SIEMENS

LMS Testing Solutions

Siemens PLM Software – Special report

LMS SCADAS XS

Extra-small, extra-smart

Durability

Maximizing your
durability testing
productivity

Pass-by noise

Your one-stop shop
for pass-by noise testing

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The LMS testing solutions portfolio has added new hardware components to its pass-by noise (PBN) testing and engineering solution. A one-stop shop for every PBN testing or engineering scenario, you will have all the necessary hardware and software for exterior and interior testing and analysis, calibration and maintenance right at your fingertips.
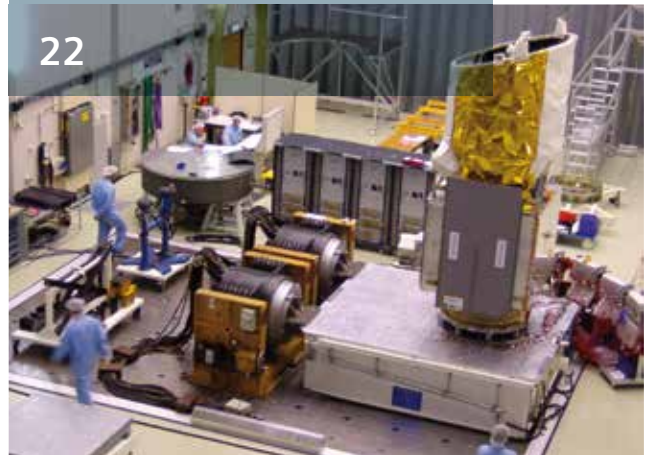
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Renown for its modal-testing experience – from impact testing of small structures to large-scale campaigns using hundreds of measurement channels – Siemens PLM Software continues its tradition of cutting-edge expertise and maximal testing efficiency with the latest release of LMS Test.Lab Structures that makes modal analysis easy.

»How do you make sure that what was designed on the computer screen will act like it should in the real world? The answer is simple: you test it.«

The pivotal importance of testing

As customers continue to demand more from their vehicles and regulations for noise, safety and emissions become increasingly strict, the winning formula for successful product design and a strong brand image continues to depend on a solid testing process.

Product success today is all about getting it right. All of it right, including producing the right car with the right functional performance profile, the right brand and regional market characteristics and the right price tag, all with the right timing. That is a lot to handle, to say the least.

So what is the magic formula for doing this? To start, there has been a seismic shift toward simulation software to streamline today's platform-based, multi-variant design process. Test experts at a major automotive manufacturer estimate that 75 percent of a car's noise, vibration and harshness (NVH), ride and handling or durability performance is now designed using simulation solutions. They estimate that this will reach 100 percent in a few years.

Even with upfront simulation, the question still remains: how do you make sure that what was designed on the computer screen will act like it should in the real world? The answer is simple: you test it.

And you test it throughout the development cycle. At the beginning, there are extensive benchmarking and target-setting studies to collect valuable data on the vehicle, system and component level for new product development. During the development process, you probably test to close verification and validation loops or investigate specific acoustic, structural or durability issues to make sure that product development is going in the right direction. And then you test again on the final prototype to validate the performance prior to production.

More precious than gold

Today prototype time is more precious than gold and test cycles simply need to be faster and faster. The trick is to optimize resources. Ask any test engineer and they will tell you that despite streamlining manpower using more sophisticated simulation processes, the testing trend today is to do as much testing as fast as possible with the best-possible quality. Final validation happens as late in the development stage as feasible. And nobody wants to have to troubleshoot during the late prototyping stage. It is just too expensive.

From a testing perspective, all this might sound like a mission impossible, but it isn't if the testing team has the innovative process, expertise and tools to get the job done right. This is why successful testing teams count on the best-possible tools such as dedicated LMS Test.Lab software and LMS SCADAS hardware.

In this special report, we are proud to present the newest LMS testing solutions. This includes the new and ultra-compact LMS SCADAS XS and innovative LMS Soundbrush, solutions for pass-by noise and durability testing engineering, highlights from our latest release, LMS Test.Lab 14, as well as a short review of our structural and environmental testing portfolios.

Please read on to discover how LMS testing software and hardware can become the gold standard in your product development process, and help you make smarter design decisions to create the best-possible products.

Bruno Massa
Vice President Test Division
Simulation & Test Solutions
Siemens PLM Software

The new extra-small, extra-smart

LMS SCADAS XS

What we are hearing from test engineers and technicians today is that they need to perform more tests with less people in less time and with less money – and that time with the prototype is scarce, at best. To succeed, both testing engineers and technicians need versatile equipment that can be used exactly how and when they need it. This is just what the new LMS SCADAS XS is all about.

LMS SCADAS XS offers channel-testing capabilities and integrated-signal conditioning. The multi-channel system supports 6 or 12 analog input channels as well as binaural recording and stereo audio replay, digital artificial heads, dual analog tacho, digital CAN and GPS.

