

Getting Started with BESA Research

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The Sentinel HASP dongle System

BESA Research is protected with a network Sentinel HASP protection key so called **HASP dongle**. BESA Research will not run unless a HASP dongle with valid license information is connected to a USB port of a computer in your local area network. The license management in your network is managed by the Sentinel HASP Run-time Environment.

The Sentinel HASP Run-time Environment is automatically installed with the BESA Research installation. For a manual installation run the **HASPUserSetup.exe** file located in the **Utilities\License\System** subfolder of your BESA Research installation directory.

After installing BESA Research, your system is ready for use. Optional specific settings can be performed as described below. For example, by default every computer in your local network can access the license on the HASP dongle that is attached to your local computer. To change that, please find more information in the next chapter below.

Individual license settings: The Sentinel Admin Control Center (ACC)

The Sentinel HASP Run-time Environment includes the HASP device drivers and the **Sentinel Admin Control Center (ACC)**. ACC is a customizable, web-based, end-user utility that enables centralized administration of HASP license managers and Sentinel HASP protection keys. ACC can be used to monitor licenses and sessions when a protected application is operating, and to manage detachable licenses. To run the ACC please type the following address in your internet browser (internet connection is not required): <http://localhost:1947>.

The following administrative options are available:

The **Sentinel Keys** page shows which HASP dongles are currently present in the network, including locally connected HASP dongles.

The **Products** page lists all BESA products available on all accessible HASP dongles in the network (this includes not only BESA Research, but e.g. also possibly licenses for BESA MRI, BESA Statistics and BESA Epilepsy).

The **Features** page lists all BESA program components (called **Features** in the Sentinel HASP system) that are licensed in each of the HASP dongles that are currently present in the network, including locally

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connected HASP dongles. In addition you can see the conditions of the license, and the current activity related to each Feature.

The **Sessions** page lists all sessions of clients on the local machine, and of clients remotely logged in to the local machine. This page enables you to view session data and to delete sessions.

The **Configuration** page enables you to specify basic settings. On this page you can also configure access to or from other computers. For example, to specify that the license on the local HASP dongle can be used only locally on that computer, switch to **Access from Remote Clients** tab and remove the checkmark in the **Allow Access from Remote Clients** box.

The MATLAB interface of BESA Research

BESA Research 6.1 features a direct interface to MATLAB. During program installation, you will be asked which MATLAB version is installed on your computer, so that the interface gets configured correctly.

Note: For MATLAB versions 2009b and higher, you may need to modify your PATH environment variable on your computer. A detailed instruction is given in the BESA Research program help ([Help → Help Topics → Chapter MATLAB/Configuration](#)).

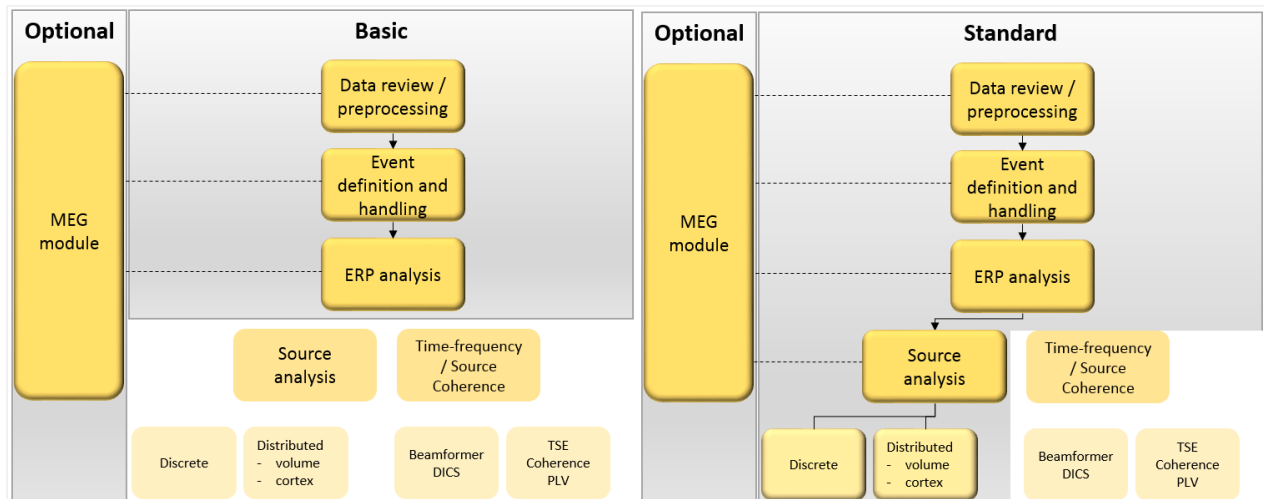
More information on the MATLAB interface and its features is provided by the following resources:

- **BESA Research program help** chapter MATLAB contains information on how the MATLAB interface works, how it can be configured, and what kind of data can be exchanged.
- **BESA Research Tutorial 3** (Batch Scripts, Multiple Subjects & Conditions, and the MATLAB interface) shows how to employ the MATLAB interface to perform cross-subject statistical analysis in MATLAB on source waveforms computed in BESA Research using batch scripts.
- The website <http://www.besa.de> provides sample MATLAB scripts and more information on toolboxes that can utilize the MATLAB interface of BESA Research.

