

Editorial

# Workshop—Introduction <sup>†</sup>

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<sup>†</sup> Presented at the Nancy Workshop on Hand-Transmitted Shock and High-Frequency Vibration, Nancy, France, 9 June 2023.

Since its initial publication in 1986, ISO 5439 [1] has been unclear on the evaluation of isolated and repeated shock vibration. In the current version of ISO 5349-1:2001 [2] the scope notes “The time dependency for human response to repeated shocks is not fully known. Application of this part of ISO 5349 for such vibration is to be made with caution”.

To be useful, any measurement or study methodology must be capable of reliable quantification of a parameter related to risk. Effective quantification of risk relies on a measurement metric targeted at a well-understood damage mechanism or injury type. Standard ISO/TS 15694:2004 [3] provides potential metrics for single shocks, but there is currently neither a preferred metric nor any accepted relationship between a specific metric and a health outcome.

In 2015, an expert workshop was held in conjunction with the 13th International Conference on Hand-Arm Vibration, in Beijing [4]. That workshop reviewed some of the issues that created the current uncertainty about the approach to the evaluation of shock hand–arm vibration and discussed some of the implications for the control of vibration risks and the development of low-vibration-risk machinery.

The expert workshop identified features of a vibration signal that may be important for predicting health outcomes. Very-high-frequency vibration was believed to have the potential to damage, although the practicalities of reliable measurement of such signals were not discussed at that time. Other parameters, such as impact force and energy entering the hand–arm system may also be influential. The use of high-speed video and measurement at the wrist were suggested as ways of assessing shock vibration.

Since 2015, ISO TC 108 SC 4 “Human exposure to mechanical vibration and shock” has considered issues around hand-transmitted shock and high-frequency vibrations. Two Technical Specifications are currently being developed related to hand-transmitted shock and high-frequency hand–arm vibration. The work on these standards will be introduced in the workshop.

Recently A revision of EU Directive 2006/42/EC was adopted by the EU and published in the Official Journal of the European Union on 29 June 2023 as Regulation (EU) 2023/1230 [5] These new EU regulations introduced a new requirement for declaration of hand-arm vibration emission: “the mean value of the peak amplitude of the acceleration from repeated shock vibrations, to which the hand-arm system is subjected”.

This requirement for declaration of peak amplitude of hand–arm vibration means that in the EU a definition is required for a suitable metric of peak amplitude measurement.

In this workshop held in conjunction with the 15th International Conference on Hand–Arm Vibration, Nancy France in June 2023, we introduce the issue of hand-transmitted shock (HTS) and the work currently active within International Standards groups. We explore questions such as:

- Do we accept that the health effects due to exposure to shocks are the same as those from continuous vibration?
- Is ISO 5349-1 and the A(8) metric suitable for predicting the risks of health effects from HTS?



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- Do we need new metrics specifically for HTS?
- Do we need new frequency weightings?
- What should be the upper frequency limit for measurement?

The principal objective of the workshop was to achieve a consensus view amongst experts on the metric most suited to HTS evaluation. In doing this, we would like to consider the measurement domain (frequency or time), frequency range, measurement parameter(s), and any required supplementary information.

The programme was structured in two parts: the first introduces questions relating to health effects and epidemiology and the second on what is needed from International Standards. Following each of these parts, there were breakout sessions, where delegates were asked to consider specific questions on the topics and report back to the workshop. In the first breakout session, on health effects and epidemiology, the questions were:

- Q1 Do we accept that the health effects due to exposure to shocks are the same as those from continuous vibration?
- Q2 Is ISO 5349-1 and its A(8) metric suitable for predicting the risks of health effects from HTS?
- Q3 Do we need new metrics for HTS?

For the second breakout session, the questions were:

- Q1 Do we need to consider frequencies greater than 1250 Hz?
- Q2 What should be our upper frequency limit (5 k, 10 k, 50 k . . .)?
- Q3 What are the measurement challenges for that upper frequency?
- Q4 Do we need a time-domain metric? If so, what metric?

Finally, the workshop organisers summarised the outcomes as a set of resolutions on which delegates can agree.

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## References

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