Microflown Technologies
Charting sound fields

Technical note

'Velocity versus Acceleration'

04-07-2007

Figure 1.1: Close up of the position of the Microflown scanning probe.

Microflown Technologies, PO Box 300, 6900 AH Zevenaar, The Netherlands
W: www.microflown.com E: info@microflown.com T: +31 316 581490 F: +31 316 581491

1. Introduction.

For an experiment the differences between velocity and acceleration signal of a vibrating shaker had to be found.

The measurement is done with a 45degree scanning probe on 1.5mm distance of the accelerometer which is excited by the shaker (chirp). The accelerometer and it's signal conditioner are from B&K.

Figure 1.2: Measurement setup

2. Theory

Close to a rigid object, Microflown acoustical particle velocity sensors can be used for the non contact measurement of the normal component of the structural velocity.
High level background noise does not influence the measurement because particle velocity of a reflecting sound wave is zero.
The normal acoustic particle velocity is a measure for the normal surface velocity at closer than distances L/2 (where L is the size of the vibrating flat object).
High surface temperatures do not influence the measurement.

Since acceleration (*a*) is the derivative of velocity (*v*), one can easily transform velocity to acceleration by multiplying with the frequency. The way back is to divide by frequency.

$$v(t) = \int (a)dt \qquad 2.1$$

With v = velocity [m/s]
a = acceleration [m/s^2]
t = time [s]

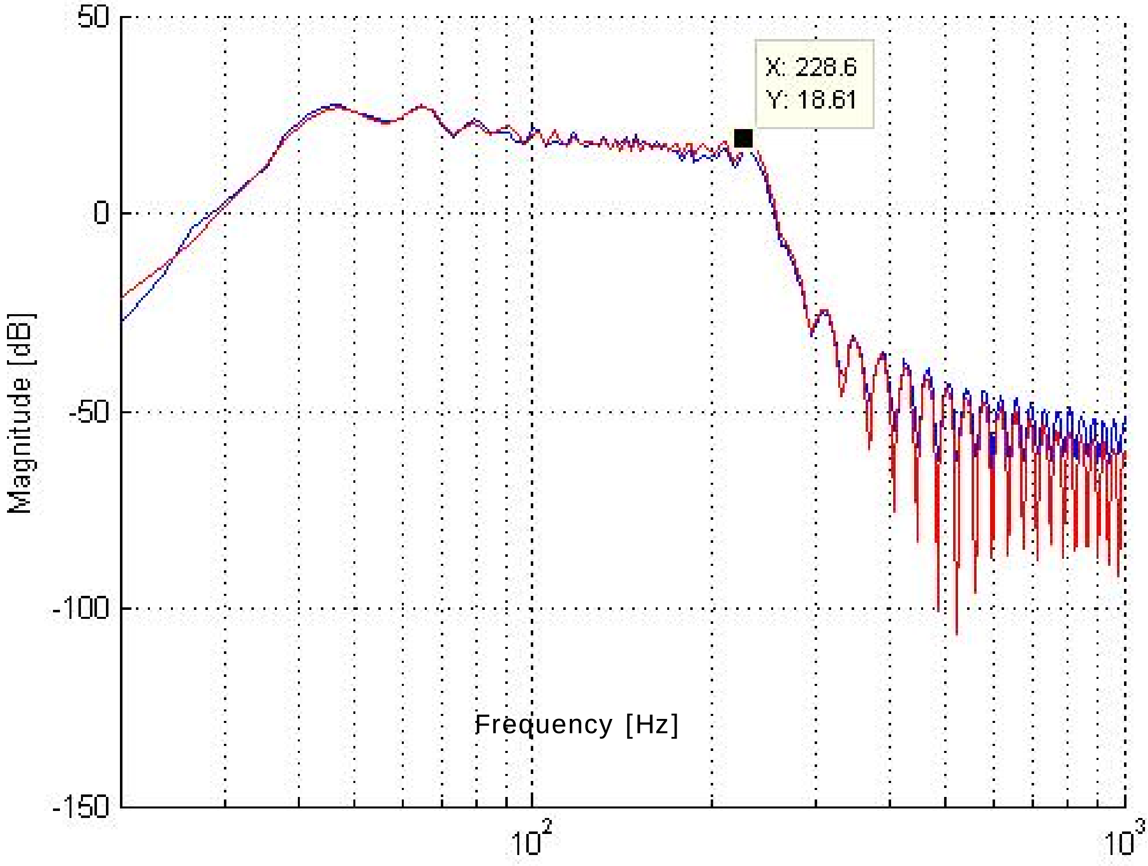

Figure 2.1: PSD of velocity(blue) vs. acceleration(red)

