

BOLD MRI Scan Protocol

For Brainlab: **iPlan 2.x, iPlan 3.x**

In order to provide complete data sets for neurosurgery, you must provide **high resolution anatomical MRI data** in addition to BOLD data. The anatomical data may be acquired in the same study with the BOLD MRI data (but not necessarily).

Paradigm	<p>The Brainlab BOLD MRI module:</p> <ul style="list-style-type: none"> • Supports only block-designed functional paradigms • Does not support event-oriented paradigms
Paradigm settings	<ul style="list-style-type: none"> • For a correct analysis, the functional paradigm must be recorded and later used with the iPlan planning software • A single task can be performed: hand, rest, hand, rest... • Multiple tasks can be performed: rest, hand, feet, rest, hand, feet... • The task and rest length for one activation must remain the same during the scan See next page for details
Field of View	<ul style="list-style-type: none"> • Include region of interest • The field of view must include sufficient anatomical landmarks in order to use the data with the image fusion • Only datasets with orthogonal slice spaces are supported (parallel slices with equal slice distance, no rotation)
Patient Setup	<ul style="list-style-type: none"> • Axial, supine and head first position only • Patient's head must be supported to reduce movement
Scan Properties	<ul style="list-style-type: none"> • Axial only • EPI BOLD scan dynamic sequence with at least 20 scans • Slice thickness 1.5 - 5.0 mm • For Siemens Mosaic images only: F>>H orientation (for iPlan 3.x also H<<F orientation) is supported (selected under System/Common card) • For Philips, enhanced DICOM format is not supported • Motion correction is supported • Slice acquisition order (e.g. interleaved) must be specified on the next page (only for iPlan 3.x)
Angulation	<ul style="list-style-type: none"> • Supported
Matrix / Pixel size	<ul style="list-style-type: none"> • Any matrix size, but must be square, e.g. 64x64, 128x128, 256x256, 512x512 • Pixel size must be square
Storage	<ul style="list-style-type: none"> • Only 16 Bit DICOM format is supported • All BOLD MRI volumes should be stored as image slices: -Exception: for Siemens data, it is recommended to create Mosaic images in order to reduce the data and accelerate import • Storage media: CD- ROM or DICOM network • No optical disc or DAT tape <p>Note: Please be aware that manipulating (e.g. anonymizing) patient data may also remove important information required for processing the data.</p>

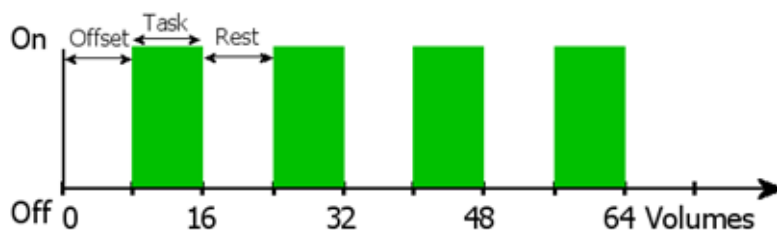
BOLD MRI Task

The Brainlab BOLD MRI module only supports block-oriented functional paradigms.

For a correct analysis, the functional paradigm must be recorded and later used with the Brainlab planning software. The following parameters can be entered as the number of volumes acquired or as the time length in seconds:

Time to first task	Number of dummy volumes (or time length in seconds) before the first task
Task length	Number of volumes (or time length in seconds) for one activation phase
Rest length	Number of volumes (or time length in seconds) rest phase in current task

This is an example of a functional task with hand movement:



In this example, the following values were used and must be forwarded to the person who will use the BOLD MRI processing with the Brainlab planning software:

Task Name	Offset (volumes)	Task length (volumes)	Rest length (volumes)
Hand	8	8	8

Any changes to the routine functional scan protocols normally used for the Brainlab system should be discussed and verified with the neurosurgery and radiology department. If you need additional information please contact your local Brainlab representative.

The form below may be used to record the functional protocol:

Protocol Name			
Task Name	Offset (volumes)	Task length (volumes)	Rest length (volumes)

For iPlan 3.x only:

Slice Acquisition Order (e.g. interleaved): _____

Additional Recommendations

<p>Safety</p>	<ul style="list-style-type: none"> Brainlab recommends using a hand-held metal detector for a last check before patients or participants enter the scanner room. Inform patients early (ideally at scheduling) what to wear for the scan, and to avoid e.g. bras with metal wires, make-up etc.
<p>Preparing the Patient</p>	<ul style="list-style-type: none"> Patients should avoid smoking or drinking coffee before scans. Functional scanning sessions should not be scheduled directly after meals.
<p>Restricting Motion</p>	<ul style="list-style-type: none"> Instruct the patient to find a comfortable position before the scan begins. Simply telling them to stay as motionless as possible is not always sufficient to obtain optimal image quality. An example instruction: <i>“Please find a comfortable position in the scanner while we're placing you into the tube. It is OK to wriggle around while we're doing so. After finding a position in which you think you can lie comfortably for quite some time, please relax and try to move as little as possible, as your movements degrade the quality of our recording.”</i> If your scanner software allows for a check of image-to-image movements Brainlab recommends checking this after each scan sequence and discarding scans with strong movements (3-4 mm or sudden strong jumps, such as after a sneeze). If your scanner software has an in-line display option, Brainlab recommends having that window open during the scan, strong movements are visible in the in-line display and patients or participants can be advised in between scans via the intercom system. <p>Tip: a MR-safe vacuumable head pillow improves both patient comfort (provides neck support) and image quality.</p>
<p>All Scanners (block design)</p>	<ul style="list-style-type: none"> Task length and rest length should be of 15-20 sec length. Although optimal temporal resolution is desirable, the TR should not be lower than 2 sec. If both spatial resolution (<3 mm slice thickness) and temporal resolution (TR<3 sec) are high and slice gap is below 30% of slice thickness an interleaved acquisition scheme (not ascending or descending) is recommended to minimize inflow effects. It is generally advisable to document the acquisition scheme (descending, ascending, interleaved ascending even-odd, interleaved ascending odd-even, interleaved descending even-odd, interleaved ascending odd-even, interleaved custom).

