

Appendix VIB1 – Vibration characteristics of floor in experimental hall

1. General information

Presented analysis is based on measurements carried out in days: 2015-07-31 and 2020-05-28 to illustrate long period changes. Seismic accelerometer PCB 393B31 was used to perform measurements of vibration in vertical direction on surface of vibro-insulated plate of synchrotron. Points on the floor from which data was taken is located in east corner of experimental hall, outside the storage ring tunnel. Location of measurements are shown on figure 1.

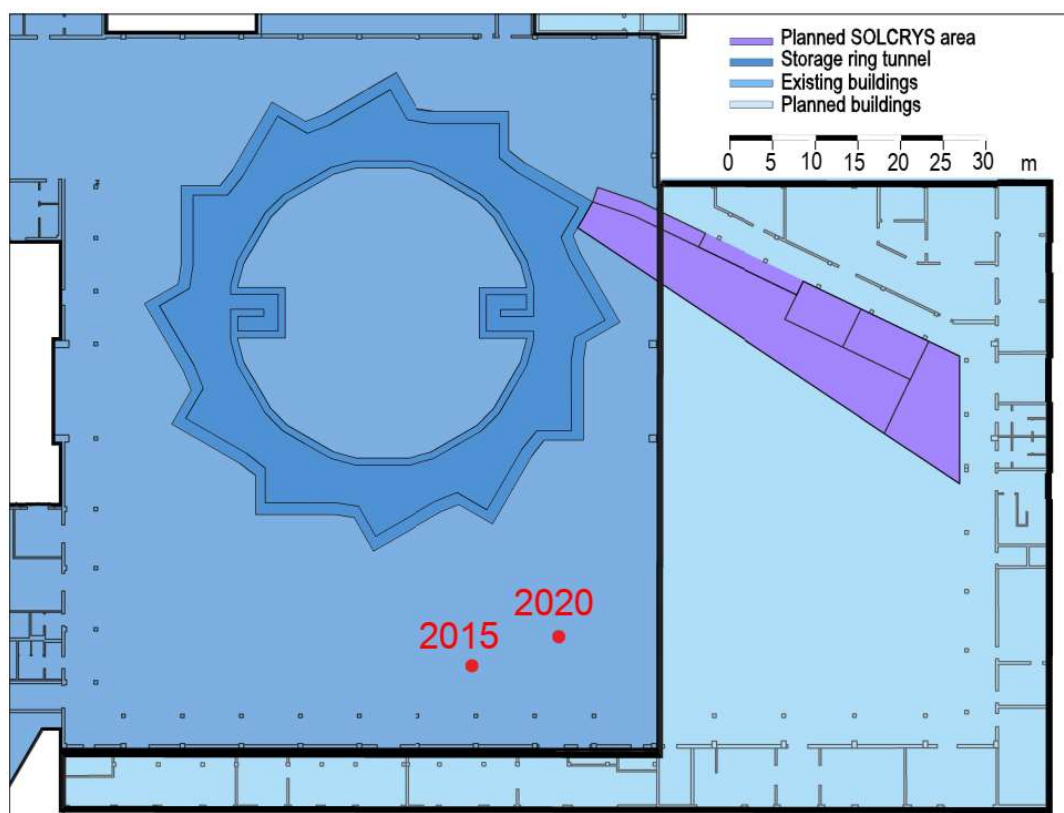


Figure 1. Location of floor vibration measurements performed in 2015 and 2020 in experimental hall of NSRC SOLARIS.

2. Displacement analysis

In 3-20 Hz band indeterministic vibrations are dominating. Above this band clear harmonic movements are clearly observed. Value for given frequency on the graph of cumulative RMS vibration displacement denotes root mean square amplitude of displacement coming from vibrations in band above this frequency. Above 10 Hz RMS displacement in year 2015 was 30 nm whereas in 2020 it was 8 nm. Above 50 Hz in year 2015 RMS displacement is on the level of 2 nm, and 0,4nm in 2020. In last measurement, the greatest amplitude characterizes the vibration of 28,9 Hz.

