Informal document No. **GRB-50-10**

(50th GRB, 1 – 3 September, 2009, agenda item 3(c))

Report
GRB ad hoc Working Group ASEP

issued by the Chairman of the ASEP WG
GRB 50; September 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).

Very helpful: ToR

3. The informal group **shall develop** a complementary test method and evaluation criteria for insertion into Annex 10. The complementary test method shall cover the noise emission under higher engine speeds and loads than the proposed procedure in TRANS/WP.29/GRB/2005/5, as amended.

Meetings: (20)

1. Amsterdam	2005 November
2. The Hague	2006 January
3. Geneva	2006 February
3 a-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
15. Flensburg (Ger.)	**2009 May**

Why did it take so long?

- Period of denial by Industry
- Seeking and shaping, three different methods
- Stringency discussion
- Struggle for every dB(A)

Why did it take so long? (2)

Please mind:

Annex 3 was a discussion for 6 years, limits still to be discussed

Annex 3 only one point in the engine map

ASEP is covering a wide area of the map

If someone says: annex 10 is ……

Reminder from last report to GRB

Remaining work to be done:

1. Fine tuning method (CVT's, Hybrids)
2. Finalize Wording
3. Stringency and Limitation

Results, Deliverables (1)

Acceptance of ASEP

Database and analyses

Stringency Analysis

An unanimous proposal to improve Annex 3

(by skipping border 2 m/ss – Formal NL)

A lot of other issues (like CVT's, Hybrids, COP, Vmax, Higher gears)

Skipping border 2 m/ss

Major improvement quality ASEP

Anchor point towards the middle of the engine map →

Improved capability to prescribe the sound behavior

Skip border 2m/s^2 Formal NL Annex 3:

Supported by the group

No relevant changes for Limits Annex 3 (kp factor)

Effect: major improvement quality ASEP

ASEP in lower gears/higher revs

Anchor point towards the middle of the engine map

Deliverables

It should be a method

OUTCOME: NEGATIVE

NO FINAL PROPOSAL ASEP METHOD

Deliverables (3): Results of stringency discussion in the group

A method as developed/proposed by OICA, supported by several members of the working group, without limitation.

A proposal by The Netherlands, with a limitation

Method ADBO

ADBO=As Developed By OICA

Lwot Annex 3 is basis

Add margin and bonus → anchor point

Slope fixed: x dB * 1000 revs

Method NL

Same anchor point (marginal difference)

Also margin and bonus

Difference:

Slope to Not To Exceed level (NTE)

Main Difference: Level Stringency

ADBO:

Slope border line: x dB times 1000 revs

NL

Slope border line:

Line to ‘Not to Exceed Level’

