BESA
Research 6.1

January 2017

BESA Research 6.1 Update History

Version 6.1 January 2017

Improvements

- General:

    o Inside the European Union and in countries that recognize the CE certification for medical devices, BESA Research 6.1 January 2017 can be used for limited diagnostic purposes in the analysis of epileptiform activity. Diagnostic use is restricted to applications detailed in the Intended Use document, and to a group of users detailed in the Intended User document, which need to be consulted together with the other safety instructions before any such use.

- Data review and pre-processing:

    o EDF reading and writing: Exporting to EDF was improved and now retains the original voltage values with higher accuracy. Also, scaling problems with polygraphic channels were fixed.

    o The Nihon Kohden data reader and the XLTek data reader were improved.

    o Any change of FFT band definition from the default is now indicated by a dash at the end of the FFT band name.

- Source analysis:

    o PCA decomposition has emerged as a very helpful tool for estimating the number of components. PCA decomposition is now shown by default when starting the Source Analysis module.

    o With less than 12 electrodes, source analysis results are not meaningful. Source analysis is now prevented if less than 12 electrodes are in use.

    o The patient name is now shown in the title bar of the Source analysis window if patient name display is selected in the review options, to prevent any accidental mixing up of patients.

    o When using artifact-corrected data in Source analysis, the string "Corrected" is now shown in the title bar of the Source analysis window to alert the user to the fact.

Bugfixes

- Data review and pre-processing:

    o In BESA Research 6.1, pattern search could sometimes lead to a program crash. This is now fixed.

    o Automatic artifact correction with less than 12 channels could result in a program crash. This is now fixed; if no meaningful artifact topography can be established, then artifact correction is not activated.

    o Batch processing sometimes had problems setting up the logging, which prevented batches to start. The logging behavior was improved and no longer impairs starting a batch.

    o Upon closing BESA Research, the license was not freed correctly after the Source Coherence module had been used. This is now fixed.

BESA
Research 6.1

January 2017

Version 6.1 July 2016

Improvements

- Data review and pre-processing:

  - ICA components that were saved in a previous session can now be loaded again, without having to re-compute them. (Note that you can save several ICA components together by holding down the CTRL key when selecting ICA components before saving them.)

  - Digitized coordinates for electrodes not following the 10-10 labeling standard are now supported and will no longer cause problems in establishing the correct head coordinate system. Use the new check box in the Head Surface Points dialog to toggle this feature.

  - When mapping raw or averaged data, the cursor position can now be controlled with millisecond accuracy using the mouse wheel: step size can be adjusted in the mapping window.

- Network configuration and installation:

  - In network installations, it can now be configured which computers pull an MEG license off the server. To prevent a computer to use an MEG license:

    Edit the *BESA.ini* file in the *[Public Documents]\BESA\Research_6_1* folder, and define `"MEGVersion=0"` or `"MEGVersion=Off"` in the `"[Defaults]"` section of the file.

  - Communication dlls for the Matlab interface are now available for the latest Matlab versions.

- Cortical Imaging:

  - In cortical mapping, it is now possible to visualize the positions of local maxima, and to seed dipole sources from these positions (new toolbar icons). Sources can be visualized together with the cortical image (right click menu). The cortical surface can be viewed in a transparent view in order to visualize sources that are inside the cortex (right click menu / Options).

  - The interpolation of the mapping values on the cortical surface was improved.

  - A new cortical Laplacian operator (Weighted Graph Laplacian) was implemented to replace one that performed less well in extensive tests. For backwards compatibility, the previous Laplacian (Geometric without area weights) is still available in the batch command.

Bugfixes

- Artifact correction:

  - A problem with writing artifact coefficients in combined EEG-MEG files was fixed. Also, a wrong error message when reading artifact coefficients where bad channels were defined no longer appears.

  - A problem with artifact topography change when changing channel type in combined EEG-MEG files was fixed.

- Data review:

- o In countries where Chinese characters or Kanji symbols are used, the *μV* text for EEG amplitude was sometimes not displayed properly. This is now fixed.
  - o BESA Research was sometimes slow when paging through raw data files if no MEG license was present. This is now fixed.
- Data export:
  - o When exporting to EDF format, polygraphic channels are now scaled correctly.
- Source Analysis:
  - o Saving bitmaps of the 3D head models in BESA Source Analysis did not show the correct image in some Windows versions. This is now fixed.
  - o Creating source montages with realistic head models now works correctly.
  - o Source Imaging: If volume source imaging methods were used with individual MRI coregistration, sometimes incorrect amplitudes were shown in the title bar for maxima at the edge of the source space. This is now fixed.
  - o Cortical imaging:
    - ▪ Recomputing cortical images with different conditions that contained different channel configurations sometimes failed. This is now fixed.
    - ▪ The cortex inflation button was not available if a batch had previously been run that used the cortical imaging methods. This is now fixed.
  - o DICS: In combined MEG-EEG recordings, the list of external channels available for DICS was sometimes incorrect. This is now fixed.
  - o Image export: Exported imaging values for sSLOFO sometimes had wrongly scaled values. This is now fixed.

