

stimtargeter

Quick Guide

CAUTION: INVESTIGATIONAL DEVICE

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Change record

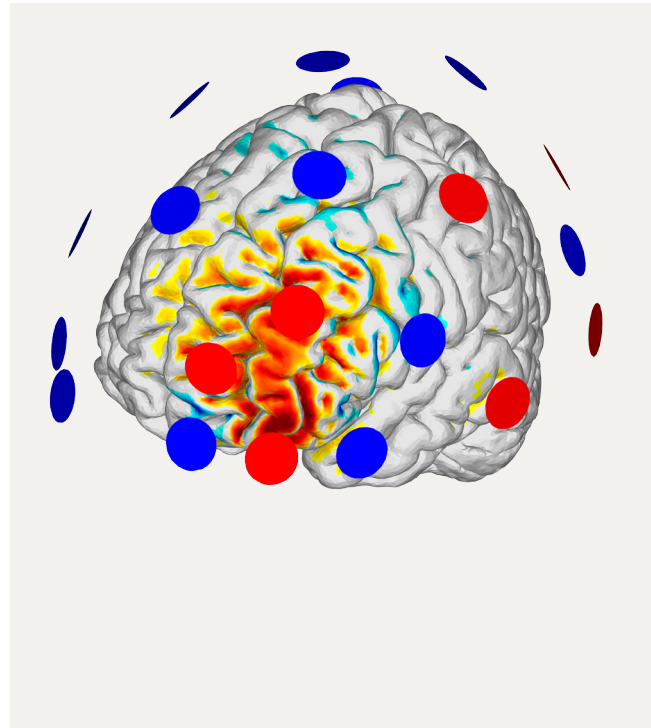
Issue	Date	Changes made	Author
1.0	2017.02.01	First version of the Stimtargeter Quick Guide	Miguel Mendes

I. Stimweaver

The **Stimtargeter** is part of the Neuroelectrics® Stimweaver service. Stimweaver [1] provides optimal multi-electrode montages for transcranial current stimulation (tCS) with Neuroelectrics® Starstim.

The Stimtargeter allows the user to accurately identify the part, or parts, of the brain to be excited or inhibited during stimulation. Coupled with the Stimtargeter, there is an online form where the user inputs stimulation constraints, such as the number of stimulation channels or the maximum current allowed. In essence, the Stimtargeter allows to select target stimulation areas that are then fed to Stimweaver. The Stimweaver service computes the optimal combination of stimulation channels, considering their position based on the 10-10 system, and the current intensity per channel.

The realistic modeling of electric fields is based on a model using Pistim electrodes.



[1] Ruffini G, Fox MD, Ripolles O, Miranda PC, Pascual-Leone A. Optimization of multifocal transcranial current stimulation for weighted cortical pattern targeting from realistic modeling of electric fields. *Neuroimage*. 2014 Apr 1;89:216-25.

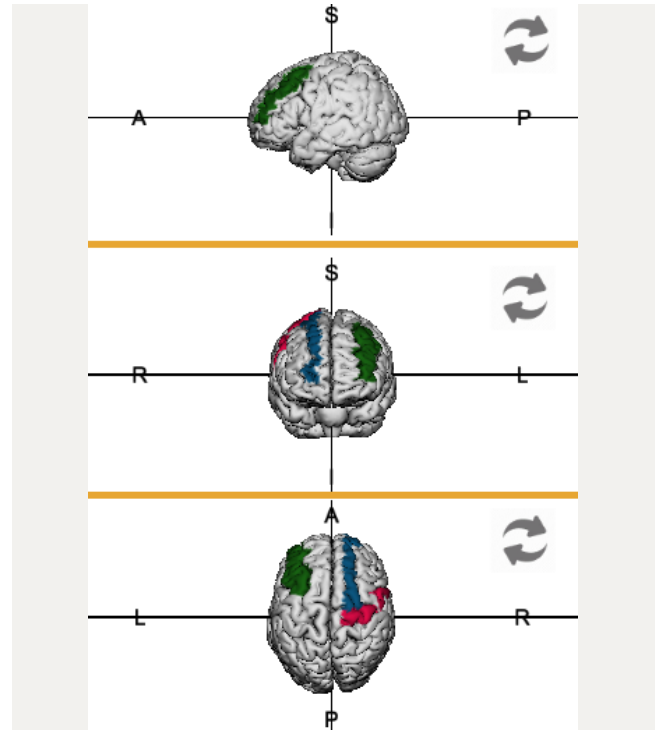
II. StimTargeter

The Stimtargeter is available online, on the Neuroelectrics® website: www.neuroelectrics.com/targeteditor

The Stimtargeter allows the user to interact with a computational 3D model of the brain. The model is based on Collins 27 data [2] and it displays both white and grey matter surfaces.

Neuroelectrics® provides this complex modeling tool to facilitate the input of targeting data by users of our Starstim montage optimization services. The main goal of the Stimtargeter is to help to accurately define the target brain region(s) to be affected by the stimulation.

