

Laboratory Fact Sheet

1 Institution

Name:	 Fundación LBEIN (Energy Unit) Parque Tecnológico, 700 48160 Derio. Bizkaia. SPAIN E-Mail: labein@labein.es http://www.labein.es
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2 Classification

- Independent
- accreditation according to IEC 17025
- long-time DG experience (more than 3 years)
- active in standardisation committees

3 Brief historical background

LBEIN is a private, non-profit technological research & innovation centre, located in Bilbao (Spain). It was founded in 1955. The members of the LBEIN Foundation are regional administration bodies of the Basque country as well as around 30 enterprises (both SME's and large ones) representing a number of industrial and service sectors from Spain, including the energy sector. LBEIN is now the Basque Country's largest Technology Centre.

4 Mission statement

LBEIN is a Technology Centre with strong links to the business world, and its mission is to act as a natural ally of companies operating in its markets, with a view to enhancing their innovative capacity using technology as a tool of competitiveness.

LBEIN support to their customers is carried out by means of RTD and Demonstration projects, Technology Transfer & Innovation projects, Technical Assistance, Advanced Management Systems (Quality, Environmental, Safety...) as well as Training and Dissemination activities.

5 Institution in brief

- Associations: LABEIN is a member of EUROLAB (European Testing Laboratories Association), EACRO (European Association of Contract Research Organization), ESI (European Software Institute), FEDIT (Spanish Private Research Centres Association), EITE (Basque Association of Technological Centres), SARETEK (Basque Technological Network), and other sectorial associations and networks.
- Accreditations: The Energy Unit of LABEIN is accredited by ENAC (Spanish Accreditation Organisation) according to EN ISO/IEC 17025 in the following testing areas:
 - Electromagnetic Compatibility (EMC)
 - Low Voltage Security
 - Power Transformers, Distribution Transformers and Measurement Transformers
 - Electrical Switchgear and Control gear
 - Human exposure to electromagnetic fields

In addition, The Energy Unit of LABEIN is:

 - Competent Body in the European Union for the 89/336/EEC Directive (EMC Directive).
 - Notified Body in the European Union for the 73/23 Directive (Low Voltage Directive).
- Number of staff: 300 (44 within the Energy Unit)
- Main source of funding: R&D projects financed by the Basque Regional Government, R&D projects financed by the Spanish Government, Contracts with companies and institutions.
- Any potential conflicts of interest with respect to the cooperation under the Net DERlab e.g. due to source of funding: NO

6 Brief summary of competences

Institution: LABEIN	
Description of competence	Yes/no / list
Involvement in standardisation groups/committees	Yes – IEC/TC57, CENELEC/TC210, ECACB, AENOR (several WGs).
Certification expertise	Yes - EMC, Safety, DG, Transformers, Switchgear, etc.
Area of Scientific expertise	<ul style="list-style-type: none"> - DG interconnection - Power electronics for power systems - Quality of supply - Power system analysis and socioeconomics - Power system regulation - Electricity network operation and management - EMC - - Other areas: Mechanics, Building,

Institution: Labein	
Description of competence	Yes/no / list
	Environment, Information Technologies,...
Involvement in consultancy (e.g. for industry and government)	Yes
DG reference project list	<ul style="list-style-type: none"> - ENIRDGnet (EU) - DISPOWER (EU) - DGFACTS (EU) - MICROGRIDS (EU) - ScadaOnWeb (EU) - EU-DEEP (EU) - BUSMOD (EU) - IRED (EU) - FENIX (EU) - EU-DEEP (EU) - MIDAS (Spanish Government) - DISTRIRED (Spanish Government) - INTERCON (Basque Government) - GENEDIS (Basque Government)
List of recent publications (say last 3 - 5 years)	<ul style="list-style-type: none"> - "Analysis of the perturbations due to disconnector switching in AIS substations based on measurements and simulations", E. Zabala, J.E. Rodriguez, et al., CIRED 2003. - "Multifunctional application of FACTS in the distribution network", E. Zabala, F. Santiago, et al., JIEE 2003. - "Control of distributed wind electricity generation", I. Laresgoiti, J. Oyarzabal, et al., CIRED 2003. - "Modelling of micro-sources for security studies", N. Hatziargyriou, J. Oyarzabal, Z. Larrabe, et al., CIGRE 2004 - "Architectural framework for the integration of distributed resources", J. Jimeno, I. Laresgoiti, et al., Powertech Conference 2003. - "Simplified precompliance radiated EMI methods based on secondary source measurements". E. Zabala, J.E. Rodriguez, et al., 14th International Zurich Symposium and Technical Exhibition on Electromagnetic Compatibility, 2001.