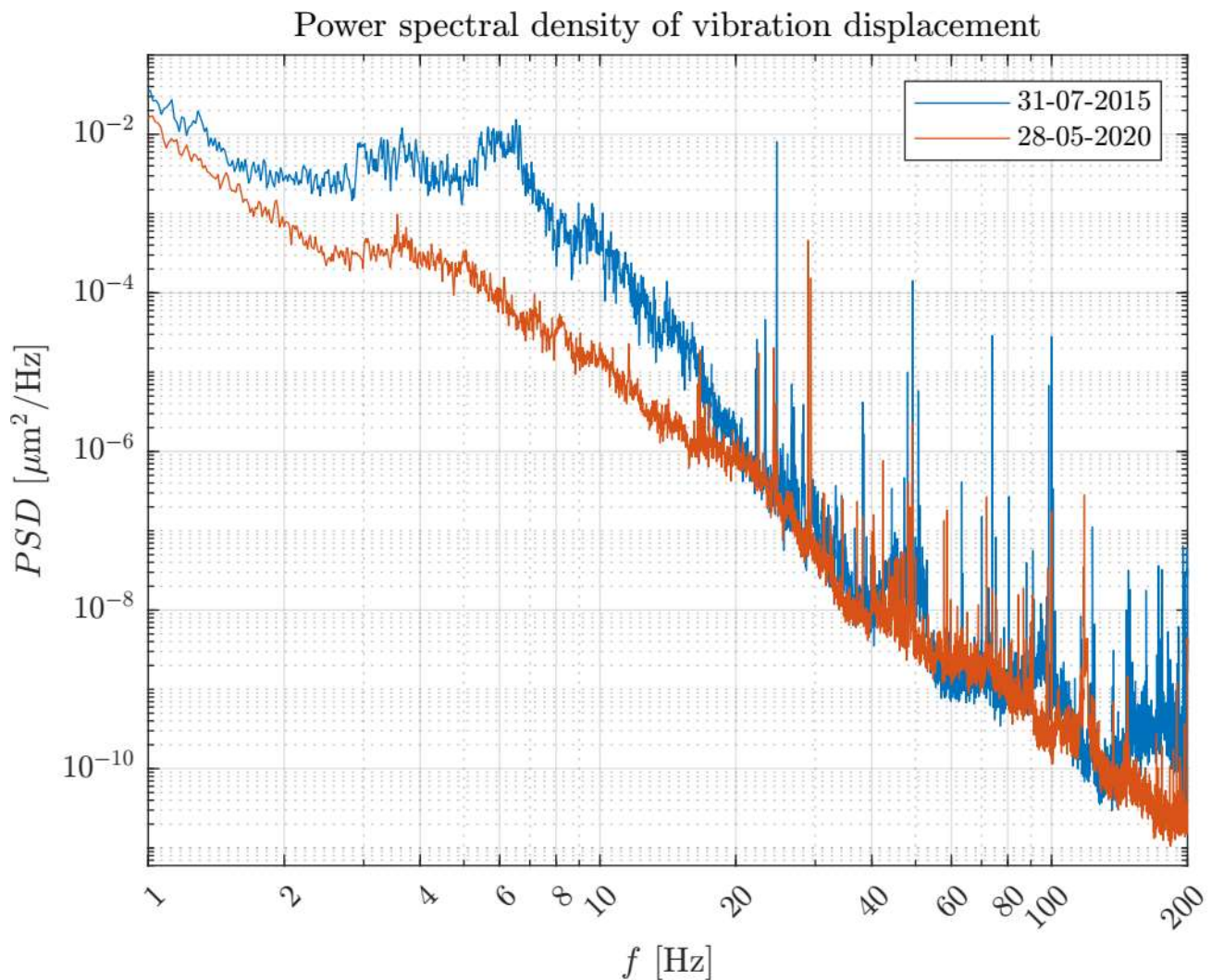


Figure 2. Power spectra density of vibrational displacement of floor in experimental hall of NSRC SOLARIS obtained in 2015 and 2020.