Designed to support fast, on-the-spot noise and vibration troubleshooting that does not necessarily require a high-channel-count system, LMS SCADAS XS is an ideal tool for automotive NVH testing teams looking to effectively expand capacity.

Small enough to slip into a pocket, this unit can be taken to the test track, offsite or moved around the lab and office where needed. A versatile tool, LMS SCADAS XS works as a standalone recorder with a tablet over Wi-Fi, or connected directly to your personal computer (PC) via USB. It is available in a standard 6-channel version or an advanced 12-channel version. Like other LMS SCADAS products, LMS SCADAS XS can handle traditional volt, AC or ICP® sensors and can be used to measure tacho signals, binaural microphone signals, controller area network (CAN) bus signals with a global positioning system (GPS).

Combined with the LMS Smart™ Scope application, users can verify measurements on the spot without a PC. Further, this little unit is tough enough to withstand shocks and vibration levels under the toughest of circumstances without recharging for an entire workday.

Measuring 17 centimeters (cm) x 11.4 cm x 2.3 cm, LMS SCADAS XS literally fits in your hand.

Unparalleled automotive industry application range

Now more than ever, testing teams in the automotive industry require advanced flexibility to test vehicles and components in real-life circumstances against increasingly tougher deadlines. LMS SCADAS XS for the automotive industry provides the ideal size and measurement performance for optimal mobility. It surprises some that such a small piece of hardware can be used on such a broad spectrum of testing activities, including chassis and driveline testing, in-field benchmarking, lab-based component testing, powertrain testing, field-quality testing, quality validation at manufacturing sites, structural and acoustic testing and sound-quality testing.

In-field target-setting and validation

Repetitive testing requires a consistent set of measurement data and an easy, consistent way to collect typical parameters. A preconfigured LMS SCADAS XS with a fixed setup and a dedicated set of sensors makes data collection and vehicle comparison easier than ever.

Preconfigured field diagnostics

The preconfigured LMS SCADAS XS can easily be handed over to less experienced users for onsite field diagnostics. When faced with specific customer concerns, you might even ship the LMS SCADAS XS unit for targeted remote field diagnostics, allowing in-depth analysis of the acquired data afterwards.

Maximum testing flexibility implies that you should be able to work independently, away from your PC and workstation. The tailor-made LMS Smart Scope application runs on a seven-inch Android tablet, which is included with the LMS SCADAS XS system.

From sound to source in minutes

LMS Soundbrush can be used for acoustic troubleshooting, including source localization, leak detection and sound propagation. Its 3D positioning technology provides new insights into acoustic phenomena and the sound flow around a device under test. The intuitive user interface and fast setup significantly reduces measurement time compared to other acoustic measurement techniques, such as traditional intensity probes or acoustic array measurements.

"LMS Soundbrush is an exceptionally user-friendly tool that allows even inexperienced users to identify sound sources quickly."

The tightly-woven relationship between acoustics, comfort and sustainability has become increasingly evident in recent years. Whether consumers buy a car, a household appliance, a laptop or a drill, the product's noise level may influence their purchasing decision and will definitely impact client satisfaction. This trend, together with the growing awareness about noise pollution and regulatory pressures, has made acoustic performance a key competitive factor in product development. To support acoustic engineers in their increasingly challenging task, Siemens PLM Software developed LMS Soundbrush, the first technology to enable you to visualize sound in 3D while measuring.

Different measurements, varying techniques

Analyzing and improving acoustic performance requires different types of measurements. Engineers will, for example, scan the surface of a hydraulic pump to investigate what factors contribute to the noise it emits. Leak detection is about investigating the ability of a casing or housing to shield noise sources within or outside the unit. To look into sound propagation, engineers have to determine how sound sources interact and propagate away from the source.
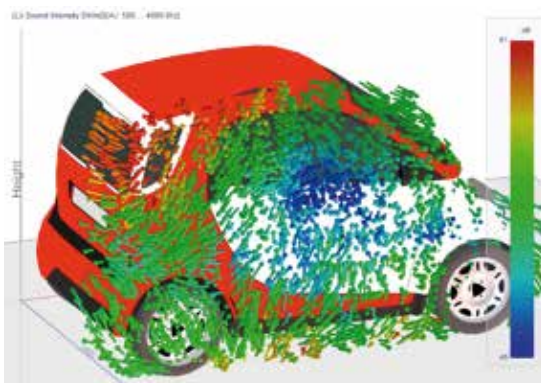
LMS Soundbrush enables users to visualize sound fields even in complex 3D volumes such as car interiors. Engineers used LMS Soundbrush to localize vehicle acoustic leaks both inside and outside on all sides of a car with a detachable roof. While measuring the exterior sound sources, the testers played a pink noise signal inside the car. At the right side of the car, LMS Soundbrush revealed that the sound intensity was highest where the isolation is lowest, i.e. the rear and front wheel bays and the back canvas of the detachable roof. Brushing at the back and top of the car confirmed this finding: the sound insulation of the canvas appears to be the least efficient in blocking the transfer noise.

