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Low frequency impact sound transmission through floors

Warnock, A. C. C.

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Low Frequency Impact Sound Transmission Through Floors

Alf Warnock

Indoor Environment Program, Acoustics

Institute for Research in Construction

National Research Council

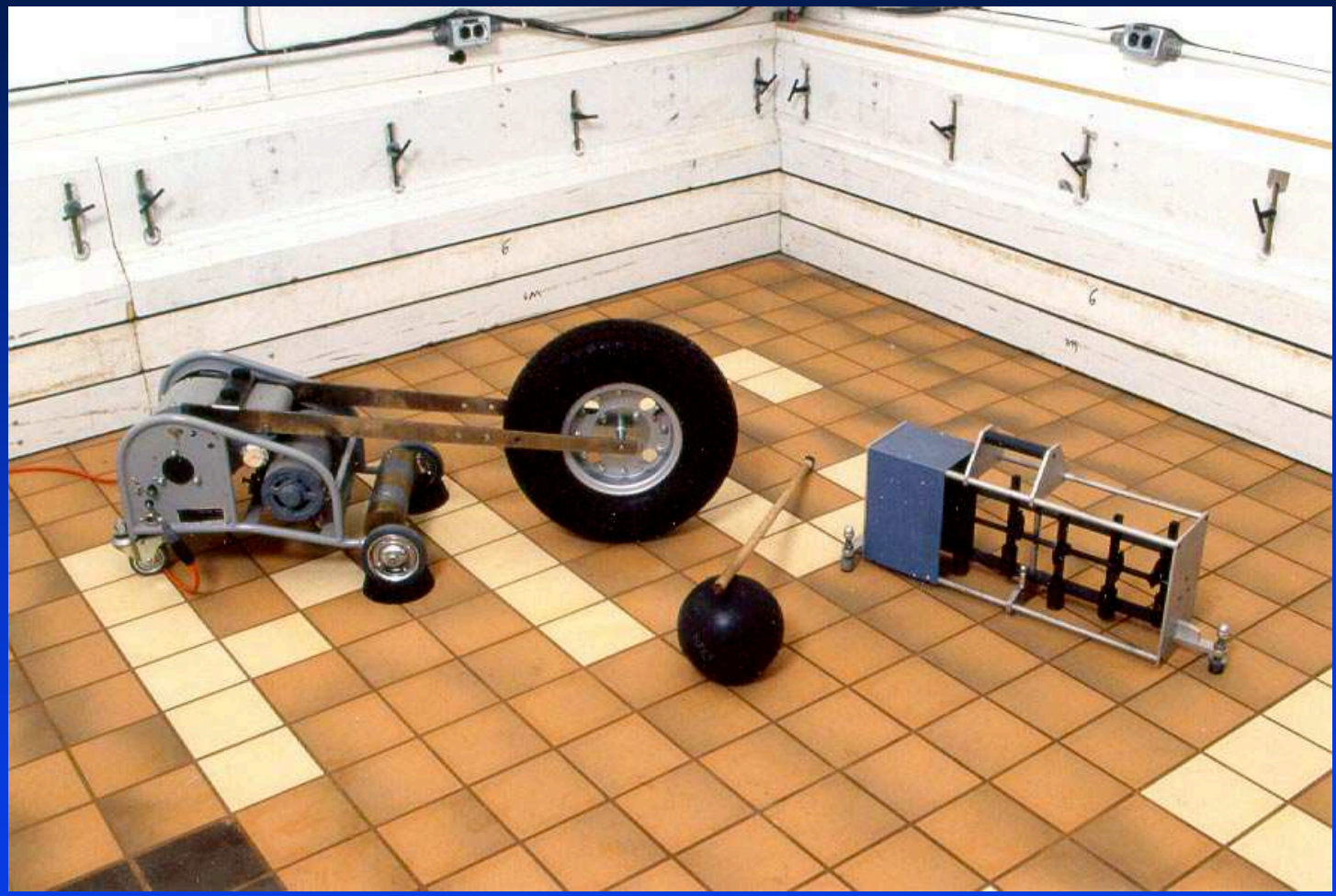
Ottawa, Ontario

Canada

Project - possible new impact test procedures

- ISO tapping machine
- JIS 1418 tire machine
- 2 experimental balls
- walker

Impact Sound Devices



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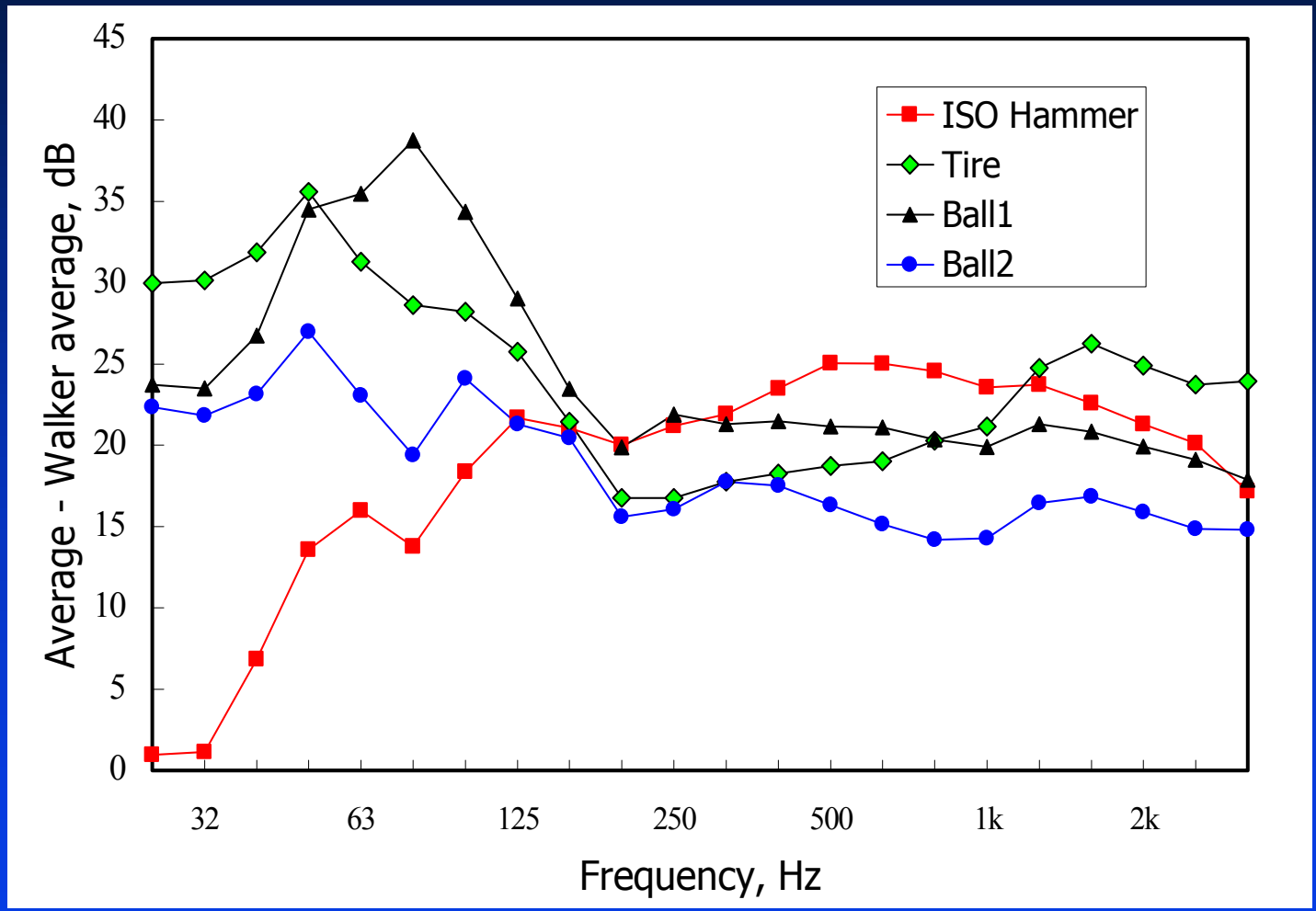
NRC floor test facility