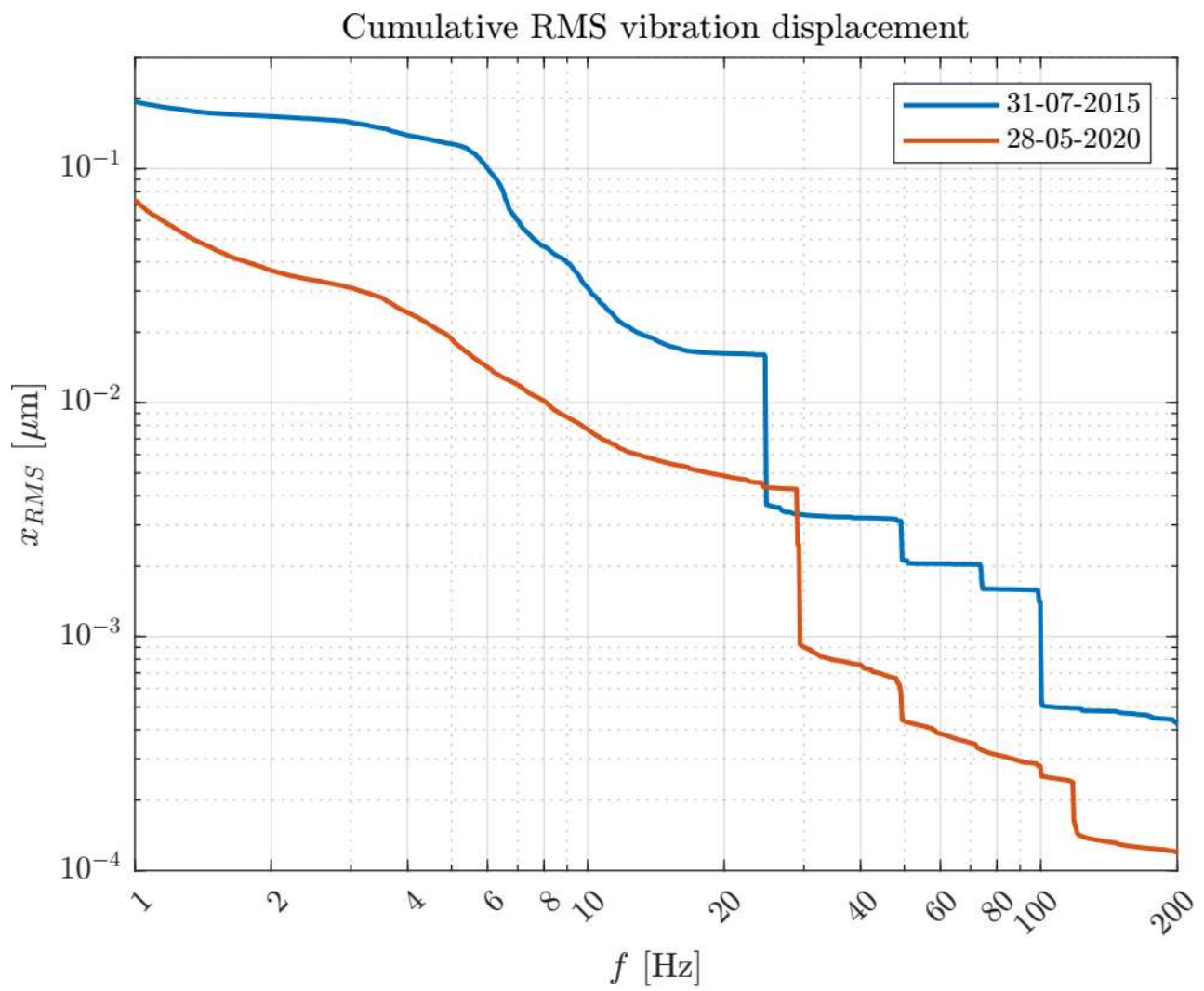


Figure 3. Cumulative RMS vibration displacement of floor in experimental hall of NSRC SOLARIS obtained in 2015 and 2020.

3. Velocity analysis

Data shown in form of third-octave RMS vibration velocity spectrum enables to refer vibrational environment of building to VC criterion. VC is widely used way to classify buildings in terms of high mechanical stability. Data obtained in 2020 shows that floor vibration meets VC-G criterion in whole range of frequency.

