Nature of force between two conductors having the same direction of current

Attractive

Nature of force between two conductors having opposite direction of flow of current

Repulsive

Derivation for expression of force per unit length in two conductors having same direction of current

- $$B_1 = \frac{\mu_0 I_1}{2\pi r}$$
- $$F_{21} = B_1 I_2 l \sin 90$$
- $$F_{21} = B_1 I_2 l$$
- $$F_{21} = \frac{\mu_0 I_1 I_2 l}{2\pi r}$$
- $$\frac{F_{21}}{l} = \frac{\mu_0 I_1 I_2}{2\pi r}$$
- $$B_2 = \frac{\mu_0 I_2}{2\pi r}$$
- $$\frac{F_{12}}{l} = \frac{\mu_0 I_1 I_2}{2\pi r}$$

Derivation for expression of force per unit length in two conductors having opposite direction of flow of current

- $$B_1 = \frac{\mu_0 I_1}{2\pi r}$$
- $$F_{21} = B_1 I_2 l \sin 90$$

- $$F_{21} = B_1 I_2 l$$
- $$F_{21} = \frac{\mu_0 I_1 I_2 l}{2\pi r}$$
- $$\frac{F_{21}}{l} = \frac{\mu_0 I_1 I_2}{2\pi r}$$
- $$B_2 = -\frac{\mu_0 I_2}{2\pi r}$$
- $$\frac{F_{12}}{l} = -\frac{\mu_0 I_1 I_2}{2\pi r}$$

Expression of force per unit length in two conductors having same direction of current

- $$\frac{F_{12}}{l} = \frac{\mu_0 I_1 I_2}{2\pi r}$$

One ampere in terms of force between parallel conductors

- Steady current
- Parallel infinitely long
- Negligible CSA
- Vacuum
- 1 m distance
- Force of
$$2 \times 10^{-7} Newton$$

Magnitude of force in one ampere current

- $$F = 2 \times 10^{-7} \frac{N}{m}$$