- Room volume - 175 m^3
- Floor area - 3.8 x 4.7 = 17.8 m^2
- About 200 floors

Measurements

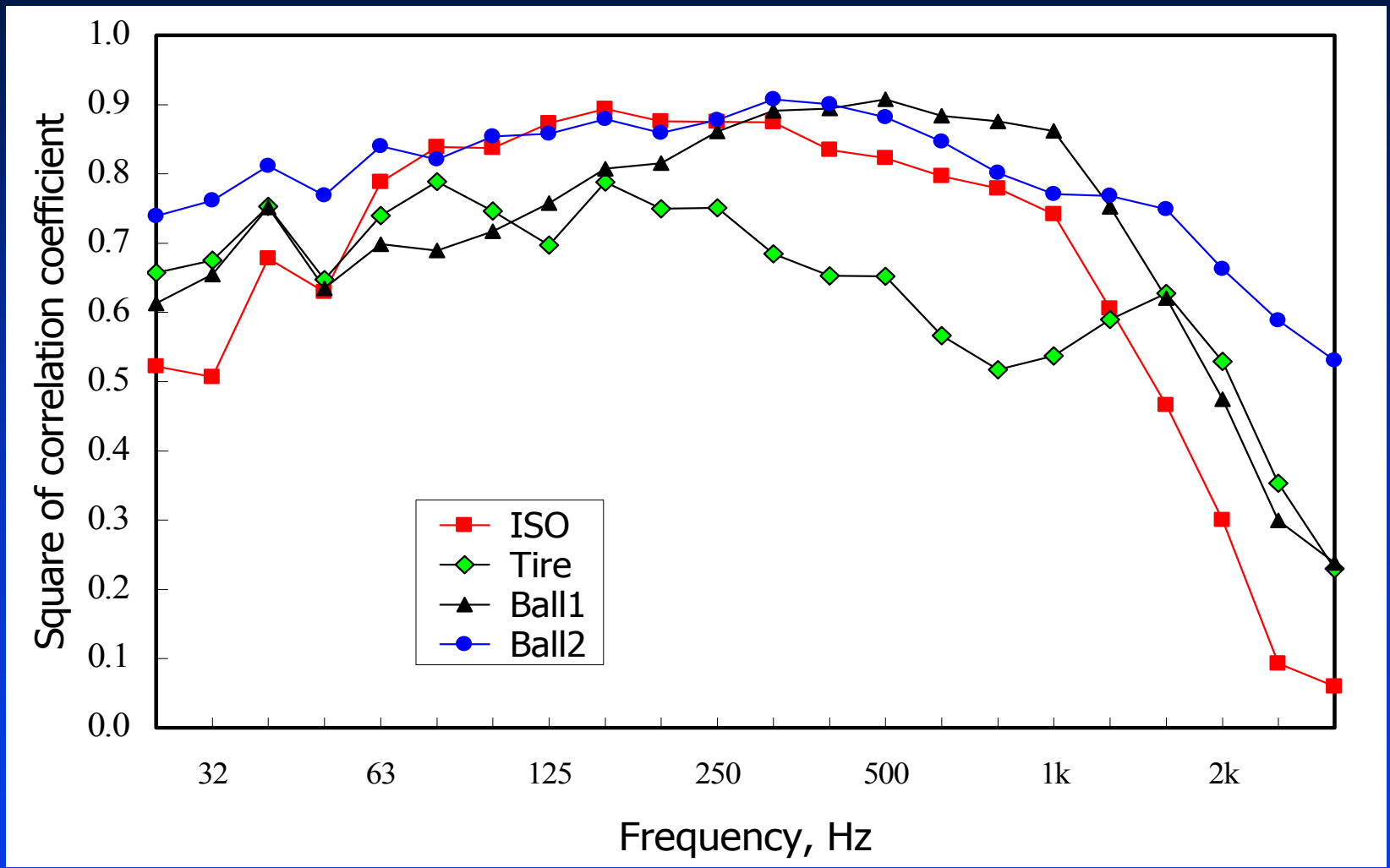
- ISO 140-6, E492 extended down to 50 Hz
- All others, 1 microphone, 1 m below ceiling, max level, 35 ms time constant, RT~0.5 s.

