Axial vs Planar Gradiometers

At the DCCN we have a CTF 275 MEG system with axial gradiometers. For a description of the difference between axial and planar gradiometers you can look at the following website (see the bottom of the page):

http://www.brainvoyager.com/bvqx/doc/UsersGuide/EMEGSuite/EEGAndMEGChannelConfigurations.html

The montage for the MEG recording system at the DCCN can be found on the intranet:

https://intranet.donders.ru.nl/fileadmin/intranet_attachments/laboratories/meg/SensLayout-275.pdf.

For many analysis types, it makes sense to convert from axial to planar gradiometers because simulating planar gradiometers allows for easier visualization of the dipoles (i.e., it is easier to see 'where' the dipole is). The order in which you perform the steps involved in these computations is **very important** and can influence the characteristics of your data. A good description of why this is the case, along with the correct order(s) can be found on the FieldTrip website:

http://www.fieldtriptoolbox.org/example/combineplanar_pipelineorder/

In the lab, we generally follow the following order:

For ERF analysis:

1. Do timelocking analysis (use ft_timelockanalysis)
2. Compute the planar gradient (use ft_megplanar
3. Combine two planar componets (use ft_combineplanar)
4. If desired, run grand average (ft_timelockgrandaverage)

For frequency analysis:

1. If computer power in the ERFs (phase-locked), do timelocking analysis (use ft_timelockanalysis)
2. Compute the planar gradient (use ft_megplanar
3. Combine two planar componnets (use ft_combineplanar)
4. Do frequency analysis (use ft_freqanalysis)
5. If desired, run grand average (ft_freqgrandaverage)

Note, if you're computing planar gradiometers separately for different conditions, then the number of trials in each condition can also influence the amplitude of your signal (the computation of the planar gradiometers involves a non-linear step). You should ensure an equal number of trials per condition by taking a random sub-sample of trials from the condition(s) with more trials.