Next Deliverable: Stringency issue

Raised by several members

Analyses done by small group

Key issues

1. Comparison with old limit
2. Maximum allowed noise level

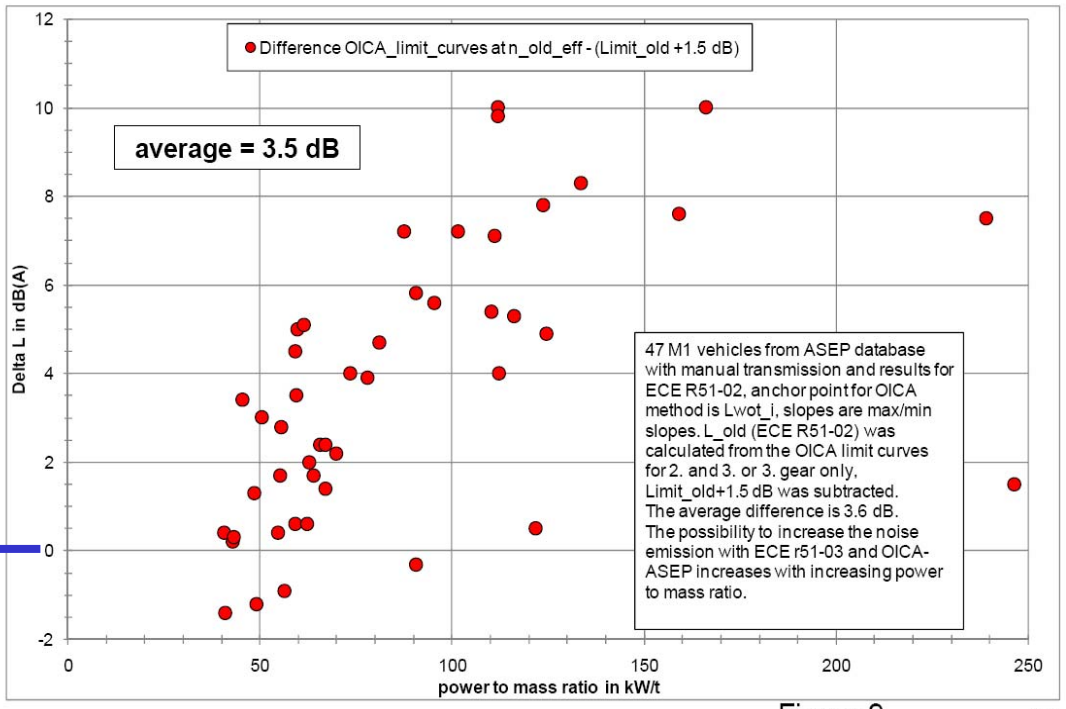
ISSUE RAISED: TNO

"After studying the proposal TNO concluded that 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."

Issue raised: Germany

- Document GRBIG 13.008 (Germany)
  - "The OICA method allows vehicles to become more noisy in the future compared to the current method"

Overview of allowances



Allowance for more noise

Demand for less noise

Figure 9

Stringency :

Two aspects

- limit
- area of control (boundary conditions)

Two regulations

Annex 3

Annex 10

Factors influencing stringency

- A table has been made summing up the most important factors.
  In rank order:

Factor	*Status*
– Limit annex 3	Proposal Germany / monitoring EC
– Boundary conditions annex 3	Proposal IG ASEP to skip 2 m/s^2
– Limit of annex 10 (X, Y, Z)	no agreement in IG ASEP
– Boundary conditions annex 10	Proposal from IG ASEP

Follow Up Stringency

Annex 3: proposal by the whole group

Annex 10:

no support in ASEP group to work on it

→

NL felt obliged to have their own proposal,

to provide GRB with an alternative

Positions of IG ASEP delegates Limitation ADBO Method

- Preliminary guesses for ASEP coefficients have been given
  - SLOPE: 5 to 7
  - MARGIN: 2 - 3
  - EDGING: 1 – 1,5

- The group <u>agreed that additional analysis is necessary</u> to judge the stringency

EDGING

- ADBO method: new element
- No decision by the group
- Edging = extra slope
- Slope 7, Edging 1,5

→real slope = 8,5 dB/1000 revs (OICA pref.)

<u>Please note:</u>

Edging intended to improve limitation curve

Means lower slope and lower margin

Without those: it’s only a weakening

Limits ASEP <–> Limits Annex 3

- A table has been made summing up the most important factors.
  In rank order:

Factor	*Status*
– **Limit(s) annex 3**	Proposal Germany / monitoring EC
– Boundary conditions annex 3	Proposal IG ASEP to skip 2 m/s^2
– Limit of annex 10 (X, Y, Z)	no agreement in IG ASEP
– Boundary conditions annex 10	Proposal from IG ASEP

ASEP <–> Future Limits Annex 3 (2)

Strong connection

Limits annex 3 in evaluation

<u>Option:</u>

Decision together

Fine tuning ASEP on limits Annex 3

Follow Up

My understanding:

Methods ready

Mr Theis: limitation up to GRB

So group is finished (?)

