

# ***Dynamic Analysis and Modelling applied to Energy performance assessment and prediction of Buildings and Components (renewables and rational use): DAME - BC***

**Issued June 2003**

Dynamic Analysis and Modelling techniques have been applied for many years to assess the solar and thermal performance characteristics of buildings and building components. However, producing accurate results which inspire confidence in clients can still be a problem.



The main objectives of the DAME-BC project are therefore:

- to bridge the gap between expertise from both physical and mathematical/statistical analysis and modelling practice and to set up cooperation with potential beneficiaries, by extending the available software tools and offering support services to a wider public;
- to transfer the necessary know-how to other areas that may profit from it, e.g. industry, designers, standards organisations (CEN, ISO), networks (IEA, EnerBuild, IQ-TEST, PASLINK), by the creation of support units to continue in a future extended network;
- to initiate collaboration with candidate EU member states and to include them in the existing network.

Continuous dissemination for the project is organised through the website [www.paslink.org/dame/index.htm](http://www.paslink.org/dame/index.htm). To support the data analysis activities, the **Data Analysis Tool LORD** is being extended with a **Prediction Error Method**. A **Guidance Tool** is under development to assess the anticipated accuracy of the performance evaluation as a function of the characteristics of the test component and test conditions. Support structures for both data

analysis and performance prediction will be available to help researchers and customers.

## **Conference**

To promote the project objectives, a conference is being organised to present to invited experts from ERA the new possibilities for support in data analysis and performance prediction in connection with the outdoor testing of building components. The conference will take place on **13-14 November 2003**

and will be hosted by the European Commission's Joint Research Centre in Ispra, Italy.

**INTERNATIONAL  
CONFERENCE**

**13 - 14 November 2003**

**Dynamic  
Analysis and  
Modelling  
Techniques**



**EUROPEAN COMMISSION  
JOINT RESEARCH CENTRE**

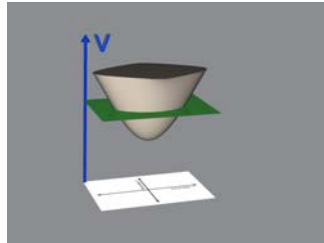
DAME-BC is set up as an accompanying measure project within the fifth Framework Programme of the European Commission to improve the performance of PASLINK EEIG, a network of 13 test centres in 11 European countries. This project is complementary to the work performed in a recent project, IQ-TEST (see page 4).

This information leaflet tells you more about the network and the various tools available.

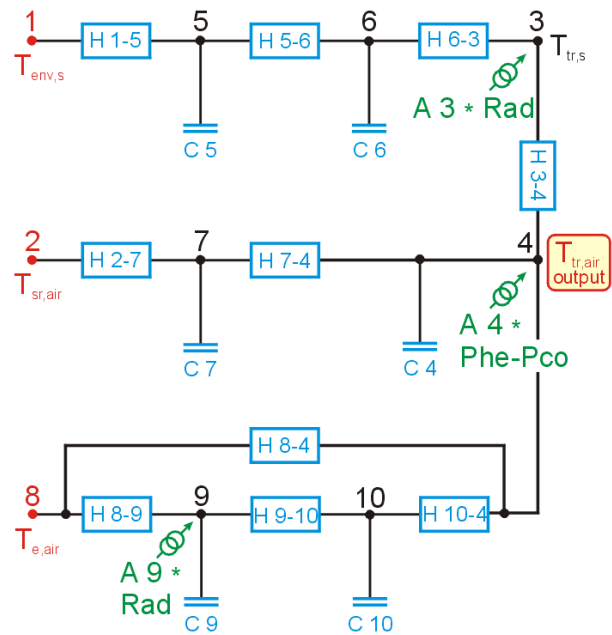
# LORD-PEM

A modern building facade must combine a high thermal insulation with a controllable transmittance for solar radiation. The assessment and optimisation of these facades may be carried out in an outdoor test facility under natural climate conditions.

The analysis of outdoor experiments is much more complicated than the analysis of laboratory experiments.



