QUARRY ACADEMY

Improving Processes. Instilling Expertise.

DYNO
Dyno Nobel

SANDVIK

Noise and Vibration Comparison
Steel Lining versus Rubber Lining

Charles Hillmann

Improving Processes. Instilling Expertise.

DYNO
Dyno Nobel

SANDVIK

Course Agenda

- **Study Generated By Elna Hoven**
- **Aim of the study:**

  Study the effect of noise and vibration levels on Equipment & Operators
- **Comparison between Steel lining in Haul Trucks versus Rubber Lining.**

QUARRY ACADEMY

Procedure

- Measurements has been taken at two different occasions before and after rubber lining in an open cast area.
- (2008-03-26 and 2008-04-16) # 3 weeks
- Totally 20 different test runs were preformed
- The truck was loaded with 2 buckets and then completely emptied
- Test object CAT 775 F loaded by a CAT 990 II.

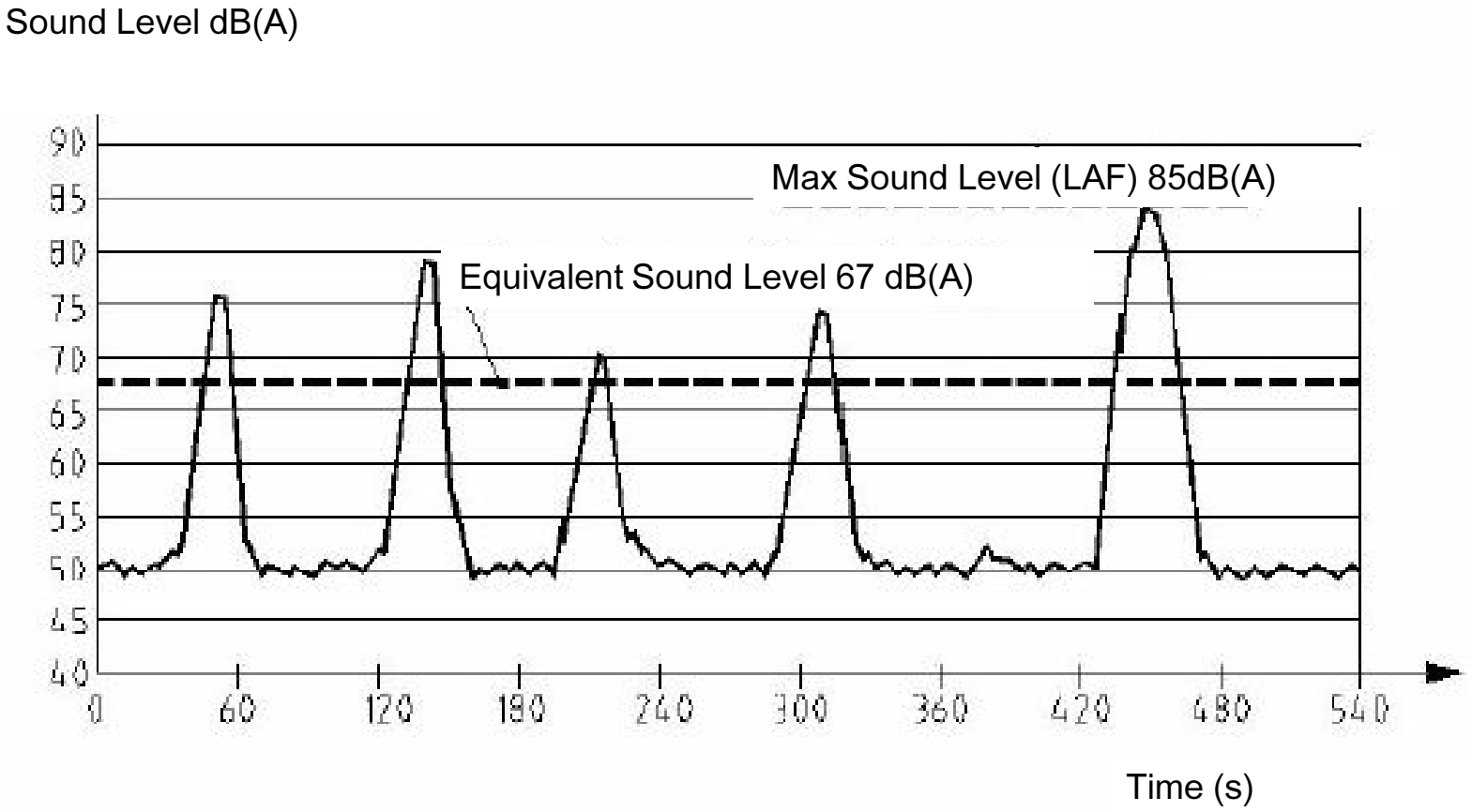
QUARRY ACADEMY

Studied Parameters

- Interior noise
