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⊕ Processing of Radial K-space DW-MRI Data

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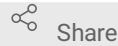
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ABSTRACT

The protocol includes reconstruction of diffusion weighted images from radial k-space data and using a 3-parameter fit to derive metrics of ADC and kurtosis index.

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1 Image reconstruction

Radially acquired diffusion-weighted images (DWIs) are reconstructed using the following steps:

1. Apply zero-order phase correction to each radial spoke using the average phase offset at the center slice of the lowest b-value image
2. Zerofill k-space by a factor of 2 to double field of view
3. Multiply signal of each point by its respective area on a Voronoi diagram of the points (including added zerofill points) in k-space
4. Re-grid each radially defined point to its nearest Cartesian coordinate using its Kaiser-Besel index
5. Apply Fourier transform to now Cartesian-defined k-space

This process can be easily conducted using the **CIRP Python library [link]**. Once the library is installed, the DWI reconstruction class can be imported using

```
from CIRP.DWI_processing import DWI_reconstructor
```

To instantiate the class, the image dimensions, b-values, readout resolution, and number of views must be defined:

```
img_size = [16, 96, 96] # [slices, yres, xres]
bvalues = [10, 535, 1070, 1479, 2141] # b-values
xres_ro = 128 # readout points per view
n_views = 403

reconstructor = DWI_reconstructor(image_size=img_size,
bvalues=bvalues,                   xres_ro=xres_ro, views = nviews)
```