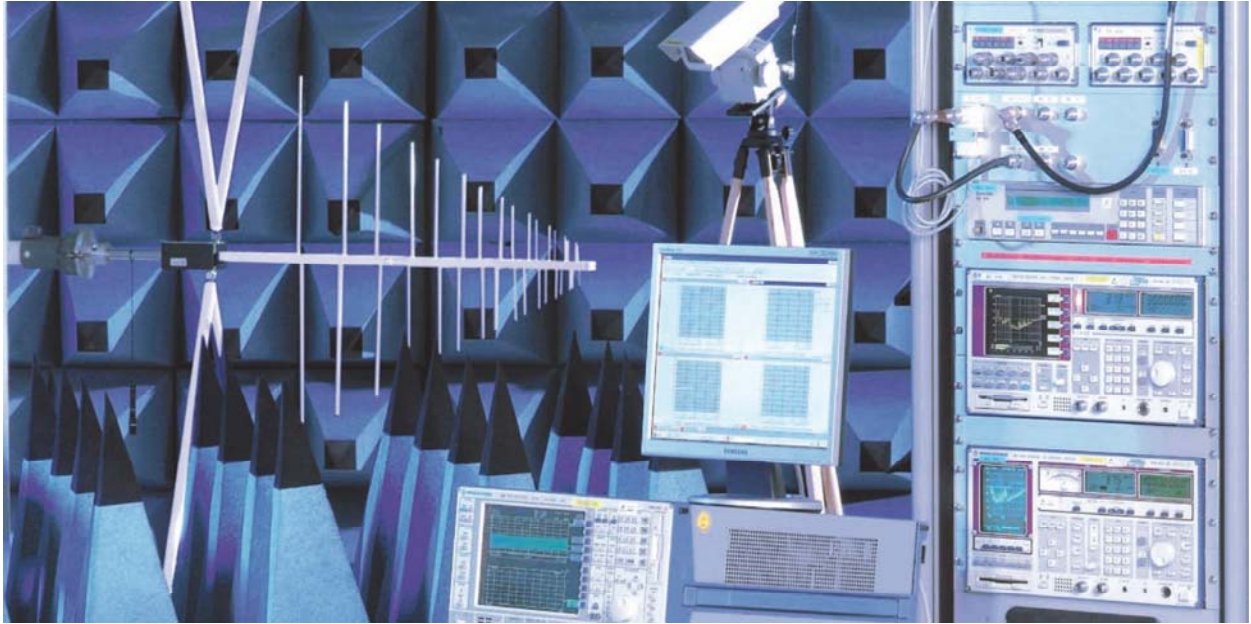


EPCOS Product Profile 2016

EMC Laboratory Regensburg



Our EMC Service – Measurement – Analysis – Consultation / Reporting



An EMC partner's performance has to meet the highest standards, because ensuring electromagnetic compatibility (EMC) is a prerequisite for the successful marketing of electronic equipment throughout Europe. Any kind of electrical equipment can produce electromagnetic interference (EMI), which can adversely affect the electronic environment around it. This EMI therefore has to be kept within maximum permissible limits to prevent it from impairing other devices or communication services in the vicinity. Conversely, EMI from the environment can cause equipment failures.

EMC – the prerequisite for marketing electronic products

EMC requirements must be met in order to ensure that different electrical equipment and systems can operate in the same environment without mutual interference. This objective is defined in the European Union's EMC Directive, which was transposed by every member state into national law. Standards harmonized across Europe lay down technical requirements for equipment as well as measurement and testing procedures. They include the applicable limits for emitted interference and the degree to which equipment must be immune to EMI.

However, it is not only within Europe that EMC is an issue. Meeting emission and immunity requirements for electronic equipment is gaining importance throughout the

world. To be able to market products, proof of conformity with international EMC standards is required in most economic regions. Staff at the EMC Laboratory work on the relevant EMC standards committees in order to contribute to international standardization of EMC requirements and keep abreast of the latest technical developments.

EMC – leaving nothing to chance

The EPCOS EMC Laboratory in Regensburg, Germany, offers comprehensive, in-depth EMC services: from consultation and training during development, through EMC measurements and tests on prototypes, to pre-compliance testing of series-production equipment.