- Exterior noise
- Structural vibrations
- Seat vibrations

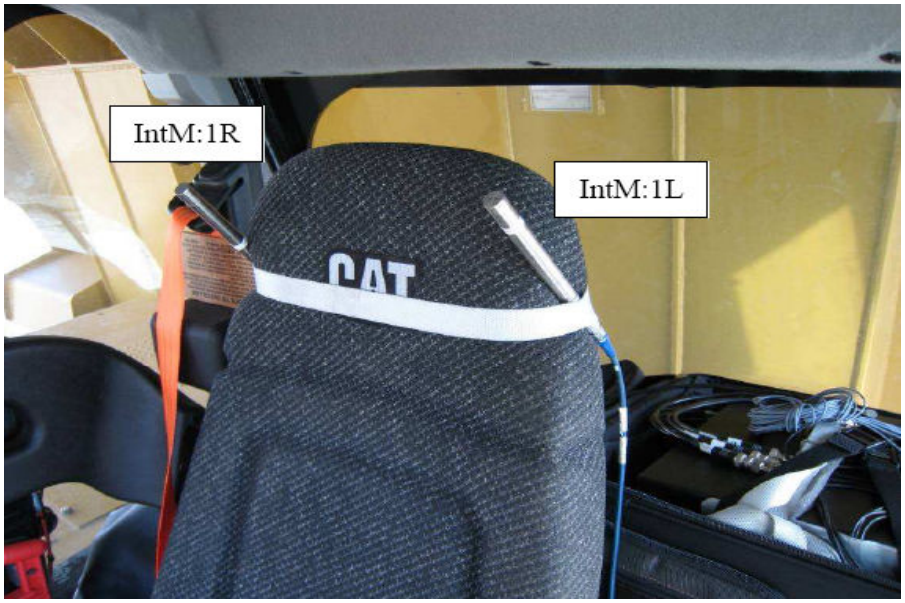
QUARRY ACADEMY

LAF and Equivalent noise Level



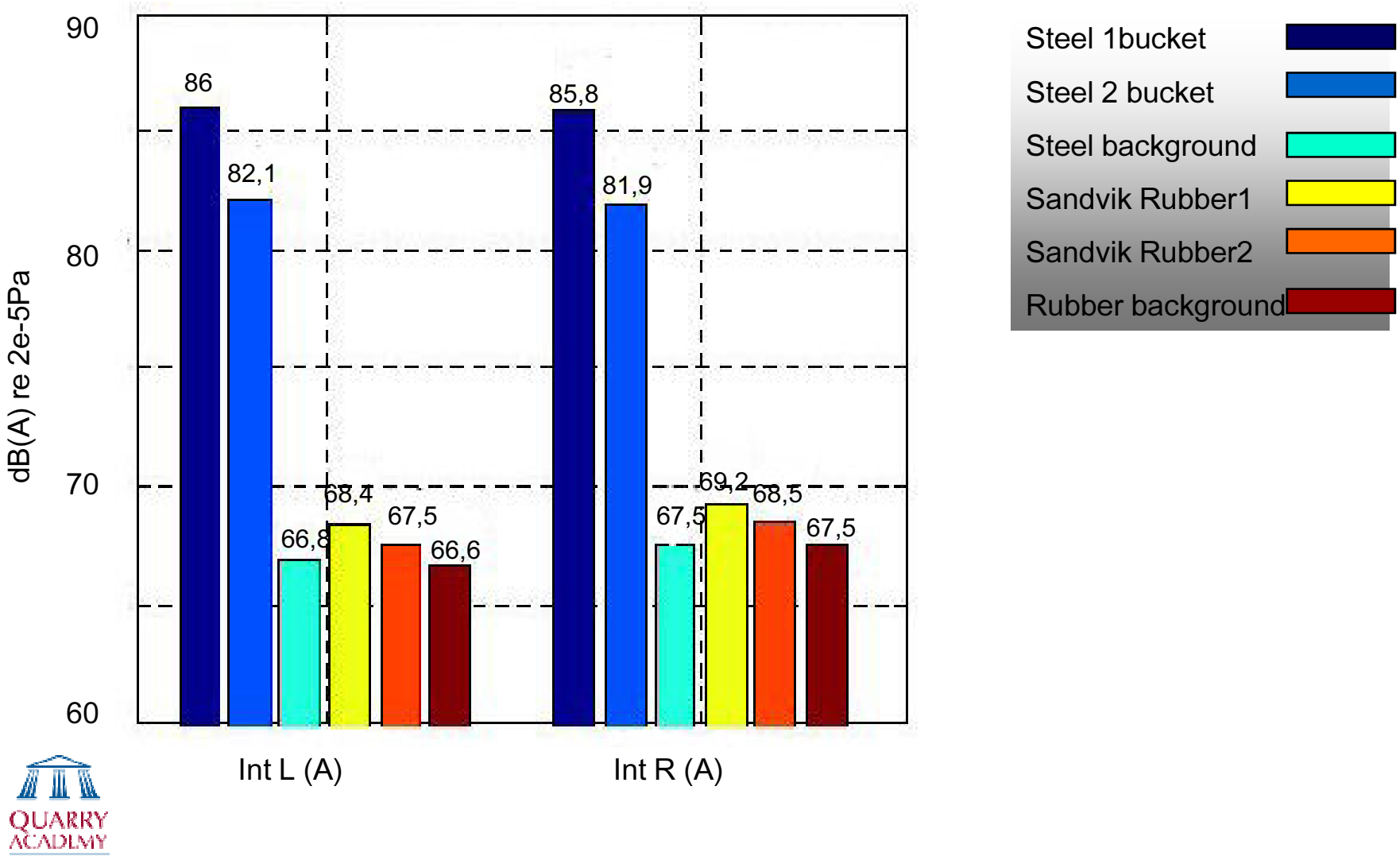
QUARRY ACADEMY

Location of interior microphones



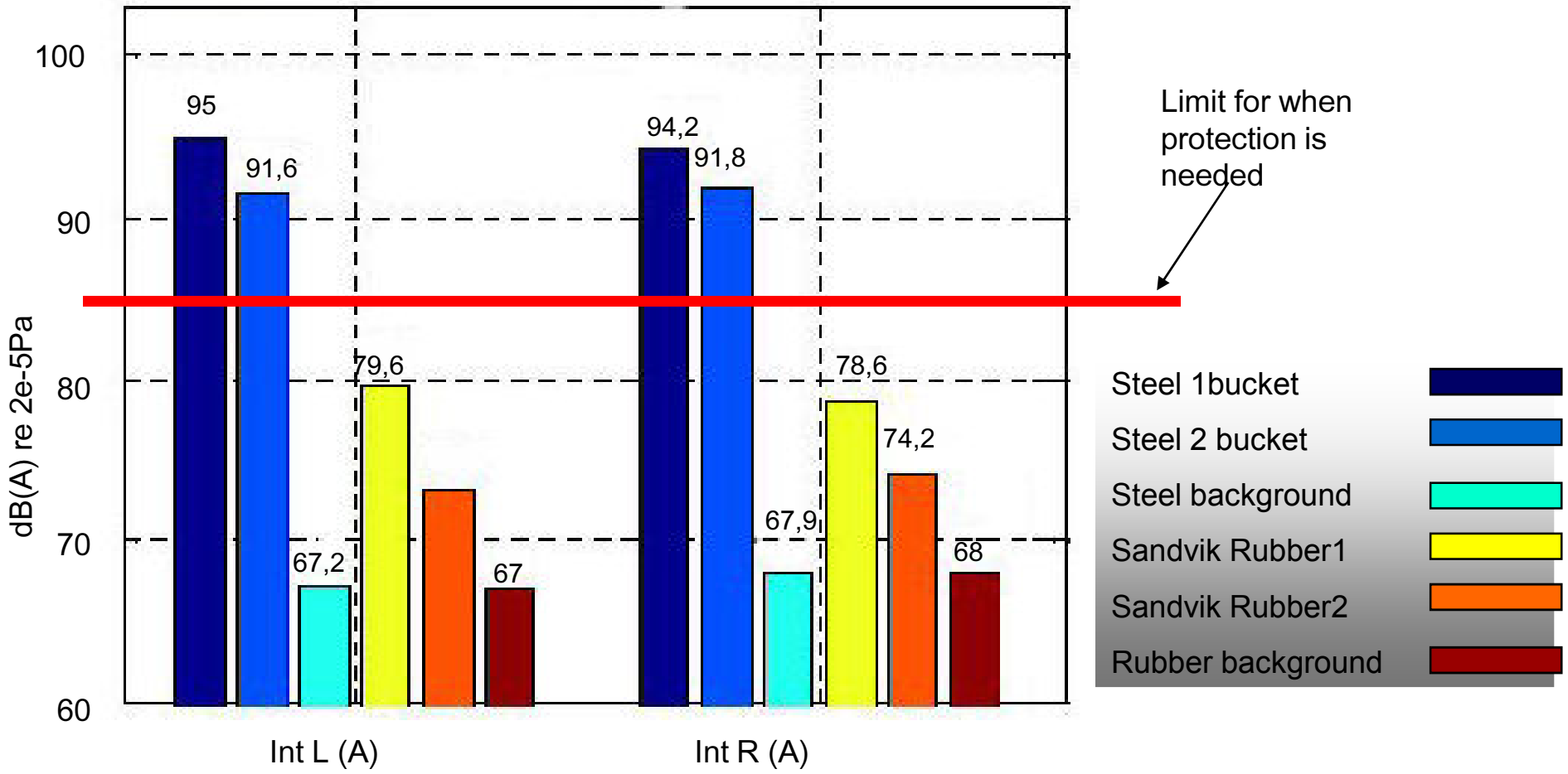
QUARRY ACADEMY

Interior Equivalent sound pressure level



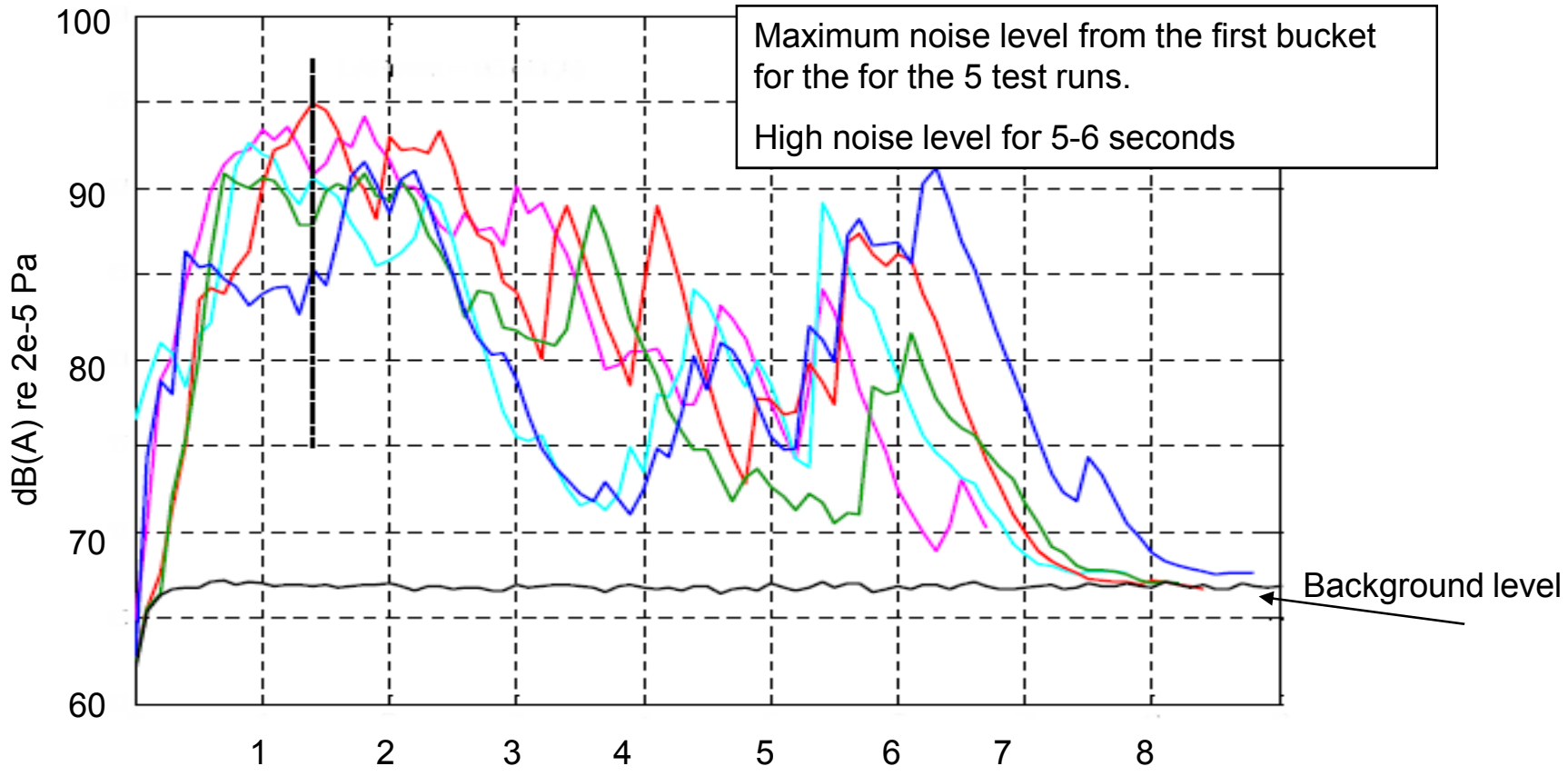
QUARRY ACADEMY

Interior LAF max