[2] Miranda PC, Mekonnen A, Salvador R, Ruffini G. The electric field in the cortex during transcranial current stimulation. Neuroimage. 2013.Apr 15;70:48-58.



III.

Interface

The Stimtargeter allows the user to accurately identify the part, or parts, of the brain to be excited or inhibited during stimulation. The following elements are present in the Stimtargeter interface:

1 Action buttons

- ▶ **Save** – the user can save the work and upload the corresponding file to Neuroelectrics® server.
- ▶ **Reset** – the user can reset all his/her work so no areas are marked in the brain model.
- ▶ **Undo** – the user can undo the last action done.

2 Panels

- ▶ **Models** – the user may switch between grey and white matter surfaces, or load a previously created target mesh.
- ▶ **Paint tools** – allows the user to change the paint settings to properly identify the desired brain areas.
- ▶ **Default areas** – the user may identify any area of the brain classified as Brodmann Area (BA) or according to the Automated Anatomical Labelling (AAL) system.

3 Work-area

The main workspace displays the brain model. Use the mouse right-click to paint the brain areas; and the left-click and drag to rotate the model. With the mouse wheel, the model can be zoomed-in/-out. It is recommended to use a mouse with two buttons and wheel for optimal performance.

4 Orthogonal views

Regardless of the model orientation within the main workarea, it is possible to simultaneously visualize the model according to three of the six orthogonal views. Click on the arrows to switch between left/right, anterior/posterior or top/bottom views of the model.

5 Sliders

The sliders allow the visualization of inner parts of the brain surfaces, by slicing it according to the orthogonal planes:

- ▶ X-axis – sagittal plane
- ▶ Y-axis – axial plane
- ▶ Z-axis – coronal plane

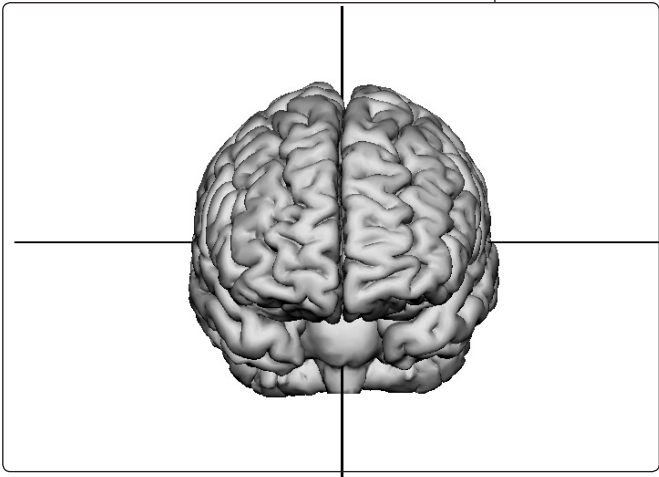
Neuroelectrics® Stimtargeter

1

Save
Reset
Undo

2

Default Areas
Paint Tools
Models



3

X - Axis Y - Axis Z - Axis

Invert Invert Invert

4

Three smaller 3D brain models are arranged vertically. Each model is shown with a different view: the top one is a superior view (labeled S at the top and P at the bottom), the middle one is an anterior view (labeled R on the left and L on the right), and the bottom one is a lateral view (labeled L on the left and R on the right). Each view includes a circular arrow icon to its right, indicating rotation. The views are separated by horizontal orange lines.

GM Loaded!

Reset View

v1.8

5

IV. Design

The Stimtargeter allows the user to accurately identify the part, or parts, of the brain to be excited or inhibited during stimulation.

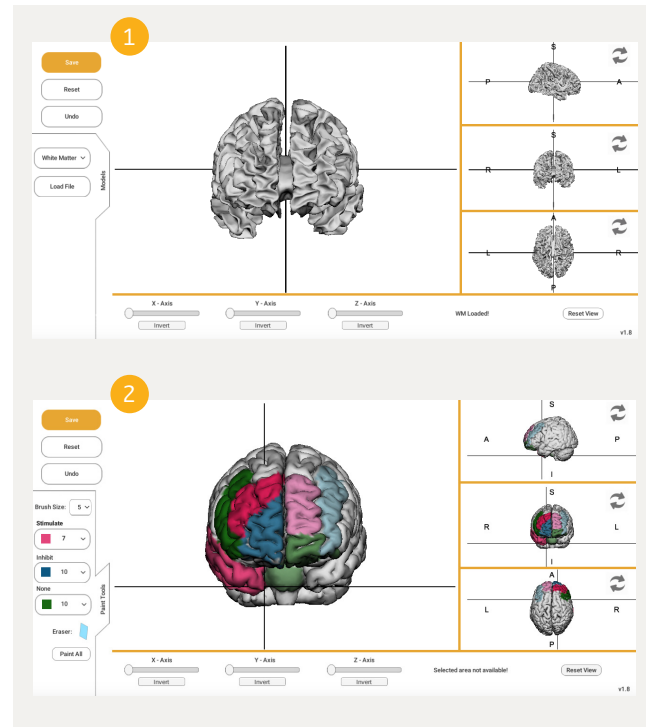
1 In the **Models** pane, select the brain surface you want to visualize and wherein you want to identify the stimulation target(s). Choose between white and grey matter surfaces.

