iccoil

The coil geometry, in real space, is determined.

[called by: oculus:bs00aa.] [calls: windsf.]

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1.1 overview

1. Given an arbitrary representation of the coils, e.g. modular, helical-winding, saddle-coils, the coils are constructed in real space.

1.2 modular coils

1. The modular coils, $\mathbf{x}_i(t)$, are described as closed loops on a winding surface.

2. The coils are assumed to be periodic, $\mathbf{x}_i(t+2\pi) = \mathbf{x}_i(t)$, and i labels each coil.

3. The representation for modular coils is

$$\begin{aligned} \theta_i(t) &= Mt + \theta_{i,0} + \sum_{n=0}^{N_F} \left[\theta_{i,c,n}\cos(nt) + \theta_{i,s,n}\sin(nt)\right], \\ \zeta_i(t) &= Nt + \zeta_{i,0} + \sum_{n=0}^{N_F} \left[\zeta_{i,c,n}\cos(nt) + \zeta_{i,s,n}\sin(nt)\right], \end{aligned} \tag{1}$$

   where $N_F \equiv$ `NFourier`, $M \equiv$ `Mwinding` and $N \equiv$ `Nwinding`. (For conventional modular coils choose $(M,N) = (1,0)$, which is the default; and for helical coils choose e.g. $(M,N) = (2,10)$, which is LHD.)

4. The ζ-offset and the Fourier harmonics are as follows:

   $\theta_{i,0} \equiv$ `xto(i)`, $\zeta_{i,0} \equiv$ `xzo(i)`.

   $\theta_{i,c,n} \equiv$ `xtc(n,i)`, $\theta_{i,s,n} \equiv$ `xts(n,i)`, $\zeta_{i,c,n} \equiv$ `xzc(n,i)`, $\zeta_{i,s,n} \equiv$ `xzs(n,i)`;

4. The position of the coil in real space is then given by the geometry of the winding surface,

$$\mathbf{x}_i(t) \equiv \mathbf{x}_W(\theta_i(t), \zeta_i(t)), \tag{2}$$

   which is computed by windsf.