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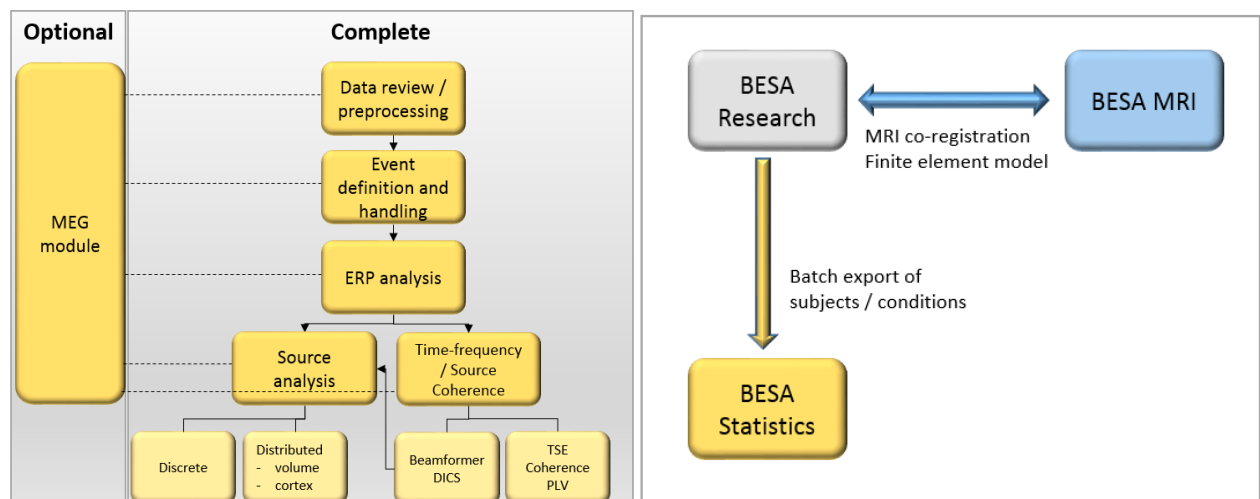
Program modules and feature overview

BESA Research is distributed in several different module configurations. The figures below illustrate these for the configurations Basic, Standard, and Complete, with the optional MEG module.



a) Basic configuration

b) Standard configuration



c) Complete configuration



d) Integration of BESA Research programs

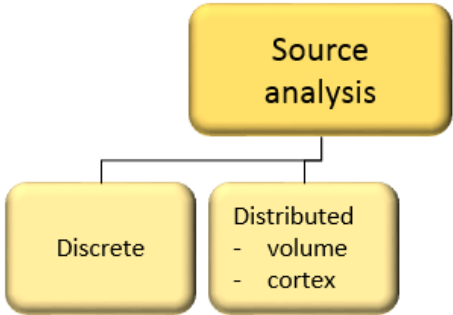
The MEG module seamlessly integrates with all configurations to enhance the analysis options for MEG.

BESA Research integrates with the other BESA Research programs BESA MRI and BESA Statistics for MRI co-registration and finite element modelling, and statistical analysis.

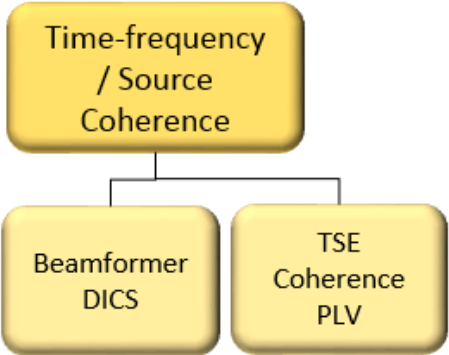
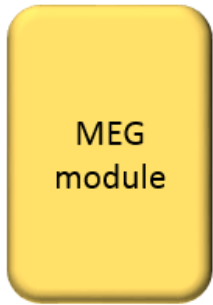
The main features of the modules are, in a short overview:

