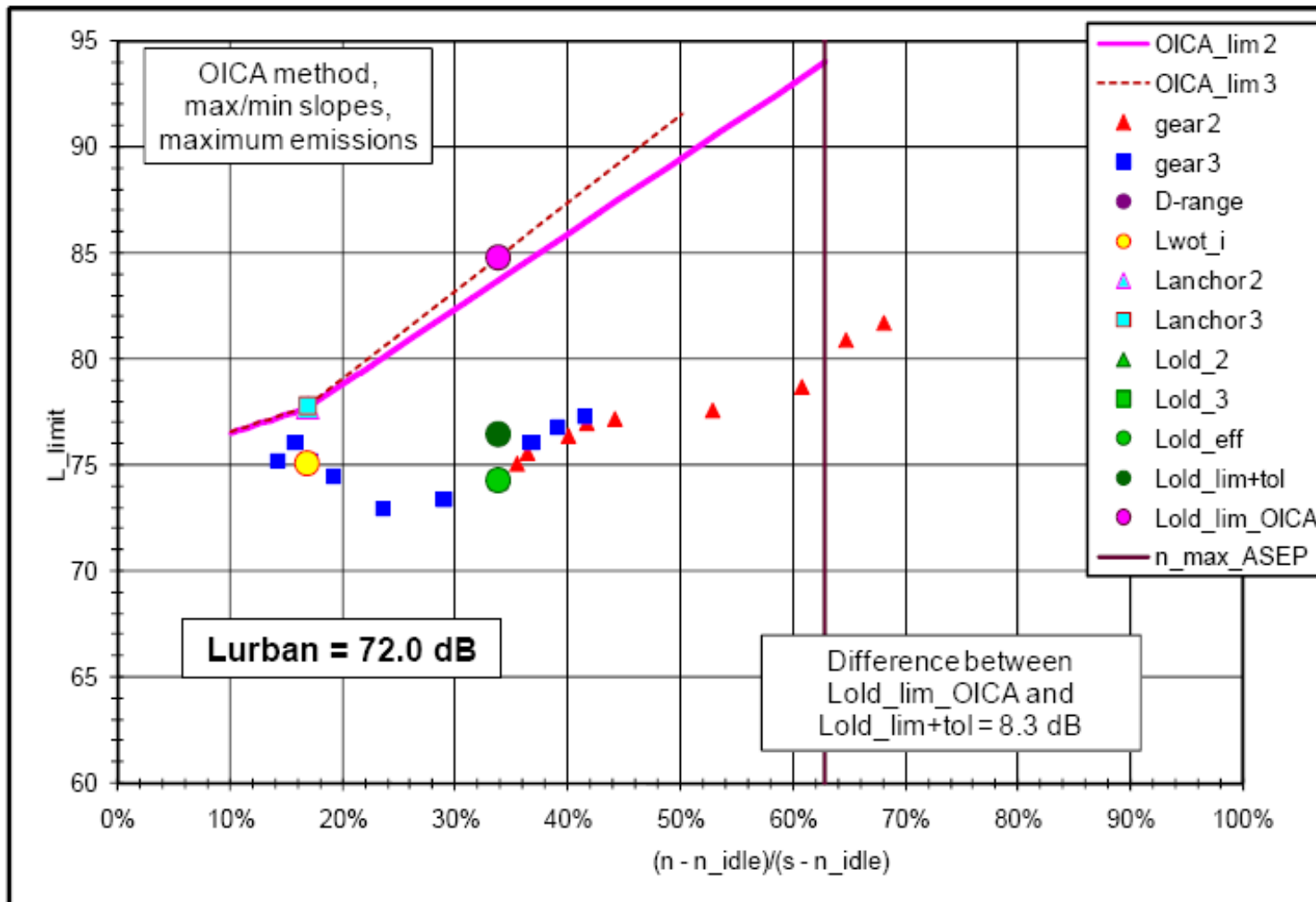
Thank You

Need for ASEP control range at low engine speed (example 1)