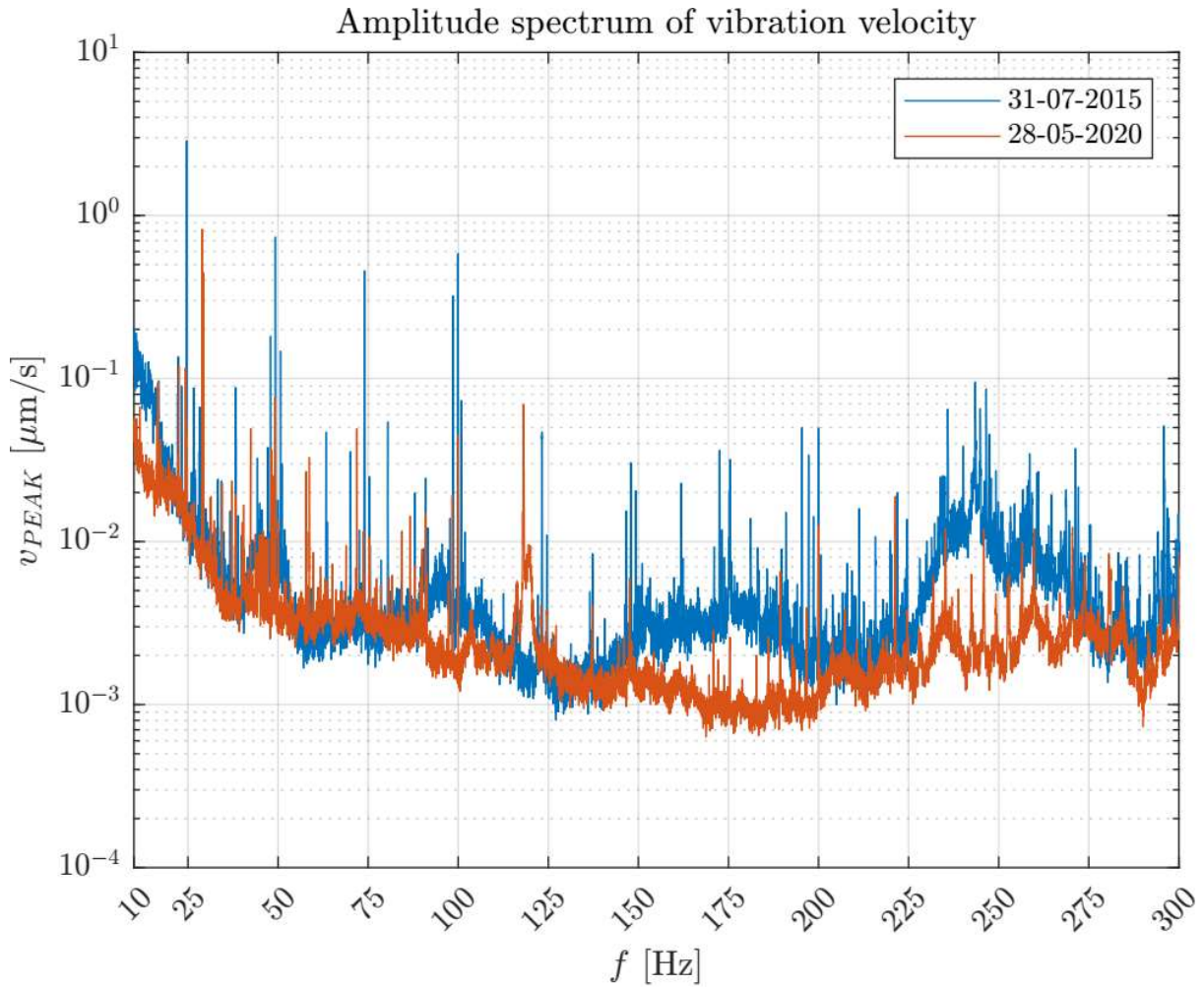


Figure 4. Amplitude spectrum of vibration velocity of floor in experimental hall of NSRC SOLARIS obtained in 2015 and 2020.

