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EMC measurements

Due to the increasing use of electronic equipment in homes and offices, there is a growing concern about electromagnetic pollution.

As a result, regulations are being imposed on the permitted levels of radiation from electronic equipment, as well as its sensitivity to incoming radiation.

Verification of the EMC-performance of e1ectrica1 and e1ectronic products has to be carried out before bringing these on the market.

Immunity standards, e.g. IEC 801-3 and the European norm EN 55101-3 require homogeneous RF-fields over the EUT's surface area where deviation from the required fieldstrength shall be less than ± 3 dB or – 0 /+ 6 dB.

Measurements used to be performed in remote open-air sites to avoid incoming radiation from radio transmitters and reflections on walls. Indoor measurements are also possible in absorber-lined anechoic rooms. Walls and ceilings of existing shielded rooms are covered with foam absorbers to attenuate reflected radiation.

A drawback of these absorbers, however, is that they have to be rather thick (1 to 2 m) to be effective in the lower frequency range below 100 MHz, thus limiting the usable space in the room. Also it is difficult to apply them on the floor.

Ferrite absorber tiles

A new approach is to cover the walls with ferrite tiles, which save space and improve the absorption quality of the room down to frequencies of 10 MHz.

The main advantages of the ferrite solution are:

Space effective

Fire-retardant

Cost effective

Impedance matching

A common problem is the impedance matching to free field. The dielectric constant of ferrite material is almost constant over the entire frequency range of interest, while the permeability changes. By proper tuning of this complex permeability, optimal matching and absorption can be obtained.

The EM-wave impedance of the ferrite material is given by:

$$\eta_{ferrite} = \eta_0 \sqrt{(\mu_r / \varepsilon_r)}$$

Optimal matching occurs when $\mu_r \approx \varepsilon_r$

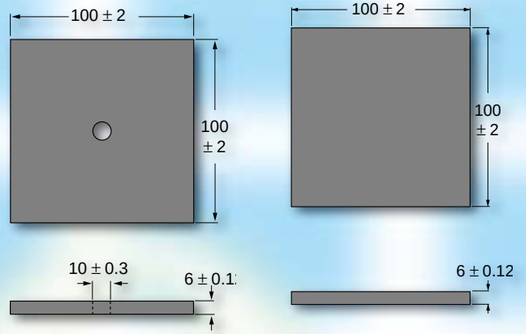
As ferrite material has a higher permittivity and permeability than air and therefore a lower propagation velocity, wave-diffraction always occurs towards the normal vector on the surface of the ferrite tile for the incident wave. The EM- energy which has entered the ferrite material will not be re-radiated again from a certain angle of incidence onwards.

This phenomenon makes the ferrite tiles very interesting because absorption is then determined by impedance matching only.

Ferroxcube 4S60 tiles

Our range of ferrite tiles was developed to give optimum absorption of impinging electromagnetic waves in the frequency range 30 MHz to 1 GHz. The damping graph below shows the normal incidence return loss of a 6 mm tile in 4S60 material, measured in a coaxial line. Attenuations between 10 and 30 dB are reached between 10 MHz and 1 GHz, sufficient to bring the characteristics of an EMC measuring room within ± 3 dB of open site conditions.

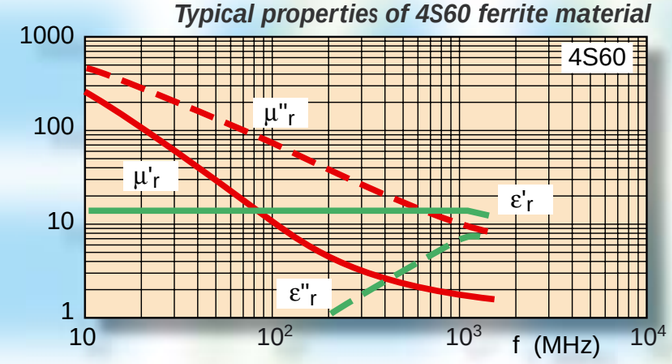
Ferrite tiles can also be effective in avoiding reflections from buildings or vehicles, and to screen parts of electronic equipment or bunches of cables.



other dimensions upon request

Material	Frequency range	Mass (g)	Type number
4S60	10 - 1000	≈ 300	PLT100/100/6/H-4S60
			PLT100/100/6-4S60

Typical properties of 4S60 ferrite material



Typical damping curve of 4S60 tiles measured in a coaxial line