Version 6.1 February 2016

Improvements

- Inflated surfaces are now available for all examples that contain MRI data with brain surfaces.
- For EEG review, the standard batches for epilepsy analysis tasks can now be automatically selected to the function keys using the check box in the menu item *Options | Open "Reset Settings" Dialog | Reset function keys to EEG Review default*.
- In the Help chapter *Source Analysis | 3D Imaging | Cortical Loreta*, there was a typo in the formula describing the area weights for the case of using the *Geometric Laplacian without area weights*. As the name suggests, the weight is 1, which is now correctly stated in the help documentation.

Bugfixes

- In the Source Analysis window, the right-click popup menu for the head model selection combo boxes now enables all possible choices of head models.

Version 6.1 November 2015

New features

- New source analysis methods Cortical LORETA and Cortical CLARA

LORETA and CLARA can now be computed with the individual or a standard cortex as the source space. Cortical LORETA and CLARA are truly computed on the cortical surface and are no projections.

- Cortex inflation in source analysis window

  For cortical methods Cortical LORETA, CLARA and Minimum Norm, it is possible to display the localization results on an inflated version of the individual cortex or age-appropriate templates.

- New head models for source analysis – age-appropriate templates

  New age-appropriate FEM templates are now available from the head model drop-down menu. Template brains used for age-appropriate models were kindly provided by John E. Richards, University of South Carolina, USA. Templates are available from infancy to adulthood.

- Resting state source montages

  New source montages are now available for the Default Mode Network (DMN), fronto-parietal task control system as well as the dorsal attention system and the ventral attention system. They allow investigating resting state EEG and MEG data in a swift and straight-forward manner.

Improvements and bug fixes

- Data readers

  - Electrode labels from Biosemi recordings are no longer associated with internal standard electrode positions.

  - CTF data: Handling of bad channels in parallel MEG / EEG recordings now runs without problems.

  - G.Tec reader is updated to work with the latest BESA Research version.

  - Improvement in memory handling when reading Neuromag MEG data.

  - Improvement in trigger handling in BrainVision reader.

- Data export

  - The time stamp when concatenating several raw data files is now correct also when recordings span several days. Later recordings will be assigned the correct date.

  - EDF export with current montage now also works for segments longer than 10000 samples.

  - EDF export now also works when surface channels are set to bad and intracranial channels are re-montaged.

  - Appending data files via export now works without problems.

- Events and conditions

  - Loading an external event file sometimes led to inconsistencies in the event count in the paradigm window. This is no longer the case.

  - Combine Conditions: Right-clicking in the header of the conditions tab no longer leads to a crash.

- Time / Frequency Analysis

January 2017

- o Long source channel names are no longer an obstacle for computing source coherence in batch mode. Please note that the complete source channel name also includes the montage name.
  - o Available frequency bands for FFT analysis are now dependent on the data sampling.
- Source Analysis
  - o Problems with the DICS computation when a discrete source is used as reference are now fixed.
  - o If sources of a loaded source model are outside the individual or standard FEM source space, the sources are automatically moved to the closest neighboring point within the source space after displaying a warning message.
- Display / warnings
  - o If the sampling rate is <= 128 Hz, it is now possible to display up to 3600 s in one screen.
  - o If many files are loaded in batch processing that cannot be read by BESA Research, only one error message is displayed instead of one error message per file.
  - o Warning message appears now, when attempt is made to run artifact scan on polygraphic data. Artifact scan is not possible in this case.

BESA Research 6.0 Update History

Listed below are the changes and bugfixes provided in the updates of BESA Research 6.0:

Version 6.0 September 2014

New features

- MEG Source Analysis: Individual MEG finite element models (FEMs) can now be used for source analysis and for all source imaging features. These models can be generated with the newly released BESA MRI 2.0 August 2014.

  After co-registration, the individual MEG FEM is automatically available in the head model selection in the source analysis module of BESA Research 6.0. In simultaneous EEG and MEG recordings, the same co-registration and source space can now be used for realistic modelling of EEG and MEG data.

- Data readers:
  - o EGI Metafile format: The data reader was updated to the new version V1.
  - o InstEP: The data reader was updated to support IWave V 7.3.

- Improvement: In Selected View mode, it is now possible to delete individual trigger events without having to confirm each individual deletion again. This is useful for example when reviewing results from a pattern search that was converted to triggers, or from an external spike detection done with BESA Epilepsy. To delete a trigger event, click into the associated epoch and press 'D' or the Delete key on the keyboard.

