

## Magnetic fields from AM-Type EAS Gate and Induced Electric Field in the Body

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Acousto-magnetic (AM) type electronic article surveillance (EAS) systems are widely used in shops in commercial facilities. They employ pulsed magnetic field (MF) of intermediate frequency (IF) at 58 kHz with high peak amplitude of tens of microtesla.

In this study we investigated characteristics of the waveform of IF-MF from AM-type EAS gate. It was found that the waveform a pulse is about 1.8 ms pulse of 58 kHz with pulse intervals of about 13 or 26 ms. Two different types of pulse are emitted with different amplitude and direction of MF vectors. The difference derives from the phases of currents in two coils included in a panel. The currents in the two coils are in-phase or anti-phase with complex sequences. An example of the sequence is shown in Figure 1.

Because of the simple structure of the coils the magnetic field distribution is easily calculated by Biot-Savart's law assuming models of the two coils. The results were validated by comparison with the measured magnetic fields assuming the current values obtained by measurement by current probes.

The incident field to human body passing through the gate was 41 and 35  $\mu\text{T}$  for in- and anti-phase, respectively. These values are 152 and 130 % of the reference level of ICNIRP guideline. Induced current density in a human body is calculated by impedance method with TARO model developed by NICT. The results of the 99 percentile maximum induced electric field are 0.45 and 0.39 V/m for in- and anti-phase, respectively. The results are 5.75 and 4.98 % of the basic restriction of ICNIRP guideline

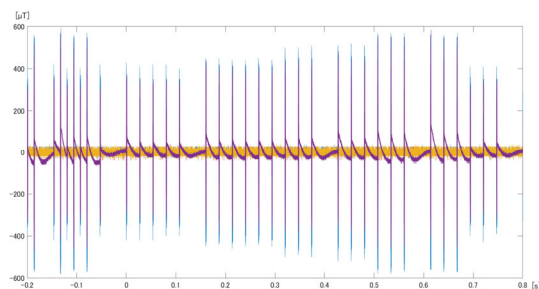


Figure 1. An example of pulse trains

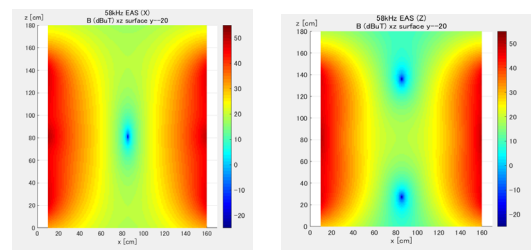


Figure 2. Distributions of magnetic fields for in-phase (left) and anti-phase (right) currents.

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## References

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