THANK YOU

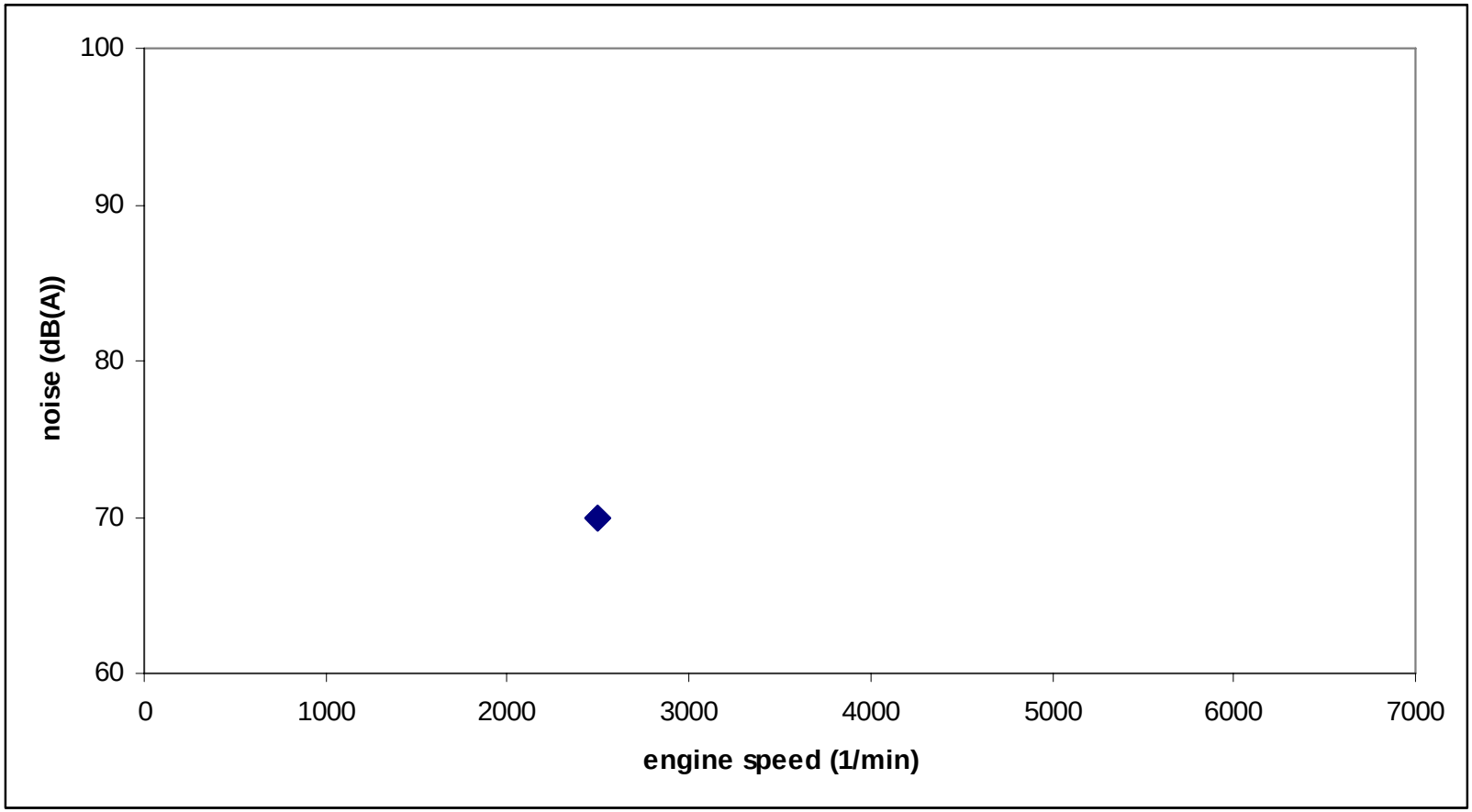
Follow Up?

