**Position Angle (Φ) and Separation (Δθ)**

*Position angle (Φ) and separation (Δθ)* are a coordinate pair used to describe the sky position of one celestial object with respect to a second (usually more prominent) object, e.g., Φ and Δθ are often used to specify the position of the fainter star in a binary star system with respect to the brighter member.

*Position angle (Φ)* is defined as the angle subtended, at the position of the reference object, between the direction of the north celestial pole (NCP) (or some other reference direction) and the direction of the object whose position is being described. The sign convention is to measure eastward with respect to the NCP direction. Hence Φ can range from 0° to 360°. It is 0° for an object due north of the reference object, 90° for an object due east, 180° for an object due south and 270° (or -90°) for an object due west.

*Separation (Δθ)* is defined as the angular distance between the two objects. Hence Δθ is always positive. It can range from 0° to 180°.

Please note the (1) the accompanying figure is drawn from an observer’s perspective, i.e., from inside the celestial sphere, looking out. Thus east is to the left and west to the right, opposite the convention on geographic maps. (2) The two apparently straight lines in the figure are great circle segments. (3) For some purposes, the basic reference direction, i.e., that of the NCP, can instead be taken as some other direction, e.g., that of the north ecliptic pole (NEP) or the north galactic pole (NGP). (4) If Δθ is small, then it can be approximated as the hypotenuse of a right triangle and one can use the Pythagorean relationship,

\[ (Δθ)^2 \approx (Δα \cos δ)^2 + (Δδ)^2, \]

Where Δα is the right ascension difference and Δδ is the declination difference for the two objects. If this relationship is used, one must take care to express Δα in convention units of angular measure, rather than units of time. δ in the expression \( \cos δ \) should be taken as the average value of δ for the two stars.