Mean difference relative to the walker

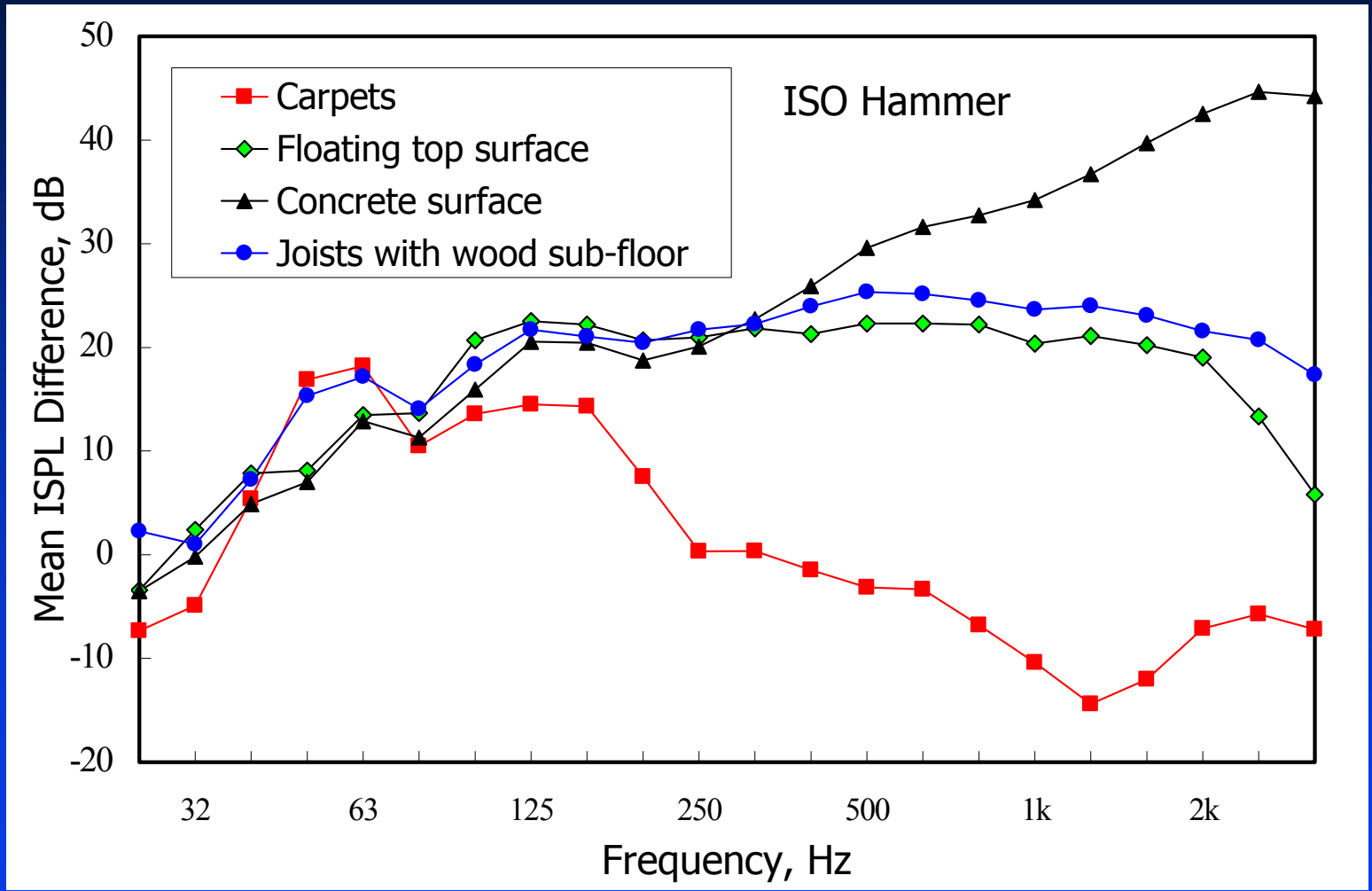


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R^2 for different devices



Floor type: ISO hammer vs walker