The method implemented in the software tools MRQT and LORD builds on a lumped parameter (RC-network) model, useful for most standard buildings and building components. A new quality in the analysis of this kind of experiments can be achieved by using advanced statistical methods. Therefore the software tool LORD will be extended by the Prediction Error Method (PEM) to make it more powerful. This tool will be easy to use and specially adapted to the needs of this kind of measurements. It will provide all the available statistical methods in an easily



applicable way and will comprise instructions and data for self-training.

The development of this software involves close cooperation between mathematicians and the intended users, building physicists.

The software will be made available to the participants of the conference.

## Software Guidance Tool

The Software Guidance Tool will inform both the researcher and the potential client on the expected accuracy of dynamic thermal and solar tests on a building component.

The software guidance tool will allow the user to select from a number of pre-defined cases the type of test object (e.g. facade), the type of test equipment (e.g. test cell), control strategy (e.g. power and test duration) and environmental conditions (e.g. climate and season).

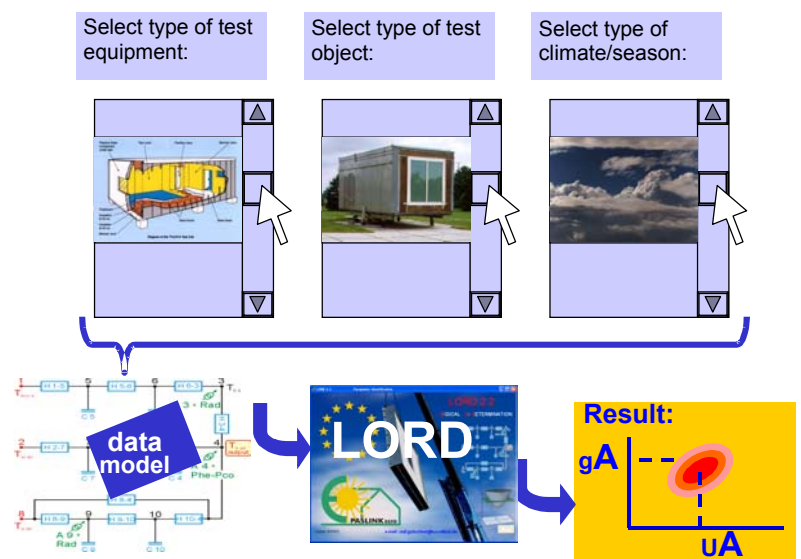
Linked with the LORD dynamic test data analysis program, the tool will produce the predicted output of the test and the expected accuracy.

The tool will be as generic as possible, for application to different types of test equipment and test conditions.

A platform independent database format (xml) will be used to store all information on the pre-defined cases. This will enable the interested user to add his/her own cases to the database.

## for dynamic thermal/solar experiments on building components

A first prototype of the tool will be available before the conference in November.



# Data Analysis Support Unit

DAME-BC is setting up the Data Analysis Support Unit (DASU), a centre of experts within statistics and mathematical modelling. They can assist the physical experts in more advanced analysis of experiments.



The DASU aims at assisting research groups - or companies - within Europe in modelling and estimating the energy

performance of buildings and building components using test data.

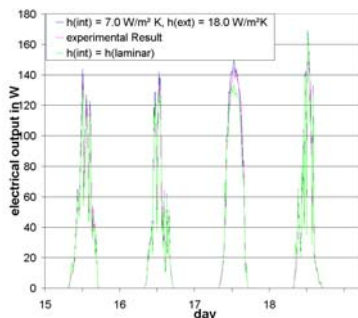
DASU can offer expertise in the use of advanced software such as CTSM (Continuous Time Stochastic Modelling), which is a program for modelling more complicated (non-linear, non-homogenous and stochastic) systems such as some of the more advanced building components. This program is used together with the software tool Matlab for analysing more involved experiments and for setting up more complicated, yet more physically realistic, models.

*DASU is involved with high performance computing. At the picture you see the project leader of DASU Henrik Madsen at the High Performance Computing laboratory at the Technical University of Denmark*

# Performance Prediction Support Unit

The Performance Prediction Support Unit (PPSU) offers support to teams involved with outdoor testing in order to predict the performance of the tested components when integrated into a full scale building. The technique employed consists of the following elements:

**Calibration** - Creating a simulation model of the test component and the test environment, comparing predicted performance with measured performance (temperatures, heat fluxes etc.).



