Acoutrain WP4
Validation of software

Final Conference

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Validation of software

Target : provide a procedure to validate tools for simulating pass-by noise and standstill noise in order to apply those tools for future certification purposes.

- Series of reference cases have been defined for validating the correct operation of tools.
- Those reference cases are based mainly on monopole and dipole knowing that some software may have more complex sources made of several monopole and dipole.
  - Reference values were computed analytically by Ecole Centrale de Lyon (ECL) for :
    - Simple academic cases : monopole and dipoles on different types of ground (9 reference cases)
    - Pass-by of broad band monopole source -Doppler effect (2 rec. points)
  - Case with rolling noise sources was also done - 3 wagons (2 speeds)

9 reference cases for static validation,
Addition of 4 reference cases for pass by.

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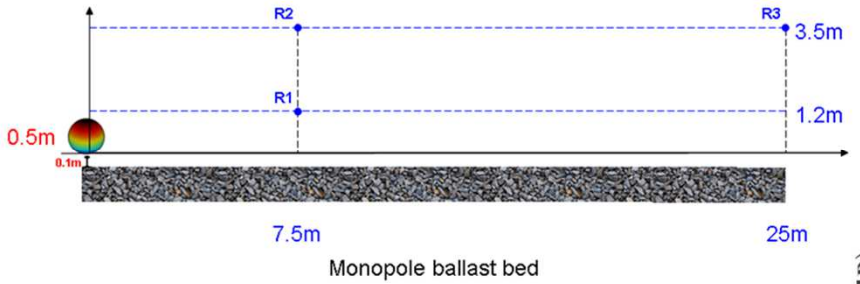
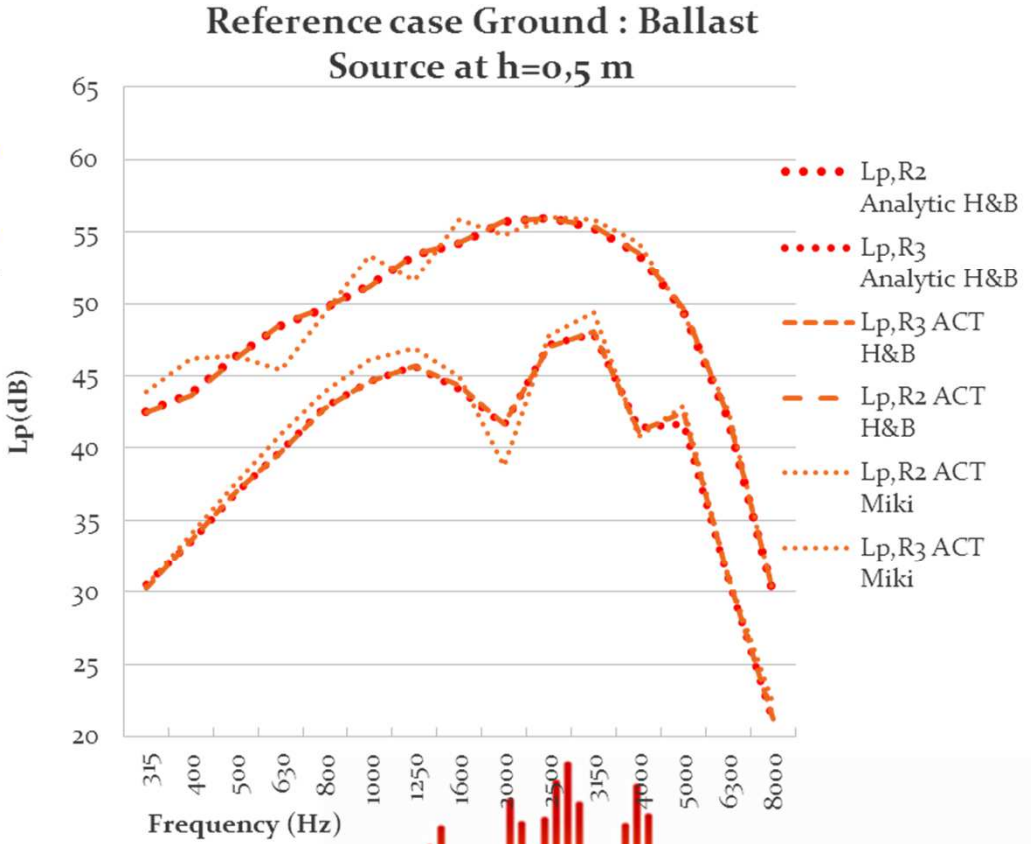
Example of a reference case – Static case

- We considerer 1 monopole on a ballasted ground at 0,5 m high





- For each reception (R1, R2, R3) point we computed 1/3 octave Lp spectrum,
- Comparison is done with reference data

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- A **tool certification procedure** is proposed
- This show how close simulation results are to a set of agreed reference solutions.
- 3 simulation tools available in the project have been submitted to the certification process :
  - ACOUTRAIN tool
  - VAMPPASS (SNCF tool)
  - SITARE (ATSA tool)
- The procedure is applied in 2 steps :
  - Frequency check
    - Deltamax: Difference in 1/3 octave band, between the reference and simulation tool spectra, which is limited to an acceptable maximum.
  - Global level check
    - Difference in 1/3 octave band is applied to a «representative» spectrum and the influence of this difference must be less than a maximum value on the global dBA