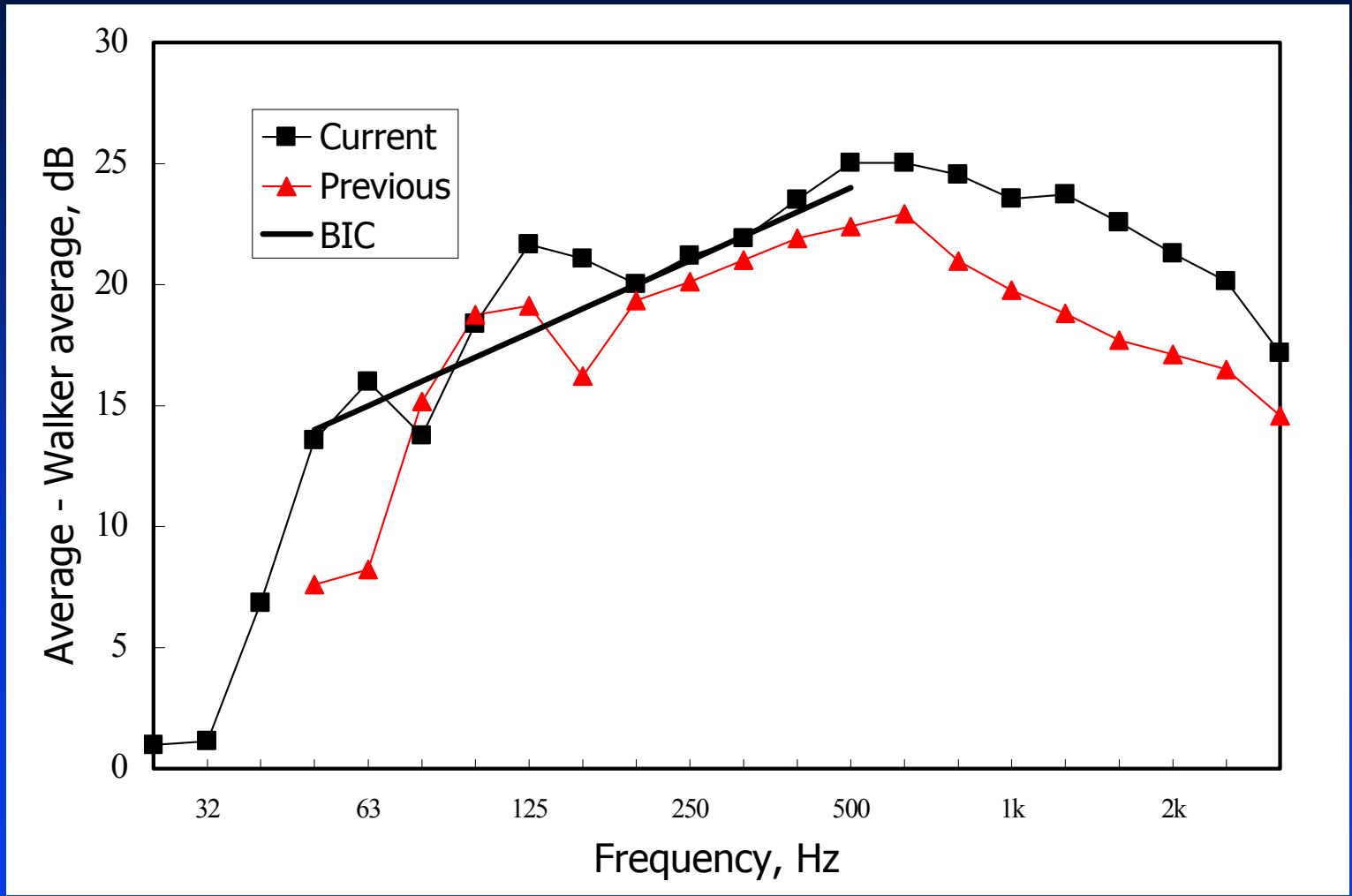


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NRC floor test facilities

	Current	Previous
Volume	175 m^3	65 m^3
Specimen size	3.8 x 4.7 m	2.4 x 2.4 m
Specimen Area	17.8 m^2	5.8 m^2