Comparison of measurements and predictions

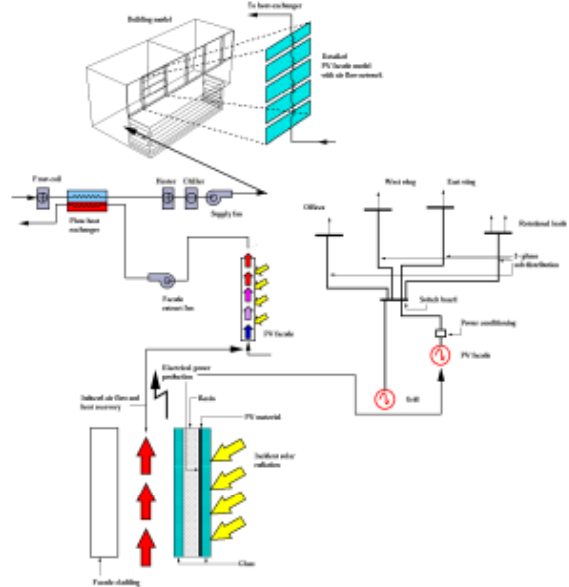
how the component will perform when it is fully integrated into a building, taking account of, for example, the utilisation of passive solar heating.

**Scaling** - Modelling of selected full scale buildings for deployment of the building component under test. Calibrated simulation models allow a more realistic estimate of

**Replication** - Repeating the simulations with different climate datasets and, perhaps, different local operational regimes to determine performance in different locations.

The PPSU support service is important for the following reasons:

- Not all experimental teams have modelling expertise themselves to calibrate models and undertake scaling/replication studies. The support service can either undertake the work or provide advice and quality assurance.
- It will allow experimental teams to market their analysis/modelling capabilities as part of the overall component test 'package'.
- For those teams who have access to modelling experts, the PPSU will document the modelling procedures to be followed, including data requirements from the experiments.



# Conference - Call for Participation

The conference aims to foster the development of new methodologies for outdoor testing and related dynamic data analysis with a view to improving the energy and economic efficiency of buildings and sustainable development. To contribute to the success of the conference, we invite you to participate in the debates and to submit papers on the following topics:



- Outdoor testing of building components (test houses)
- Application of dynamic analysis techniques
- Linear and non-linear behaviour (ventilated windows, PV integration)
- Renewable energies in the built environment
- Scaling and replication

Papers should address recent and new developments and should have a non-commercial nature.

Deadline for abstracts or draft papers is 30 June 2003. Accepted papers have to be submitted by 3 October 2003.

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## PASLINK & IQ-TEST

PASLINK, a network of 13 test centres in 11 European countries, is using almost identical facilities and applies common quality procedures for performance assessment of the thermal and solar characteristics of advanced building components under real climate conditions.



Within the European thematic network project IQ-TEST, common quality procedures have been further developed for

testing, calibration, data gathering, cleaning and analysis, interpretation of test results, scaling/replication to real buildings and maintenance of test infrastructure. Pragmatic quality procedures for test site management, testing and data analysis have been updated or developed to become more practicable. The procedures are integrated into a software tool for daily practice. The application of these procedures is subject to an inspection visit at all member test sites.

A set of training instruments was applied in training sessions for the test site managers to promote the compliance of each member's test site expertise in design, preparation and execution of tests and analysis of test data with the required quality level.

To assess the inter-site quality of testing and analytical procedures of the members, round robin tests were performed, showing the feasibility of further standardisation of outdoor testing.

For dissemination of the network activities, case studies were documented and published on the website <http://www.paslink.org/> and a series of industrial workshops was organised.

All these activities were aimed at consolidating the network, for integrating new test sites and strengthening the common approach of support for new product developments in the field of innovative building components through semi-standardised tests and pragmatic, practicable and affordable but accurate procedures. Last but not least, the intention is to give professional clients a high confidence in the results and to enlarge the market for performance evaluation using the tools and facilities of the network.

## DAME-BC

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A PASLINK EEIG Project (Accompanying Measure) in the *Energy, Environment and Sustainable Development* programme of the European Commission

For more information on DAME-BC or the coming Conference on Dynamic Analysis and Modelling Techniques, contact:

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