

# Application Guide & Release Notes

**FAST(EST)MAP Shimming C2P**

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Center for Magnetic  
Resonance Research

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UNIVERSITY OF MINNESOTA

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# Conditions of Use

This package is provided to support collaborative research projects between the University of Minnesota and users of Siemens MRI equipment, in accordance with a current C2P agreement.

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# Overview

For general information on how to use FASTMAP and background literature, start here: <http://www.cmrr.umn.edu/~gruetter/fastmap.htm>

## Installation Procedure

**Important note:** Starting with versions **VE11C**, **VB19A**, and **VB20P**, the host uses McAfee Embedded Control (Solidifier) security software. It is necessary to switch Embedded Control into UPDATE mode before installing any custom sequences. Please see the `Embedded_Control_Mode.pdf` document included in this archive for instructions on how to switch the Embedded Control mode.

1. Login as “Advanced User”. *If the Advanced User account is not enabled or you do not know the password, contact Local Service.*
2. If the system has Embedded Control installed, start the MrEmbeddedControlGui and switch the Embedded Control system into UPDATE mode. *If you do not know the Administrator account name or password, contact Local Service.*
3. Extract the .zip file to a temporary directory.
4. Run the installer program. The installer will automatically restart various processes and reboot the imager if necessary to unlock shared objects.
5. If the installer reports any error, please power cycle the system and try again.
6. If a sample protocol is available for your system, it will appear at the end of the USER tree in the Exam Explorer. If a sample protocol is not available, create a default protocol in Exam Explorer by selecting Insert Sequence, USER, then fastestmap.
7. If the system has Embedded Control installed, re-enable host security and switch the Embedded Control system into the ENABLED mode.

# Usage

1. Acquire a suitable localizer image.
2. Open the *fastestmap* sequence.
3. The shim FOV is drawn graphically by sizing and positioning the voxel in the same manner as a single-voxel spectroscopy sequence. RF pulse durations and various settings can be found on the **Sequence|Special** card. **TR/TE/tau** can be set as usual on the **Contrast** card.

## NOTES:

- **Excite flip angle** adjusts the power of the adiabatic full passage excitation pulse ( $90^\circ$  = nominal/default)
  - **Refocus flip angle** adjusts the power of all of the adiabatic half-passage refocusing pulses ( $180^\circ$  = nominal/default).
  - **Bandwidth** is the total (spectroscopy-style) bandwidth, not bandwidth per-pixel.
  - **Vol fit factor** allows fitting the shims over a larger area than the prescribed voxel to account for selection profile inaccuracy.
  - Automatic coil receive phase correction is built into the ICE program, so it is preferred to use coil mode **Triple** when using matrix coils (this is the default).
  - It is helpful to start out with a decent base shim. Initial shim settings can be selected on the **System|Adjustments** card (select **Tune up** to start with predefined shims for a spherical phantom, or **Standard/Advanced** to begin with a Siemens 3D field map shim).
4. Select **Scan** to start the scan and automatically prepare the next iteration. Open the online display window to view the traces as they are acquired (in EPI mode, only the first and last echo are displayed). Generally, 2-3 iterations will be necessary and sufficient.
  5. When scanning and post-processing is finished (indicated by the shim fit plot appearing in the online display), type CTRL+ESC then 4 ("Set FASTMAP Shims") to open the shim-setting program.
  6. The shim-setting program will display the four most recent calculated shim sets. Select the shim set you wish to use, and these values will be applied using the Siemens *AdjValidate* tool. This is functionally equivalent to typing values into the manual adjustment interface and pressing "Apply".

Note that you may need to repeat this step if you later reposition your voxel/FOV, since shim settings are NOT globally persistent--they are remembered by the scanner only for the specific location ("adjust volume") to which they are applied. A workaround to this is to select "**Tune up**" shim mode for each sequence with which you wish to use FAST(EST)MAP shimming.

# Debugging

Log output for the ICE process can be read using the Siemens *logviewer* tool.

In the case of a severe error, please generate a savelog according to the procedure described in the included `Savelog_Instructions.pdf`.

# Acknowledgements

The reconstruction algorithm is based in part on the implementation for Varian INOVA systems originally developed by Rolf Gruetter and Ivan Tkáč.