Notation for position vector in biot savart law at the axis of circular current loop

s

Notation for distance of position with center of circle in biot savart law at the axis of circular current loop

r

Notation for distance of radius of circle in biot savart law at the axis of circular current loop

a

Angle between current element and position vector in biot savart law at the axis of circular current loop

90

Notation for angle between distance of position from center of circle and position vector in biot savart law at the axis of circular current loop

$$\phi$$

List of resolution of components of magnetic field element in biot savart law at the axis of circular current loop

- Perpendicular
- Axial

Expression for perpendicular resolved magnetic field element in biot savart law at the axis of circular current loop

$$dB\cos\phi$$

Expression for axial resolved magnetic field element in biot savart law at the axis of circular current loop

$$dB \sin \phi$$

Consequence of perpendicular opposite resolved magnetic field elements in biot savart law at the axis of circular current loop

Cancel each other

Consequence of axial components in resolved magnetic field elements in biot savart law at the axis of circular current loop

Added up

Expression for magnetic field element in biot savart law at the axis of circular current loop

$$dB = \frac{\mu_0}{4\pi} \frac{Idl}{s^2}$$

Expression for sine of phi in biot savart law at the axis of circular current loop

$$\sin \phi = \frac{a}{s}$$

Initial expression for Total magnetic field at position in biot savart law at the axis of circular current loop

$$B = \int dB \sin \phi$$

Derivation for expression of total magnetic field at position in biot savart law at the axis of circular current loop

-

$$B = \int \frac{\mu_0}{4\pi} \frac{Idl}{s^2} \frac{a}{s}$$

- $$B = \frac{\mu_0}{4\pi}\frac{Ia}{s^3}\int dl$$
- $$B = \frac{\mu_0}{4\pi}\frac{Ia}{s^3}2\pi a$$
- $$B = \frac{\mu_0}{2}\frac{Ia^2}{s^3}$$
- $$B = \frac{\mu_0 Ia^2}{2(r^2+a^2)^{\frac{3}{2}}}$$

Expression for total magnetic field at position in biot savart law at the axis of circular current loop

- $$B = \frac{\mu_0 NIa^2}{2(r^2+a^2)^{\frac{3}{2}}}$$

Vector form of Expression for total magnetic field at position in biot savart law at the axis of circular current loop

- $$\vec{B} = \frac{\mu_0 NIa^2}{2(r^2+a^2)^{\frac{3}{2}}} \times \hat{i}$$

Expression for total magnetic field at position of coil of N turns in biot savart law at the axis of circular current loop

- $$B = \frac{\mu_0 NIa^2}{2(r^2+a^2)^{\frac{3}{2}}}$$

Expression for total magnetic field at the distance of very very large position in biot savart law at the axis of circular current loop

- $$B = \frac{\mu_0 NIa^2}{2r^3}$$

Expression for total magnetic field at an axial point at a distance equal to the radius of the coil in biot savart law at the axis of circular current loop

- $$B = \frac{\mu_0 N I a^2}{2^{5/2} a}$$

Nature of graph of variation of magnetic field along the axis of a circular current loop in biot savart law

Inverted V

Representation of graph of variation of magnetic field along the axis of a circular current loop in biot savart law

[Illustration Missing]

Inverted V

Differential equation for expression of magnetic field at the axis of solenoid from biot savart law

- $$dB = \frac{\mu_0 n I a^2}{2 s^3} dx$$

Notation for axis of solenoid in magnetic field at the axis of solenoid from biot savart law

x

Derivation for expression of position vector at the axis of solenoid form biot savart law

- $$\sin \phi = \frac{a}{s}$$
- $$s = \frac{a}{\sin \phi}$$
- $$s = a \operatorname{cosec} \phi$$

Expression of position vector at the axis of solenoid from biot savart law

- $$s = acosec\phi$$

Derivation for expression of distance element in magnetic field at the axis of solenoid form biot savart law

- $$\tan\phi = \frac{a}{x}$$
- $$x = \frac{a}{\tan\phi}$$
- $$\frac{dx}{d\phi} = acosec^2\phi$$
- $$dx = acosec^2\phi d\phi$$

Expression for distance element in magnetic field at the axis of solenoid from biot savart law

- $$dx = acosec^2\phi d\phi$$

Derivation for general equation of magnetic field at the axis of solenoid from biot savart law

- $$dB = \frac{\mu_0 nIa^2}{2a^3 cosec^3\phi} acosec^2\phi d\phi$$
- $$dB = \frac{\mu_0 nI}{2}\sin\phi d\phi$$
- $$B = \frac{\mu_0 nI}{2}[\cos\phi_1 - \cos\phi_2]$$

General equation of magnetic field at the axis of solenoid from biot savart law

- $$B = \frac{\mu_0 nI}{2}[\cos\phi_1 - \cos\phi_2]$$

Magnitude of phi 1 for solenoid of infinite length in magnetic field at the axis of solenoid form biot savart law

0

Magntidue of phi 2 for solenoid of infinite length in magnetic field at the axis of solenoid form biot savart law

180

Derivation for expression of magnetic field at the axis of infinitely long solenoid from biot savart law

- $$B = \frac{\mu_0 nI}{2}[1 + 1]$$
- $$B = \frac{\mu_o nI}{2}2$$
- $$B = \mu_0 nI$$

Expression of magnetic field at the axis of infinitely long solenoid from biot savart law

$$B = \mu_0 nI$$