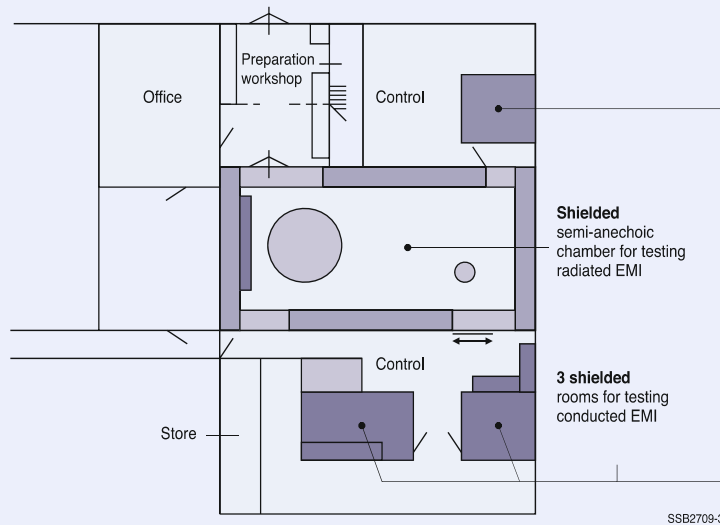
Our fully equipped laboratory, combined with our many years of experience and EMC expertise, as well as our active participation in national and international standardization bodies, provide a solid foundation for meeting our customers' requirements.

A comprehensive test report provides proof of compliance with the relevant standards and is the basis for the customer's declaration of conformity.

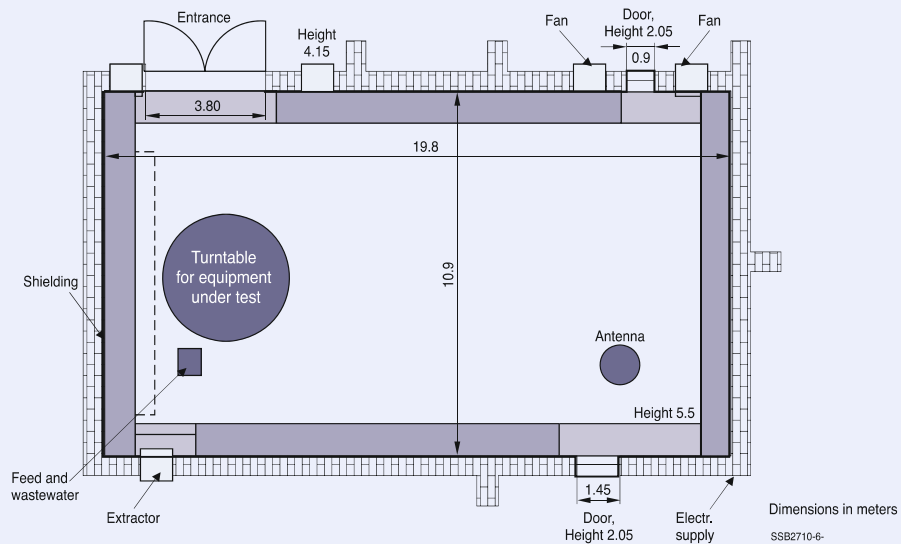
The EMC services offered are rounded off by an extensive range of components developed and manufactured in-house.

EMC Laboratory

EMC laboratory floor plan



EMC laboratory semi-anechoic chamber



The EMC laboratory features a semi-anechoic chamber for field strength measurements in accordance with the relevant standards at a measurement distance of 10 m between the antenna and the equipment under test.

Special equipment such as large entrances, exhaust gas extraction system, power supplies up to 100 A, resistive and inductive (motor) loads, as well as transformers with an input voltage of up to 690 V enable the testing even of large or high-power equipment and systems.