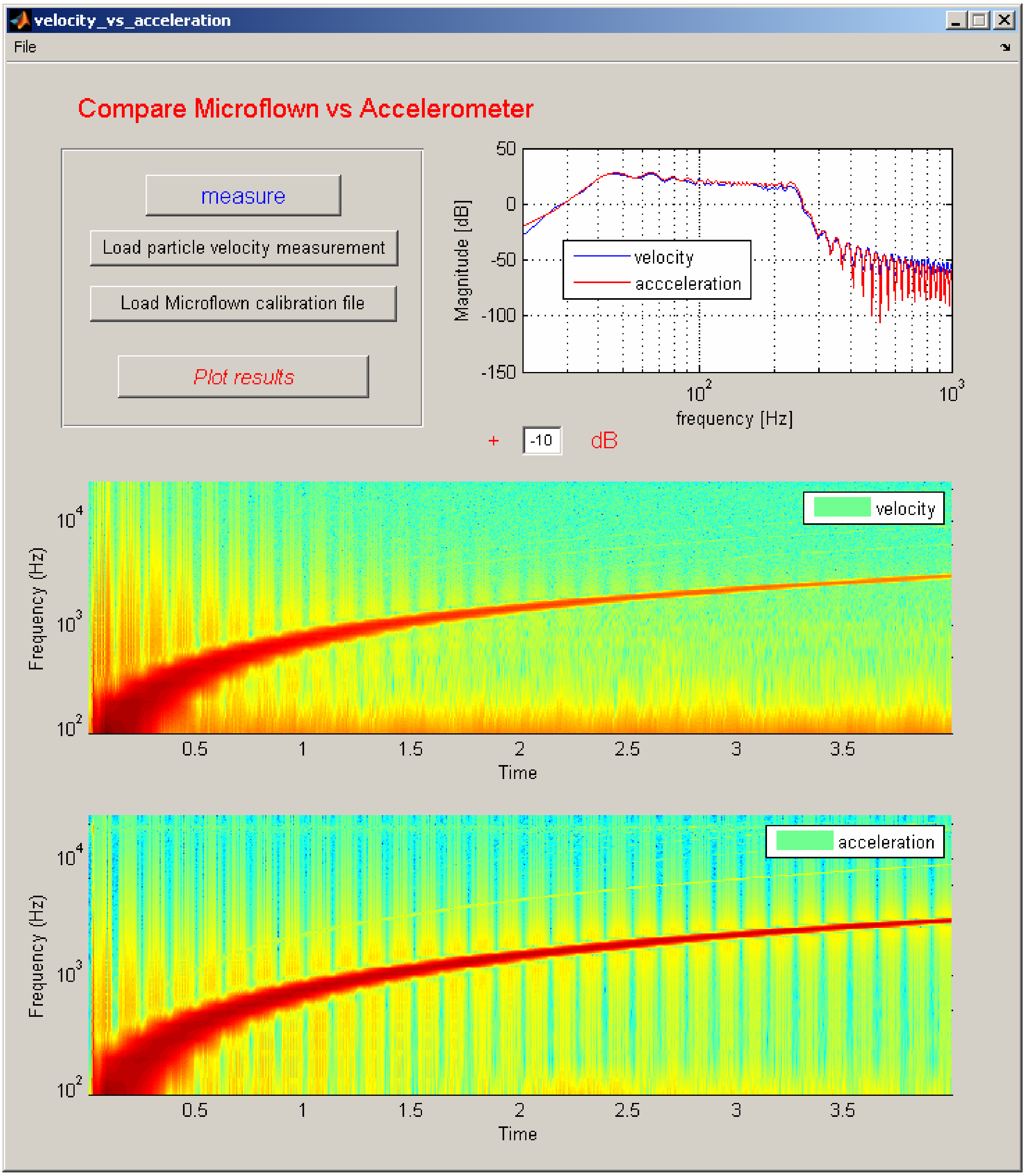

Figure 2.2: Matlab based software to visualise the two different signals.

As can be seen in the screenshot the velocity signal is corrected with its calibration data to achieve perfect results. After multiplying the velocity signal with the frequency, almost two identical signals are obtained.

The spectrogram of velocity as well as acceleration are also shown. Applied excitation on shaker was a chirp (20-1500 Hz).