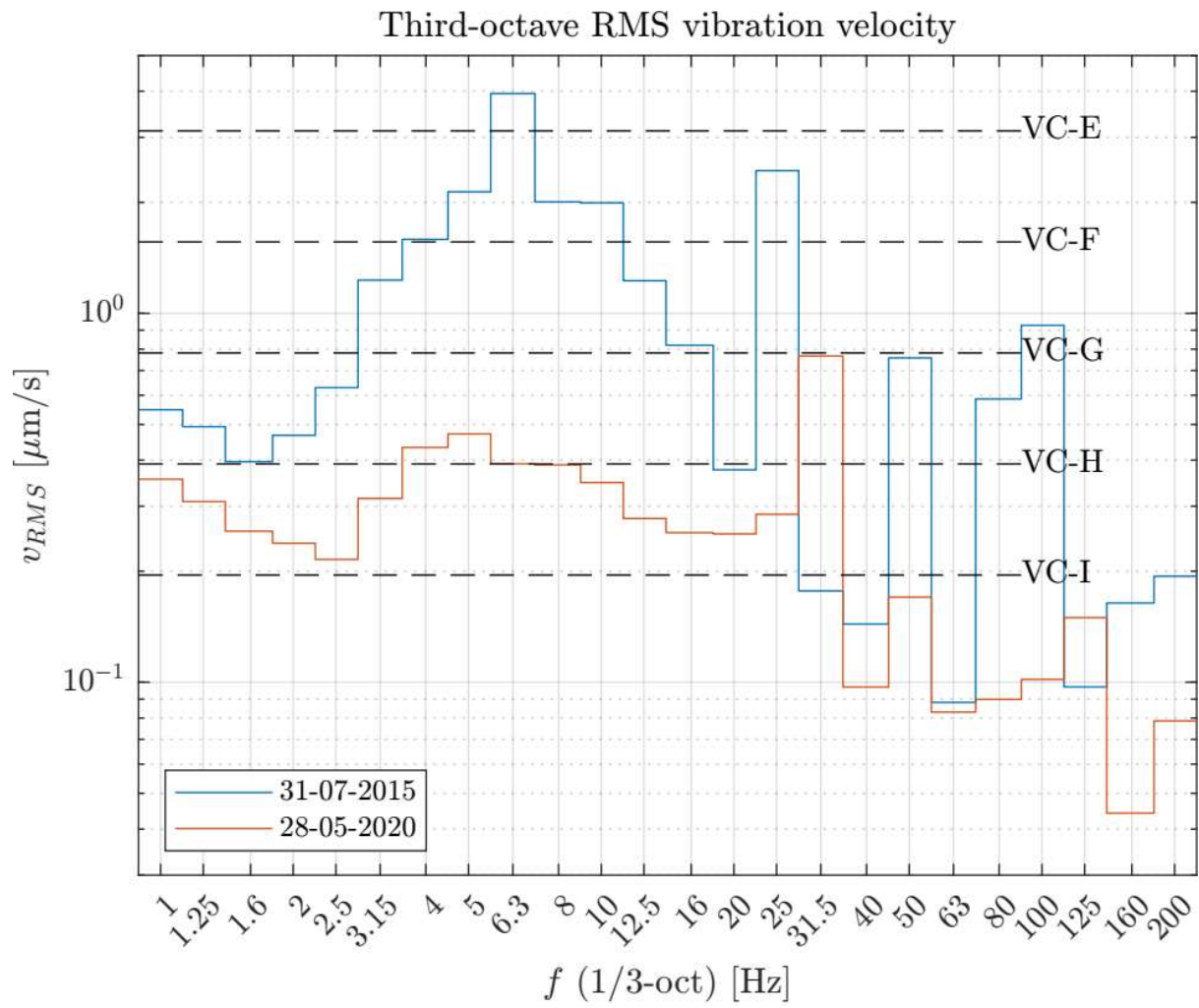


Figure 5. Third-octave RMS vibration velocity of floor in experimental hall of NSRC SOLARIS obtained in 2015 and 2020.