2D Doppler image - A 2-D laser beam array will be projected on a vibrating object to detect the Doppler frequency shift of the surface.

Remote laser Doppler vibration sensing - Based on remote multi-beam scanning system, Doppler images of different targets will be generated much faster than normal LDVs.
Laser Doppler Vibrometers (LDV) has significantly extended the measurement capabilities with respect to the traditional vibration sensors (such as accelerometers, strain gauges, etc.) as they allow "remote" non-intrusive measurement of vibration with frequency bandwidth up to 20MHz. However, most of the existing vibrometers are based on point-by-point measurement. A scanning system is normally employed to generate a 2-D measurement. This will dramatically increase the measurement time and limit the system to study the repeatable events.
In this project, we will build up a multi-beam Doppler remote vibration sensing system that can measure the vibration on different points simultaneously.

The key benefits of this solution are related to a faster data acquisition. The simultaneous measurement of several points allows shorter measurement time by an order of magnitude. Since all the multiple points are measured at the same time, transient events can be accurately measured with a single shot. In addition, the relative phase between measurement locations can be used to generate modal vibration patterns in real time by direct comparison of time histories, without the use of a reference signal.