ISO tapping machine vs walker: 2 series

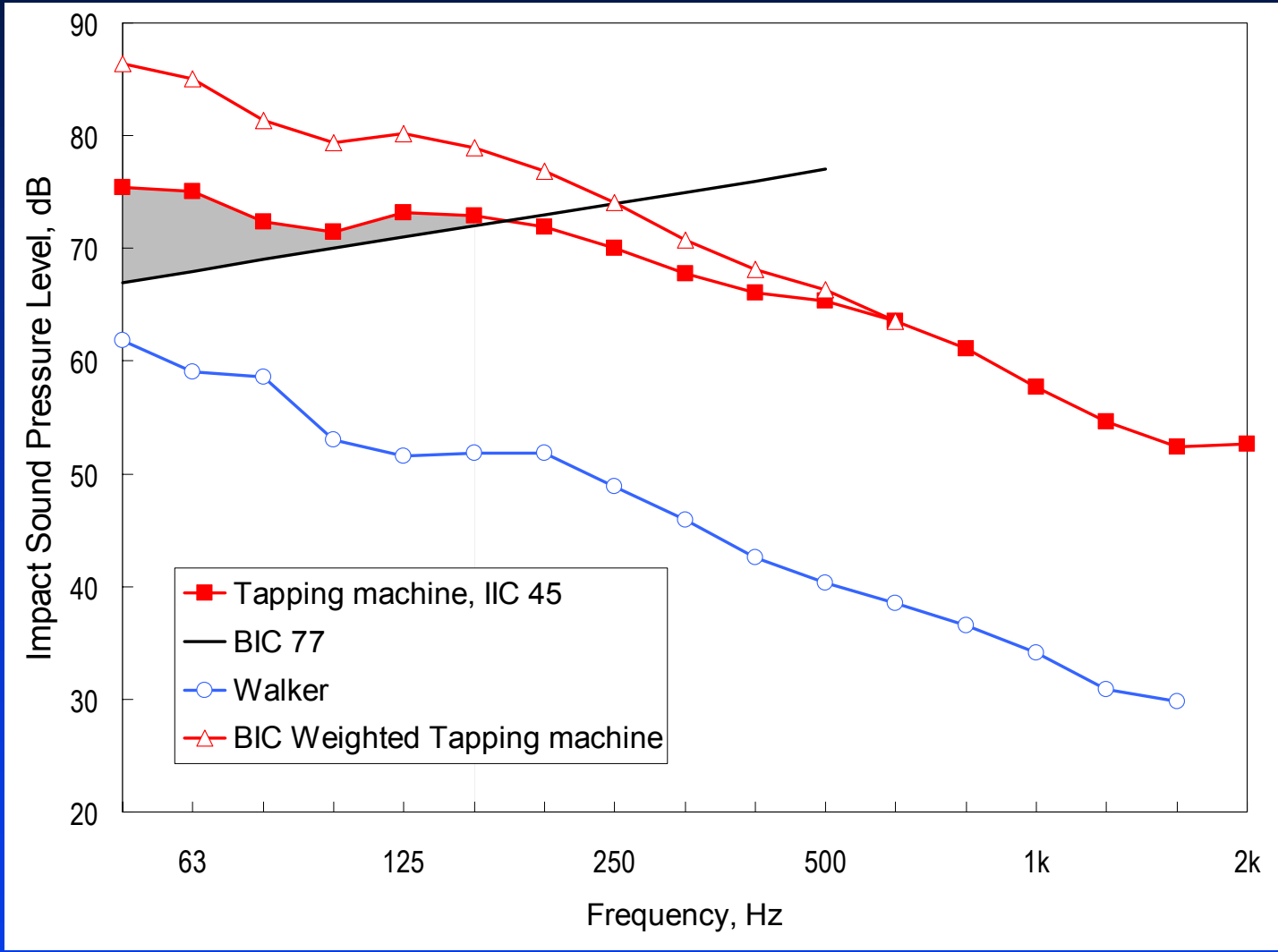


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ISO Tapping machine ratings

