MULTI SHAKER TABLE SYSTEMS

by Jeff Zhao, Ph.D., Crystal Instruments Product Manager
Multiple Shaker Table Systems
There are many different shaker table arrangements based on various types of MIMO testing applications. The Multiple Shaker Table System ranges from Multi Exciter Single Axis (MESA) to Multiple Exciter Multiple Axis (MEMA) with 2 to 6 shakers involved (e.g., three axis translational shaker table, four-poster, 6 DOF Multi Axis Shaker Table (MAST), etc.)

Multi-Exciter Single-Axis (MESA) is a type of application in which multiple exciters provide dynamic input to a test item along a single axis. For cases in which two exciters are driven to a common specification with respect to both phase and amplitude, the output may be described basically in one axis of excitation. For cases in which two exciters are driven to independent magnitude and/or phase specifications, the output may need to be described in terms of a forward axis and aft axis and, perhaps, a rotational axis about the test item's center-of-gravity (CG).

Note that the system would require appropriate bearing assemblies to allow a pure rotational MESA or a combined linear and rotational MEMA motion. The following photo illustrates a dual shaker vertical push-push arrangement.

The four-poster arrangement is another common MIMO testing application, which falls into the MESA category. The automotive industry has been using the four-poster arrangement to test their vehicles for decades. Nowadays, the availability of sophisticated MIMO control raises four-poster testing to another new level. The time waveform recorded from the testing tracks or real roads can be reproduced accurately inside the lab.

Three axis shaker tables are available for Multiple-Exciter Multi-AXis (MEMA) test arrangements. Many testing applications require testing the DUT simultaneously in all three directions. With a three-axis shaker table system, the overall testing time is reduced by two-thirds in comparison to single-axis testing along each axis. More importantly, it identifies failures otherwise undetected with single-axis testing.

Crystal Instruments' Spider MIMO Control System takes use of multiple shakers and assigns multiple control channels with defined profiles. The control process of MIMO Control is expanded into a Matrix fashion, unlike the Scalar fashion of single shaker control.