7 Laboratory facilities

ELECTRICAL LABORATORY

Electrical power substation in Burtzeña

The feeding is made at 132 kV. There exist 7 single-phase transformers 132/32 kV, 6 of them grouped in two three-phases transformer, and the last one kept for back-up purposes in case of failure of any of the others.

Load room

It has an approximated area of 270 m². The loads are fed by underground single polar cables, it also allocates voltage transformers, grounded switchgear, differential protection and principal beaker isolated in SF₆. There also exist three big reactances with regulation, MV resistor banks and capacitors. Medium voltage synchronous sectionalizers and a 100 MVA transformer for medium voltage tests are also available.

Test chamber

It has an area of about 200 m² with four access points, from the control hall, the load chamber, workroom and the charge and discharge area. It includes a measurement rack, a synchronous LV breaker, control panel, three shunts for the test currents measurements and a LV resistance and reactance.

Main equipment

- Transformers (7), forming two three-phase banks plus a reserve transformer. 10 MVA nominal power, 60 MVA maximum power during 1 s, 132/√3/33-24-24/√3 kV.
- Three-Phase LV transformer, 100 MVA power during 1 s, 137 kA (three phase), 200 kA (one phase) of current, 33-24 kV/120÷912 V of voltage, 2.5% regulation step.
- LV synchronous breaker, 1300 V of nominal voltage, shunt-down capacity at 150 kA (rms) but 375 kA (peak).
- MV synchronous breaker, 36 kV of nominal voltage, 1200 A of nominal current, shunt-down capacity at 20 kA (rms), but 25 kA (peak).
- MV reactance, 0.3-70 Ω (at 50 Hz) of nominal value, 8 kA÷1 kA during 1 s, 2.5% regulation step.
- Register system, 10 analogic channels, 8 digital channels, 64 kB of memory, cc-100 kHz of frequency band, differential inputs,... rms, peak values calculation, energy, etc.
- Sequence programmer, 12 channels, 0-360° phase deviation, 1° regulation, double timing of each channel.
- 2 areas for electrical ageing studies, with the possibility of applying variable voltages with a frequency up to 600 Hz.
- Voltage amplifier for tests performed at industrial frequency, constituted by a LV regulator and a transformer up to 300 kV with 200 kVA of power in 15 minutes intervals.
- Spinterometer of 0.5 m diameter. Possibility of performing tests with a signal that has been cut substituting the inferior sphere.
- Collision waves generator up to 800 kV, formed by 8 modules 100 kV and 2.5 kJ each.

- Partial discharge detection equipment by the direct and bridge methods (300 kV).
- Measurement equipment to diagnose the existence of electric fields in the proximity of conductors along the insulators.
- Equipment for the measurement of the capacity and the loss tangent angle (up to 300 kV in the laboratory, up to 12 kV in the field).
- Equipment for cable tests up to 250 kV.
- Fittings for heating tests up to 50 kVA.
- Devices to measure, in solid insulators at specified humidity conditions (IEC112) and severe conditions (IEC 587), the resistance to conductive paths formations.
- Burning wire and burning spike.
- Equipment for different tests like warm ball, dripping test, rain projection, tilt plane, etc.

