Proposal for new geometry settings in Line integrated signals

EDRG   17/12/2009   Rev.2 (16/12/2010)

I – Present status (until dataversion 4.07c)

- First pivot point + Two angles + Second pivot point
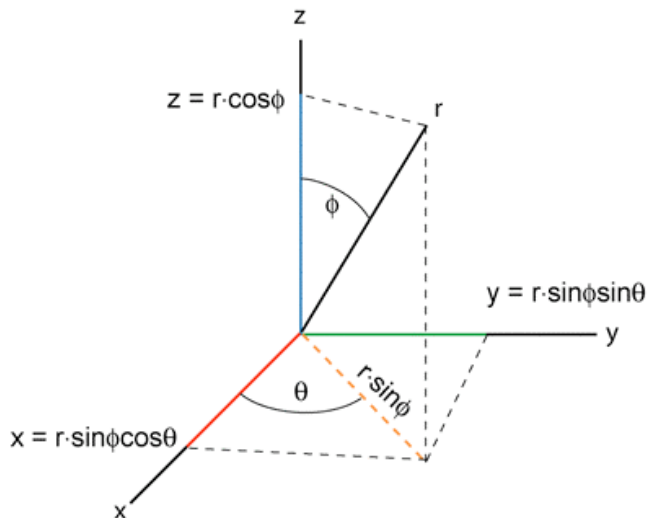
- Poloidal and toroidal angles are defined :

→ polchordang - Viewing angle in poloidal plane [rad]; 0 is directed towards low field side, pi is towards high field side. Positive is anti-clockwise when viewed with low field side at the right
→ torchordang - Viewing angle in horizontal plane [rad]; positive is anti-clockwise when viewed from above.

This representation has caveats whenever we have lines lying in a plane perpendicular to the R-Z plane sharing the same pivot point on that plane. Polchordang=Pi/2 and torchordang=0,2Pi

II – Proposed fix

- First pivot point + Two angles + Second pivot point.

- *horchordang* (θ) and *verchordang* (ϕ) angles are defined according to the Figure below.

Convention
→ First pivot point lies at the origin.
→ xz-plane is the poloidal plane : x-axis ⇔ R-axis and z-axis ⇔ Z-axis. The y-axis points to increasing toroidal angle in a (R,Phi,Z) c.s.
→ $\theta \in [0,2\pi]$ and $\phi \in [0,\pi]$: vertical chords have $\phi=0$ (laser fired bottom-up) or π and θ is not defined. In the latter case default values ought to be set (horchordang = −1 suits the purpose)

Conversion

The change in the data structure is effective from ***4.08a onwards***.

Let's show how to convert from the past to the present definition (from the machine descriptions available for 4.07 data structures) :

- FTU : series of purely vertical chords, contained in a poloidal cross-section : polchordang = $\pi/2$, torchordang = 0 → horchordang is set to –1 and verchordang is 0
- Tore Supra : series of chords with various angles, contained in a poloidal cross-section : polchordang = various values, torchordang = 0, becomes :
    - o For the set of quasi-vertical chords going from the top of the chamber to the bottom (polchordangle ~ -$\pi/2$) :
        - Horchordang = (0 if polchordang + $\pi/2$ > 0) ; (π if polchordang + $\pi/2$ < 0)
        - Verchordang = π – abs(polchordang + $\pi/2$)
    - o For the set of quasi-horizontal chords going from LFS to HFS : (polchordangle ~ +/-π) :
        - Horchordang = π
        - Verchordang = ($\pi/2$ + (polchordang + π) if polchordang < 0) ; ($\pi/2$ - (π - polchordang) if polchordang > 0)
- MAST : one chord in a horizontal plane : polchordang = 0, torchordang = 55 (degrees) → horchordang = $\pi/2$ + π(55/180) and verchordang = $\pi/2$