Concepts

概 念

主要概念与定义 Main concepts and definitionss

比损耗因子
Specific Loss factor

称比损耗因子，与材料几何尺寸无关，表示小信号下材料的损耗特性。

is called specific loss factor, which is independent of geometrical size of material, indicating small signal loss characteristic of the material.

$$\frac{tg\delta_m}{\mu_i} \quad \text{or} \quad \frac{tg\delta}{\mu_i}$$

气隙的影响
The influence of gap

当磁路中有气隙时，其损耗因子为带气隙损耗因子，(tg δ)gap与无气隙时损耗因子的关系为：

因μ_e、μ_i>>1，所以有:

由于μe<μi，所以开气隙后，损耗因子减小，Q值增加。磁芯开制气隙后，磁芯内部磁场强度Hi大大减小，由Hi=He–Hd=He–NM可以看出，退磁因子N越大，Hi越小。这里He是绕组通以电流后产生的磁场(He=$\frac{NI}{Le}$)，M是磁化强度。退磁因子为0—4π，对闭路磁芯N=0，气隙越大，N越大，反之亦然。开制气隙可增加磁场和温度的稳定性。

When the magnetic circuit is unclosed with a gap, the loss factor is called gap loss factor(tgδ)gap, The relation between gap loss factor and loss factor without the gap is:

Because μ_e, μ_i>>1, the above equation becomes

Where μ_e<μ_i , It is clear that (tgδ)gap>tgδ, Q value increasing

After the gap is made, the internal magnetic intensity of core decreases in large scale, form the formula Hi=He-Hd=He-NM, we could see when demagnetising factor N increases, Hi will decrease on the contrary. Here He is the magnetic field produced by the winding with current ($He=\frac{NI}{Le}$), m is intensity of magnetization, demagnetising factor is 0~4π, if magnetic circuit is closed,N=0, when the gap is bigger, demagnetising factor is bigger,and it is the same on the contrar y. Gap-making will increase the stability of magnetic field andtemperature.

$$\frac{(tg\delta)_{gap}}{\mu_e - 1} = \frac{tg\delta}{\mu_i - 1}$$

$$\frac{(tg\delta)_{gap}}{\mu_e} = \frac{tg\delta}{\mu_i}$$

即有 ie $$(tg\delta)_{gap} = \frac{tg\delta \cdot \mu_e}{\mu_i}$$

品质因素Q
Quality factor Q

磁性器件作滤波器的电感时，通常用品质因素(Q)来表示它的质量，品质因素 ，

R_{tot}表示总电阻，它是线圈和磁芯的总电阻。
tg δ 表示损耗，包括磁芯损耗、铜线损耗。
Q与频率和绕组参数有关。

When magnetic device is used as electric inductance in wave filter, its property is usually characteriaed using quality factor Q.

When R_{tot} is total resistance including coil and core resistance. tgδ indicates loss including magnetic core loss and copper wire loss. Q value is closely related to frequency and coil parameters.

$$Q = \frac{1}{tg\delta} = \frac{\omega L}{R_{tot}}$$