Measuring transmission loss on an automotive car door.

The range of techniques used for these measurements is just as diverse as the measurements themselves. A simple microphone can help identify critical peaks or frequency ranges. To gain deep insight into the location of sound sources, engineers will rely on more advanced techniques such as sound intensity

Visualize sound source in 3D while measuring
The methods described above are accurate and efficient, yet they require significant setup time, acoustical expertise and expensive equipment. A new generation of acoustic troubleshooting tools, such as

"This easy, real-time visualization allows an immediate and quick interpretation of the measurement data, thus enabling efficient acoustic troubleshooting."

probes, which are often combined with scanning techniques that use wireframe grids or even robots. Finally, array techniques based on beam forming or acoustic holography methods will help localize sources by back propagation onto a surface.

LMS Soundbrush, is different.
LMS Soundbrush is an exceptionally user-friendly tool that allows even less-experienced users to identify sound sources quickly. The setup is simple: click the antenna with an acoustic sensor onto the probe, plug the USB probe and camera into the PC and launch the intuitive software. In no time, users can start moving the probe around the test object to capture acoustic measurements and visualize all sound sources in 3D.

In the following example, LMS Soundbrush is used to find weak spots (acoustic leaks) in a door trim panel. For the test, a complete car door was mounted in a window between two test chambers. Using white noise excitation in the reverberant source room, the transmitted noise at the receiving side of the door was measured, once with and once without the side panel. The comparison yielded some surprising results. While the speaker area and the window were clearly the main sources of noise for the original door, the measurements indicated that the window transmitted more noise after removing the panels. The 3D visualization revealed the reason: by removing the door panel, an extra gap is created in front of the window. This causes a high-vertical component of the noise, which reflects against the window, showing up as if the window were transmitting more noise. Without the 3D vector visualization, these effects could not have been discovered and explained.

How it works

The 3D visualization makes LMS Soundbrush a unique product. At the heart of the solution is the patented optical position tracking technology, which is integrated into the probe and combined with either a sound pressure microphone or a 3D sound intensity sensor (antenna). The antenna contains measurement sensors and embedded memory for automatic configuration and calibration. The probe has an illuminated 45-millimeter (mm) diameter sphere that is continuously tracked by a camera, thus providing the probe's positions. Inside, inertial sensors are used to continuously measure its orientation around three axes. Together with the positions measured by the camera and the offset of the antenna sensors stored in the embedded memory, this allows the software to represent in real time the acoustic signals at the sensor location in terms of both position and orientation.

Quick interpretation of the data

The acoustic measurement data is immediately shown in 3D on the computer screen while "brushing" the sound field. Sound pressure is displayed as point clouds, while acoustic intensity is visualized as intensity vector plots. All resulting data can be viewed from any possible angle. Users can freely rotate the test object and zoom in on a specific hot spot or run a section plane through the measurement data to make an interpolated contour plot. This easy, real-time visualization allows an immediate and quick interpretation of the measurement data, thus enabling efficient acoustic troubleshooting.

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# Maximize your testing productivity

Use enhanced LMS durability testing solutions for road-load data acquisition and processing

Just how long will it last? Whether you design trucks, sports cars or electric vehicles, this is an important question for any brand. With quality being such a major factor for consumers these days, durability engineering has taken a front row seat, answering questions such as: just how much can a vehicle handle? Is the vehicle designed to go the distance?

A critical factor in successful durability engineering is gaining a precise understanding of the load that a product will undergo during its anticipated lifetime. However, conducting accurate data acquisition and processing can be challenging and time consuming.

Siemens PLM Software's LMS testing solutions have enhanced its durability-testing product line with several new solutions for road-load

