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FAST(EST)MAP sequence for VB15A
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## FASTMAP Theory & Introduction

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

## Installation of the Sequence/ICE Program for VB15A

1. Unzip the distribution .zip file into a temporary directory.
2. Run the included install_fastmap_vb15a.bat
3. If necessary (most likely for upgrade installs):
    a. Run *ideacmdtool*; select "2. PAS unload"
    b. Restart the MRIR Image Calculation process

## Using the FAST(EST)MAP sequence for VB15A

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° = nominal/default)
    - **Refocus flip angle a**djusts the power of all of the adiabatic half-passage refocusing pulses (180° = 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 postprocessing 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.

## Current Limitations/Future Improvements

- In the current implementation, oblique rotated voxels are not fully supported. If the voxel is rotated, shims will be fit to the smallest sphere that can fully contain the voxel. If the voxel is not rotated, shims will be fit as well as possible to the exact voxel dimensions. It is recommended to maintain **Transverse** orientation and just change the voxel dimensions and position.
- It may be preferable in the future to use the “adjust volume” as the shim VoI instead of manually positioning a spectroscopy VoI. The “adjust volume” does not allow oblique rotations, however, so it would preclude the addition of this functionality.

## Debugging

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