

EVOLUTION OF THE ASTM 4169 Truck Profile SIMULATION TEST PROTOCOLS

During transport, goods encounter important vibratory stresses. These vibrations can have a harmful influence on conveyed goods, from a packaging simple abrasion to the pallet destruction. To detect and avoid these problems during the actual transport, it is very important to realise transports simulations on goods in laboratory.

These simulations are performed utilizing a vibration table controlled with PSD (Power Spectrum Density). PSDs represent in some way, the vibratory signature of a particular transport type.

The simulation performance will be, in part, based on the utilized PSD accuracy in laboratory. To obtain these PSDs of transport, it is possible to utilize an actual transport record which will be used for the goods, or PSDs from standardized tests protocols.

To obtain these vibratory spectrum of a particular transport, METROPACK utilize autonomous on-board recorder.

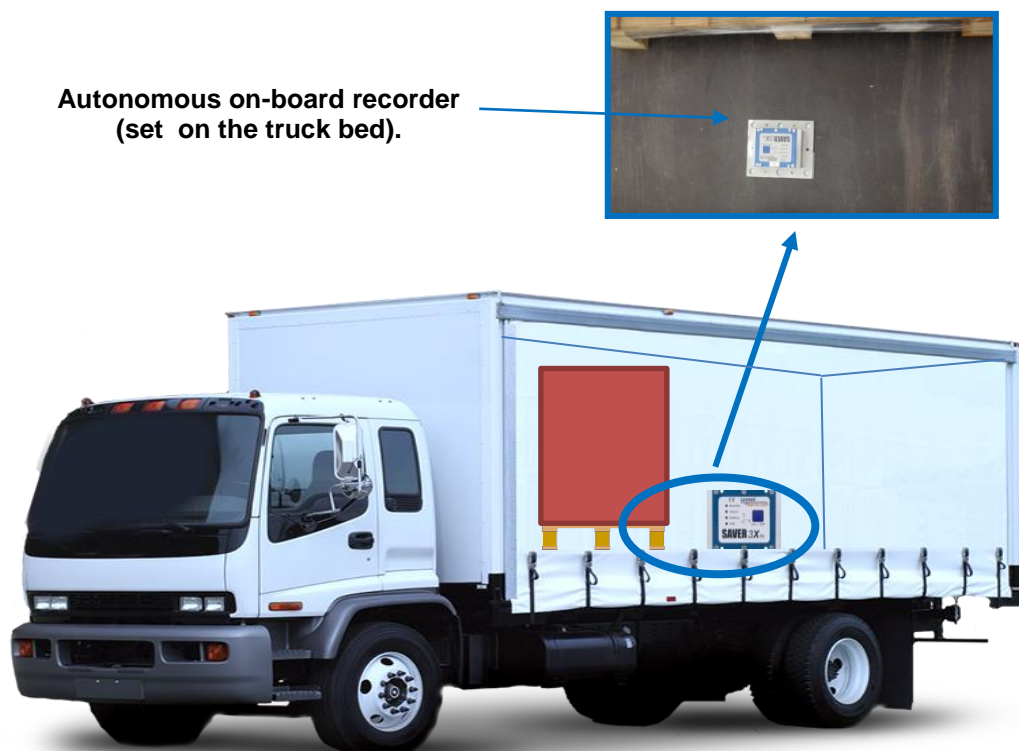


Figure 1 : Sensor of record on the truck bed.

Set on the truck bed, these sensors can record there, all vibrations induced by the transport. These vibrations are noted by the accelerometric magnitude at each moment. These vibrations are then transcribed from temporal to frequential domain to obtain a vibration spectrum, with a characteristic shape of the studied transport (Figure 2).