data acquisition (RLDA) and processing. Its unmatched durability engineering expertise is reflected in an integrated, end-to-end solution for RLDA. From a single software platform, you have complete control of the full RLDA process. LMS Test.Lab Durability Acquisition software combines universal, multi-channel data acquisition with a full suite of channel setup, measurement, validation, reporting and data-sharing tools.
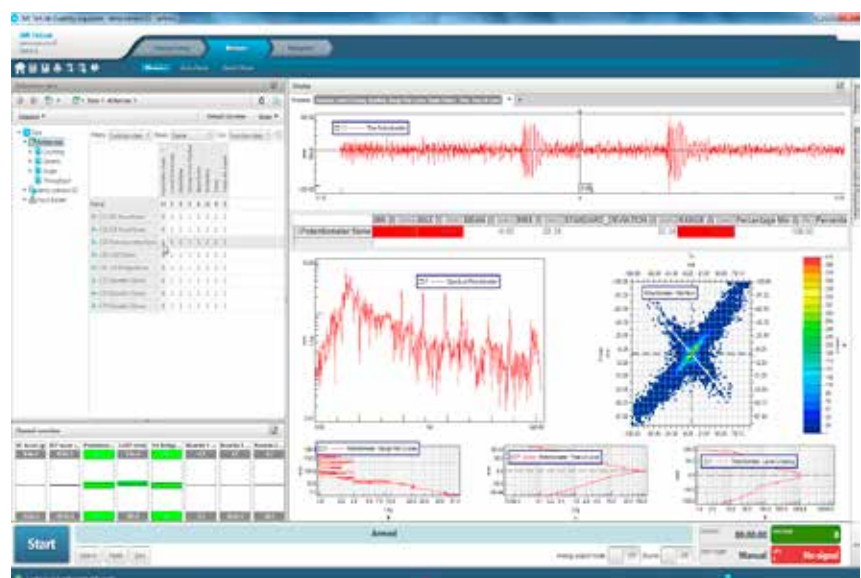
Built around three basic steps (setup channels, measure and validate and report and share), the LMS Test.Lab Durability Acquisition user interface (UI) will guide you through the durability acquisition process from start to finish. In addition to the interface, tables, graphs and views can be fully customized to meet your personal requirements.

These dedicated solutions and services are already helping durability testing engineers around the world to beat ever stricter deadlines and manage the ever-increasing data volumes to develop durable, high-quality products.

The LMS Smart Control seven-inch Android tablet and application prevents errors and annoying test reruns. With LMS Smart Control, users can instantly validate recorded data quality during and after each measurement right on-site. On-the-spot, trackside-data validation guarantees high-quality data and eliminates the need for costly test campaign reruns.

An end-to-end solution for RLDA

LMS Test.Lab Durability Acquisition is an integrated, end-to-end solution for road load data acquisition. From a single software platform, you have complete control of the full load data-acquisition process. The application combines universal, multi-channel data acquisition with a full suite of channel setup, measurement, validation, reporting and data-sharing tools. Seamless integration with the LMS SCADAS data acquisition hardware allows you to complete durability acquisition processes more confidently and in less time with fewer errors.

With its unique workflow-based interface, LMS Test.Lab Durability Acquisition sets new standards for ease of use, productivity and data consistency. The software naturally follows the test-campaign process in three basic steps: set up channels, measure and validate and report and share. LMS Test.Lab Durability Acquisition is designed to make testing more efficient and more convenient. It is the ideal tool for future-focused, durability-testing departments, offering the right balance between ease of use and functional flexibility.

LMS Smart Control for instant data validation

RLDA becomes a one-man operation with the LMS Smart Control application that runs on a seven-inch touchscreen tablet. It's compact and particularly suited for use under challenging conditions. Set up tests, monitor in real time, and validate measurements on the spot, avoiding lengthy test reruns.

Measure more with the LMS SCADAS data acquisition modules

LMS SCADAS Recorder hardware offers maximum measurement power in a single, rugged box. It enables you to perform virtually any load-data measurement imaginable. With the addition of two new durability data acquisition modules, it is possible to capture synchronized video signals and expand your measurements with IP67-compliant temperature acquisition.

Process more data faster with the latest LMS Tecware release

With its latest release, LMS™ Tecware software continues to support test engineers in the consolidation and analysis of gigabytes (GB) of raw data from mobile acquisition campaigns. New drivers add support for the HBM SoMat, HBM catman, imc Famos, MTS RPC3 float and MOOG formats, enabling direct access to raw data files and avoiding data conversion and data duplication. LMS Tecware LayoutBuilder software, a dedicated environment for creating custom reports, facilitates sharing and documenting critical test results.

The new, innovative features of the LMS Durability Testing solution allow you to maximize testing productivity on all levels. You will be able to acquire data faster, benefit from more measurement flexibility and execute test campaigns with complete confidence. In other words, you can be confident that your RLDA test expertise contributed to the creation of a long-lasting, quality product.

New LMS SCADAS hardware modules

LMS SCADAS Recorder hardware offers maximum measurement power in a single, rugged box. It enables durability engineers to perform virtually any load data measurement imaginable. With the addition of two new LMS SCADAS modules, it is now possible to capture synchronized video signals and expand measurements with IP67-compliant temperature acquisition.

A dual-channel digital interface module enables users to document lengthy public-road measurements by capturing a synchronized video data stream in parallel with dynamic, GPS, vehicle bus and wheel-force data.

Test setups requiring more than 16 temperature channels enable you to rely on a new module for IP67-compliant type K thermocouple data acquisition. The hardware is designed to withstand extreme environmental conditions. Its galvanic isolation and screwless mounting make this module particularly well suited for engine-compartment applications.

