APPENDIX B2: Detailed descriptions

The human Intracerebral EEG Platform (HIP) is a unique platform that provides the neuroscience clinical and scientific community access to the most advanced solution worldwide for storing, curating, sharing, and analysing data directly recorded from the human brain during iEEG in patients with epilepsy, in full compliance with ethics and data privacy EU regulations. It aims at tackling the current limitations of SEEG-based human brain research by promoting international collaboration in the field and provides digital tools and services which can be used to address challenges in brain research by using brain-inspired technology. Its components are designed with, by, and for researchers.

The HIP has been developed and funded within the framework of the Human Brain Project (HBP), a European flagship project which general objective is to delineate a multiscale model of the human brain and some of its dysfunctions, based on a large gathering of available data and knowledge. It is integrated in the research infrastructure called EBRAINS, which is a sustainable European research infrastructure, developed as the legacy of the Human Brain Project.

This agreement permits the update of the provided data as may be necessary, so long as the nature of such update corresponds to the object and the research as established and defined in the agreement.

Data shall mean

Data Domain

Neuroimaging Data:

- Computer Tomography data and/or Magnetic Resonance Imaging (MRI) data and their surface reconstruction are being used to co-registrate intracerebral electrodes on the patient's MRI to precisely delineate the anatomical location of the latter

Neuroimaging Electrophysiological Data:

IEEG data are at the core of the HIP platform and are primarily used to detect, whether a given brain region, sampled by the intracerebral electrodes, participate to a pathological (e.g. high frequency oscillations) or physiological brain activity (e.g. increased power in the gamma band).

Demographic and clinical Data:

Such data might be used as covariables of interest in iEEG data analyses. These variables will be extracted from the dedicated eCRF made available in REDCap. Direct clinical and demographic data is not stored on HIP.

System Property Data:

- Metadata: Metadata schema used e.g. by the Medical Informatics Platform or the EBRAINS Knowledge Graph (i.e. OpenMINDS), which comprises a set of metadata models for research products in the field of neurosciences.
- Image output: Output file from various software for results presentation
- Processing storage data: Structured database used to store persistent results during the various pipelines processing

BIDS

Imaging data shall be stored in BIDS format. BIDS is currently used for organizing and sharing brain imaging data for many imaging modalities. BIDS fosters interoperability and reuse of acquired datasets by using naming conventions and dedicated metadata files to store dictionaries (.json) and data (.tsv), and addresses issues of reproducibility by allowing the creation of fully automated data analysis workflows.

iEEG data to advance human brain research

iEEG is the only clinical setting enabling the recording of neural activity directly from within the human brain in awake patients, offering a unique opportunity to advance our understanding of both epilepsy and human brain physiology. Patients undergoing iEEG are free to move and can consequently perform many more tasks than subjects undergoing fMRI experiments who are required to remain still within the scanner gantry. While SEEG is carried out for clinical purpose only, it offers a powerful research framework for studying various cognitive processes, which are performed in patients who gave their written informed consent to participate.

The most widely used method to extract relevant information from SEEG-based cognitive research consists in transforming the raw data into the time-frequency domain. In particular, the power of the gamma band (30-100 Hz) appears to best reflect the involvement of local neural networks and their cooperation in a given task.

iEEG-BIDS

To support the extension of the BIDS format to iEEG data, we shall use the BIDS manager. It allows the creation of iEEG-BIDS data, which can harmoniously modularize data in a single dataset, with modification of pre-existing metadata and includes fields for iEEG data files. The iEEG-BIDS format holds metadata for iEEG data files, amplifier settings for each channel, electrode contacts data, and their coordinates in the patient-specific reference space.