

Multi Shaker Table Systems

Application Note 047



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 Multiple 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. (Figure 1.1)

Three axis shaker tables are available for Multiple-Exciter Multiple-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.



Figure 1.1

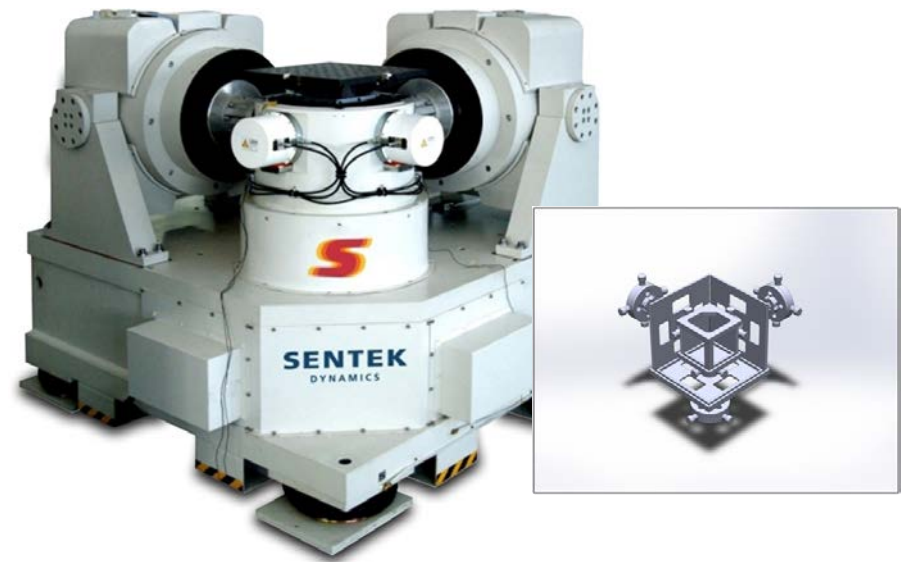


Figure 1.2

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. (Figure 1.3)

The vibration environment is incomplete without rotation. The MEMA Type 6 DOF Shaker Tables are available for these types of testing. The arrangement of shakers among all three axes allows the roll, pitch, and yaw to be achieved along with the three-dimensional translation motions from the table.

The following six-DOF testing table consists of eight electro-dynamic shakers arranged along all three directions. Four shakers under the table will provide the excitation along the vertical axis translational motion together with the roll and pitch rotational motion. The four shakers, with two along each horizontal direction, will excite the table to generate transverse and longitudinal translational motion, as well as yaw rotational motion. (Figure 1.4)



Figure 1.3

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.



Figure 1.4

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