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Test Procedures

EMC fundamentals				
EMC standards		Germany	Europe	World
Generic standards				
	Emission	DIN EN 61000-6-3/-4	EN 61000-6-3/-4	IEC 61000-6-3/-4
	Immunity	DIN EN 61000-6-1/-2	EN 61000-6-1/-2	IEC 61000-6-1/-2
Basic standards				
Measuring equipment	Emission	DIN EN 55016-1-x	EN 55016-1-x	CISPR 16-1-x
Measuring methods	Emission	DIN EN 55016-2-x	EN 55016-2-x	CISPR 16-2-x
Harmonics	Emission	DIN EN 61000-3-2	EN 61000-3-2	IEC 61000-3-2
Flicker	Emission	DIN EN 61000-3-3	EN 61000-3-3	IEC 61000-3-3
ESD	Immunity	DIN EN 61000-4-2	EN 61000-4-2	IEC 61000-4-2
RF fields	Immunity	DIN EN 61000-4-3	EN 61000-4-3	IEC 61000-4-3
Fast transients (burst)	Immunity	DIN EN 61000-4-4	EN 61000-4-4	IEC 61000-4-4
Surge	Immunity	DIN EN 61000-4-5	EN 61000-4-5	IEC 61000-4-5
RF fields, induced	Immunity	DIN EN 61000-4-6	EN 61000-4-6	IEC 61000-4-6
Magnetic fields	Immunity	DIN EN 61000-4-8	EN 61000-4-8	IEC 61000-4-8
Voltage dips, variations, short interruptions	Immunity	DIN EN 61000-4-11	EN 61000-4-11	IEC 61000-4-11
Product family standards				
ISM equipment	Emission	DIN EN 55011	EN 55011	CISPR 11
Domestic appliances	Emission	DIN EN 55014-1	EN 55014-1	CISPR 14-1
	Immunity	DIN EN 55014-2	EN 55014-2	CISPR 14-2
Lighting	Emission Immunity	DIN EN 55015	EN 55015	CISPR 15
Radio and TV equipment	Emission	DIN EN 55013	EN 55013	CISPR 13
ITE equipment	Emission	DIN EN 55022	EN 55022	CISPR 22
EMC standards from the automobile industry				
Vehicles, vehicle components	Emission	DIN EN 55025	EN 55025 ¹⁾	CISPR 25
Vehicles and boats	Emission	DIN EN 55012	EN 55012	CISPR 12
Pulses (on-board power supplies)	Immunity			ISO 7637-2 ISO 7637-3
RF currents, induced (BCI procedures)	Immunity			ISO 11452-4
RF fields (stripline procedures)	Immunity			ISO 11452-5

¹⁾ The Directive 2004/104/EC on electromagnetic compatibility of vehicles also contains limit values and interference immunity requirements.

Range of measuring methods offered

The laboratory can test in accordance with most international EMC standards. The above table lists the most important standards (measuring procedures and CISPR standards as well as some procedures from the automobile sector). Tests can, of course, also be conducted according to EMC requirements of numerous IEC series. One key area on which the laboratory concentrates is power electronics applications such as frequency converters or variable-speed drives (IEC/EN 61800-3). The laboratory has all the necessary equipment to conduct such tests, including motors, load stands and shielded cables.

Testing conducted electromagnetic interference

The underlying principle of all EMC solutions is to reduce conducted interference, i.e. interference currents and voltages on the cables connected to the equipment under test. Four measuring stations allow several devices to be tested simultaneously. The measuring stations are positioned in shielded rooms to eliminate the possibility of interference from external sources.

The laboratory is equipped to measure emission of, and test immunity to narrowband and broadband EMI. Instruments for testing low-frequency system perturbations complete the range of facilities. Apart from the range of test services for standards, we are also equipped to perform analyses of the voltage quality or of leakage currents.

The measuring and testing equipment is regularly calibrated and is checked against our internal comparison standards at frequent intervals in order to enable reproducible measurements to be performed.

System test routines prior to the performance of tests guarantee the functionality of the entire measuring sequence.

Testing radiated electromagnetic interference

At higher frequencies, equipment parts also act as antennas, propagating interference to the environment by electromagnetic radiation. A semi-anechoic chamber with a reflecting floor (designed to measure at a distance of 10 m and for the frequency range from 30 to 1000 MHz) ensures a measuring environment free from external interference. This allows the measurement of even very small interference field strengths or the generation of high test field strengths. Above 1 GHz and up to a maximum of 6 GHz the measuring procedure with floor absorbers at a measuring distance of 3 m is normally used in our laboratory.

