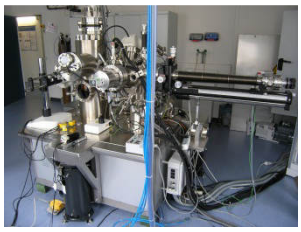
Laboratories and Research Buildings





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The Baudynamik Heiland & Mistler GmbH works for decades in the field of research buildings for high vibration sensitive laborartory usage. Well known Institutes and Universities like Fraunhofer Institute, Max-Planck Institute, Research Center Jülich, Universities in Aachen, Dresden, Karlsruhe, Heidelberg, Konstanz, Duisburg and many others trust in the dynamic calculations and dynamic design of our consulting office for their new buildings.

We use special high accuracy vibration sensors and for the purpose of semiconductor industry optimized analysis software. These instruments together with the international known Finite Elemente Software „Nastran“ allow us to make precise vibration predictions as well as optimized building design. We are used to operate all over the world.

As experts for structural dynamics we do not only perform data evaluation of measurements but we are proud to use the building structure as a vibration filter and optimize its dynamic behaviour in order to achieve best vibration reduction performance by the building itself.

Usually, we are asked by the client for a building concept, which will guarantee the high vibration sensitive usage of the building. The client will be sure to get a building with full serviceability.

The first step is the definition of a well-defined vibration limit for the building. Therefore, we already consult the client, since we know hundreds of tools from many clients and we are very familiar with its real sensitivity against structural vibrations.

The effect of self induced vibrations is very important. Persons inside the building, machines or HVAC will emit dynamic forces from inside the building, which must be taken into account.

In most cases we make our own vibration measurements at site to be sure of its high precision, which is required for this technology. The accuracy of our equipment is 10 nm/s between 1 and 315 Hz.

The calculations and the prognosis consider the following physical effects:

- the wave equation behaviour of the stiff building (high impedance of the structure compared to the elastic soil)
- the rigid body behaviour
- internal resonance of structure or components

If possible the parameters are measured and identified at site. Also the experience at comparable other projects are considered, so that the real behaviour can be approximated as good as possible.

Our engineering office is one of the leading consulting companies for structural dynamics. Regularly, we publish recent project reports and research results. A short extract of the published literature is shown on our website:

www.baudynamik.de

Year	Reference Projects (Extract)
2016	**Fraunhofer WKI, Braunschweig** Dynamic investigation of ambient ground vibrations, vibration prognosis and dynamic conception of the new ZELUBA building, followed by a variation study of slab frequencies in the planned laboratory areas.
2016	**CAU, Kiel** Conception for the construction works of the new Institute of Geosciences. Dynamic building conception and basic engineering für the new animal housing and physiology building.
2016	**EMPA Ersatzneubau PAV Eawag Areal, Zürich, Schweiz** Investigation of vibration immissions on the ground and in the existing buildung for detailed planning of a new laboratory building.
2016	**EMBL Heidelberg** Building concept to minimize vibrations and low frequency electromagnetic interferences in the new TEM laboratory.
2016	**Fraunhofer HHI Berlin** Vibration Study for a lithography laboratory.
2016	**Fraunhofer IWU Chemnitz** Vibration study to retrofit a tool pedestal.
2016	**RWTH Aachen, Laborneubau IMM** Concept for minimisation of low-frequent magnetic fields in a Nano Tech Lab.

2016 **Hochschule Hamm-Lippstadt, Campus Lippstadt**
Dynamic investigations and consulting concerning the installation of a climate-testing stand with electrodynamic shaker. Determination of dynamic parameters based on measurements with shaker Butterfly.

2016 **Universität Münster**
Site evaluation with ground vibration measurements for the new physics building IG1.

2015 **Universität Freiburg**
Expert report on the influences of external vibrations and electromagnetic fields due to a tram line on the institutes IMTEK and FIT of University Freiburg.

2015 **Universität zu Köln**
Location evaluation inside the building shell of building 310b of the geosciences. Documentation of the measurements of vibrations and electromagnetic fields.

2015 **Universität Osnabrück**
Conzept for minimisation of low-frequent magnetic fields in a TEM labororatory, new research centre CellNanOS.