- The group agreed that additional analysis is necessary to judge the stringency

Control range

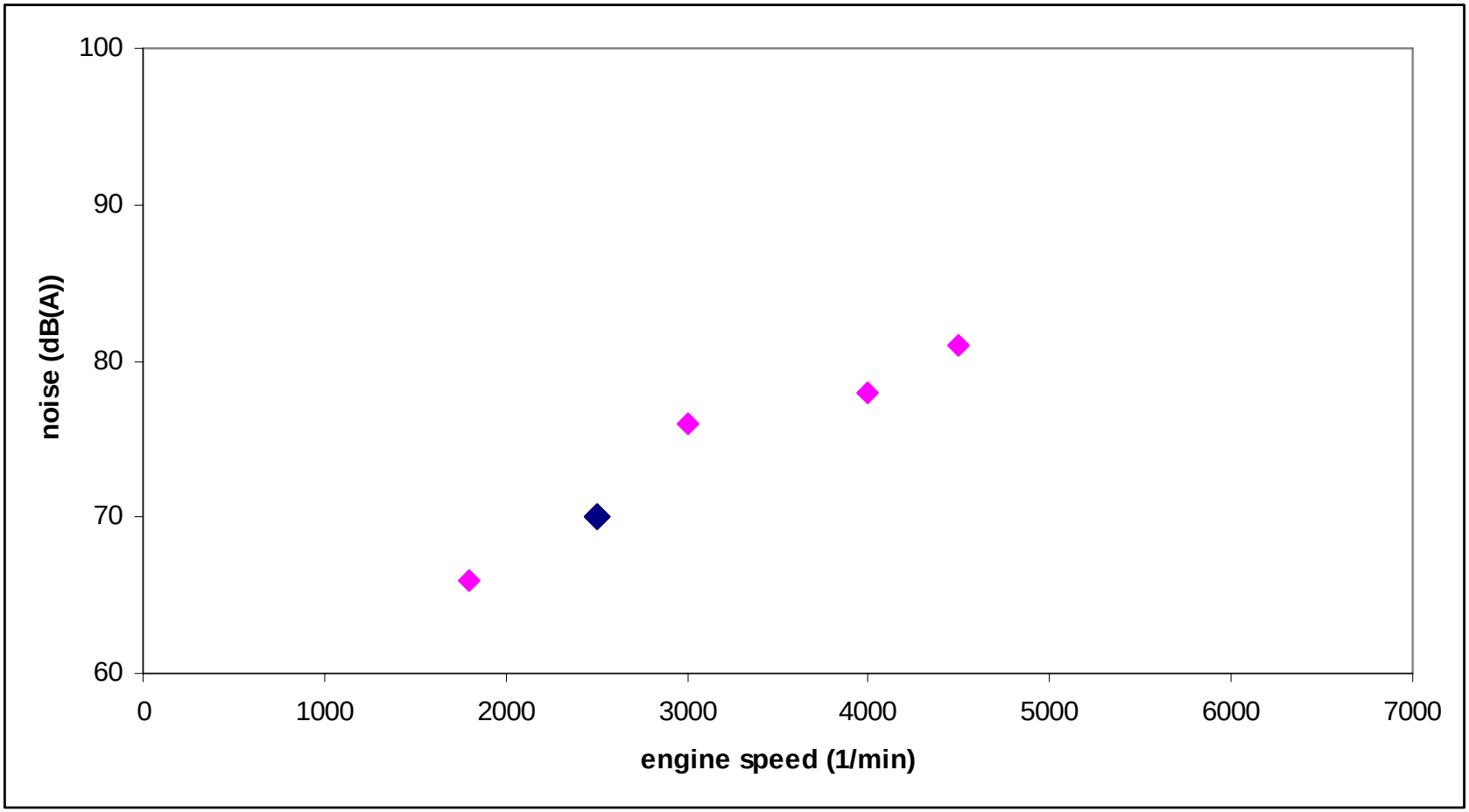
- Vehicle speed $v < 80$ km/h
- Acceleration $a < 4$ m/s2
- Engine speed $n < 2{,}0 * pmr^{-0{,}222} * s$