An unrivaled suite of test-based engineering solutions

Faster, more complete and deeper engineering insights

The newly released LMS Test.Lab 14 adds to the renowned reputation of its predecessors with an even more complete and faster approach to test-based engineering solutions.

From multi-channel data acquisition to a full suite of testing, analysis and reporting solutions, LMS Test.Lab14 provides you with a versatile and rigorous problem-solving toolkit. A wide range of updates enables more targeted engineering insights and higher-detailed problem analysis. Real-time data monitoring speeds up the overall testing process and gives you a clear, on-the-spot picture of your test data.

Empowering test-based engineering
LMS Test.Lab offers the right balance between ease of use and functional flexibility.

The extended functionalities of the newly released LMS Test.Lab 14 add to these benefits with even faster, more complete and deeper engineering insights.

Acoustic testing
Acoustic engineering teams will appreciate key innovations such as more advanced PBN engineering solutions and a new transfer path analysis (TPA) workbook. Specifically, the extended pass-by noise

certification offers an answer to ever more stringent standards and regulations, while enhanced transfer-path analysis capabilities add accurate source-contribution quantification to the PBN tests.

With various other acoustic testing improvements, including the sound source localization, sound quality and sound transmission loss extensions, LMS Test.Lab Rev 14 helps deliver more detailed insights and greatly enhances overall acoustic testing efficiency. Other additions to acoustic testing include support for the new LMS 3D Binaural headset, additional standards for sharpness calculation and enhanced insights with the LMS Sound Intensity solution.

Structural dynamics testing
With its enhanced functionalities, LMS Test.Lab Structures software offers test engineers more flexibility in analyzing complex structures. While the support of the new LMS SCADAS V24 module directly connecting to triaxial accelerometers allows you to measure more signals

in one cycle, improved interaction with graphical models lets you analyze test results data in greater detail.

Other highlights in structural dynamics testing include faster channel setups, synchronization of multiple geometry display formats and extended LMS Ground Vibration Test (GVT) and flight flutter solutions.

A new extension for rotating machinery testing introduces online angle domain testing based on real-time torsional vibration analysis.

Dynamic environmental testing
Gaussian random test signals aren't always enough to simulate a full real-life operational environment. Failure to incorporate specific environmental conditions into a testing cycle can lead to costly product failures and warranty costs.

LMS Test.Lab 14 introduces the option LMS Test.Lab Kurtosis Control software to the LMS Test.Lab Random Control Workbook software. This extension enables you to generate non-Gaussian signals with a preset Power Spectral
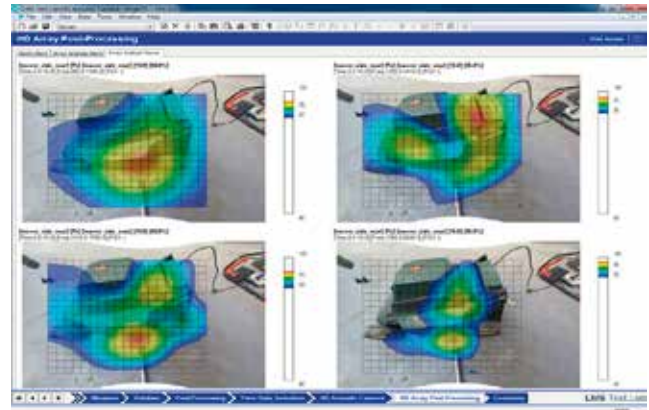
Sound Source Localization (SSL) – side-by-side comparison of SSL results for different designs and frequencies speed up analysis and reporting.
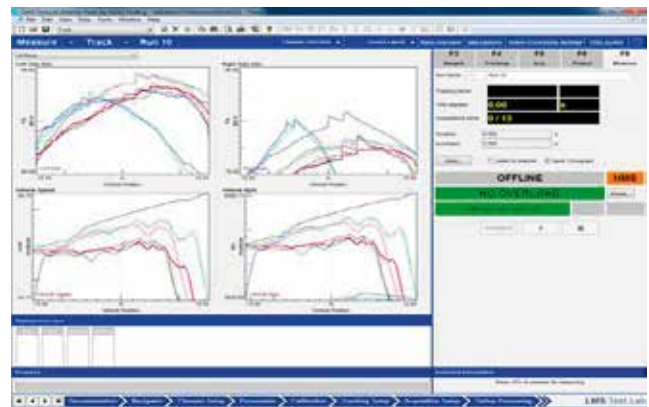
Pass-by-noise testing – a clear run overview for validation is available at any moment.

