EEG Processor

## Important notes

1. When importing hypnograms and scored sleep events, please do make sure that this is done by the computer correctly by using the Visual Inspection app. The hypnogram is simply aligned from the start of the recording in 30-second epochs. The onset latencies of the scored events are calculated by the timestamp of each event relative to the start time of the recording as taken from the MFF filename. If the scored event timestamps are not aligned to the MFF start time, then all imported scored events are misaligned.
2. The EEG Processor is written by only a few people, who are not professional software developers but scientists. Although the software is written to the best of their abilities, it is developed with a particular use-case in mind. Your dataset may contain particularities that present as edge-cases for the software i.e., have some parameters that the software was not designed to handle. Always question every step the software automatically does for you and verify it did what you expected.

## Change Log

# Version 2.1.0

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| **FIXED** |  | **Improved readability of event markers and labels in the visual inspection app** |
| Version 2.1.0 ID #0016 6 Mar 2023 | | The placement of the event markers and their labels have been improved such that there should me very minimal to no overlap between events. |

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| **ADDED** |  | **User defined number of channels and channel step** |
| Version 2.1.0 6 Mar 2023 | | In the visual inspection app, instead of predefined sets of the number of shown channels and the channel-step, the user can now specify exactly how many channels to visualize and the step. |

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| **ADDED** |  | **Delete multiple files in one process** |
| Version 2.1.0 3 Mar 2023 | | The user can now use the checkboxes in the file list and select the process ‘Delete all checked files.’ Which will ask the user to confirm this action. Then, the files are not yet deleted, but this action is added to the processes list. To delete these files, click ‘run’. |

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| **ADDED** |  | **Insert current value of a key in the ‘desc’ value of preproc output files** |
| Version 2.1.0 3 Mar 2023 | | Until now, in the ‘Select and Preprocess’ GUI, there was no way to prepend or append the value of the ‘desc’ key in the output filename. For example, when processing 3 files with ‘desc’ values of ‘eo1’, ‘ec’, and ‘eo2’, the ‘desc’ value of the output files could only be specified as one new value resulting in an error as the 3 output files would have the same filename. Now the user can specify any key between angle brackets (‘<’ and ‘>’) to be inserted in the ‘desc’ value of the output file. This string will be replaced by the value of that key from the input file. For example, use ‘<desc>preproc’, and the 3 output files will have a ‘desc’ value of ‘eo1preproc’, ‘ecpreproc’, and ‘eo2preproc’. |

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| **FIXED** |  | **Mismatch of files to subject when subject ID was a substring of another subject ID** |
| Version 2.1.0 ID #0015 2 Mar 2023 | | When a subject ID was a substring of another subject ID e.g., “sub-3” and “sub-30”, then files belonging to “sub-30” were also listed under “sub-3”. |

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| **FIXED** |  | **Incorrect color of channel indicator in topoplot of group-level results** |
| Version 2.1.0 ID #0014 20 Feb 2023 | | Due to an incorrect correction for one- or two-sided tests, channels that were significant were incorrectly coloured black instead of yellow, turquoise, or white. |

# Version 2.0.0

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| **ADDED** |  | **Instant overview of data quality** |
| Version 2.0.0 11 Jan 2023 | | A “traffic-lights” system is shown in the main EEG processor app when a file is selected. Here the user can instantly see how many bad channels and bad epochs there are in a recording. Green indicates the recording contains no identified bad channels or bad epochs and less than 10% interpolated channels, yellow indicates that the recording still contains bad channels or epochs (less than 10%), otherwise red indicates a low-quality dataset (i.e., more than 10% bad channels/epochs/interpolated channels). |

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| **ADDED** |  | **Instant overview of all events** |
| Version 2.0.0 25 Jan 2023 | | All events within a recording are now displayed from within the main application. |

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| **ADDED** |  | **Importing Grael system EDF data** |
| Version 2.0.0 11 Jan 2023 | | The import functions to import Grael system EDF datasets are now operational. |

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| **ADDED** |  | **Importing Compumedics 257 system EDF data** |
| Version 2.0.0 11 Jan 2023 | | The import functions to import Compumedics 257 system EDF datasets are now operational. |

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| **ADDED** |  | **Added channel cluster indices for Compumedics 257 system** |
| Version 2.0.0 11 Jan 2023 | | The clusters of the Compumedics 257 electrodes are matched to the major scalp divisions based on the EGI257 system. For any other system, all channels will be set to cluster 1 by default. |

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| **ADDED** |  | **Source file references in JSON sidecar** |
| Version 2.0.0 31 Jan 2023 | | All derived files now contain the field “Sources” in the sidecar JSON file to point to the input file that was used to create the derived file. |

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| **ADDED** |  | **In select and preproc process, remove non-cranial channels (HD-EEG only)** |
| Version 2.0.0 20 Jan 2023 | | For HD-EEG recordings (EGI-257 or Compumedics-257), the default setting in the ‘select and preprocess’ menu is to remove non-cranial channels. This option is not available for other systems (e.g., Grael). It is not recommended to perform this step if source localization analyses will be performed. If selected, the removal of these non-cranial channels is done after removal of rejected independent components, and before interpolation of rejected channels and before average referencing. |

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| **ADDED** |  | **In select and preproc process, create separate files for each event instance** |
| Version 2.0.0 11 Jan 2023 | | Now, a user can not only create separate files per event label, but also a separate file for each event instance. The ‘desc’ key-value pair will encode the event label and instance number. |

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| **ADDED** |  | **Calculation of normalized power in the power-spectral analysis** |
| Version 2.0.0 11 Jan 2023 | | Normalized power was not automatically calculated. Now, a new section in the power-spectral analysis interface allows the user to select how normalized power is calculated. |