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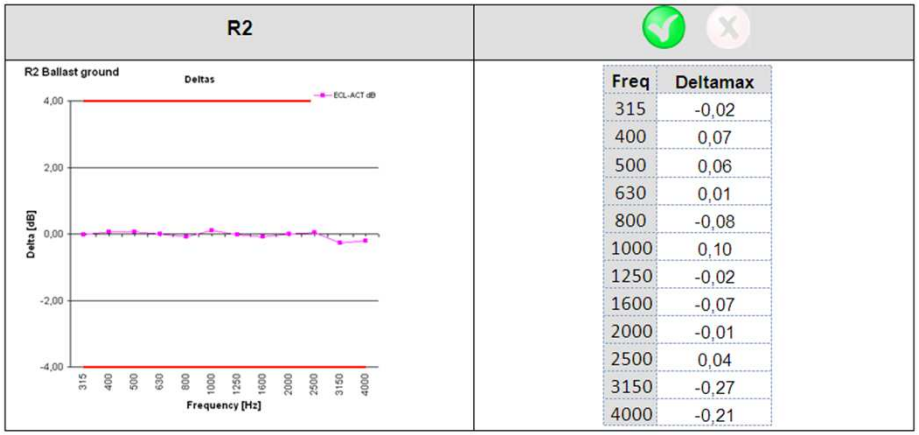
Example of the application of the procedure

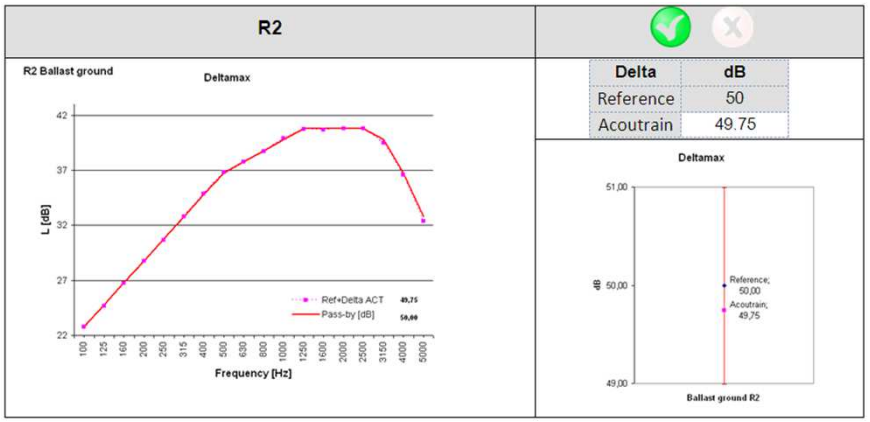
- Frequency check



Freq	Deltamax
315	-0,02
400	0,07
500	0,06
630	0,01
800	-0,08
1000	0,10
1250	-0,02
1600	-0,07
2000	-0,01
2500	0,04
3150	-0,27
4000	-0,21

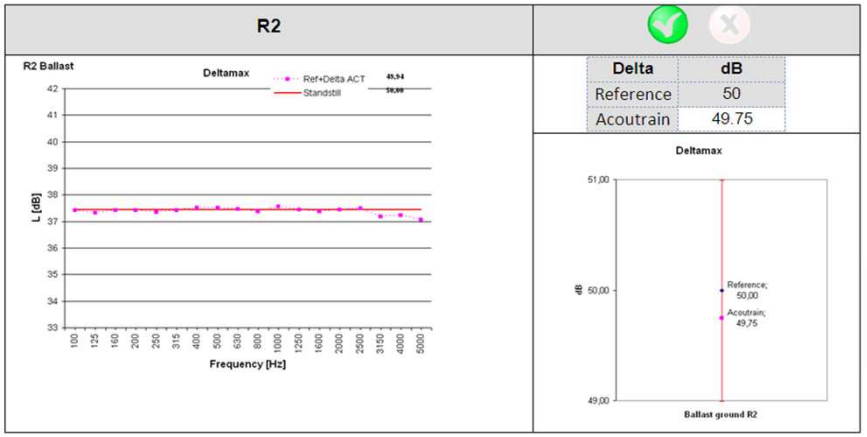
The criteria is :
TOOL IS CERTIFIED IF
- Delta max < **4dB** in freq. band 315Hz-4kHz
and
- Delta on global dBA < **1dBA**

- Global level check



Delta	dB
Reference	50
Acoutrain	49.75

Typical pass by comparison spectrum



Delta	dB
Reference	50
Acoutrain	49.75

Flat comparison spectrum

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- To conclude :
  - A Tool Certification Procedure is proposed in order to provide reliability in simulation results to Notified Bodies.
  - This procedure is based on reference cases to evaluate basic prediction performance, which are the minimum claimable to any simulation tool intended to be used for Noise TSI homologation.
  - Assessment criteria for acceptable values are given
  - Application of the certification method has been defined step by step and applied to the tools available in the project (SITARE, VAMPASS and ACOUTRAIN tool)
  - To go further : the tool homologation is based on simple tools that don't take into account source integration effect, it has to be taken into account separately => Similar procedure should be established to certify models that take into account source integration.

- Public Deliverables of WP4 :

  D4.1 Report with definition of input/output data for each global model

  D4.2 Basic global prediction tool and user manual (interim)

  D4.6 Report with a validation guideline to certify tools

  D4.7 Basic global prediction tool and user manual (final)

Thank you for your attention !