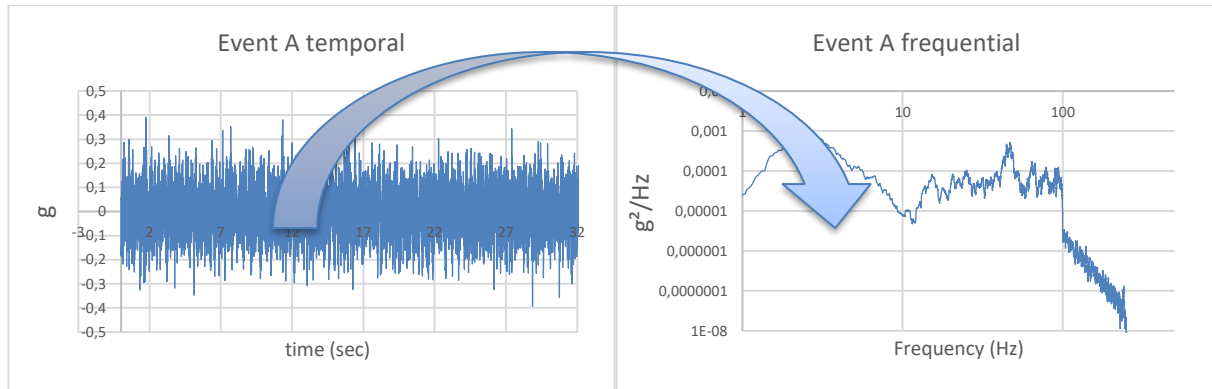


Figure 2 : Spectrum realisation from temporal data.

This spectrum, this vibratory signature can be injected to vibration table to reproduce the transport.

Previous ASTM 4169 Truck profiles.

Previous ASTM 4169 Truck profiles were realized at a time where the truck transport records were difficult to be realized and rare. These ASTM profiles were proposed under three magnitude levels (Level I, II and III). The magnitude level was chosen of the demand. The chosen program was used during all the test duration.

For fifteen years, with the technology evolution, these records became common and numerous. The truck transportation compilation of the last ten years shows an important difference between the previous vibration profiles proposed by ASTM 4169 Truck and actual transports profiles (Figure 3).

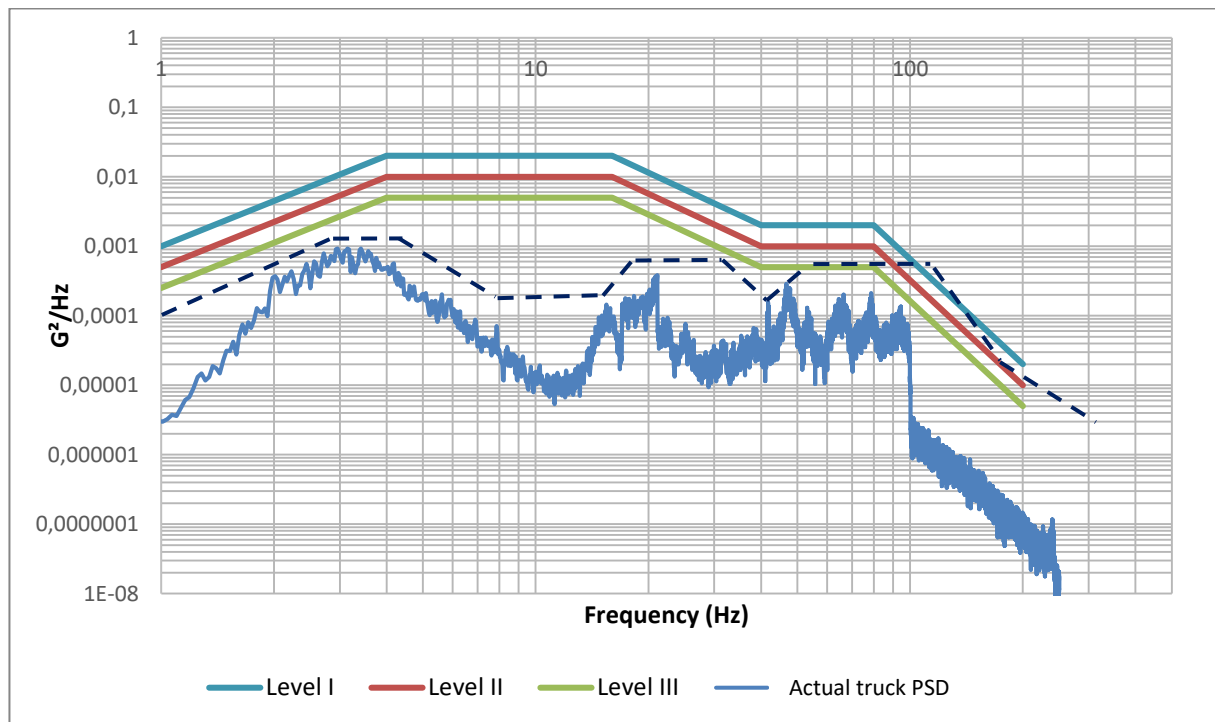
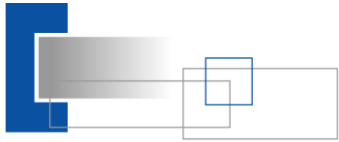