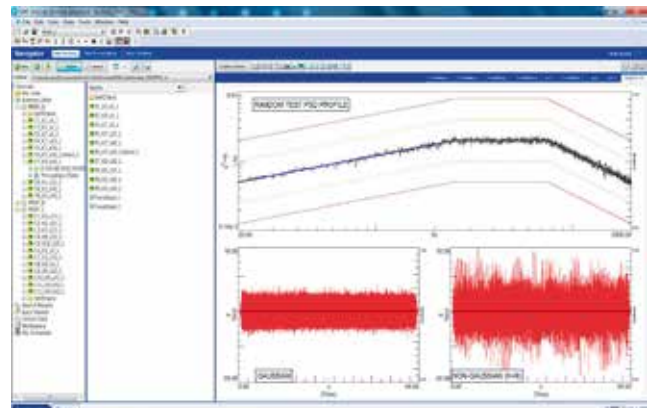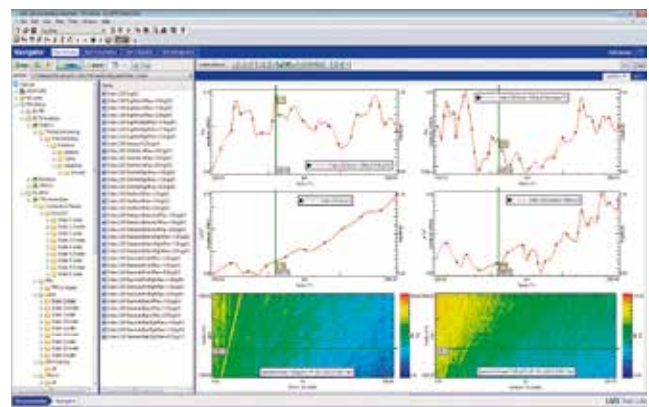Density (PSD) and a user-defined Kurtosis value. Non-Gaussian excitations result in a more realistic representation of operational conditions by submitting the test item to the higher-range accelerations more frequently during a single test cycle.

Data management
LMS Test.Lab Data Management has been extended to manage and search project collateral documents more efficiently, while LMS Test.Lab Desktop has new data comparison capabilities.

LMS Test.Lab Durability Acquisition
And, finally, LMS Test.Lab Durability Acquisition now features a new, integrated end-to-end solution for RLDA. The solution covers every step of the test campaign process in a coherent workflow: from channel setup through pre-instrumentation checks, real-time measurements and quick data validation before uploading to a server. It also provides seamless report sharing. This comprehensive approach ensures efficient, fast and seamless distribution of realistic loads to both simulation and testing teams.

Kurtosis Control – enable to reproduce the desired PSD target with Guassian or Non-Gaussian signals.

Data management – compare data more easily with coupled cursors.

Your one-stop shop for pass-by noise testing

The LMS testing solutions portfolio has added new hardware components to its PBN testing and engineering solution. A one-stop shop for every PBN testing or engineering scenario, you will have all the necessary hardware and software for exterior and interior testing and analysis, calibration and maintenance right at your fingertips.

Complete hardware solution
By expanding the PBN hardware portfolio, engineers can benefit from a complete set of sensors: speed radar or GPS speed sensor for vehicle speed, track-based light barriers for position, optical revolutions per minute (RPM) and kickdown sensors, a weather station for ambient conditions and wired or wireless microphones to capture noise levels. All these sensors are conditioned with dedicated pass-by noise conditioning modules within the LMS SCADAS Mobile family.

The centerpiece of the solution is the LMS Pass-by Noise Conditioner module, a dedicated two-slot module designed for the LMS SCADAS Mobile™ hardware renowned for its state-of-the-art integrated signal conditioning resulting in strong data quality. This module

directly conditions the inputs of the above sensors and delivers conditioned outputs for all sensors. Telemetry is used to synchronize all sensors on both the track and the vehicle side. Standalone wireless microphone units provide a high-speed data link with the moving vehicle.

All types of configurations

The LMS Pass-by Noise hardware portfolio is suitable for testing on different standard configuration types. Supported configurations are track-only (testing without in-vehicle instrumentation; it is not appropriate for certification, but it is suitable for quick troubleshooting), track-based (PBN homologation testing, all sensors measured at or sent to the track system) and in-vehicle (certification or advanced engineering, all sensors measured in or sent to the vehicle).

A user-centric mindset

Central to this expanded portfolio is providing maximum efficiency, ease of deployment and ease of use. This is proven by the integration of the conditioners within LMS SCADAS Mobile, as well as by the scalability of configurations. It is easy to upscale from track to vehicle configuration, or even to use it in dual mode.

The same user-centric mindset is present in the postprocessing software. Given the increased testing and shorter development timeframes, the demands of documenting and reporting have become more burdensome. With LMS Test.Lab Pass-by Noise software, data and reports can be easily archived, retrieved and compared in a user-friendly environment.

The history behind dynamic environmental testing today

If you are launching a €300 million satellite into space, you probably want to be absolutely certain it is going to get there in perfect shape. LMS solutions for dynamic environmental testing are tried-and-trusted solutions amongst rocket scientists the world over.

What is environmental dynamic testing?