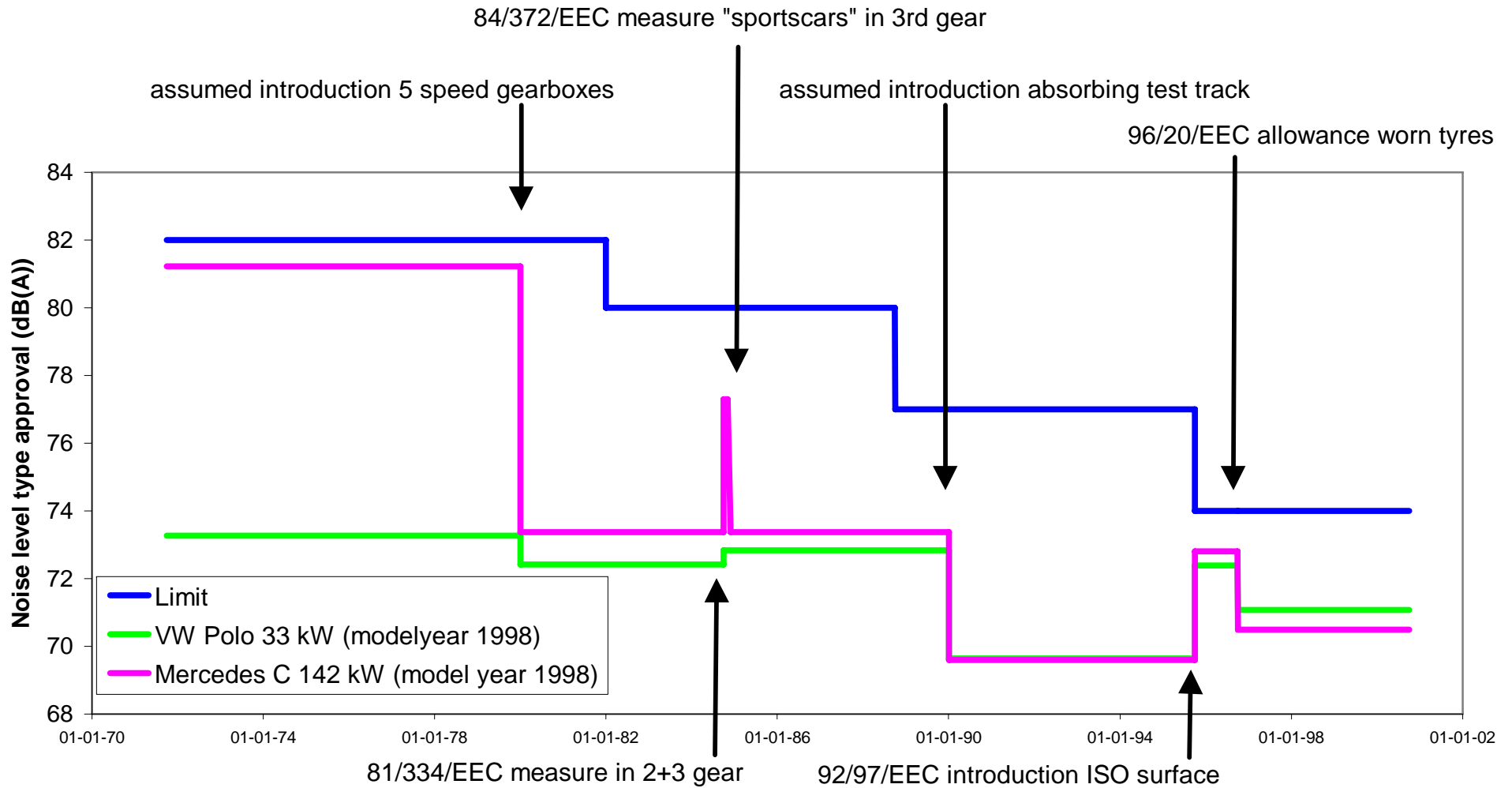
Noise does not decrease at low engine speed

Need for ASEP control range at low engine speed (example 2)



Noise increases at low engine speed

Effect of changes in measuring method (example of 2 vehicles)



Effect of changes in measuring method (estimated effect total population)