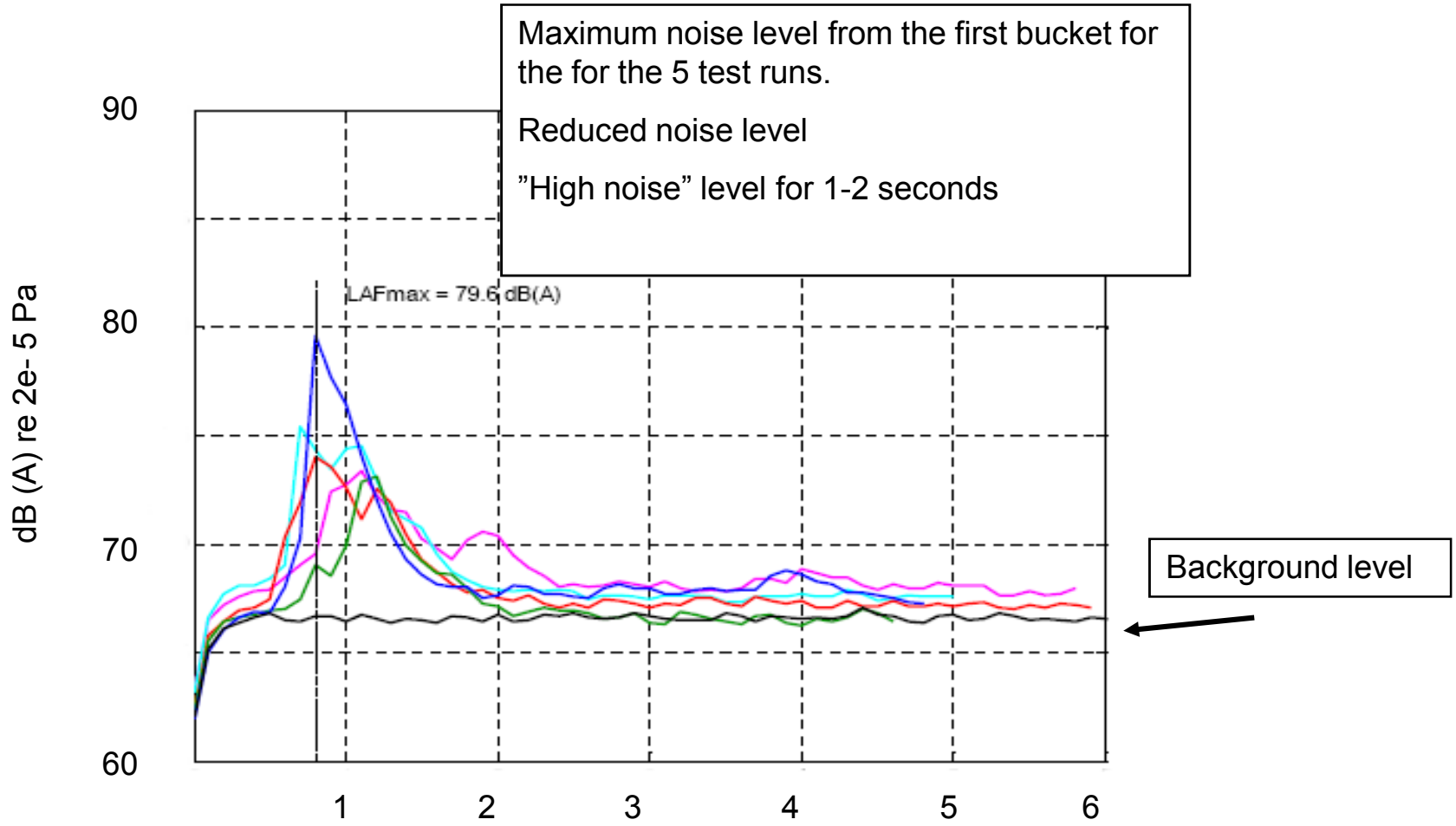
QUARRY ACADEMY

Interior time weighing fast sound pressure level with steel lining, LAF max



QUARRY ACADEMY

Interior time weighing fast sound pressure level with Rubber Lining, LAF max

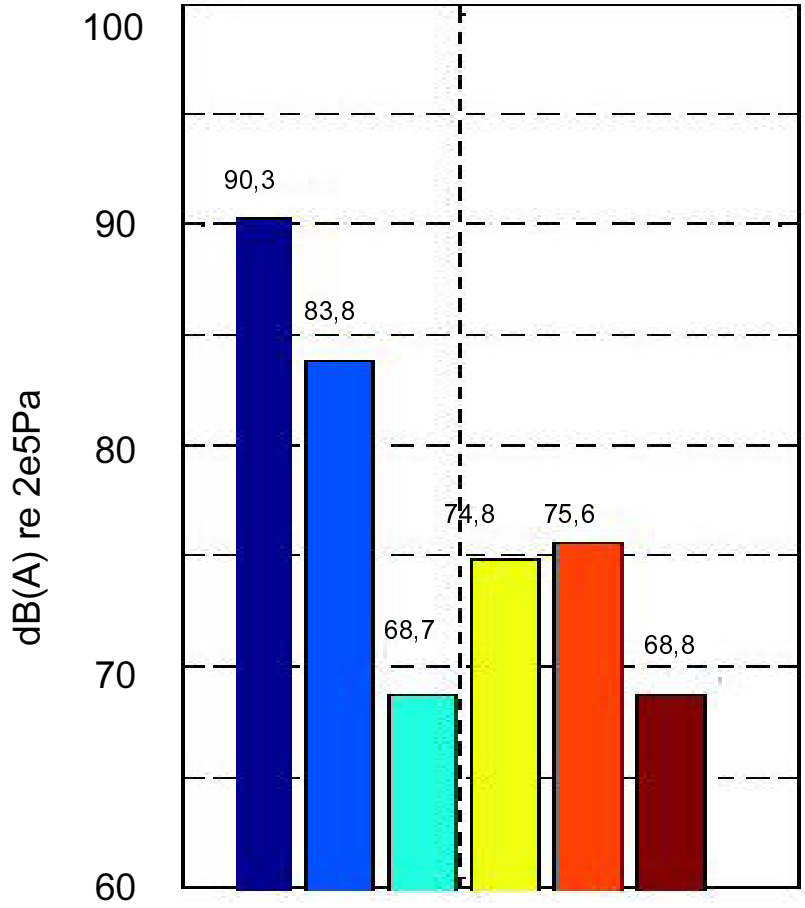


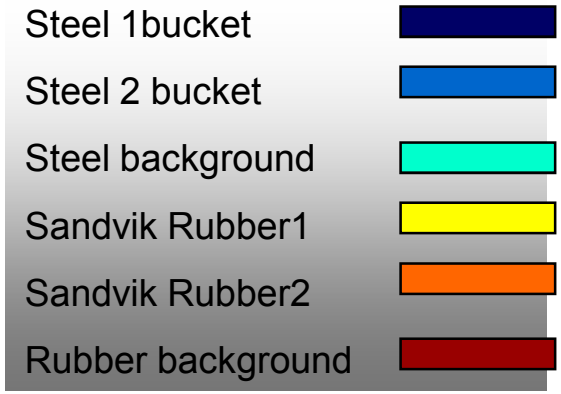
QUARRY ACADEMY

Location of exterior microphone

QUARRY ACADEMY

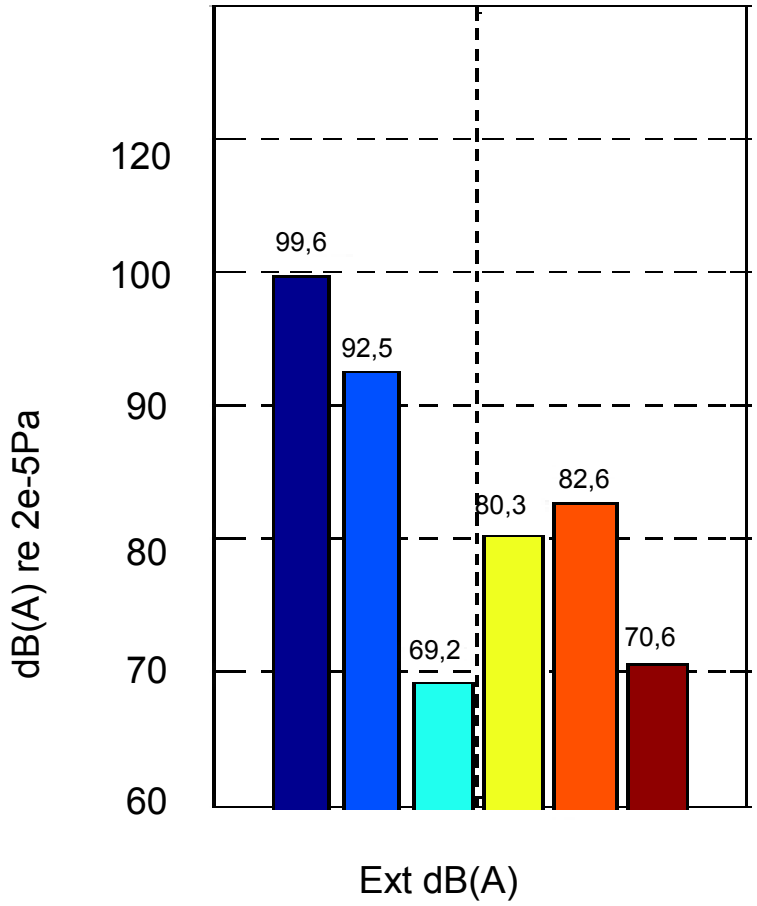
Exterior Equivalent sound pressure level