System: how it works
step 1: anchor point



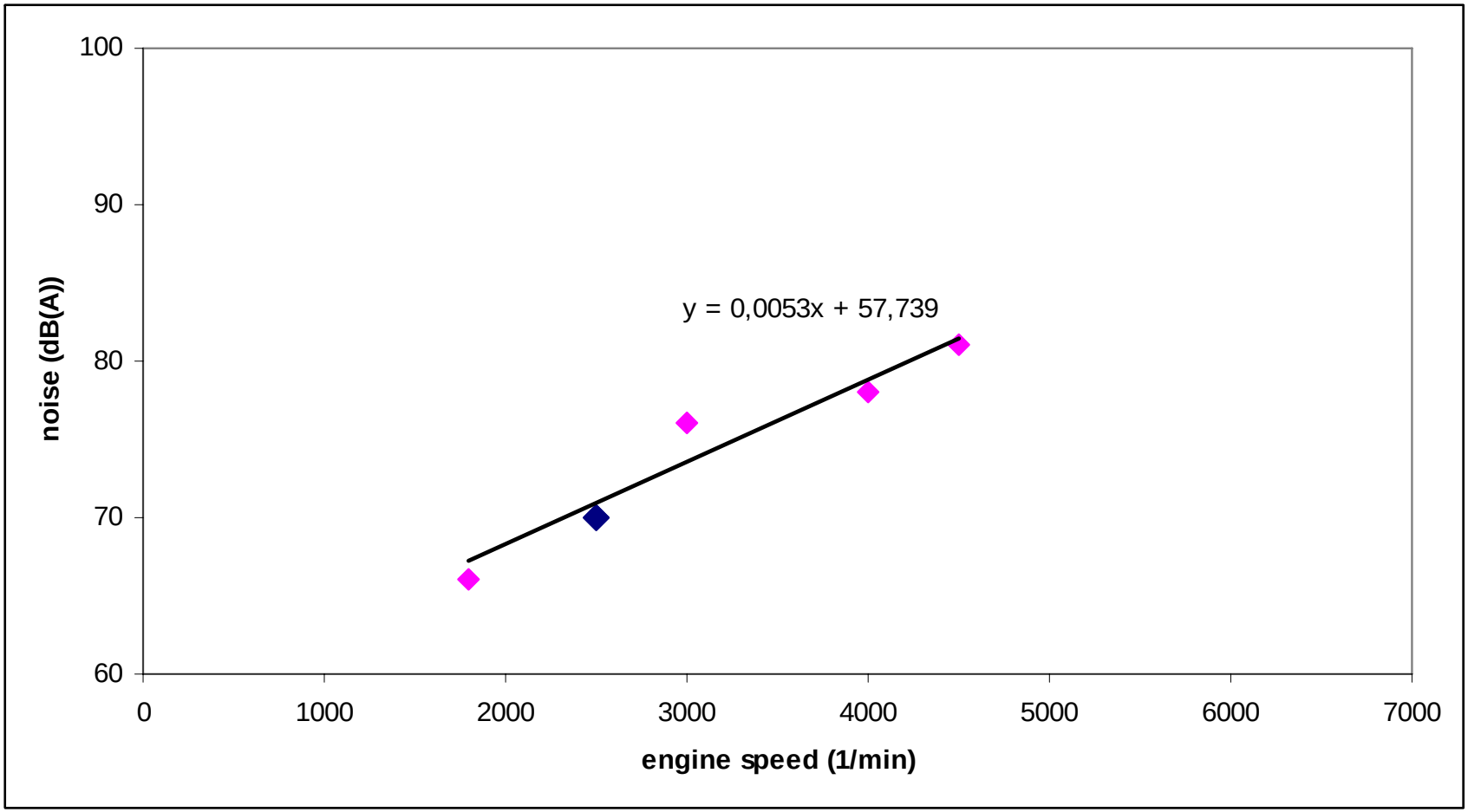
Anchor point in gear i comes from Annex 3 ($L_{wot,i}$, $n_{BB,i}$)

System: how it works
step 2: ASEP measurements



4 additional measurements in gear i within boundaries

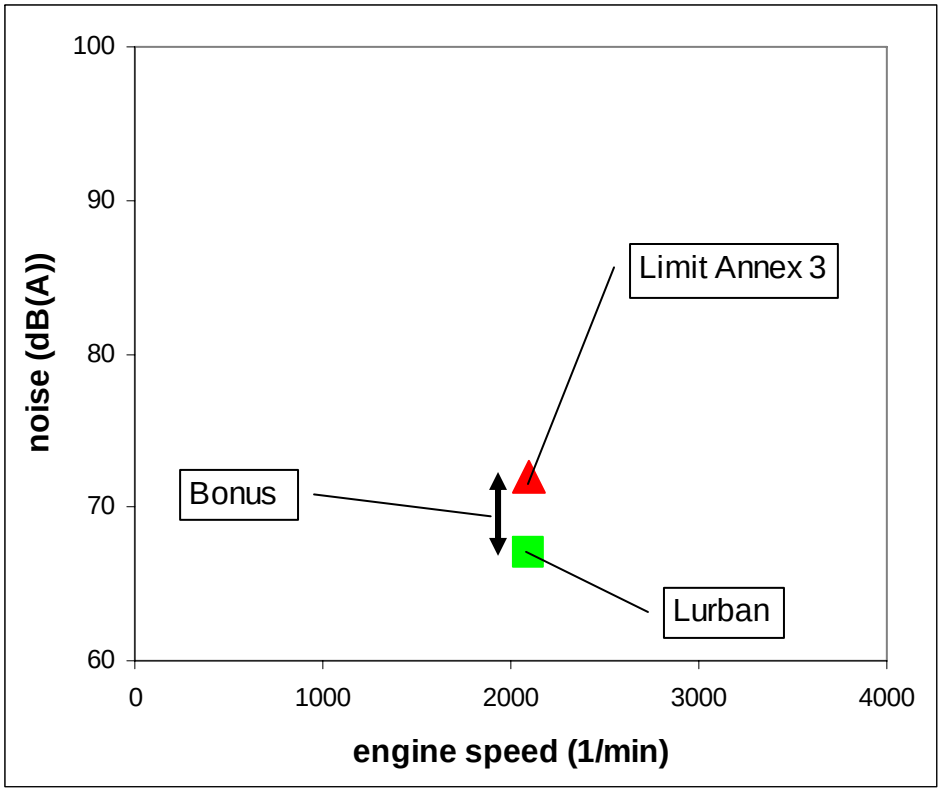
System: how it works
step 3: construction of slope

