

Optical testing of curved displays

The new fully automated 7-axis DMS 904 goniometer is ideally suited to the optical characterization of large and curved displays.

Instrument Systems presents its latest goniometers of the DMS series: the fully automated 7-axis DMS 904 goniometer was designed specifically for the optical characterization of large and curved displays. This also includes pillar-to-pillar displays that extend over the entire width of the vehicle. The new DMS 904 features seven motorized axes for automated display measurement. The seventh axis enables additional linear movement of the measuring head and thus decentralized, angle-dependent measurements for displays up to a width of 1.8 m. The enlarged temperature chamber allows movement in X- and Z-direction during the measurement process and has dimensions of 160 x 60 x 20 cm.

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\\ METROLOGICAL CHALLENGES OF CURVED-DISPLAY SYSTEMS

Among the new display trends, so-called curved displays in cars have undergone a particularly impressive development. Their curvature opens up a multitude of new possibilities in terms of design and applications. They embrace the functions of the individual cockpit instruments and give the driver an almost vertical view of all displays. The instrument display should be perceived as pleasant, legible in sunlight and switch instantly, even at low temperatures. A further quality factor is the stability of the perceived image content. If contrast and color change with viewing direction, for example, it is perceived as unpleasant.

Characterization of the quality of curved displays involves the measurement of many metrological parameters: color gamut, chromaticity and luminance of the grey states, luminance contrast between black, white and grayscale, as well as the change in these sizes with the viewing direction and in ambient light. The ever-increasing size of curved displays thus presents a very special challenge for optical display measurement technology.



▲ With the development of the curved display there is now only one continuous screen in the cockpit.

\\ DMS SERIES – GONIOMETER SYSTEMS FOR PERFECT DISPLAYS

Instrument Systems developed the DMS goniometer system specifically for the characterization of displays. Established display measurement systems offer many options for view direction-dependent optical evaluation of displays in consumer electronics and automotive engineering. They are regarded as a global standard and reference for extensive analyses of electrooptical displays in construction phases and production processes.

All DMS models enable the following measurements:

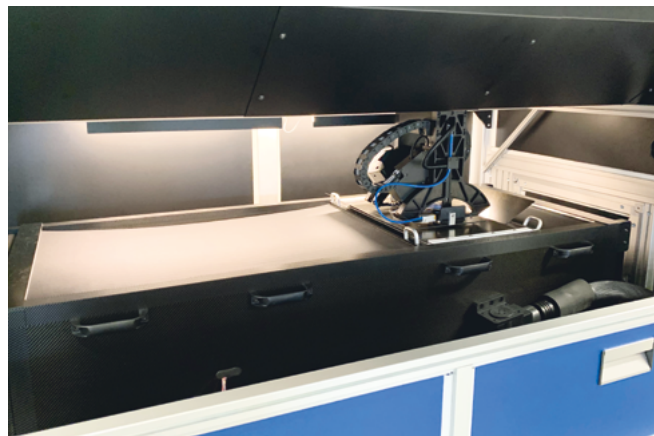
- ▲ Luminance, color and contrast under different viewing directions and display operating conditions
- ▲ Electrooptical transfer functions (EOTF) and flicker
- ▲ Spectrally diffuse and direct reflection and transmission
- ▲ Qualification of the effects of ambient lighting and temperatures

The basis of a DMS system is a high-precision goniometer that permits a full scan of viewing direction by motorized azimuth rotation Φ and angle of inclination θ . Uniformity scans can be made with control of the lateral DUT position (X, Y). The integral DUT driving unit controls samples, e.g. analog signals, source meters or display interfaces. An optical microscope enables reproducible selection of measurement spot size. Additionally, two light meters – a spectrometer and a photometer – are connected to the microscope via fiber optic cable. Sophisticated software controls the automated measurement processes and prepares comprehensive result reports.

\\ DEVELOPMENT FOR LARGE AUTOMOTIVE DISPLAYS

The new goniometer DMS 904 was specially developed for large and curved displays for customers in the automotive sector. It has seven motorized axes for automated measurement, a motorized microscope aperture wheel and an integrated alignment camera. The additional X-axis enables decentralized, angle-dependent measurement of curved displays up to a width of 1.8 m. A heat-cool system can be integrated if needed for temperature-dependent measurements and conformance testing. The HCS-7 temperature chamber permits movements in X- and Z-direction. Its enlarged interior of 160 x 60 x 20 cm can be temperature controlled in a range between -40°C and +105°C.

Quality control is of great importance in the automotive industry, in order to ensure compatibility throughout the supply chain. This calls for clear, precisely specified and standardized testing and measurement methods as a basis for reproducibility. The DMS systems from Instrument Systems are used worldwide in both R&D and production, in order to ensure the highest quality for our customers and promote display development.



▲ *The new goniometer DMS 904 has an additional linear motion axis for curved displays and an extra-large chamber with heat-cool system for particularly large devices.*



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