<http://dbic.dartmouth.edu/wiki/index.php/Slice_Acquisition_Order>

# Slice Acquisition Order

Determining Slice Acquisition Order

(thanks to Katherine Alfred for compiling this information)

Introduction:

The following describes how to determine slice acquisition order, e.g., for inputting into a text file to be read by FSL. (If you’re using AFNI, check out Andy’s Python script, located elsewhere on the wiki). The method differs depending on how you’ve chosen to export the volumes from the scanner.

Obtaining Slice Order from Existing Files:

If your data is in DICOM format, you can use the dcmstack program located here (<https://github.com/moloney/dcmstack>) to convert your DICOM data to Nifti format, while preserving metadata. Within the metadata, which can either be injected into a Nifti header extension or written out as a JSON text file, will be the slice order. If your data is in Nifti or Par/Rec formats, the slice order may not be preserved, and you may need to check your scanning protocol against the MR scanning options defined below. If your Nifti file does contain the slice orders, it can be located via these steps (<http://nifti.nimh.nih.gov/nifti-1/documentation/faq#Q20>). If the dim\_info is 0, the slice order was not preserved and will have to be recovered from your protocol and will be one of the options outlined below.

Philips Slice Timing Options:

1) DEFAULT - Philips default slice timing correction for a single package scan is as follows: 1, 3, 5, 7... 2, 4, 6, 8. If it is a multipackage scan, the slices are first distributed over packages, then it proceeds with first off, then even slices. For example, in a two package scan, it would be 1, 5, 9...3, 7, 11 in the first package and 2, 6, 10.... 4, 8, 12 in the second one.

2) ASCENDING - Single package ascending order slices are as follows: 1, 2, 3, 4, 5... from anterior to posterior, from left to right, and from foot to head. For multiple packages, it would be slice 1, 3, 5, 7 in the first package and 2, 4, 6, 8 in the second.

3) DESCENDING - Single package descending order slices are as follows: ...5, 4, 3, 2, 1 from posterior to anterior, from right to left, and from head to foot. For multiple packages, it would be slice ...8, 6, 4, 2 in the first package and ...7, 5, 3, 1 in the second one.

4) CENTRAL - In central slice order, the middle slice is measured first, and then outwards in a ping pong type order, such as: 3, 4, 2, 5, 1 or 4, 3, 5, 2, 6, 1.

5) REVERSE CENTRAL - Opposite from central order, reverse central measures the outer slices first and ping pongs towards the middle slice, such as: 1, 5, 2, 4, 3 or 1, 6, 2, 5, 3, 4.

6) INTERLEAVED - An advantage of interleaved order is the minimization of spillover from neighboring slices, since the time spacing between any set of neighboring slices is always large. On our scanner, the interleave index is estimated by the square root of the number of slices in a volume, rounded to the next integer. For example, a 10 slice interleave estimates to 3.162 and rounds to 3, making the slice order: 1, 4, 7, 10, 2, 5, 8, 3, 6, 9. If you are unsure about the integer rounding, the slice order can be determined by running your protocol with the phantom, viewing the logging display, and determining the interval between the s values on each line.

* We have 40 slices and a multiband of 2, with interleaved slice order
* SO, we need to solve for 20 slices in interleaved order.
* First get the square root:
  + sqrt(20)
  + ans = 4.4721
* Our slice ordering should be thus (i.e. adding by 4):

1, 5, 9, 13, 17, 2, 6, 10, 14, 18, 3, 7, 11, 15, 19, 4, 8, 12, 16, 20, 1, 5, 9, 13, 17, 2, 6, 10, 14, 18, 3, 7, 11, 15, 19, 4, 8, 12, 16, 20

* Our TR = 1110ms
* For afni we need to put the ordering in terms of seconds from the onset of the volume acquisition;
  + TR = 1.11;
  + num\_slices = 20;
  + slice\_order = [1, 5, 9, 13, 17, 2, 6, 10, 14, 18, 3, 7, 11, 15, 19, 4, 8, 12, 16, 20, 1, 5, 9, 13, 17, 2, 6, 10, 14, 18, 3, 7, 11, 15, 19, 4, 8, 12, 16, 20];
  + slice\_order\_TR = (slice\_order - 1) .\* (TR/num\_slices);
  + dlmwrite('slice\_order\_SNP\_MB2\_40slices\_interleaved\_AFNI.txt',slice\_order\_TR,'delimiter',' ');