2015 **RWTH Aachen, Campus Melaten**
Dynamic concept for minimizing vibrations and electromagnetic fields in a SEM laboratory, Cluster Integrative Production Technology

2015 **RUB, Bochum, Germany**
Consulting during the planning phase for laboratory buildings (ZGH, NA, IA-IB, etc.) of the RUB University.

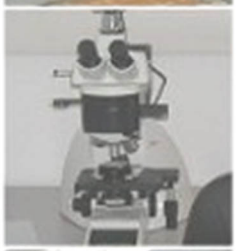
2014 **Universität Heidelberg**
Consulting concerning vibration isolation for the new campus line in Heidelberg, faculties of physics and geosciences.

2014 **Protein Centre, MLU Halle, Germany**
The new Protein Centre at the Martin Luther University in Halle will colocate laboratories with vibration sensitive equipment of different faculties. Consulting during planning phase and optimisation of the installation of vibration sensitive devices.

2014 **Fraunhofer IAF, Freiburg, Germany**
Location evaluation for the installation of highly sensitive equipment.

2014 **Hochschule Niederrhein, Krefeld, Germany**
Site evaluation for the relocation of laboratories of the Faculty of Chemistry.

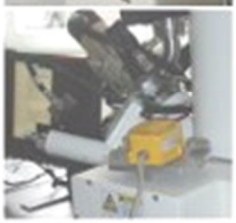
2014 **Max-Planck-Institut Dortmund, Germany**
Site evaluation for a new TEM area of the MPI of Molecular Physiology.



2014 **Cfaed, TU Dresden, Germany**
On the location site of the Barkhausenbau at TU Dresden University will be built a new institute. There will be available 3250 sqm of laboratory and office areas for the Faculty of Physics and the Center for Advancing Electronics Dresden (cfaed).

2014 **University Koblenz-Landau, Germany**
Vibration measurements and dynamical design to provide the full usability of the new laboratory building for the Faculty of Natural and Environmental Sciences.

2014 **LASE, TU Kaiserslautern, Germany**
New research building LASE (Laboratory for Advanced Spin Engineering) of the TU Kaiserslautern University. Assessment of the dynamical situation of different possible sites. The new building will also include the Nano Structuring Center (NSC). In the new building will therefore be colocated all local available devices for micro- and nanotechnological fabrication.



2014 **Fraunhofer ENAS, Germany**
Site evaluation concerning structural dynamics, sound and EMI for the installation of sensitive tools in the ALD clean room.

2014 **DZNE und BCUBE, TU Dresden, Germany**
Consulting during the planning phase and dimensionning of the foundation for the planned research building.

2014 **Fraunhofer IPMS, Germany**
Placement evaluation concerning structural dynamics, sound and EMI for the installation of a SEM.

2014 **RWTH Aachen, Electrotechnical Institute, Germany**
Dynamic conception of the new building for the Faculty of Electrical Engineering. There will be a separate cleanroom connected with the institute by an extra building.

2013 **Low Temperature Laboratory of PTB Berlin, Germany**
Dynamic conception for a building with a vibration sensitive Low Temperature Kryostat and REM usage. Measurements, simulation and structural conception.

2013 **European XFEL Hamburg (DESY), Germany**
Consulting and measurements with vibration prognosis for an underground experimental room including different tool foundations necessary to conduct experiments with extremely short and powerful X-ray flashes.

2013 **MAIN TU Chemnitz, Germany**
Dynamic conception of the new MAIN (Materials, Architecture and Integration of Nanomembranes) for vibration sensitive usage (REMs). Measurements and structural conception.

2013 **Fraunhofer IML, Dortmund, Germany**
Modification of an existing experiment hall. Measurements, simulation and structural conception.

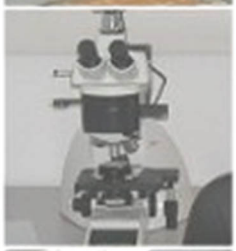
2012-2013 **Zemos Ruhr Universität Bochum (RUB), Germany**
Preliminary study for the concept planning of the new research building ZEMOS. Dimensioning of the foundation for the laboratory area and dynamic consulting in placement of laboratory equipment and building services.

2013 **IJS Joszef Stefan Ljubljana, Slovenia**
Design of the structural elements of the new research building in the way that the building will offer an optimal performance for the installation of vibration sensitive equipments and devices.