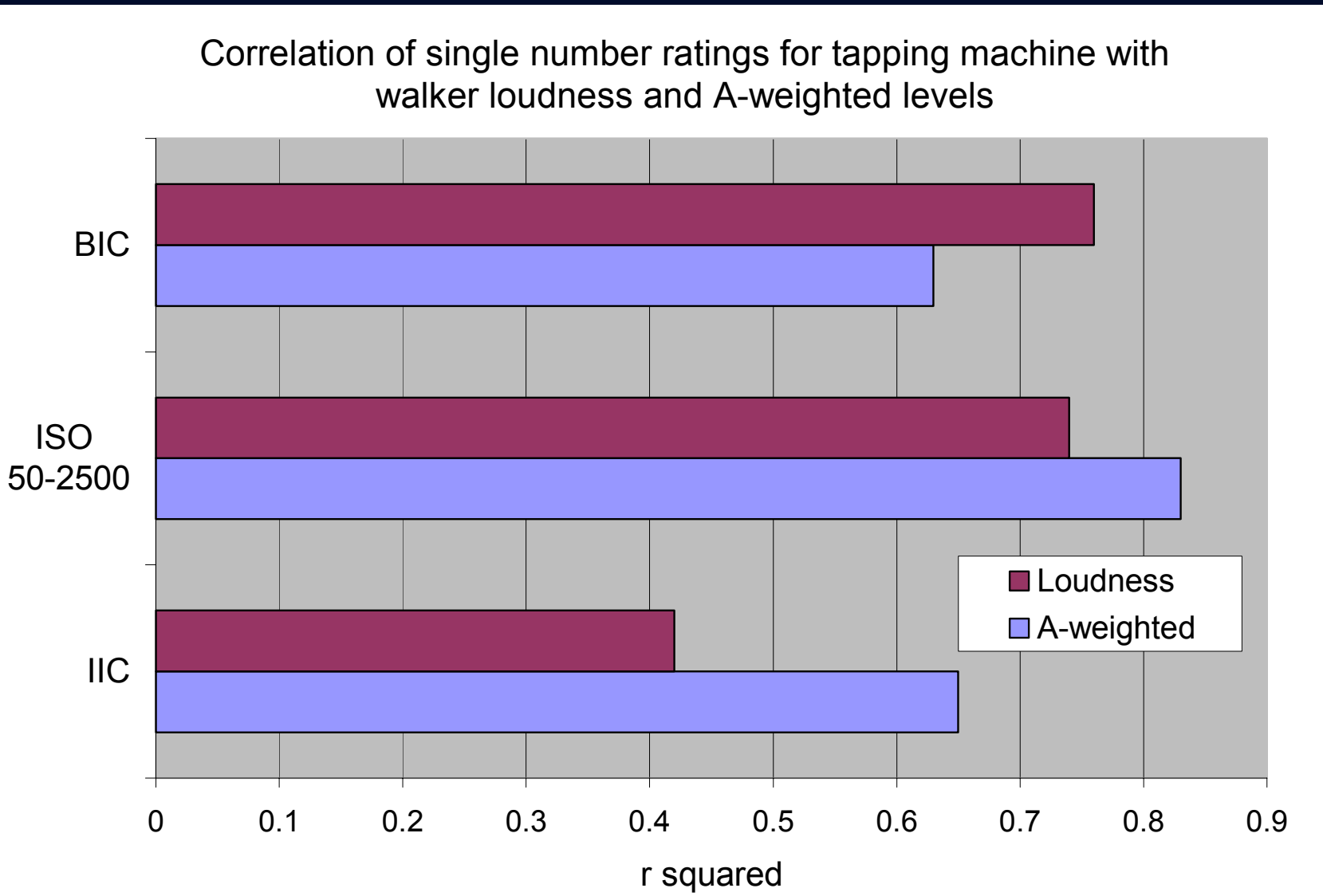
- IIC ≈ 110 - $L_{n,w}$
- ISO - energy sum, 50 to 2500Hz - 15 dB
- BIC - Bodlund curve, 50 to 500 Hz, curve fit