Environmental dynamic testing is a technical discipline that includes all vibration tests conducted on most engineering structures. The goal is to simulate the effects of the operational environment on a given object. A car clutch, a dishwasher pump or an airplane altimeter are just a few objects required to pass a dynamic environmental test prior to use. Engineers use different names according to when the test is performed during the product lifecycle, such as development, qualification, functional, endurance, durability, reliability and worthiness.

The tests described above are only part of a test series belonging to environmental testing. These tests can be traced back to World War II. Between 1939 and 1945, mechanical machines were used on an unprecedented scale. Parts and equipment were produced mainly in American factories to repair broken cars, planes or ships. One issue was that broken machinery was often deployed to different continents. For example, a factory in Ohio was required to produce the same instrument for a plane flying in sunny Italy and well as freezing Russia. Engineers were puzzled by the fact that the same component would last much longer depending on the

environment. In 1945, the United States Army issued the Army Air Force Specification No.41065 "General Specification for Environmental Test of Equipment." This is regarded as the first document to attempt to standardize testing procedures so that items and components could be tested and a lifespan predicted for various operational environments. After 20 years of trial work in June 1964, these recommendations were issued in what has become the world's most authoritative standard: the Military Standard (MIL-STD) 810. Since then, the original 60-page A version has become an 804-page G release.

Preparing BepiColombo for vibration testing, ensuring the spacecraft will survive the brutally jolting start of its journey to Mercury atop the Ariane 5 launch vehicle.

LMS leading acoustic and vibration solutions from Siemens PLM Software focus only on the dynamic environmental test area.

In general, there are three main stages in vibration tests:

1) Test setup: This phase is crucial to test success. The actual component lifespan relies on a good test setup. Two tasks need to be accomplished: define a test profile that represents the operational vibratory environment and fix the test item to the shaker in a way that represents its real operational mounting. In many cases, tests profiles are taken from standards. In others, the manufacturer provides a pre-tested component. However, it is important to ask how are these approaches relevant to my case? Am I under- or over-testing? LMS solutions and experts take into account the specific
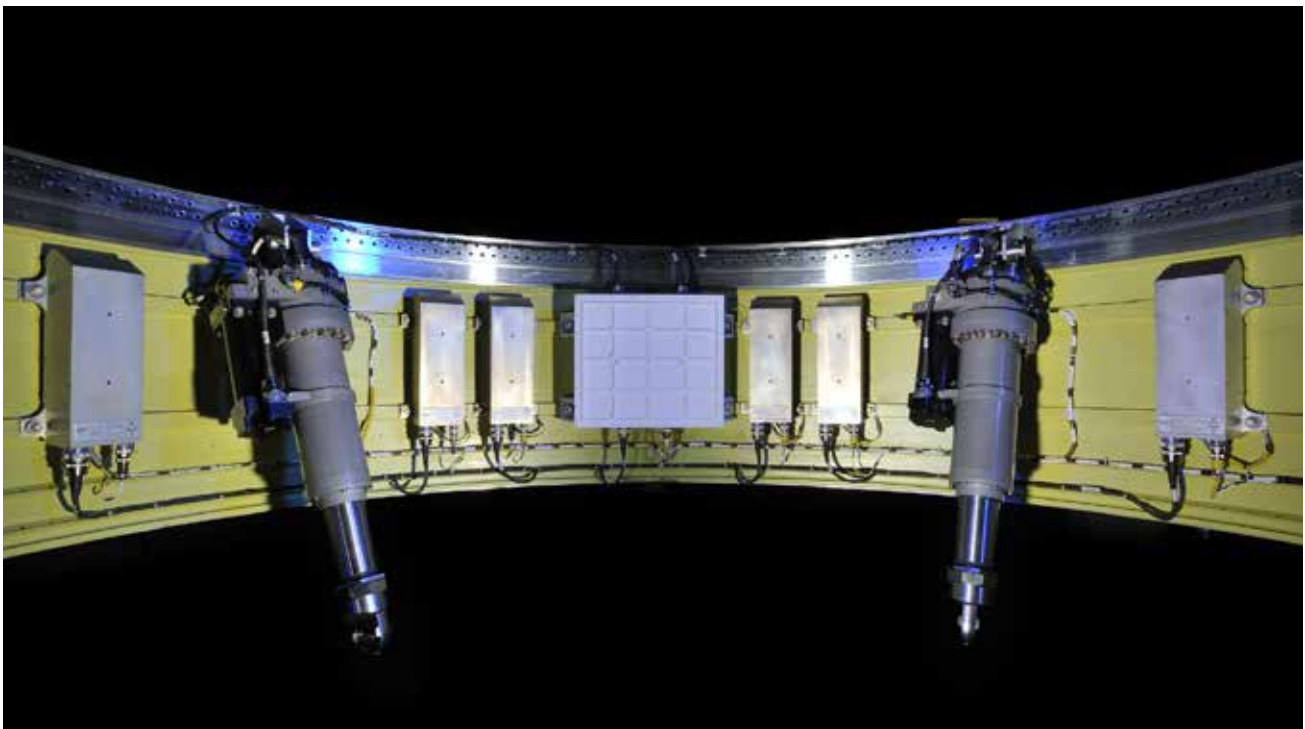
Electrical Thrust Vectoring Control Systems (TVC) for the VEGA program undergoing vibration testing at SABCA.

dynamic environment of each application. The LMS Test.Lab Mission Synthesis solution lets engineers take hours and days of operational field measurements and transforms them in a lab test, which maintains real damage potential.

