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EXPERIMENTAL RESULTS ON THE HIGH POWER AUDIO SPEAKER VIBRATION

Liliana Căiniceanu[1], Constantin D.Stănescu[2], Tudor Burlan[3]
[1]Prof.ing. doctorand Universitatea Politehnică, Bucureşti, e-mail:lili_cainiceanu@ yahoo.com
[2]Prof.univ.Dr.ing., Universitatea Politehnică, Bucureşti, e-mail:prof_cstanescu@yahoo.com
[3]Prof.Fiz. -doctorand Universitatea Politehnică Bucureşti, e-mail:burlan.tudor@ yahoo.com

Abstract: *This paper presents the experimental results of using NdFeB permanent magnetsin high power audio speakers to substantially reduce vibrations.*
Experimental researchs,on the Permanent Magnet ,in High Power Audio Speakers ,the authors Dynamic Simulation Electromecanical System using ANSYS.
Keywords: *magnetic induction, air gap ciruits,*

1.INTRODUCTION

Magnetic performed measurements for audio speaker, provided by SC ELCOMP SA, followed rezultates knowledge and correlation of simulation with experimental results obtained on reference magnetic circuits. These measurements were made with a coil fluxmetru with fluxmetric or compensated probe of potential. Also made measures of a very thin gausmetru Hall probe. Measurement of gausmetru with thin Hall probe is made with a high degree of uncertainty due to impossibilities placement and maintaining the Hall probe in maximum magnetic points of induction of air gap ciruits. Compesated coils are consisted of five turns per coil.

2.EXPERIMENTAL RESULTS

The points where the measurements were made using magnetic potential probe are represented In Figure 1. Points where measurements were made on the drawing are follows: point a. corresponds to Φ_α flow, point b -. Φ_β flow and points g,, d and e correspond respectively flows Φ_γ, Φ_δ, Φ_ε.
In Tables 1,2 and 3 are the results of magnetic measurements performed on three different magnetic circuits. Values are an average of six different measurements. $\mu_0 H_u^1$ value is obtained by extracting the coil, and the value is obtained from the difference .
$\Phi_\beta - \Phi_\gamma$.flows .
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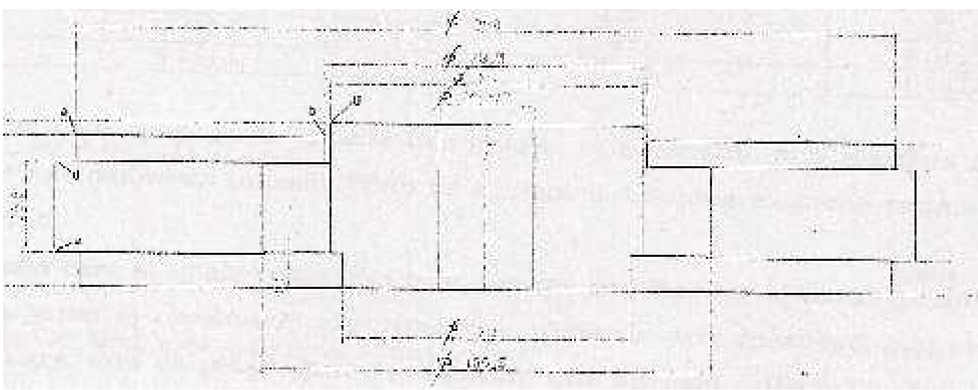

Figure 1. Points where measurements were made on the magnetic circuites.

Table 1. The results of magnetic measurements for the first high power device

$\mu_0 H_u^1$ [T]	$\mu_0 H_u^2$ [T]	B_m [T]	$\mu_0 H_m$ [T]
1,0889	1,0004	0,2160	0,05419
1,1300	1,0069	0,2140	0,05033
1,1029	1,0662	0,2140	0,052264

Table 2. The results of magnetic measurements for the second high power device

$\mu_0 H_u^1$ [T]	$\mu_0 H_u^2$ [T]	B_m [T]	$\mu_0 H_m$ [T]
0,4945	0,6844	0,1861	0,047407
0,4902	0,6795	0,2179	0,046893
0,4892	0,6844	0,2192	0,048127
0,4881	0,7009	0,1869	0,049361

Table 3 The results of magnetic measurements for the third high power device

$\mu_0 H_u^1$ [T]	$\mu_0 H_u^2$ [T]	B_m [T]	$\mu_0 H_m$ [T]
0,7109	0,8446	0,1053	0,062518
0,7746	0,8227	0,1173	0,061248
0,7746	0,8281	0,0812	0,069114

Table 4 includes the avarage values of mesurements $\mu_0 H_u^1$ si $\mu_0 H_u^2$ corresponding value obtained by simulating the program FEMM, respectivejy $\mu_0 H_u^3$.

Table .4. Comparison between measured values and those obtained by simulations

Device	$<\mu_0 H_u^1>$[T]	$<\mu_0 H_u^2>$ [T]	$\mu_0 H_u^3$ [T]
1.	1,1073	1,0245	1,0215
2.	0,4905	0,6873	0,6155
3.	0,7534	0,8318	1,1822

Differences which arise between measured values and those obtained by simulation for the measurement device. 3 is due to the inability to bring the permanent magnet of saturation in the magnetic circuit

The conclusion results from comparing the simulation results achieved and the experimental results obtained by magnetic measurements on the three devices electrodynamic is that simulation program is appropriate to use in designing of magnetic circuits for high power devices.