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<p>Basic</p>	 <pre> graph TD A[Data review / preprocessing] --> B[Event definition and handling] </pre>	<ul style="list-style-type: none"> • Data reading • Data import and export • Channel definition • Review • Filtering • Pattern search • Remontaging including source montages • Montage Editor • Density spectral arrays • Artifact correction • ICA • FFT • 3D whole-head mapping including FFT maps • Event definition and annotation • Batch processing • Top View of data • Peak finding and measurements • Matlab interface
<p>Basic</p>	 <pre> graph TD A[ERP analysis] </pre>	<ul style="list-style-type: none"> • Paradigm definition including Boolean logic • Epoch definition • Artifact rejection • Averaging including sub-sets • FFT averaging • Event import and export • Editing triggers – recode or delete • Creating triggers • Overplot of averaged conditions and channels • Combining conditions • Grand average • Channel subset averages

<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Standard</p>	 <pre> graph TD SA[Source analysis] --> D[Discrete] SA --> DI[Distributed
- volume
- cortex] </pre>	<ul style="list-style-type: none"> • Discrete source localization <ul style="list-style-type: none"> ○ Single dipoles ○ Regional sources ○ RAP-MUSIC ○ Genetic algorithm ○ Adding spatial components from PCA or ICA analysis • Distributed source localization (volume) <ul style="list-style-type: none"> ○ LAURA ○ LORETA ○ sLORETA ○ swLORETA • Iterative source localization methods <ul style="list-style-type: none"> ○ CLARA ○ sSLOFO • Distributed source localization (surface) <ul style="list-style-type: none"> ○ Minimum-norm estimate ○ Cortical LORETA ○ Cortical CLARA • Time-frequency beamformer <ul style="list-style-type: none"> ○ Single or multiple source beamformer • Head models <ul style="list-style-type: none"> ○ Spherical multi-shell head models ○ Realistic approximations ○ Age-appropriate template models • Realistic anatomy and 3D visualization <ul style="list-style-type: none"> ○ 3D slicing ○ Individual cortices ○ Inflated cortices • Generation of source montages • Export of localization data, source waveforms, leadfields, images • Matlab interface • Batch scripts
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<p>Complete</p>		<ul style="list-style-type: none"> • Event-related time-frequency transformations • Based on complex demodulation • Temporal spectral evolution • Analysis of surface or source channels • Scaleable 2D colour-map display • Comparison of conditions • Separation of induced and evoked activity • Coherence, phase coherence, phase-locking value • Bootstrap statistics within subject • Computation of phase delays • DICS: coherence between two brain locations or between brain and EMG • Export of result matrices • Matlab interface • Batch scripts
<p>Optional</p>		<ul style="list-style-type: none"> • 3D MEG scalp mapping of flux or gradients • 2D FFT maps • MEG source montages for fast and easy review <ul style="list-style-type: none"> ○ Pre-defined montages available for general or ERF review ○ Generate dedicated source montages • MEG spherical head models, or individual MEG finite element models created in BESA MRI can be used • Combined source space and common co-registration for EEG and MEG source localization • All other BESA features for pre-processing, ERP/ERF analysis, connectivity analysis, source localization and source imaging

The BESA Research folder structure

BESA Research generates the following default directories on your computer:

- The **installation folder** contains the executable programs of BESA Research. During installation, you can specify the location of the installation folder. The default is the **BESA\Research_6_1** subfolder of your default **Program Files** folder.
- **Example data, montages, scripts** and the **BESA Research initialization file BESA.ini** are located in the **BESA\Research_6_1** subfolder of the **Public Documents** folder. The default location of the Public Documents folder for the different operating systems:
 - Windows 7, 8, 8.1, 10: C:\Users\Public\Documents\ (directly accessible from the Windows Explorer under Libraries\Documents\Public Documents\)
 - Windows Vista: C:\Users\Public\Public Documents\ (directly accessible from the Windows Explorer under Desktop\Public\Public Documents\)
- The **BESA Research database** and **individual settings** are stored in **BESA\Research_6_1** subfolder of the **My Documents** folder.

You can change the above default locations by modifying the initialization file **BESA.ini**. Please refer to the BESA Research Help chapter in the program help (**Help → Help Topics → Chapter Special Topics → The initialization file: BESA.ini**).

Tutorials, Quick guides, and Help

For an introduction on how to use BESA Research, please refer to the following sources:

- **BESA Research Tutorials:** These tutorials provide hands-on step-by-step examples on specific types of data analysis. The tutorials use the BESA Research example data that is installed with the software. In addition to the material provided in this package, please also refer to our website www.besa.de. In the **Tutorials** section, tutorial material is available as **.pdf** download.
- **Quick guides:** Quick guides are available on the website and can be downloaded from <http://www.besa.de/downloads/quick-guides/>. Currently, they cover the topics of 3D Mapping, EEG in Epilepsy, and EEG-MEG co-registration with MRI data.
- **BESA Program Help:** All features of BESA Research are described in the program help. It can be started from the menu item **Help → Help Topics**.
- **BESA Research Support:** If you have any program-related questions that are not answered by the material mentioned above, please send us an email through our web-interface here: <http://besa.de/contact/support/form.php>.