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PRESS RELEASE

Near field measurements with the NFS3000 for electromagnetic characterization of components and systems

The Fraunhofer Institute for Electronic Nanosystems ENAS presents a near-field scanning system with both a very precise positioning system and a large movement range at the SENSOR+TEST 2019 in Nuremberg.

As a result of the ever-increasing digitization, there is an enormous increase in electronic devices in the private, public and industrial sectors today. With the »Internet of Everything« and the resulting increase in interconnectivity, data from a wide variety of applications can be linked with each other, promising a gain in usable information. Three major trends can be observed in the development of such devices. First, electronic systems get ever smaller. Second, the used frequency bands will be higher. And third, the number of wireless connections and protocols continues to grow. Hence, problems with electromagnetic compatibility (EMC) will increase. By a comprehensive distribution of numerous devices, both far-field and near-field coupling between those components becomes more important for reliable functioning. If different systems are disturbing each other by means of such unwanted coupling paths, it can lead to malfunctions of components. Therefore, other systems or, in the worst case, even a person can be harmed. Often the problem with EMC is that the sources of radiation can only be located poorly or not at all in the components. So the search for the cause begins.

By use of near-field measurements, electric and magnetic fields can be locally resolved and are depicted a few millimeter to centimeter above the device under test (DUT). Such results then can be utilized for EMC analysis and search for error causes. Adapted near-field probes are used for each field component. With a robot system, the test object is moved in a predetermined grid in the reception area of the probe and a spatially scanned field image of the object is created. One such system for electromagnetic near-field measurements is the NFS3000. It was developed at the Fraunhofer Institute for Electronic Nano Systems in Paderborn. One of its uniqueness's is the very precise positioning system with an accuracy of one micron, making it capable to visualize the local field distribution of even integrated circuits. On the other hand, the measurement system has a maximum movement range of 80 cm x 50 cm x 50 cm (xyz) and hence can electromagneti-

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cally characterize whole systems. Comparable near-field scanners have either a small step size or a large measuring range. With a phase-related measurement of magnetic and electric fields up to 2.7 GHz and a pure measurement of amplitudes up to 6 GHz, systems up until the Wi-Fi and Bluetooth spectrum can be characterized. Currently, the extension of the measurement system up to 80 GHz is planned to be equipped for future 5G and radar applications.

The measurement results, which originate with the NFS3000, can then be post processed and utilized in different ways. The simplest purpose is the analysis of the fields above the DUT, to detect and locate unwanted radiations. For instance, the developer accidentally could have implemented resonant circuits and loops into the layout. Certain trace geometries can lead to radiation hotspots and couplings into other parts occur, or components and circuits malfunction and radiate in unexpected frequency ranges. Furthermore, the results can be post processed with a near-field to far-field transformation, to predict EMC measurements, as they are done by a certification center. For that reason, the near-field data are imported into a simulation tool and get extrapolated into the far-field. Thus, the directivity of antennas can also be determined. Thirdly, the measurement results can be imported into an electromagnetic simulation tool as source to perform further analysis. These include effects of field distribution on enclosures, the effectiveness of shielding methods, or coupling to other nearby systems and components.

In all its functions and with its connection to simulation tools, the NFS3000 is an ideal measuring instrument for performing EMC analysis and interference suppression of components during development. The range extends from the simple measurement of devices as a service for developers to the combination of measurements with simulations in research and industrial projects. In the early phases of hardware development, for example, parameter studies can be carried out and accompanied by measurements and simulations in order to obtain systems with optimum properties.

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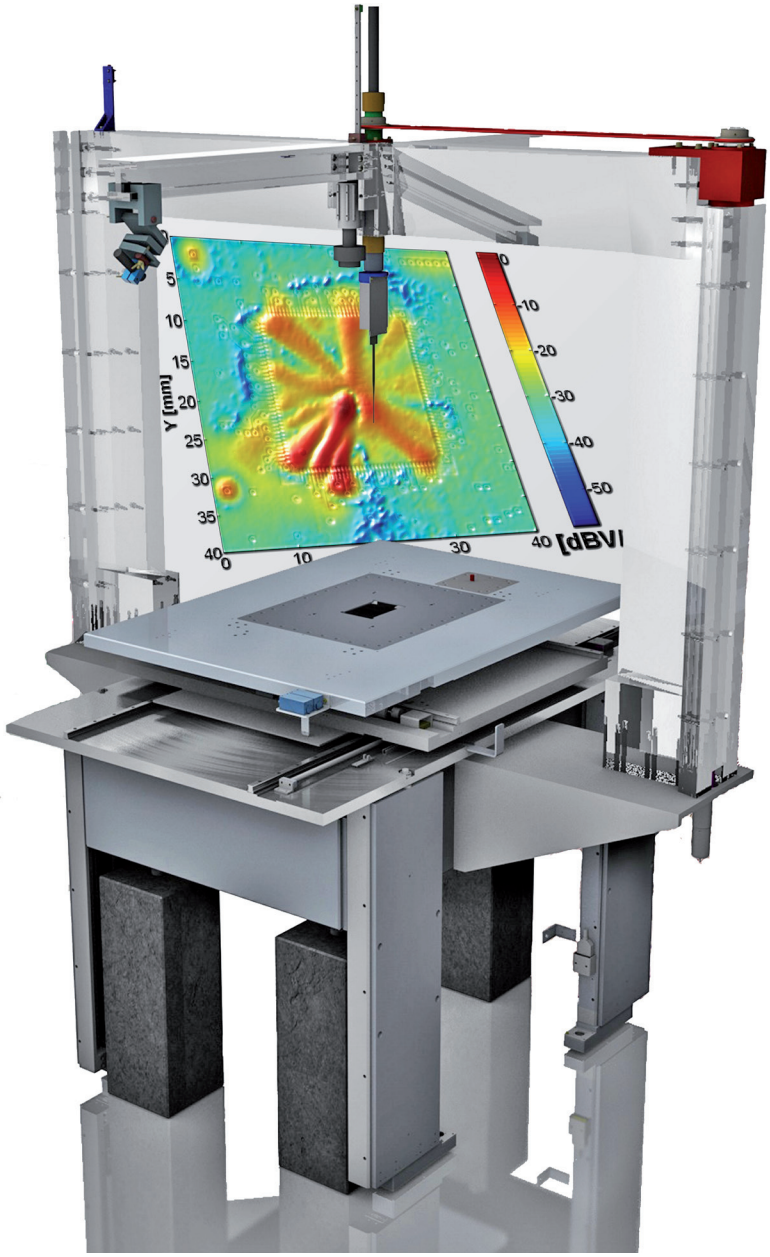

Model of the near-field scanner NFS3000 for detection of electro-magnetic fields.
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