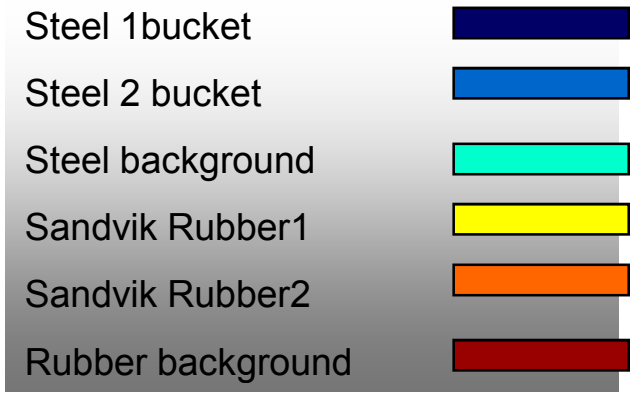




QUARRY ACADEMY

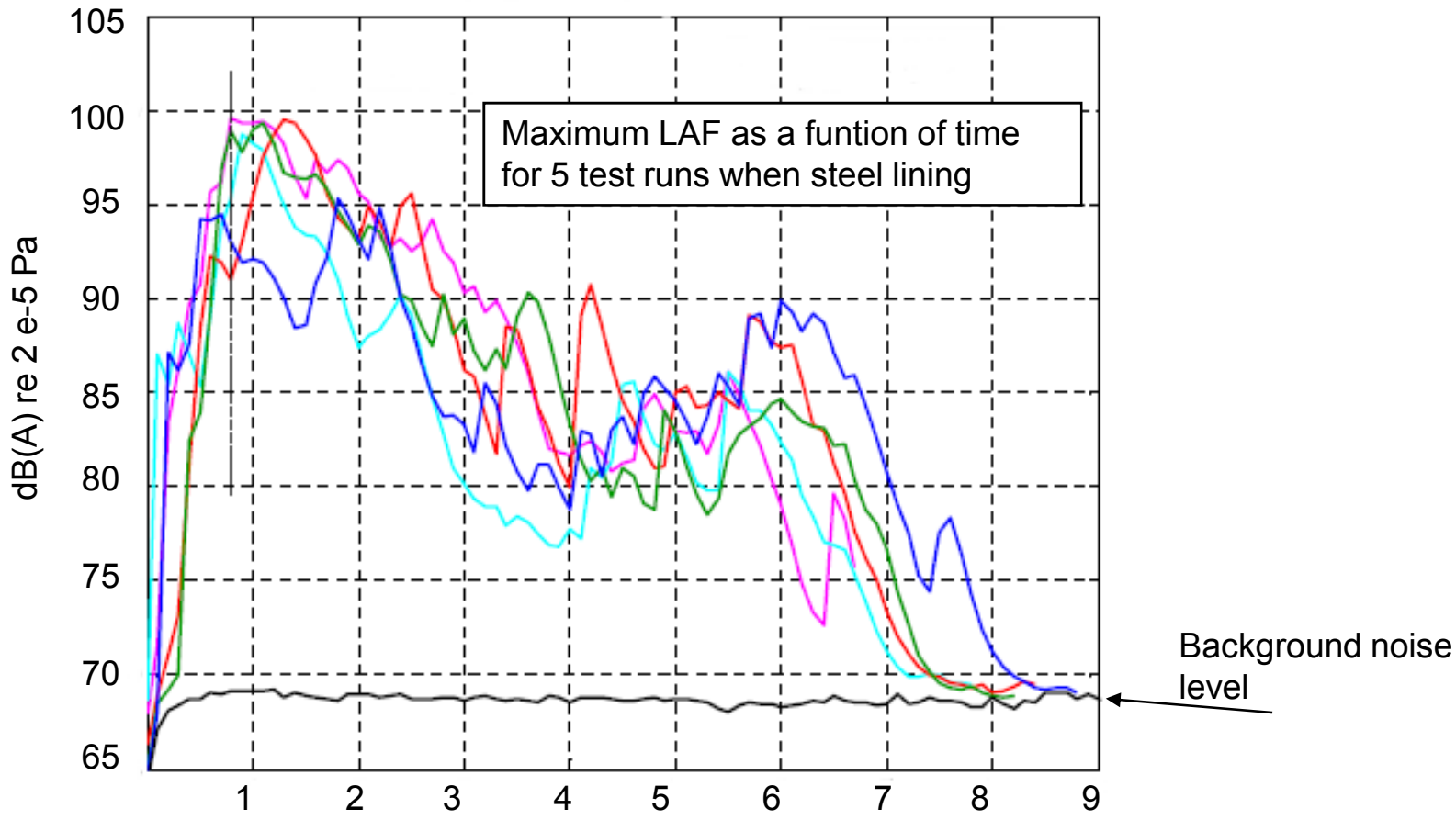
Exterior LAF max





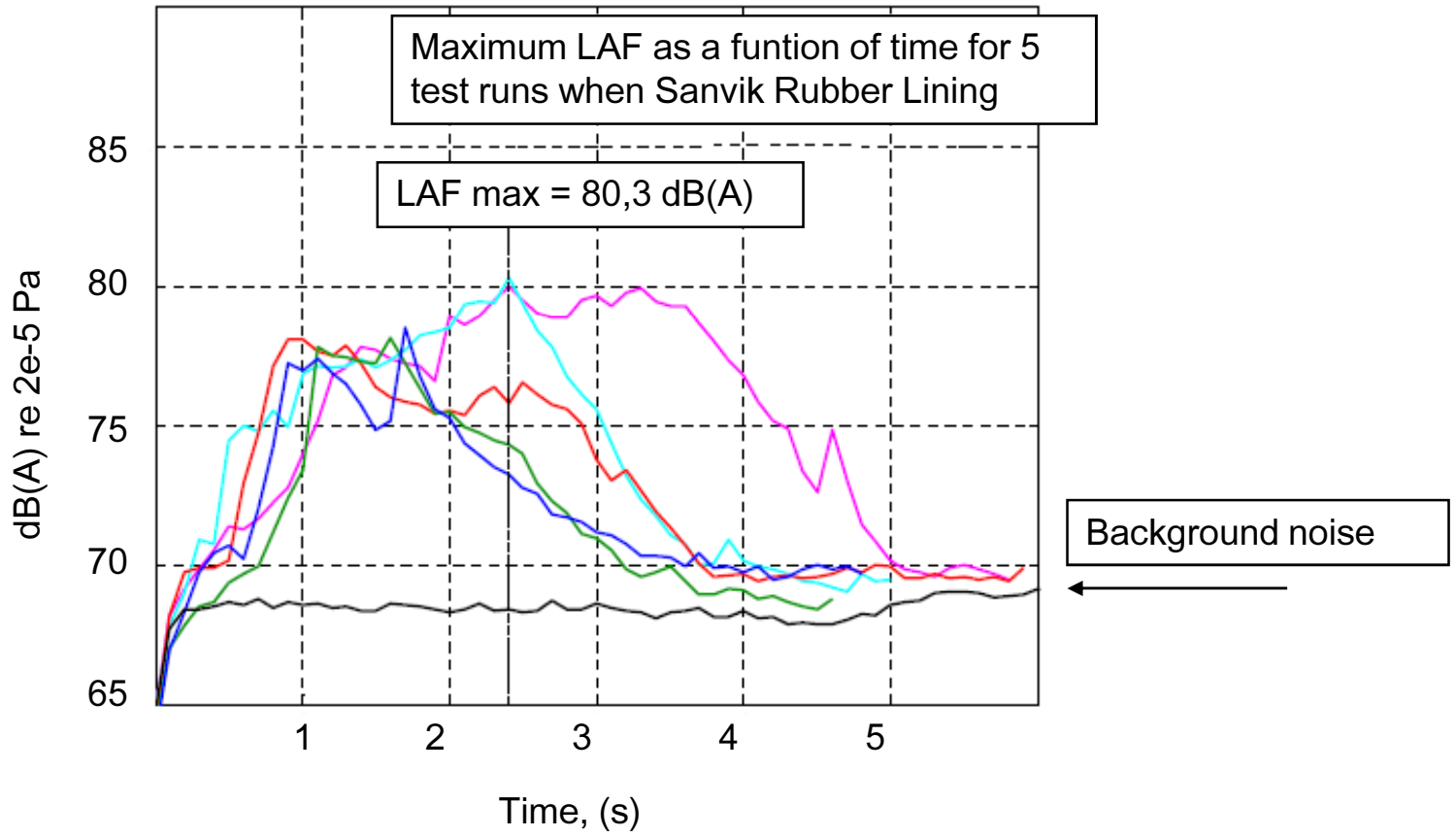
QUARRY ACADEMY

Exterior time weighing fast sound pressure level with steel lining LAF max



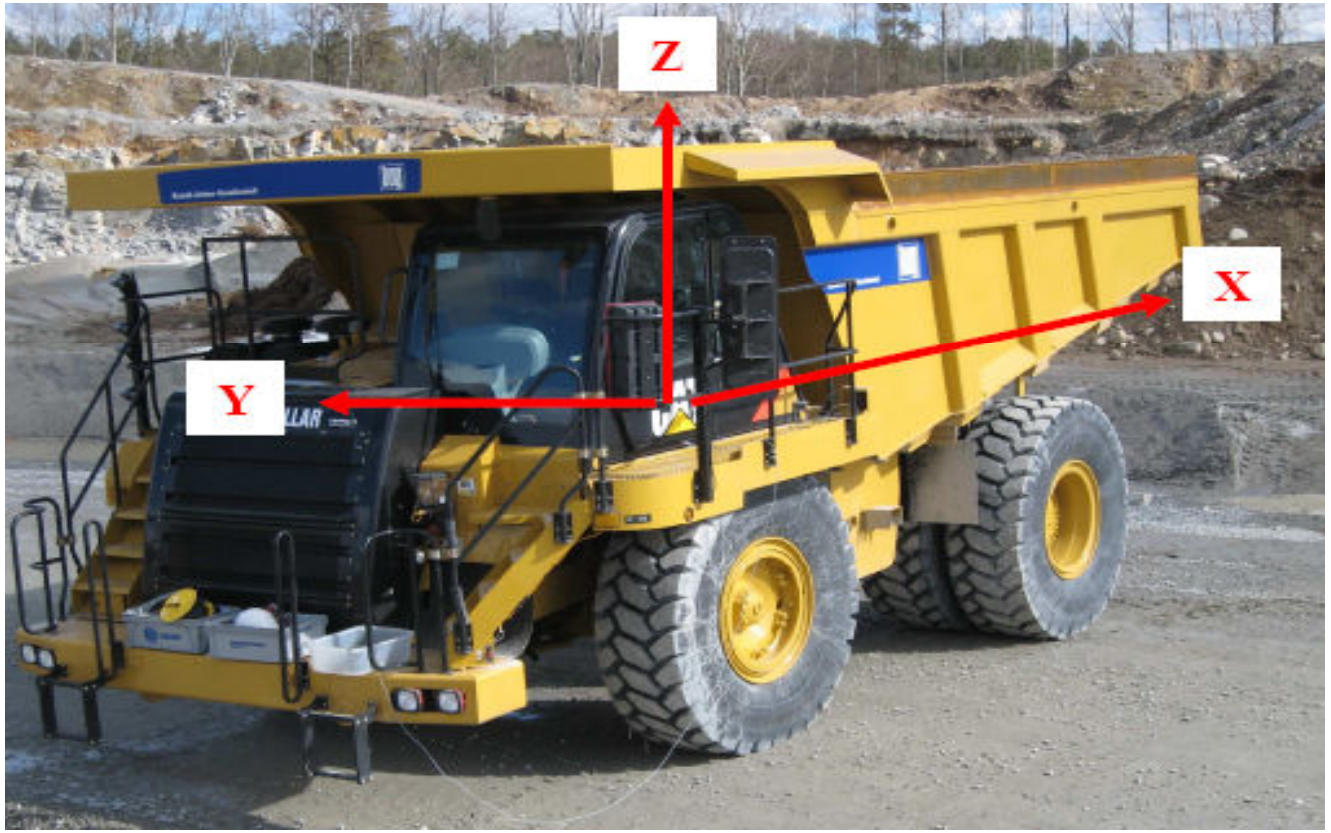
QUARRY ACADEMY

Exterior time weighing fast sound pressure level with Rubber Lining, LAF max



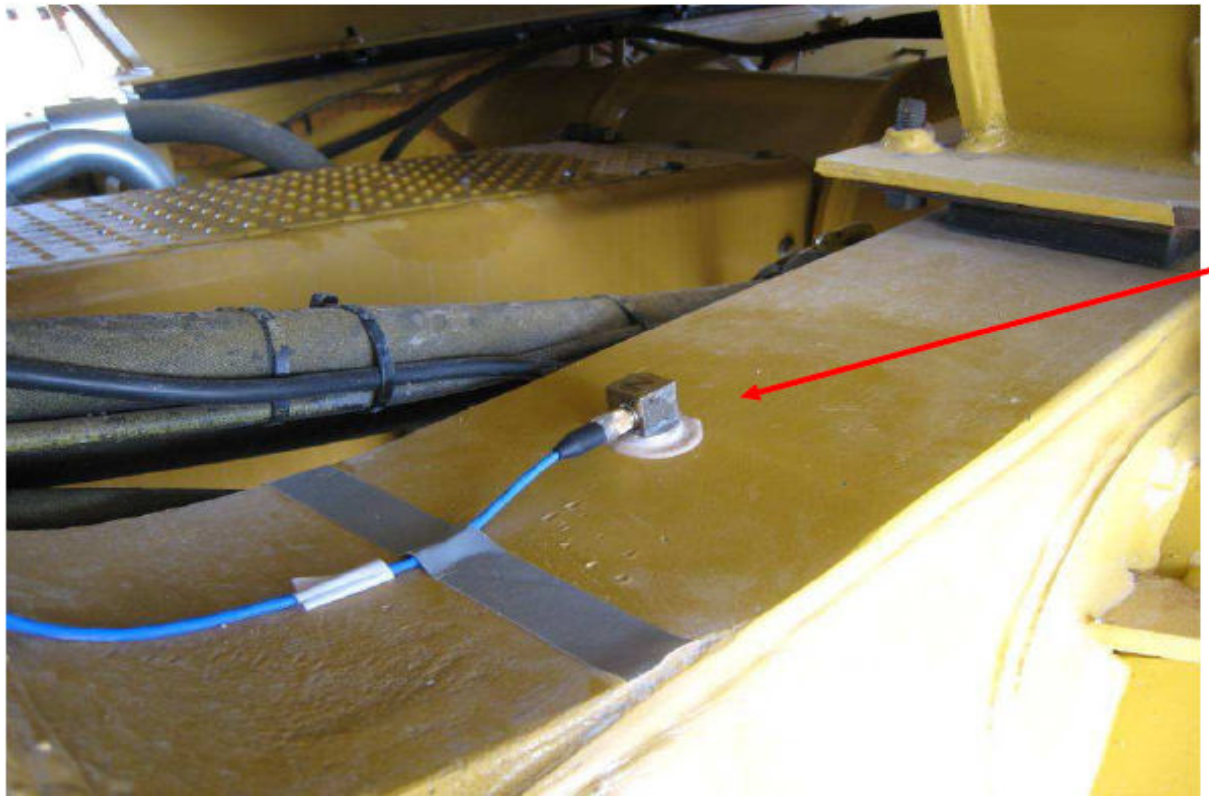
QUARRY ACADEMY

Definition of global coordinate-system



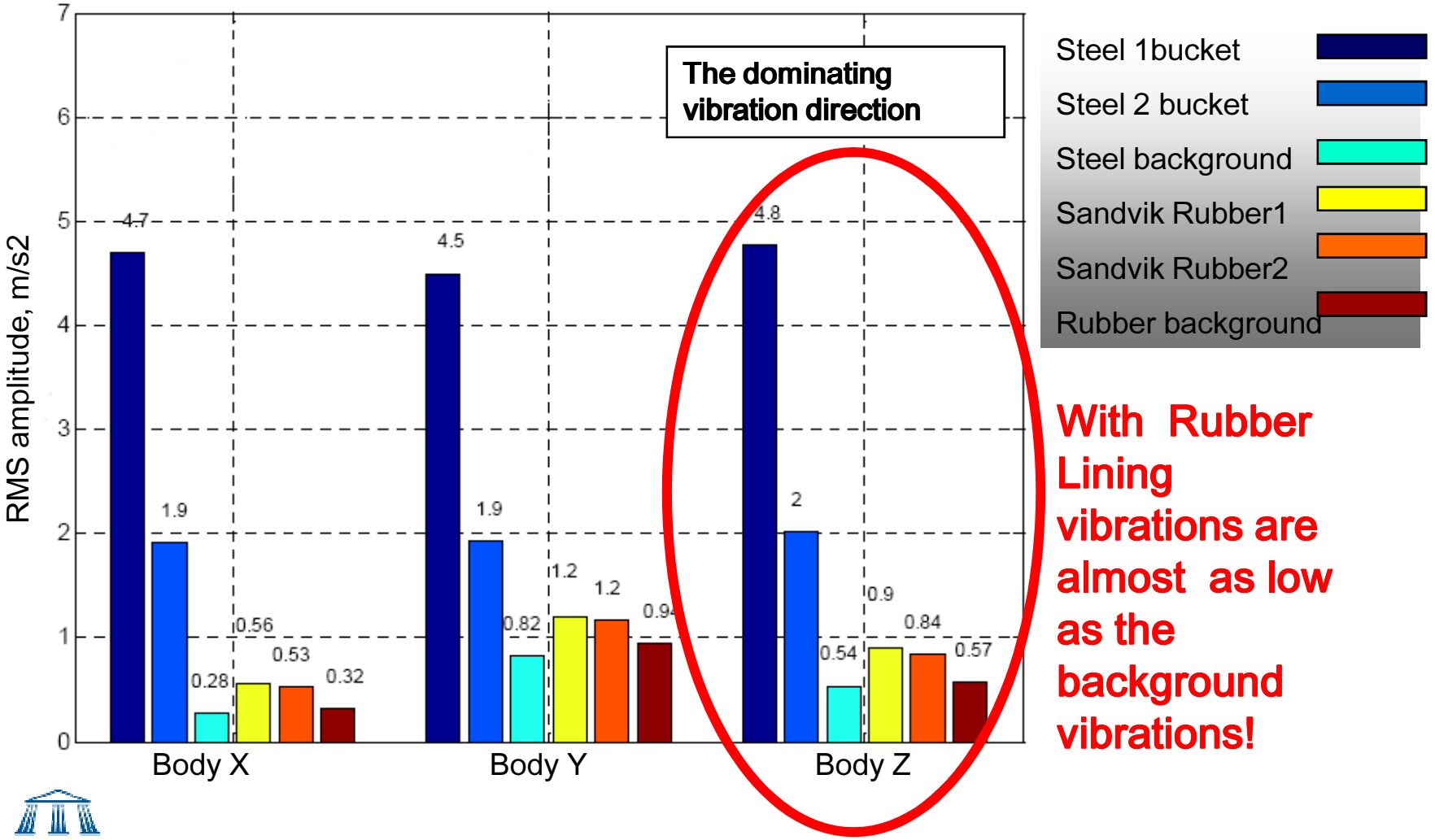
QUARRY ACADEMY

Location of accelerometer



QUARRY ACADEMY

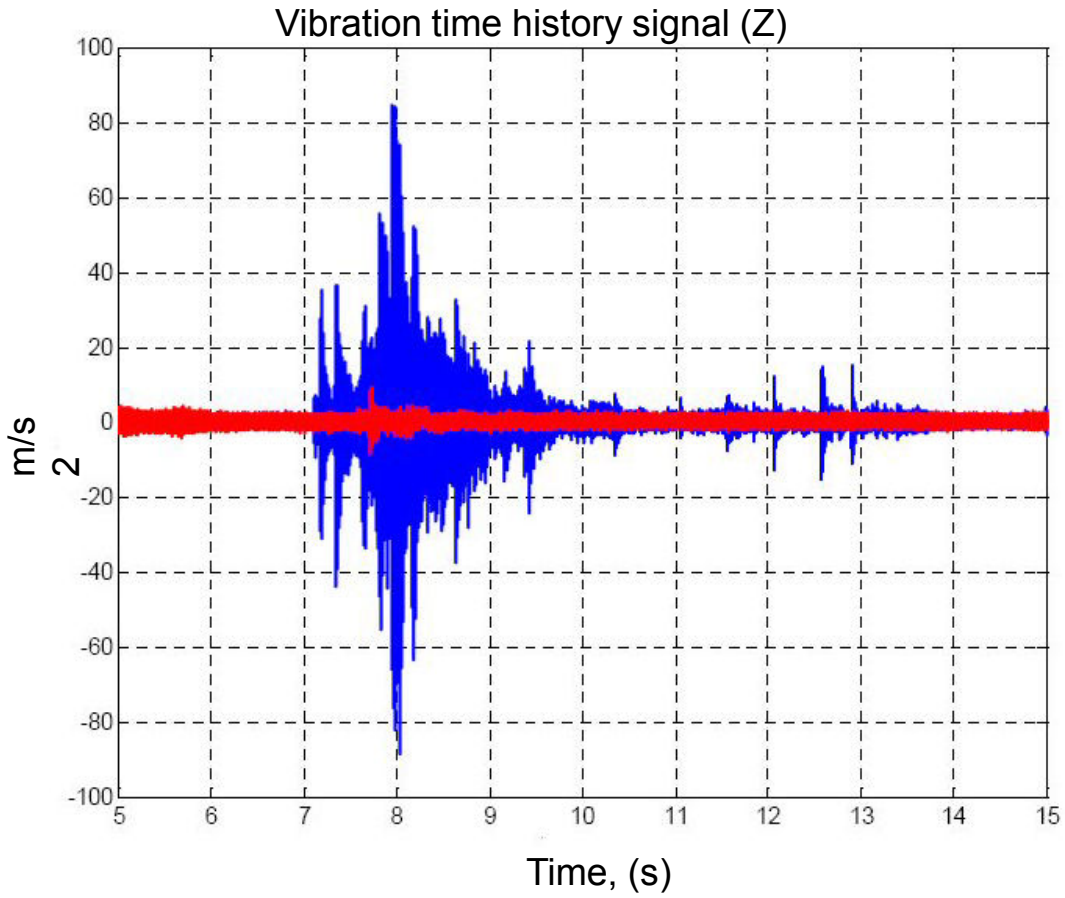
Structural Vibrations