3. THE INFLUENCE OF UNWANTED AIR GAP ON THE OPTIMAL OPERATION OF HIGH POWER ELECTRODYNAMIC AUDIO DEVICE

Previous simulations did not take into account unwanted air gap between polar plates and permanent magnet This air gap is due to the adhesive film existence between the polar parts and permanent magnet, but also can be generated by the surface with the large roughness of polar parts that come in contact with permanent magnet.

We studied the influence of the unwanted air gap according to the magnetic circuit geometry.

Unwanted air gap was introduced between the lower plate and the permanent magnet. It actually represents an amount of air gap that occurs both in the upper and lower permanent magnet. It used to ease drawing the magnetic circuit in program. Maximum magnetic flux density values obtained in air gap were considered in the same point. It take into account unwanted air gap for each simulation separately.

In these simulations magnetic material is barium ferrite and ferromagnetic material for polar plates and steel vault is OL37. Unwanted air gap size was varying between 0.2 mm and 1.2 mm.

In Figures 2-4 are detailed flow distribution in air gap studied the parasite was introduced successively from 0.2 mm air gap to 0,6 mm, the growth rate of 0.2 mm.

. The appearance of only 0.2 mm unwanted air gap leads to a decrease in air gap induction due to 10% (Fig. 2).

Further decrease in the rate of magnetic induction in air gap is less useful, such as an unwanted air gap of 1.2 mm lower total parasite is approximation 88%.

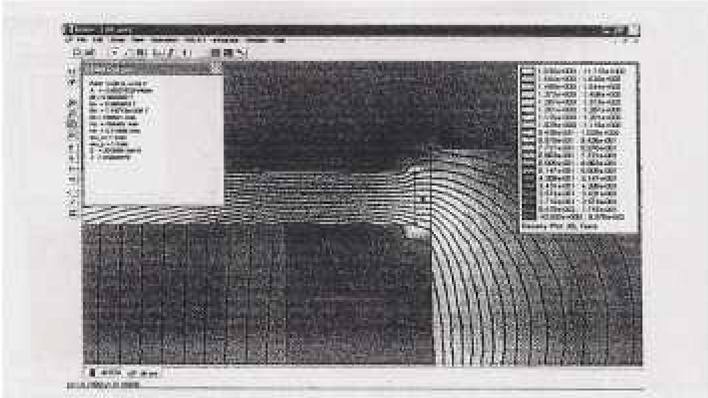

Figure 2. Distribution of magnetic flux in useful air gap for unwanted air gap by 0,2 mm between polar parts and ferrite ; |B| =0,9656 T

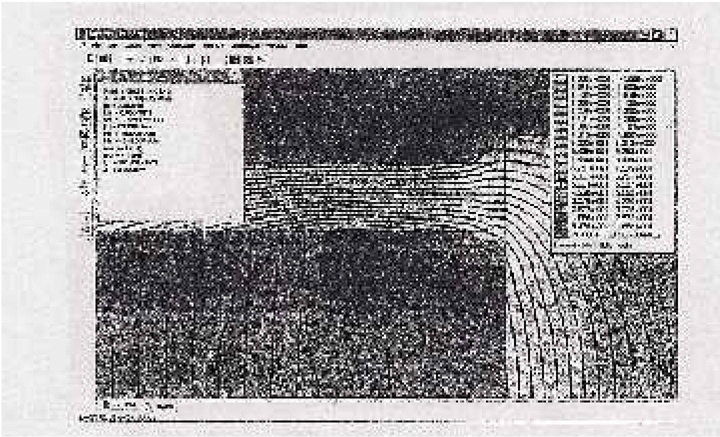

Figure 3. Distribution of magnetic flux in useful air gap for unwanted air gap by 0,4 mm; between polar parts and ferrite |B| =0,9537 T

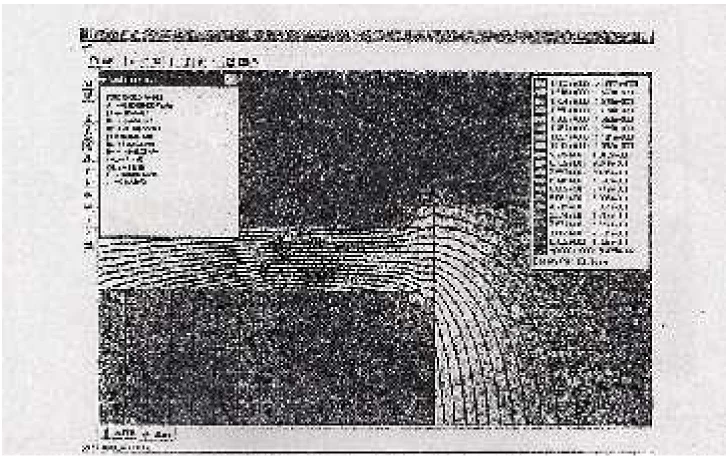

Figure 4. Distribution of magnetic flux in useful air gap for unwanted air gap by 0,6 mm; between polar parts and ferrite |B| =0,9555 T

4. CONCLUSIONS

This parazit air gap between the polar parts and permanent magnet leads to a decrease in useful air gap. It is attenuated by quality of ferromagnetic material.

The conclusion results from comparing the simulation results achieved and the experimental results obtained by magnetic measurements on the three devices electrodynamics is that simulation program is appropriate to use in designing of magnetic circuits for high power devices.

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