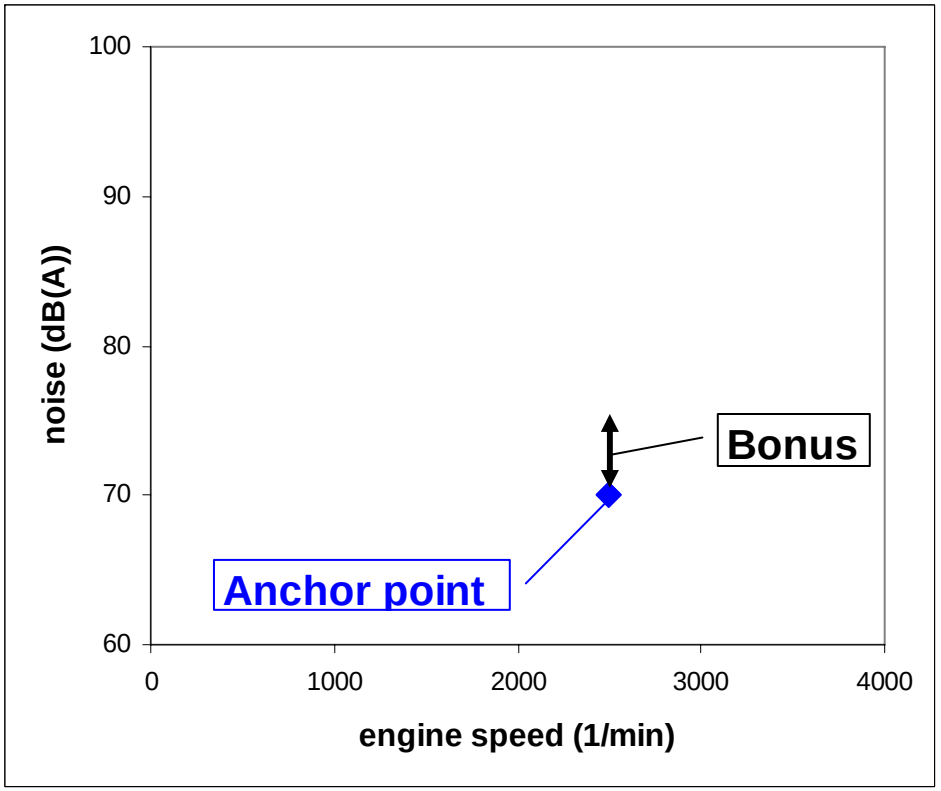


Calculate slope trough measurements

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

System: how it works
step 4: add bonus to anchor point





Bonus = $Limit_{A3}$ - $L_{urban,A3}$ (bigger for silent vehicles)