Fields up to 20 V/m in the 80 MHz to 1 GHz frequency range can be generated for radiated immunity testing, as well as somewhat smaller field strengths in the frequency range up to 6 GHz. In this way it is possible to apply significantly higher field strengths than usually required by product standards or generic standards, in order to meet specific customer requirements, e.g. arising from particular safety needs. For this test setup the floor is fitted with additional absorbers to create a homogeneous field in accordance with IEC/EN 61000-4-3. The chamber is also suitable for testing larger objects such as industrial systems or motor vehicles. For example, a three-phase current of up to 100 A per phase, as well as compressed air, feed and waste water connections, and an exhaust extraction system are available.

Measuring and testing in the automotive sector

Although measuring procedures for emitted interference on vehicle components have been part for the service spectrum of the laboratory for decades, the range of procedures in the field of noise immunity has been considerably expanded in recent years. Not only the common on-board power supply pulses can be tested, for example, but also narrowband variables. Moreover, the laboratory can test induced interference using the BCI procedure, as well as at higher frequencies through field interference in the stripline procedure. In addition, the laboratory performs EMC measurements on both conducted and wireless power transfer appliances for charging electric vehicles.

Development support

Because EMC begins long before the acceptance test for the declaration of conformity, we consider it our task to support customers at every stage of testing during development. A comprehensive range of EMC components enables most EMC problems to be tackled quickly and reliably. Our extensive portfolio includes interference suppression capacitors and feedthrough components, VHF and RF chokes, power and data line chokes as well as EMC filters and line reactors or output filters for the power electronics. Suitable solutions can be worked out together with product developers. Not every EMC problem can be solved at the component level. Emission of EMI and coupling to adjacent lines sometimes also require design changes to the equipment under test. To this end, the laboratory has the necessary infrastructure for swiftly implementing minor device adaptations, such as providing suitable shielding, and for sounding out possible improvements.

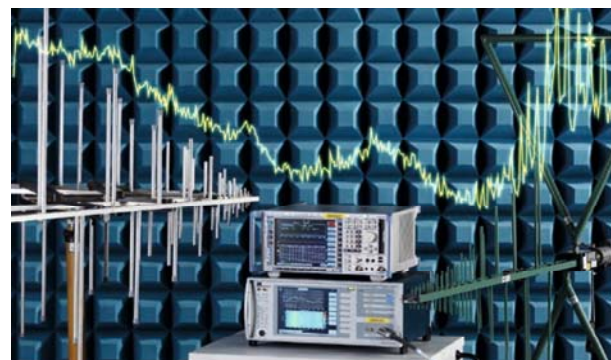
This work requires clear documentation explaining and justifying the nature of the measures taken, and their effect on the test result, as precisely as possible with the aid of informative photos, demonstrating the necessity of these measures by means of comparisons, and defining the developer's scope for implementing them cost-effectively.

On-site measurements

In some cases, due to excessive costs and time required, or the size, weight or power connection requirements of a unit to be tested, it may not be practical or even possible to perform EMC testing in the laboratory during development. The EPCOS EMC laboratory also has many years of experience in carrying out interference voltage measurements on the customer's premises. In this process, suitable modifications can be made both to the equipment under test itself and to the filter circuit in order to meet the required limits.

Type tests

The range of services offered is rounded off by type tests that are performed on equipment ready for series production on the basis of the laboratory accreditation.



Quality as a Corporate Philosophy



To ensure that manufacturers can live up to the responsibilities they make by signing a declaration of conformity, they must be able to rely on the quality of the services provided by an EMC laboratory. High quality standards are the cornerstone of EPCOS AG's corporate philosophy.

The EMC laboratory in Regensburg has been an accredited test laboratory since October 1994. Accreditation in accordance with the guidelines of DAkkS, German accreditation body, now meets the current EN ISO IEC 17025 quality standard for laboratories. The latest valid accreditation certificate, together with a list of the accredited test procedures (standards list) can be found on our homepage at www.epcos.com/emc_services. On this basis, the independence, impartiality and integrity of measurement and test results are guaranteed.



In addition, the entire EPCOS Group is certified in accordance with ISO 9001 and ISO TS 16949. As part of EPCOS certification, the laboratory is separately audited as an independent organizational unit. The excellent results achieved confirm our guiding principle and spur us on to raise the quality bar even higher.

1994 – 2016
**More than two decades of
laboratory accreditation**

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