2 In the **Paint Tools** pane, you can define the target brain areas by marking them on the brain surface. Use the following tools:

Brush Size: select the size of the free-painting brush tool.

Choose the desired **Effect** on the area to be painted:

- ▶ **Stimulate** – maximize the excitatory (anodal) effect of the electric field generated due to the stimulation
- ▶ **Inhibit** – maximize the inhibitory (cathodal) effect of the electric field generated due to the stimulation
- ▶ **None** – minimize the effect of the electric field generated due to the stimulation

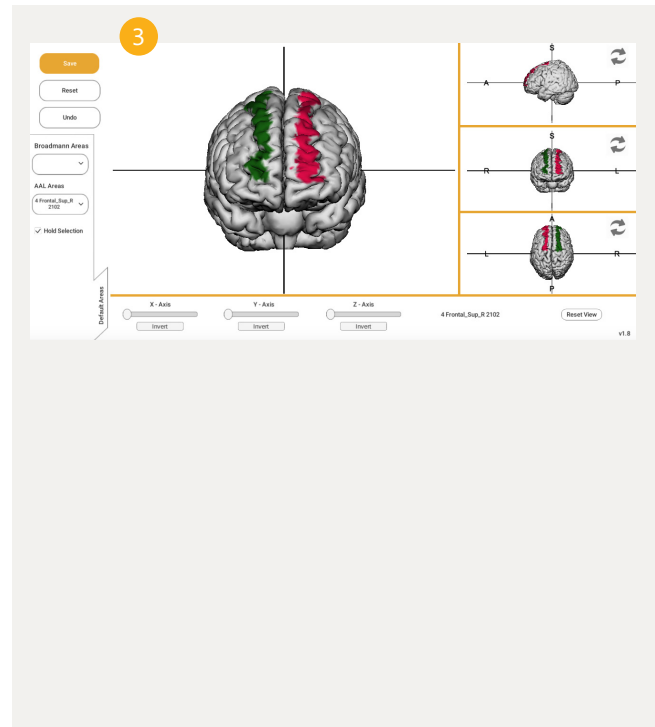


Weight

The weight of the effect shall be scaled from 1 to 10; with 1 corresponding to a weak weight (low priority), and 10 to a strong weight (high priority) of the chosen effect. The numeric values correspond to the relative importance of the selected areas. The chosen weight value will be reflected in a variation of the color gradient of the brush tool.

Eraser: the user can erase parts of the areas previously painted.

3 The **Default Areas** pane allows the user to select any brain area that corresponds to a Broadmann Area (BA) or to the Automated Anatomical Labelling (AAL) system. This option allows the user to select areas of interest based on commonly used brain topology maps instead of the free-painting brush tool. Keep in mind that each time an area is selected, it will be displayed with the color gradient of the effect and weight previously selected.



V. Online Form

After using the 3D brain model to identify the areas of the brain to be stimulated, scroll down and fill in the form. The form contains two sections: **Customer Information** and **Stimulation Parameters**.

1 Customer Information

Introduce your contact details: first and last names, institution, e-mail, phone number and country. The areas previously identified in the brain model will be loaded to Neuroelectrics® server and linked to your contact information. This way a fully personalized service is provided.

2 Stimulation Parameters

This section allows the user to add information relevant for the multi-electrode optimization system:

▶ Stimulation type

Choose the type of stimulation to use among direct (tDCS), alternated (tACS) and random-noise (tRNS) options.

▶ Current intensity per electrode

The maximum current intensity per channel, allowed with Starstim devices, is 2 mA. You may want to limit the maximum current per channel to values inferior to 2 mA.

▶ Total current intensity

Starstim devices do not deliver more than 4 mA in total (i.e. the sum of all channels), at any instant. You may want to limit the total maximum current to values inferior to 4 mA.

▶ Number of electrodes

Here you can constrain the number of stimulation channels you want to use for stimulation.

▶ Other considerations

Add any important information that you find relevant for the Stimweaver optimization.

1

Customer Information

First name*:

Enter name

Last name*:

Enter last name

Institution*:

Institution

Email*:

your_email@example.com

Phone:

+34 93 254 03 66

Country*:

2

Stimulation Parameters

Target data: Successfully added

Use the "Save" button in the Target Editor to update the data.

Type of stimulation*:

tDCS

Maximum current intensity at any electrode*:

Please specify the maximum current intensity for any electrode in mA (μ 4 mA)

Maximum Total Injected Current at any time*:

Please specify the maximum total injected current intensity in mA (μ 8 mA)

Desired number of electrodes*:

Please specify the number of electrodes to be used in the optimization: (e.g.: 4, 4-12, \geq 8)

Other considerations:

Write your message here

Describe in your own words the optimization problem. E.g., are certain areas to be avoided? Is this a multi-target problem? tDCS or tACS/tRNS? Is there a restriction in the number of electrodes to use?

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