BESA
Research 6.1

Bug fixes

- MEG: In certain conditions, when loading artefacts for Neuromag files where bad channels had been marked, a wrong error message could appear. This is now corrected.

- Data readers:

    o XLTEK: A problem with matching electrode labels that could cause a crash of the software was fixed.

    o EDF, BDF: A problem with the calculation of the start times of segments was fixed.

    o Nihon Kohden: File reading problems occurring under Windows XP, and problems with handling of very large files (larger than 4 GByte), were fixed. Also, an issue with assigning the correct channel type based on the channel label was resolved.

Version 6.0 April 2014

Bug fixes

- MEG Source Analysis: Optional interpolation allows faster computation and display of MEG scalp maps.

- Scaling options for distributed source imaging methods are now extended.

- Scaling bug (rescaling of minimum norm images was not possible if volume image was computed beforehand) for minimum norm solutions is fixed.

- Global field power (available in batch processing) is now computed by most common standard (sum of squares divided by number of channels).

- Combine conditions bug (crash when montage was used that contained more channels than the original recording) is now fixed.

- License handling bug (in a network with >1 HASP keys only one key was addressed when retrieving licenses) is now fixed.

- Minor update of standard default electrode coordinate definitions and BESA-MRI-Standard-Electrodes.sfp in accordance with current practice.

Version 6.0 June 2013

New features

- Batch commands: New batch commands **For, EndFor, GoTo, FFT, FFTmean**.

- Batch commands: All **ICA** commands are now available in batch commands.

- ICA: Multiple **ICA** components can now be saved as artifact coefficients: up to 10 per category.

- ICA: Export of **ICA** reduced data can now be done for the whole file.

- ICA: New **ICA** Select dialog to select components and export topographies and reconstructed data.

- ICA: **ICA** reconstructed data is now exported excluding the selected components (instead of excluding all others).

- Source Analysis: Added hot key function "Save Ind. FEM Pars." for BESA Simulator Individual FEM export.

BESA
Research 6.1

![BESA logo]

January 2017

- Source Analysis: Improved dipole fitting algorithm for individual FEM head models.

- Montage Editor: Default montage can now be specified in BESA.ini. This can be either a standard montage, specified by label, or an user montage, specified by the file name.

Bug fixes

- Source Analysis: Distributed inverse methods computation speed for individual FEM head models is now much faster.

- Source Analysis: Issues with bad channels and the individual FEM head models are now fixed.

- Fixed crash when using key shortcuts to start or open batches (e.g.ctrl+R) when no file is open.

- Combine Conditions: Baseline correction is now taking an additional sample into account, fixing the inconsistency with the interval definition in the combine conditions dialog.

- Fixed crash when opening the DSA window for EEG data without default sensor labels and when switching to the next page.

- Export: Fixed export functionality for data segments crossing the midnight line.

- Export: Export with append is now again possible from the menu File -> Export.

- ICA: The wrong polarity flip of **ICA** exported data has been corrected.

- Settings stored in *fst* file are now kept as far as possible when accessing a file from two different computers, e.g. on the network.

- Research 6.0 now reads *fst* files written by Research 5.3.7.x and below.

- Read filter settings from local *fst* files even for averaged data.

- ERP: Upgrades in fonts in the ERP module for better visualization in all screen resolutions.

- Fixed crash for very long file lists in batch mode.

BESA Research 6.0 November – Quick Patch 6.0.1.1

Bug fixes

- Fixed occasional crash when loading artifact (*atf*) files.

- TopView: BESA Research no longer crashes under Windows XP when more than two FSG-files are open and more than two peak searches are performed subsequently.

- Paradigm window: If specific font size settings were chosen in Windows some of the buttons in the Paradigm window weren't visible. This is no longer the case.

Version 6.0 November 2012

Bug fixes

- Interaction with new BESA MRI 2.0 November version has been updated. Uses individual 3D source space in case individual FEM is selected. Otherwise uses default source space.

BESA
Research 6.1

Version 6.0 Beta September 2012

New features

- Independent Component Analysis (ICA): Decomposition of EEG/MEG data into ICA components in the main window. ICA components can be used for artifact correction or as spatial components in source analysis. It is also possible to create ICA-reconstructed data only consisting of selected ICA components.

- Dynamic Imaging of Coherent Sources (DICS, Gross et al., 2001): New source analysis method. Allows to calculate coherence between any two brain voxels or between an external source and brain voxels. DICS can be used to determine coherence in evoked or induced data.

- Source analysis can now be performed with individual volume conductor models (FEM) that were created in BESA MRI. After co-registration, the individual FEM model is automatically available in the head model selection in the source analysis module of BESA Research 6.0.