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| **ADDED** |  | **Statistical outlier detection of power-spectral values** |
| Version 2.0.0 11 Jan 2023 | | A new user interface is added whereby the user can set the parameters for detection of statistical outliers of channels with delta or beta power above a threshold in at least *n* input files of the same subject. |

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| **ADDED** |  | **Keeping track of history** |
| Version 2.0.0 11 Jan 2023 | | All main processes now include history code-tracking. This way, anything that is done in the user interface can be replicated by the history code. |

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| **ADDED** |  | **General linear modelling using permutation-based correction for multiple comparisons** |
| Version 2.0.0 11 Jan 2023 | | A general linear modelling framework called PALM from the neuroimaging group FMRIB, was adapted to run group-level statistical analyses in the EEG processor. |

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| **DEPRICATED** |  | **No longer required to import routine-EEG files created by the EEG Processor** |
| Version 2.0.0  ID #0013 30 Jan 2023 | | Any EDF that is created by the EEG Processor i.e., the routine EEG 10-20 System recordings can simply be placed within the BIDS database. These files will automatically be loaded, no need to import them. |

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| **DEPRICATED** |  | **No more data types of ‘\_continuous’ or ‘\_epoch’** |
| Version 2.0.0  ID #0008 11 Jan 2023 | | According to the BIDS guidelines version 1.8.0, all filenames of EEG recordings end with the data type ‘\_eeg’. Data types ‘\_epoch’ and ‘\_continuous’ used in version 1.4.0 are deprecated. |

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| **FIXED** |  | **Incorrect spherical channel coordinates for imported geoscan files** |
| Version 2.0.0 ID #0012 20 Jan 2023 | | Whilst the cartesian channel coordinates were correct, the spherical coordinates were not. The ‘topoplot’ function uses the spherical coordinates and this resulted in a switch between left and right. This error is now automatically detected when you open your recording and all header files are automatically saved with the correct channel coordinates. |

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| **FIXED** |  | **Incorrect event onsets from MFF event XML files when recording is epoched** |
| Version 2.0.0 ID #0011 18 Jan 2023 | | When the MFF recording was epoched, the event onsets were not adjusted for the missing blocks of time in between epochs. |

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| **FIXED** |  | **Processes panel not cleared when re-loading a new dataset** |
| Version 2.0.0 ID #0010 16 Jan 2023 | | The processes panel was not cleared when a new dataset was loaded. |

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| **FIXED** |  | **Error when selecting part of a recording** |
| Version 2.0.0 ID #0009 16 Jan 2023 | | In the process ‘Select and preprocess data’, an error occurred when selecting part of a recording using timepoints. |

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| **FIXED** |  | **Incorrect label of sleep stage when scrolling backwards** |
| Version 2.0.0 ID #0008 16 Jan 2023 | | The large grey text indicating the sleep stage in the Visual Inspection app was not always correctly showing the current sleep stage. This is now resolved. |

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| **FIXED** |  | **Issue when loading a new dataset in the EEG processor** |
| Version 2.0.0 ID #0007 11 Jan 2023 | | The files of the currently loaded dataset and of the newly loaded dataset would not be shown correctly. |

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| **CHANGED** |  | **Derivatives directory ‘EEG-select’ becomes ‘EEG-preproc’** |
| Version 2.0.0  ID #0006 11 Jan 2023 | | It was judged that the name ‘EEG-preproc’ is a better descriptor of the contents of this derivatives directory. For legacy support, the directory is named ‘EEG-preproc’ only if the database does not already contain the ‘EEG-select’ directory. |

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| **CHANGED** |  | **Importing any event XML file from within the MFF package** |
| Version 2.0.0  ID #0005 11 Jan 2023 | | Only the ‘Events\_User Markup.xml’ file used to be imported. However, when triggers are sent from e.g., E-Prime, these event makers are stored in separate XML files. Now, any event XML file from within the MFF package are automatically imported. |

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| **FIXED** |  | **Incorrect sampling frequency in JSON sidecar after resampling** |
| Version 2.0.0 ID #0004 11 Jan 2023 | | When a recording was resampled, the variable ‘SamplingFrequency’ in the JSON sidecar file was not updated, now it is. |

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| **FIXED** |  | **Recording start-date added even when no external events are imported** |
| Version 2.0.0 ID #0003 11 Jan 2023 | | The ‘EEG.etc.rec\_startdate’ variable used to be only defined when importing external events along with importing MFF recordings. Now this variable is initialized in ‘mff\_newset.m’. |

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| **FIXED** |  | **Making sure ‘rec\_startdate’ is the correct variable type** |
| Version 2.0.0 ID #0002 11 Jan 2023 | | When using the function ‘compumed\_import\_sleep\_events.m’ on an existing file, then the variable ‘rec\_startdate’ should be a date-string, which would result in an error. Now a check has been added to convert the variable to a date-number if this is not the case. |

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| **FIXED** |  | **Scored sleep events before midnight may have not been imported** |
| Version 2.0.0 ID #0001 11 Jan 2023 | | In an edge-case where a scored sleep event occurred before the start of the recording, all subsequent sleep events before midnight were not imported. |

# Template tables

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| **ADDED** |  | **Title** |
| Version 2.0.0 ID # Date | | Description |

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| **FIXED** |  | **Title** |
| Version 2.0.0  ID #0001 Date | | Description |

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| **CHANGED** |  | **Title** |
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| **DEPRICATED** |  | **Title** |
| Version 2.0.0  ID #0001 Date | | Description |

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| **REMOVED** |  | **Title** |
| Version 2.0.0  ID #0001 Date | | Description |