Figure 3 : Previous ASTM Truck profiles and actual truck PSD.



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To increase vibration transports simulations of ASTM 4169 Truck Profile, the utilized spectrum shape must evolve to obtain a simulation more representative of the truck transport.

New ASTM 4169 Truck 2016 profiles.

From this truck PSDs compilation, new ASTM 4169 Truck profiles were realized. They are designed to reproduce more accurately the vibratory behaviours of a truck. On Figure 4, the ASTM 4169 Truck profile shape, better corresponds to a truck transport PSD envelop (black dashed line).

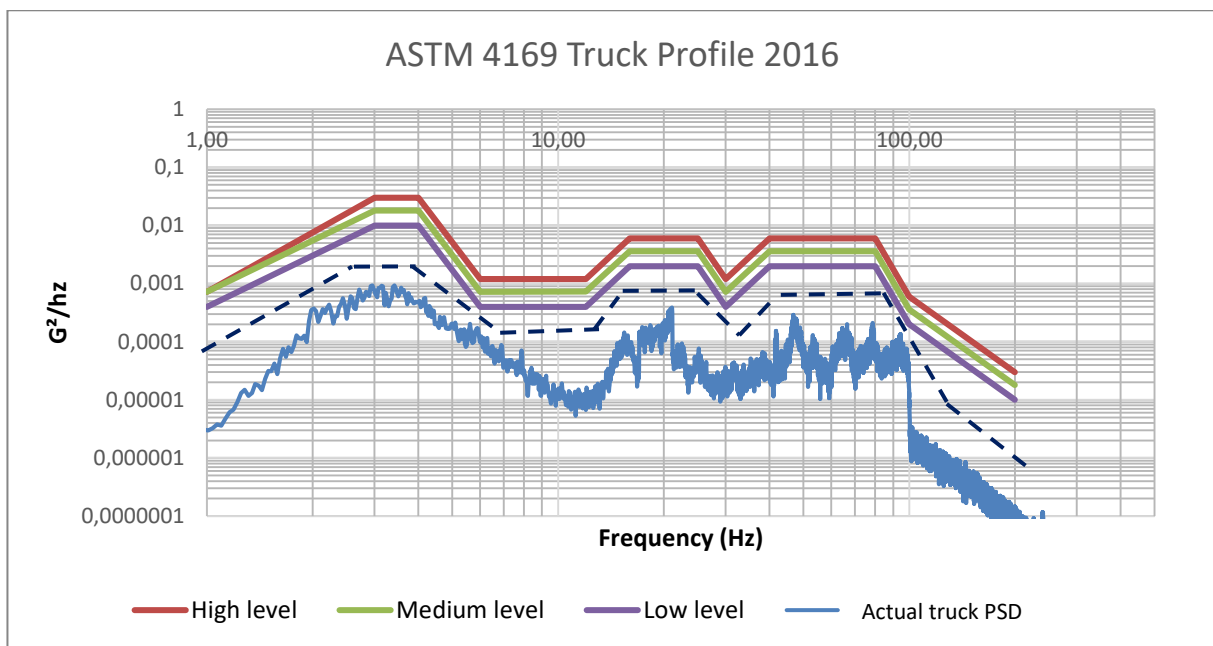


Figure 4 : New ASTM Truck profiles and actual truck PSD..