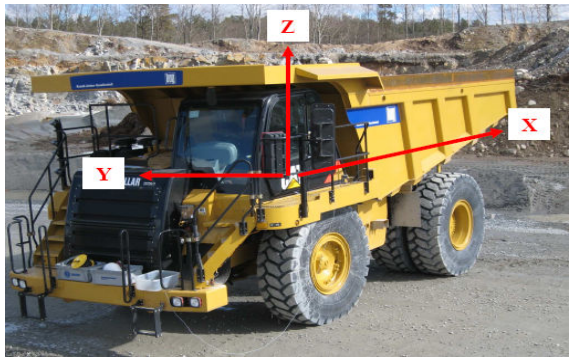


With Rubber Lining vibrations are almost as low as the background vibrations!

QUARRY ACADEMY

Acceleration as function of time





Peak level is typically 8 times higher for steel lining compared to Sandvik Rubber Lining

Sandvik Rubber Lining
correspond to background vibration

Steel Lining

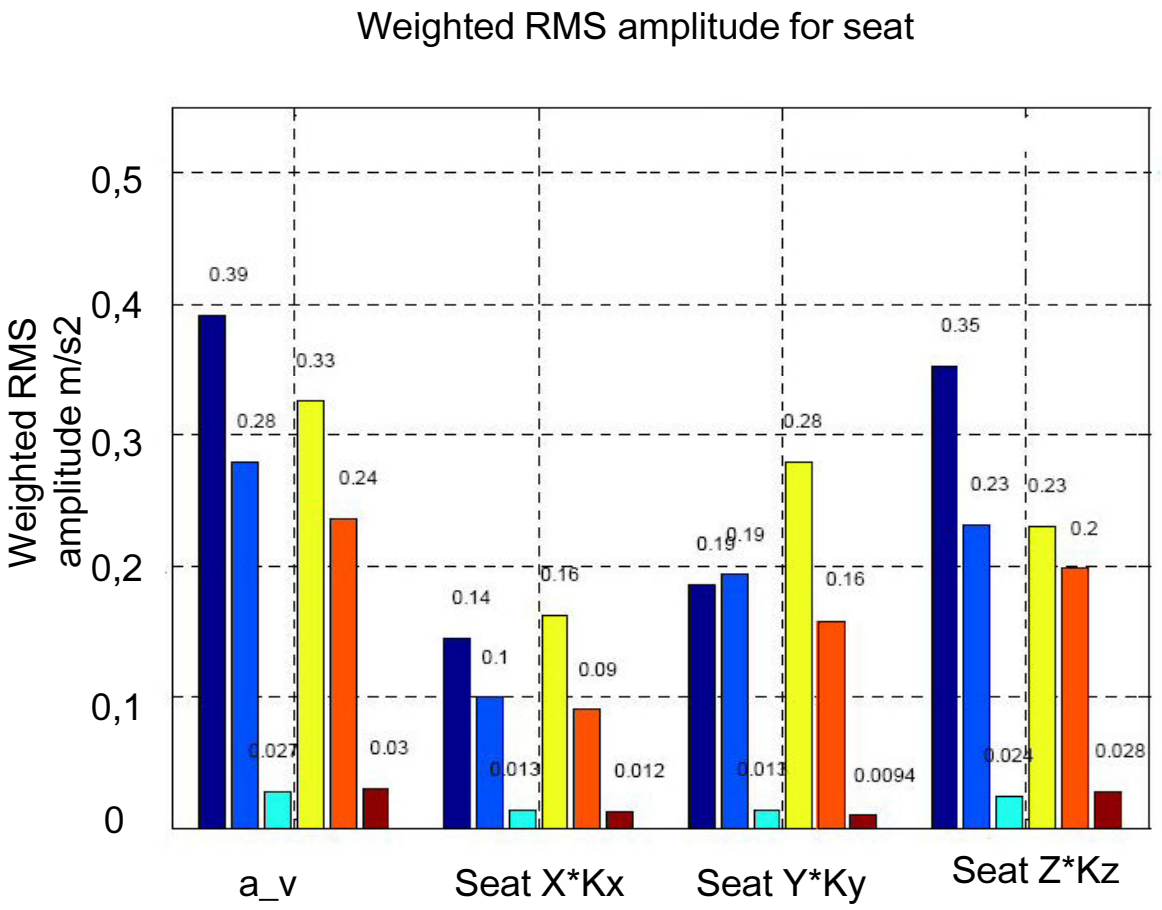
QUARRY ACADEMY

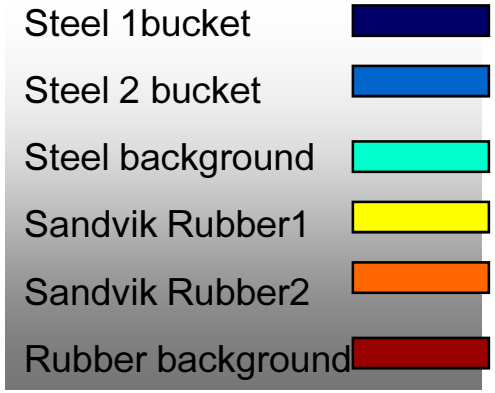
Seat Vibration

Seat pad accelerometer

QUARRY ACADEMY

Seat Vibrations





Only minor effect on the vibrations in the seat

QUARRY ACADEMY

Summary

- Exterior reduction: eqv : 15 dB(A) and LAF:20 dB(A)
- Interior reduction: eqv: 17 dB(A) and LAF: 15 dB(A)
- Structural vibrations: RMS reduction factor of 5
- Instantaneous peak acceleration over time:
  Reduction factor of 8.
- Seat vibrations: minor

QUARRY ACADEMY

CONCLUSION

- Major interior and exterior noise reduction gives a much better environment for both workers and neighbors.
- Now proved and quantified.

- The reduction of the structural vibrations has major benefits for the truck body when it comes to fatigue and welds. Life time of the truck structure will increase.

- Only a minor effects on seat vibrations was achieved due to an effective seat air suspension system. For the driver those minor reductions makes a big impact in the longer perspective.

QUARRY ACADEMY

Context for all Presentations:

- Why are we presenting the material we propose to cover?
- Where does it fit in the value chain?
- How does it impact total cost / value enhancement/safety issues?
- What is the specific informational take-away for student for application in his quarry?
- What does this presentation deliver to the student?
- Answer the following questions in the mind of the student:
  - ✓ What? (What is being covered)
  - ✓ Now What? (What do I do now with this information)
  - ✓ So What? (What is the significance of this knowledge or action)

QUARRY ACADEMY

www.quarryacademy.com

Improving Processes. Instilling Expertise.

DYNO
Dyno Nobel

SANDVIK