2012 **Fraunhofer IMS Duisburg, Germany**
Site evaluation concerning soil vibrations for the placement of an AFM in the Fraunhofer IMS in Duisburg.

2012 **Infineon - Fraunhofer CNT Dresden, Germany**
Site evaluation for the relocation of vibration an EMI sensitive tools of Fraunhofer CNT Dresden.

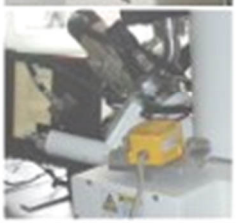
2012 **Fraunhofer Institute Jena, Germany**
Examination of the structural dynamics of the specially designed foudations of the IOF Jena.



2012 **University of Karlsruhe, Germany**
Dynamic design and building concept for labs for high sensitive equipment (REMs, TEMs) at University of Karlsruhe (KIT).

2012 **Ruhr-University Bochum, Germany**
Dynamic concept for new labs for TEMs in the new ZGH building.

2011 **Leibniz University Hannover, Germany**
Preliminary investigation of structural dynamics and pre-dimensioning for the new building of Testing Centre for Load-bearing Structure.



2011 **University of Freiburg, Germany**
Dynamic design and vibration evaluation of new institute building FIT.

2011 **Max-Planck-Institut, Düsseldorf, Germany**
Evaluation of additional areas for new TEM labs for the Max-Planck Institut für Eisenforschung MPI EIFO.

2011 **Plastic Logic, Dresden, Germany**
Dynamic design of the foudation of a Zeiss AURIGA CrossBeam workstation and acceptance measurements.

2011 **Max-Planck Institut, Dresden, Germany**
Conceptual dynamic design for the new TEM laboratory.

2011 **NIC Ljubljana, Slovenia**
Dynamic design of new institute building, National Institut of Chemistry (NIC).

2011 **University Heidelberg, Germany**
Expert consulting services concerning the dynamic effects of the new tram route.

2011 **Max Planck Institute, Berlin, Germany**
Expert consulting services concerning a new building for a cleanroom for the Fritz Haber Intitute.

2010 **Insel Bern, Switzerland**
Conceptual dynamic design and feasibility study for a new Laboratory.

2010 **Fraunhofer Institute Itzehoe, Germany**
Dynamic concept and structural dynamic design of a new cleanroom building.

2010 **Forschungszentrum Jülich, Germany**
Dynamic concept and structural dynamic design of the Helmholtz Nanoelectric Facility (HNF).

2010 **MPIL, Max Planck Institute Heidelberg, Germany**
Expert consulting services concerning the dynamic effects of the new tram route.

2009-2010 **University Dresden, Germany**
Dynamic concept and structural dynamic design for the new Technikum Dresden (TUD).

2009 **Fraunhofer Institute Aachen, Germany**
Expert consulting concerning structural dynamics of the new high-tech production centre (IPT and ILT).

2008 **University Konstanz, Germany**
Feasibility study for the installation of an STM, University Konstanz, Germany

2007 **Institute for Nanoresearch, Havanna, Cuba**
Complete dynamic concept of main and support buildings.

2007 **Max-Planck Institute, Dresden, Germany**
Trouble shooting of the institutes SEM (Omicron).

2006 **Institute of Analytical Science (ISAS), Dortmund, Germany**
Structural dynamic building concept.

2005 **Fraunhofer Institute Duisburg, Germany**
Dynamic calculations for a new cleanroom.

2005 **University Karlsruhe, Germany**
Dynamic concept and structural dynamic design for the new Centrum for nanostructures at Karlsruhe (CFN).

2004 **Max Planck Institute Dresden, Germany**
Special investigation in order to avoid vibration influence on a SEM by a planned new impact machine nearby.

2003 **University Bielefeld, Germany**
Dynamic design of the Institute for Genom Research.

2001 **Fraunhofer Institute IAF, Freiburg, Germany**
Consulting for new vibration free pedestals for ebeams, Fraunhofer Gesellschaft, Institute for applied physics.

1999 **GSI, Darmstadt, Germany**
Dynamic design of spezial mirror tower foundation at GSI, Gesellschaft für Schwerionenforschung.

1998 **IFW Dresden e.V., Germany**
Dynamic design of new Institute.

1997 **Fachhochschule Koblenz, Germany**
Dynamic concept and structural dynamic design for the new Institute of applied science Koblenz.