DISTRIBUTED GENERATION LABORATORY

Experimental Centre for the Development and Demonstration of Distributed Generation Technologies

- Power Quality equipment:
 - Power Quality and Energy Monitoring System DRANETZ-BMI Signature System (InfoNode 5500, DataNode 5530)
 - Power Quality Analyser DRANETZ-BMI PX5
 - Power Quality Analyser LEM TOPAS 1000
 - Universal Disturbance Analyzer DRANETZ 626 G
 - AC Power Line Harmonic Analyzer WANDEL&GOTERMANN NOWA-1
- Prototypes for the grid connection and improvement of QoS (design by LABEIN)
- Power electronics-based Generating System for simulating the electrical network Pacific Power Source 3060-MS:
62.5 kVA/50 kW Solid State AC Power Source. 380/220 V, up to 500 Hz. Programmable for sags, swells, harmonics,...
- Resistive load bank AVTRON K595: 55 kW
- Resistive load bank AVTRON Millenium 150: 150 kW
- Reactive load banks AVTRON K596: 2 x 36 kVA
- Diesel Generators: 2 x 55 kW (one of them with a controllable rectifier).
- Photovoltaic installations: single-phase 0.6 kW, single-phase 1.6 kW and three-phase 3.6 kW
- Micro turbine MAGNETEK EG-50: 50 kW
- Wind turbine INCLIN NEO 6000: 6 kW, 4 m rotor
- Flywheel UPS Caterpillar: 250 kVA
- Battery banks: 519 Ah (connected to 48 V DC bus), 1799 Ah (connected to three-phase bus by inverters)
- Microgrid protection and control equipment
- Solar simulator ENDEAS OY QuickSun 400 A.
- Electric Simulation Tools: ATP-EMTP, MATLAB-PSB, PSS/E, SINCAL, Powerworld,...

EMC LABORATORY

- Facilities: 3 m semi anechoic chamber, 10 m Open Area Test Site (20 x 25 m), several additional chambers (small anechoic chambers and shielded rooms):.
- Equipment: EMI receivers, spectrum analysers, digitizing oscilloscopes, RF generators, radiocommunication analysers, power amplifiers, ESD generators, surge generators, transients generators, climatic chamber, artificial mains networks (AMN), overvoltage generator, several coupling networks, etc.
- Antennas: Biconic, log-periodic, bi-log, horn, loop, etc.
- Probes: Electric and magnetic near field probes, current probes, voltage probes.

Facilities	Capabilities				
HV-MV testing:	Up to 550 kV rms at industrial frequency; up to 800 kV crest for pulse				
LV testing:	Up to 12000 A				
Power interrupting capacity tests for LV switchgear:	Voltage (V)	242	418	550	660
	Current (kA rms)	83	137.5	70	77
Power interrupting capacity tests for MV switchgear:	Voltage (kV)	13-16	23-29.7	33-36.6	
	Current (kA rms)	8	5.2	4.4-4	
Short circuit tests:	Impedance calculation (mΩ)		0.5	1	2
	One-phase rms current (kA)		200	150	112
	Three-phase rms current (kA)		137.5	127	91
Electrical substation:	132 kV feeding; 7 three-phase transformers 132/32 kV				
Quality of supply measurements:	DRANETZ-BMI "Signature System", LEM TOPAS 1000, DRANETZ-BMI PX5				
Generating System for simulating the electrical network:	62.5 kVA/50 kW Solid State AC Power Source. 380/220 V, up to 500 Hz				
DG sources:	Diesel Generators (2x55 kW), Micro turbine (50 kW), Wind turbine (6 kW), Photovoltaic installation (0.6, 1.6 and 3.6 kW), Flywheel (250 kVA)				
Power electronics facilities:	Prototypes for grid connection and quality improvement (designed by LABEIN)				
EMC testing:	3 m semi anechoic chamber; 10 m Open Area Test Site (OATS)				
Simulation:	ATP-EMTP, MATLAB-PSB, PSS/E, PSS SINCAL				

8 Standardisation activities

The Energy Department of LABEIN is a member of:

- IEC/TC57 – Power systems management and associated information exchange
- CENELEC/TC210 (EMC) Spanish National Committee
- European Community Association of EMC Competent Bodies (ECACB)
- Joint Working Group CENELEC/CECIMO on EMC standardisation for machine-tools.