a little clarification on the bonus

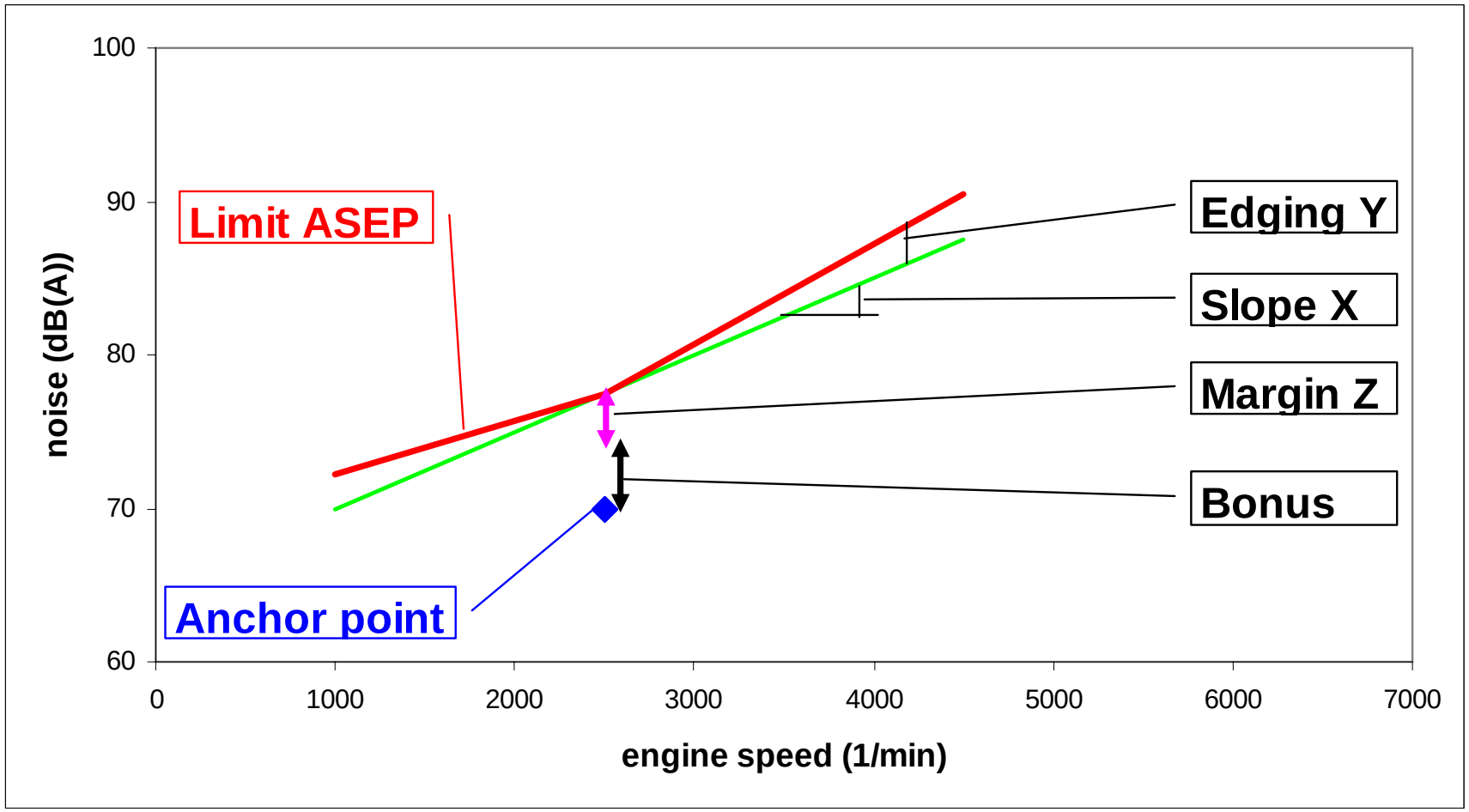
- The agreed starting point for the ASEP limit curve (= anchor point + bonus) is actually equal to the limit of Annex 3 (with a small correction of 2 a 3 dB(A) for the gear and the throttle position as used in ASEP compared to Annex 3)

- Anchor point = $L_{wot,i}$ (at $n_{BB,i}$)
- Bonus = $Limit_{A3}$ - $L_{urban,A3}$

- Anchor point + Bonus = $L_{wot,i}$ + $Limit_{A3}$ - $L_{urban,A3}$
- Anchor point + Bonus = $Limit_{A3}$ + $L_{wot,i}$ - $L_{urban,A3}$
- Anchor point + Bonus = $Limit_{A3}$ + ($L_{wot,i}$ - $L_{urban,A3}$)

