

# MR Quick Steps

Diffusion Weighted Imaging (DW-EPI) & High B-Value Diffusion Weighted Imaging

## Step 1: Select the Protocol from the GE Protocol Library

- **H.7 8HR Brain ASSET**

## Step 2: Prepare and Position the Patient

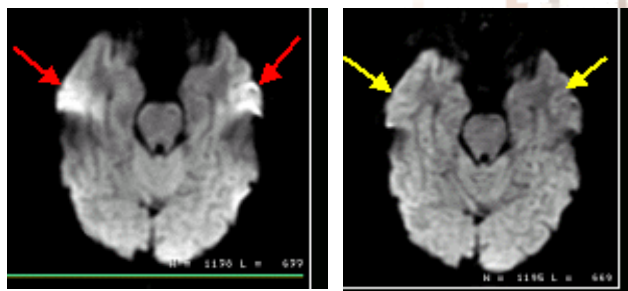
- Patient entry is HEAD first
- Choose the appropriate coil (Head or 8-Channel Brain Coil).
- Pad the patient to reduce the likelihood of artifacts related to motion
- Ask the patient to un-clasp hands
- Landmark to the nasion

## Step 3: Perform Localizer and ASSET CAL Series

- **Select and scan both the 3-plane localizer series and ASSET calibration scan in the protocol**

**FYI-** Be certain to include the entire brain anatomy in the ASSET calibration scan.

### Why ASSET with DWI- EPI?



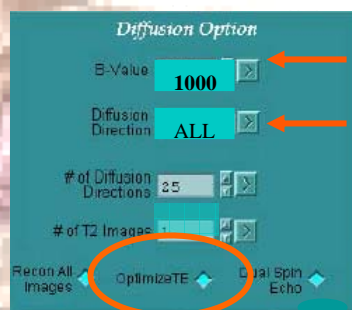
No ASSET

With ASSET

**Shorter EchoSpacing with ASSETx2 Diffusion-weighted EPI Reduces Commonly Seen Susceptibility Artifacts**

## Step 4: Perform DW-EPI

- Select the “DW-EPI with ASSET” series from the RX Manager.
- Prescribe an Axial Graphic RX DWI series.
- Select the Diffusion Options Screen and Enter the “Diffusion Direction ” and B-Value (and Opt. TE for High B-Value Scanning)



- Save Series/ Prepare to Scan / Scan

**FYI-** When performing DW-EPI, motion sensitive gradients may be applied in the phase, frequency and slice direction or all three directions simultaneously. There are four choices for the Diffusion Direction. They are:

**S/I** – Diffusion gradient is applied only in the S/I direction.

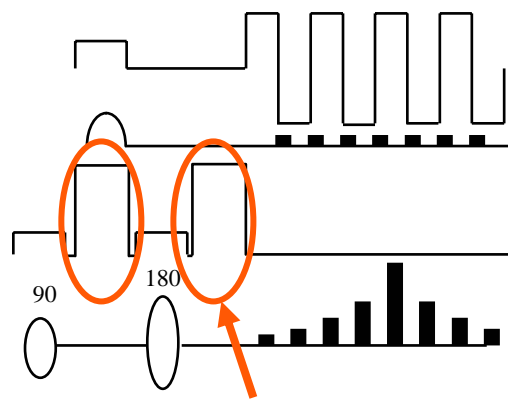
**A/P** - Diffusion gradient is applied only in the A/P direction

**R/L** - Diffusion gradient is applied only in the R/L direction

**ALL** - Diffusion gradients are applied in all three directions.

**IMPORTANT!** As “B-Value” increases, so does the diffusion weighting but at the expense of SNR! Select a B-Value that represents the best compromise between IQ and clinical benefit. Typical values for standard Diffusion Weighted Imaging is 900-1000s/mm<sup>2</sup>. For **High B-Value Diffusion Imaging**, you may select up to a 7000s/mm<sup>2</sup>. To help ensure IQ, consider utilizing more than one NEX to improve SNR and select **Optimize TE** to apply the lowest TE value.

### DW-EPI: How it Works

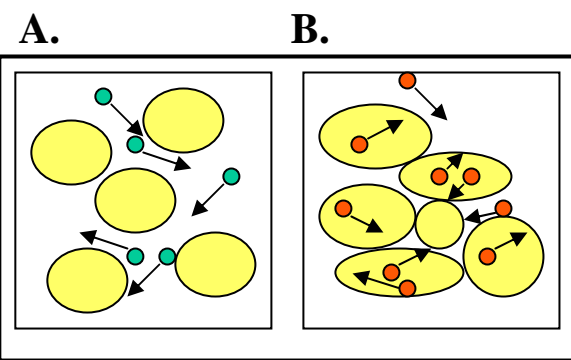


Diffusion gradients are applied before and after the 180 degree RF pulse. The example above illustrate the diffusion gradients applied slice direction (Z)

**DWI –EPI is a single-shot EPI** sequence designed to create images which illustrate differences in tissue signal intensity based on restriction of interstitial water molecule motion. To create this contrast diffusion gradients are applied in one or all of the following directions (R/L, A/P, L/R or ALL). If “All” is selected, the diffusion gradients will be applied in the frequency, phase and slice directions. Images from each direction are then combined to produce a single image at each slice location which demonstrates areas of diffusion restriction.

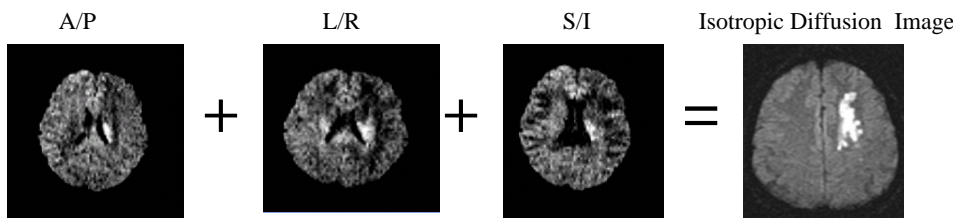
When the diffusion gradient is applied, the signal from protons bound in highly mobile water molecules dephase in the direction in which the gradient was applied. This means those same protons produce no signal and thus appear dark or hypo-intense on the final image.

Conversely, protons that are bound in molecules that are not moving (dead tissue) will not be dephased (figure B). The signal produced from these motionless protons should appear bright or hyper-intense on the final image. The end result of a DW-EPI acquisition should be a contrast difference between tissues with free diffusion, such as gray matter or CSF, and tissues with restricted diffusion, such as white matter or dead tissue.



**Diagram A:** Represents normally diffusing tissue resulting dark signal

**Diagram B:** Represents restricted diffusion resulting in bright signal



Since normal water diffusion does not necessarily occur in all three directions, the diffusion gradient must be applied in all 3 orthogonal planes. If only two directions were scanned, restricted motion that is normal for that direction might be misinterpreted as pathologic.



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