Curves with constant RDC values on the unit sphere.

Figure 1. A family of dipolar coupling solution curves, as seen looking down the x axis of the principal alignment frame, for a typical value of the rhombicity ($R = 1/3$). The central black dot represents the +x axis, which points up out of the page, whereas the +y and +z axes point to the right and vertically, respectively, in the plane of the page. The differently colored curves represent the solution Equations 6–8 and 12–14 for values of the dipolar coupling ranging from the one extreme ($D = D_{xx} = 2D_a$) to the other [$D = D_{yy} = -D_a - (3/2)D_r$] in steps of 0.25 $D_a$. Thus, the red curve corresponds to the unit vectors with dipolar coupling $D = 1.75 D_a$, the magenta curve to those with $D = 1.50 D_a$, the orange curve to those with $D = 1.25 D_a$, and so on. The solution curves for the critical dipolar coupling [$D = D_{xx} = -D_a + (3/2)D_r$] form two great circles that meet at the ±x axes and, hence, appear here as straight lines (in purple) radiating from the central black dot. These intersecting great circles divide the surface of the unit sphere into four sections (denoted as gores), which contain the +z, +y, −z and −y axes, respectively (clockwise from the top).

Figure taken from:
William J. Wedemeyer, Carol A. Rohl, Harold A. Scheraga.
Exact solutions for chemical bond orientations from residual dipolar couplings.