2) The test: During the test, the vibration controller is the main player. And there are lots of questions. Should there by single or multiple inputs? Do you need response limiting? How many statistical degrees-of-freedom (random test) or what compression factor (sine test) should be considered?

A vibration controller is a two-part system. Various vibration controller vendors offer control software with similar features and characteristics. LMS solutions emphasize system safety: the controller provides a number of user-definable parameters that ensure the test item's safety at all times. This includes features like self-check, drive-output voltage, notching and abort limits. At the same time, there is more diversity on the hardware side. Hardware specifications are extremely important to conduct a successful test: signal conditioning and processing, sensors types, reliability and versatility in channel expansion and mobility are decisive factors. LMS solutions have always pioneered the integrated LMS Test.Lab software-LMS SCADAS hardware approach. The success of these two platforms results from continuously implementing customer feedback for the past 30 years combined with accumulating engineering experience and know-how by working together with the world's leading automotive and aerospace companies.

3) Post test and analysis: At the end of a dynamic environmental test, there is a vast quantity of data available. During these tests, which can last for hours or even days, different data is acquired: the drive signal, time traces of the control and measurement channels and different spectra formats. This wealth of data contains valuable information that can be used to further analyze and understand the system dynamics of the test item.

Analyzing large quantities of data becomes necessary when structural failures occur. Unfortunately, understanding the physics of failure (PoF) does not seem to be as a widespread as it should be. This is why LMS state-of-the-art tools for signal processing and dynamic analysis, like time-frequency analysis and modal analysis, are especially appreciated by engineers.

Even though standards provide most testing guidelines, engineering insight is needed to conduct a correct and successful dynamic environmental test. Even the best engineer needs the right tools, which is why LMS solutions are relied upon by experts the world over to complete safe and reliable dynamic environmental testing.

"There are over 220 LMS satellite testing systems totaling 16,000 channels in use around the world today."

Straightforward structural dynamics

Structural dynamics testing used to be a long and complex process involving quite extensive trial-and-error and time-consuming test setups. This is no longer the case. With LMS Test.Lab Structures and LMS SCADAS, test engineers perform large-scale modal surveys in hours rather than days. They can focus on identifying root causes of vibration problems and apply powerful analysis tools to explore the best solution for practically every dynamic problem. Renown for its modal- testing experience – from impact testing of small structures to large-scale campaigns using hundreds of measurement channels – Siemens PLM Software continues its

tradition of cutting-edge expertise and maximal testing efficiency with the latest release of LMS Test.Lab Structures.

Modal analysis made easy

Structures are test-characterized for many different reasons using methods of varying sophistication and complexity. Engineers can quickly pinpoint and correct a vibration problem by simply identifying structural resonances and dominant forcing mechanisms, or by plotting the structural deformation pattern at a specific frequency. To really understand the structural dynamics in detail, engineers turn to modal analysis to characterize measured force inputs. These modal models can be used to validate and update existing finite element (FE) models or used directly as the basis for design modification or multi-attribute studies.

Since every testing department works differently, LMS Test.Lab Structures offers a fully scalable solution and covers the broadest application scope. LMS Test.Lab Structures is highly flexible and suitable for a wide variety of applications and differing levels of expertise. So whether a structural dynamics expert needs to make an in-depth review of a system's structural behavior, or a new operator needs to set up a basic test, every LMS Test.Lab Structures user will be able to get the right results to answer mission-critical questions exactly on time. Testing departments can fully protect their system investment as LMS Test.Lab Structures can easily be expanded and tuned to their changing needs. Starting with impact testing, users can extend their solution with modal analysis, multiple input, multiple output (MIMO) testing or operational modal analysis capabilities.

What's new?
For those of you who are already fans of LMS Test.Lab Structures, you will be glad to know that the new release offers test engineers even more flexibility in analyzing complex structures. Not only does it support the new LMS SCADAS V24 module directly connecting to triaxial accelerometers so that you can measure more signals in one cycle, but you will benefit from improved interaction with graphical models to analyze test results data in greater detail.

Other new highlights in structural dynamics testing include faster channel setups, synchronization of multiple geometry display formats and extended LMS Ground Vibration Test (GVT) and flight flutter solutions.