ASTM 4169 Truck profiles are three (Low, Medium, High) and successively utilized during a transport simulation of the norm. During a transport simulation, the test time is divided utilizing the three different vibration profiles.

This test profile modification is a normal and necessary evolution, which permits an ever-greater reliability of transports tests. This evolution is also linked to the transport system evolution. The common truck of today is different from the yesterday one and from the tomorrow one. Their mechanical behaviour and induced vibrations evolve with these systems evolutions. That is why it is crucial to analyse regularly the transport stress evolutions and adapt tests protocols.

Others tests transport organisms have ever effected these necessary vibrations profiles modifications (Figure 5).

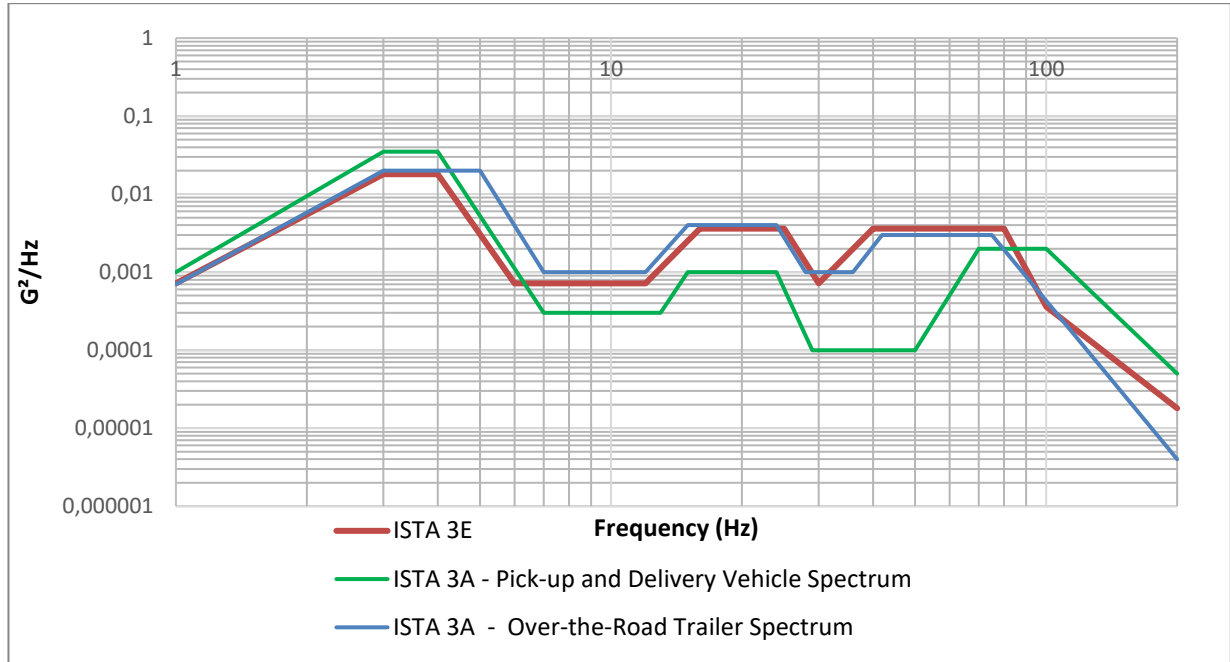


Figure 5 : Protocols shapes of ISTA (International Safe Transit Association) 3E and 3A profiles.