The Energy Department of LABEIN is a member of the following Working Groups of AENOR (Spanish Association for Standardisation)

- AENOR GT42 – High Voltage Testing Techniques
- AENOR GT17AC/32A – High Voltage Switchgear and Fuses
- AENOR GT17B-D – Low Voltage Switchgear
- AENOR GT14 – Power Transformers
- AENOR GT32B – Low Voltage Fuses

The Energy Department of LABEIN is a member of the following Sectional Groups of ENAC:

- Electronics, Informatics and Telecommunications Committee (CSEIT)
- Electrical Committee

9 Testing activities

EMC LABORATORY

Standard tests for the application of the 89/336 Directive: EN 55011, EN 55022, EN 55014, EN 55015, EN 61000-3-2, EN 61000-3-3, EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, EN 61000-4-6, EN 61000-4-8, EN 61000-4-11.

Other standard tests according to: IEC 61000-4-9, IEC 61000-4-10, IEC 61000-4-12, IEC 61000-4-16, IEC 61000-4-17, IEC 61000-4-29, IEC 60255-22-1, IEC 60255-22-2, IEC 60255-22-3, IEC 60255-22-4, IEC 60255-22-5, IEC 60255-22-6, IEC 60255-4, IEC 60255-5, IEC 60255-11, and several ETSI standards.

Assessment on the procedures and necessary documentation for the certification and CE mark.

Telecommunication Terminals Area

Standard tests for the application of the 99/5 Directive: EN 300220, EN 300330, EN 300440, EN 300086, EN 300113, EN 300135, EN 300296, EN 300328, EN 300224, TBR21, TS 103-021, TBR38, Advisory Notes for EU countries that modify TBR21, ITECA001 (Interface of Telefónica).

ELECTRICAL LABORATORY

High-Medium Voltage Area

Standard tests and assessment on HV switchgear, metal-enclosed switchgear, alternating current disconnectors and earthing switches, switches and automatic

breakers, MV fuses, insulators and diverse insulating materials, power, distribution and instrument transformers.

Other special tests applied in this H-M Voltage Area are diagnosis of nuclear plants, diagnosis and ageing of rotating machines, electrical machines, continuance under electric voltage (IEEE Std 1043), etc.

Low Voltage Area

Standard tests and assessment on LV switchgear, switches and automatic breakers, fuses, distribution control panels, cables, etc.

Electrical Power Area

Only laboratory in Spain authorized by ENAC to perform the electrical power tests with a maximum installed power (250 MVA).

Standard tests on measurement and distribution transformers, arcing tests due to internal defects and others are also included within the capabilities of the Electrical Power Area.

Low Voltage Safety Area

Standard tests for the application of the Low Voltage 73/23 Directive: EN 60950, EN 60335, EN 60065, EN 60601-1.

DISTRIBUTED GENERATION LABORATORY

DER interconnection requirements

Certification and pre-compliance testing according to different international regulations and standards.

Wind Energy

Certification tests in the laboratory: dry transformers, LV panels and MV cubicles.

Diagnosis in wind farms: evaluation and diagnosis tests of the insulation of substation power transformers, insulation tests and partial discharge measurements of generator and transformer of wind generators, power quality evaluation.

Photovoltaic

Evaluation of conformity according to the standards: IEC 61215 (Crystalline silicon terrestrial PV modules - Design qualification and type approval), IEC 61646 (Thin-film terrestrial PV modules - Design qualification and type approval), IEC 61730 (PV module safety qualification), IEC61646.