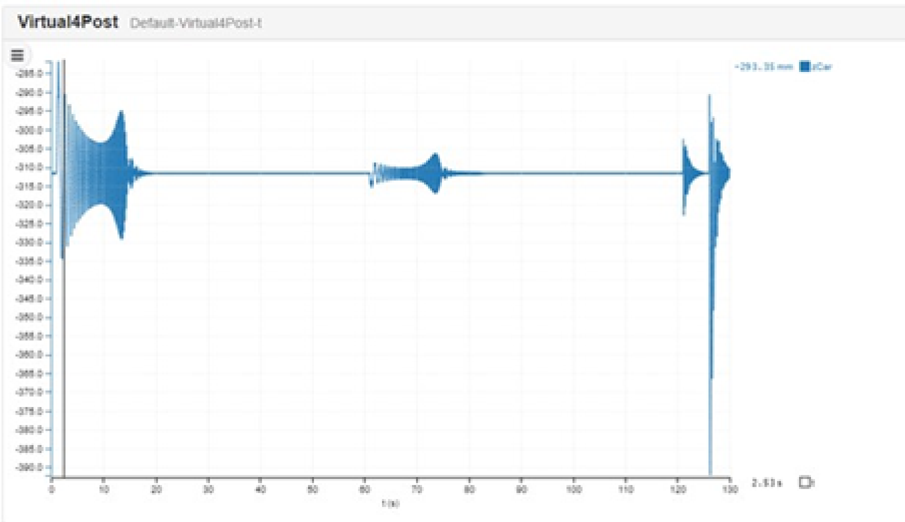
improvements in simulation, having used the rig primarily as a correlation tool.
6. When running the car at the track respond to specific issues but otherwise have confidence that ride is in the broad range of good performance.

3 Virtual 4 Post

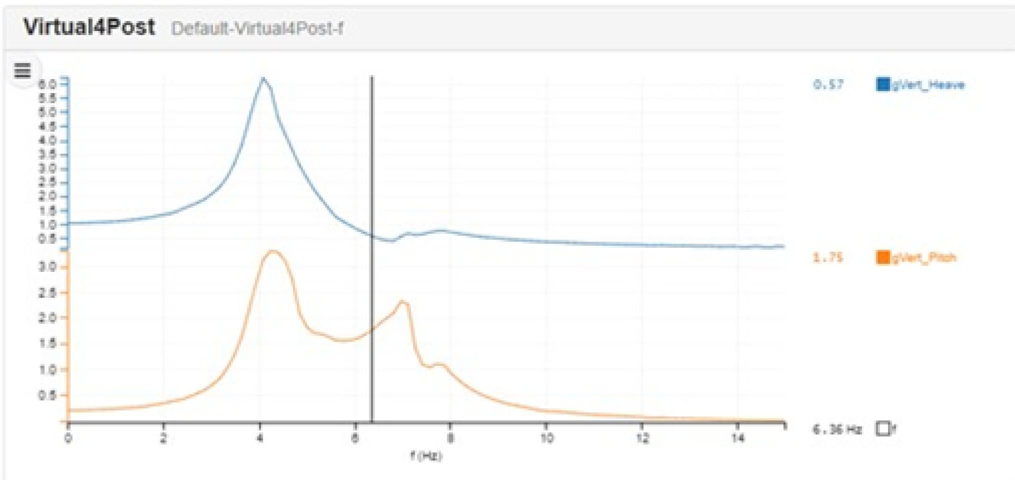
Virtual 4 Post offers a relatively simple tool for ride analysis. There is a choice between running a *Standard Sweep* or a *User Defined Sweep*. The standard sweep goes through the following stages:

1. Heave sweep: wheel pans under the front and rear wheels go through a frequency sweep with front and rear z-displacements equal.
2. Pitch sweep: wheel pans under the front and rear wheels go through a frequency sweep with front and rear z-displacements 180 degrees out of phase.
3. Kerb strikes: the car drives over bump applied only to the left hand side of the car.
4. Symmetrical bump: the car drives over a bump which is left/right symmetrical.

The results of a single sweep typically look like the following:



Having gone through these stages post processing is performed on the two sweeps. For each sweep we compute the numerical transfer function from the road profile inputs to the heave and pitch outputs. This yields frequency spectra like those below:



For all the channel names in the plot the format is outputChannel inputExcitation so gVert Heave is the frequency response of gVert to a heave excitation. These plots show typical features of F1 car ride behaviour: the heave mode at about 4Hz, the pitch mode at about 8Hz and some complicated modes associated with the hubs. Users wishing to generate similar plots can do so using the MATLAB function ‘tfestimate’.

For the *Standard Sweep* we specify:

1. vCar the speed of the car, which determines: (a) The speed of the airflow over the car. (b) How hard the bump and kerb are hit. (c) How long it takes to traverse the length of the bump and kerb.
2. zAmplitudeHeave the amplitude of the chirp signal used for the heave sweep.
3. zAmplitudePitch the amplitude of the chirp signal used for the pitch sweep.
4. zBump the height of the bump.
5. zKerb the height of the kerb. Note that if any of these amplitudes are set particularly high the simulation is likely to terminate early as the car is launched skywards.

3.1 Time History Correlation vs. Frequency Domain Correlation

It is rare verging on unheard of to achieve good time domain correlation between a simulation and the rig. This is because as a dynamic process the effect of any poor correlation will have a wide influence. I therefore recommend that the bulk of the correlation work is done in the frequency domain.

4 User Defined Sweeps