Vibrations in Skeleton Sports

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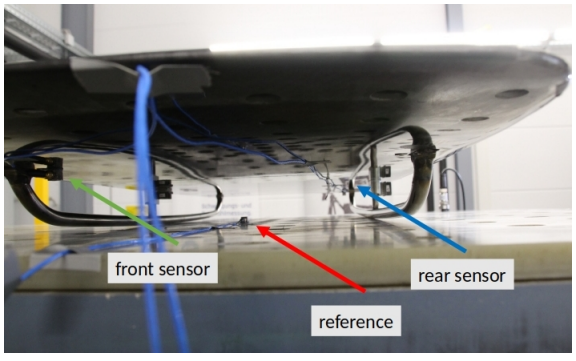
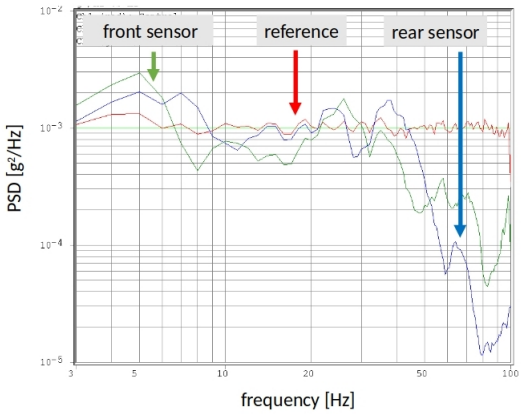
Vibration is critical to achieving top-ranks in skeleton racing. The magnitude of the vibration influences the steering properties of the sled as well as the degree of ice destruction. When analyzing the vibration, the entire system, i.e. sled and athlete, must always be considered. Both the sled and the athlete have a damping effect. Both ”dampers” can be controlled. The measurements were carried out with an electrodynamic vibration test system. The platform is 1.20 m × 1.20 m wide, the maximum force is 100 kilonewtons in a frequency range from 5 to 3,000 Hz. Two vibration sensors were attached to the sled. The first sensor at the front connection point of runner and frame and the second at the rear connection point. The third sensor was placed directly on the measurement platform.



Based on feedback from the athletes, the frequency space for the measurement was defined. White noise in a frequency range from 2 Hz to a maximum of 200 Hz was used. In addition, a broadband shock excitation with a duration of one millisecond was applied to the system. The lower image shows the power absorbed by the system. This quantity is called power spectral density (PSD). Plotted above the excitation frequency, one can see a red, green and blue curve. The red curve represents the reference signal, the green curve the signal of the front sensor, and the blue curve the signal of the rear sensor.



The more the curves tend to smaller values, the lower the excitation of the athlete-sled system. It can be seen that the subsystem of sled and lower leg leads to significantly higher damping than the subsystem of upper body with head and sled. Thus, aspects of the design-related damping by the sled can be analyzed. Furthermore, the damping by the athlete can also be evaluated. That is, the effect of body tension during the ride. Furthermore, the damping can also be modified via the adjustment of the bow.