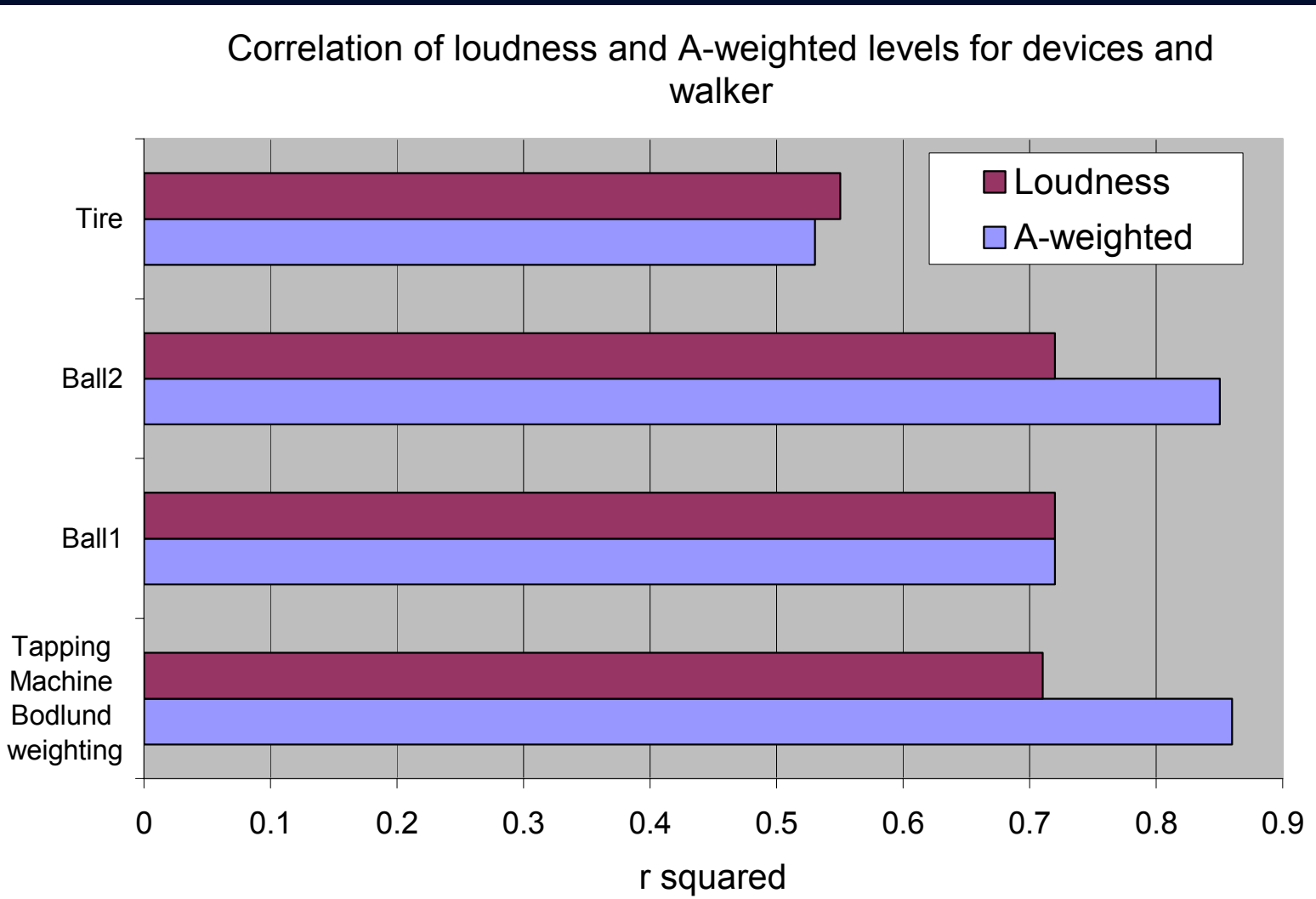
Calculation of ratings



Single Number ratings

- Tapping machine - Bodlund curve weighted, 50 to 500 Hz, A weight, loudness
- A-weighted levels and loudness for Ball1, Ball2, and Tire


Correlation of single number ratings for tapping machine with walker loudness and A-weighted levels
BIC
ISO 50-2500
IIC
Loudness
A-weighted
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
r squared


Correlation of loudness and A-weighted levels for devices and walker
Loudness
A-weighted
Tire
Ball2
Ball1
Tapping Machine Bodlund weighting
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
r squared

Conclusions

- Balls work well
- ISO hammer can work as well and no new device is needed
- Subjective studies would be useful