Contribution ID: **538** Type: **Poster Presentation**

A circular current's duo Cartesian magnetic dipolar model and limitations on fields as spatial derivatives of potentials

Tuesday, 9 July 2013 17:40 (1 hour)

Abstract content
   (Max 300 words)

It is shown that spatial derivatives of the general component and total magnetic vector potentials in the circular current's duo Cartesian magnetic dipole model successfully yield the correct related component and total magnetic fields. This is unlike the functionally limited traditional component magnetic vector potentials derived in specific Cartesian planes. We attributable the limitation to such component magnetic vector potentials' lack of the minimum number and type of variable coordinates, which is exactly that set of coordinates completely describing the position of the source. When the circular current lies in the xy-plane, the minimum coordinate set is the Cartesian x and y, or the cylindrical rho and phi or the spherical r and phi coordinates. A similar effect is found in the determination of the electric field from the electric scalar potential of an axially (z-axis) orientated electric dipole, for which the minimum set of variable coordinates is simply the single Cartesian or cylindrical z or the spherical r coordinate. Thus in the xy-plane, spatial derivatives of the component magnetic vector potentials yield the related magnetic fields, while the spatial derivative of the electric scalar potential does not give the electric field in that plane. Meanwhile, on the z-axis no magnetic field is obtainable as a partial derivative of a corresponding magnetic vector potential, but the electric field is obtainable from the related electric scalar potential. Thus it is not surprising that the traditional ad hoc definition of a circular current's magnetic dipolar moment, based on the functionally limited component magnetic vector potentials, is incorrect by a factor of 2.

Apply to be
 considered for a student
   award (Yes / No)?

no

Would you like to
 submit a short paper
 for the Conference
 Proceedings (Yes / No)?

Yes

Primary author: Dr CHIRWA, Max (Walter Sisulu University)

Presenter: Dr CHIRWA, Max (Walter Sisulu University)

Session Classification: Poster1

Track Classification: Track A - Division for Condensed Matter Physics and Materials