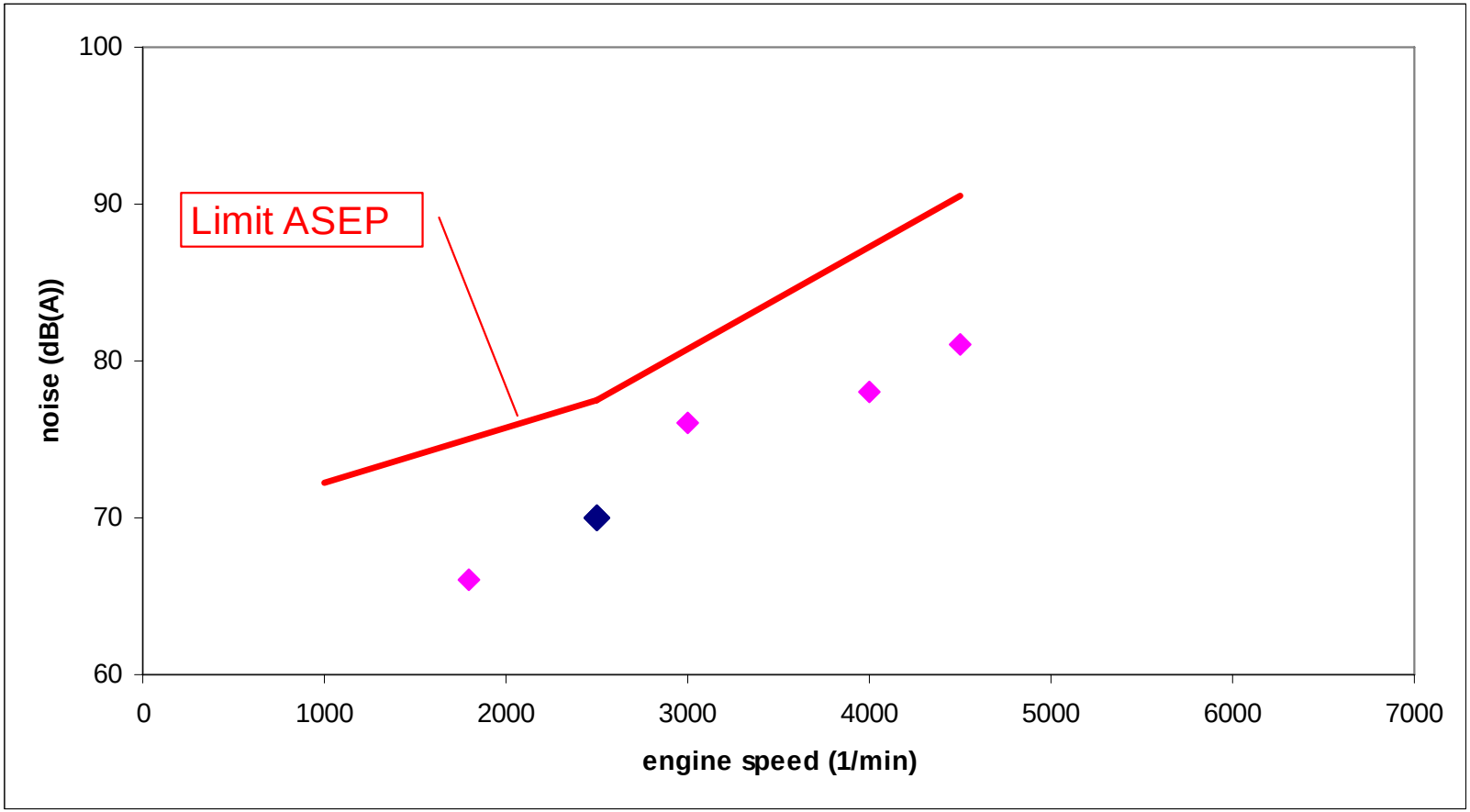
- Anchor point + Bonus = $Limit_{A3}$ + correction for gear and throttle

System: how it works
step 5: limit line



Limit = anchor point + bonus + margin Z + slope X + Edging Y
Parameters X, Y and Z determine 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

- In principle all gears and modes have to fulfill ASEP, however
  - Gears higher than i+1 are exempted
  - Gear 1 likely to be skipped due to engine speed overrun within test track
  - In practice mostly only gear 2 and 3
  - Gear i and i+1 have different limits
  - Limit gear i applies also for gear i-1 i-2 etc