6th International Conference
ðComputational Mechanics and Virtual Engineering ð
COMEC 2015
15-16 October 2015, Braşov, Romania

EXPERIMENTAL RESEARCH OF THE PARAMETERS OF HIGH POWER AUDIO DEVICES EQUIPPED WITH NdFeB PERMANENT MAGNETS IN THE ANECHOIC CHAMBER

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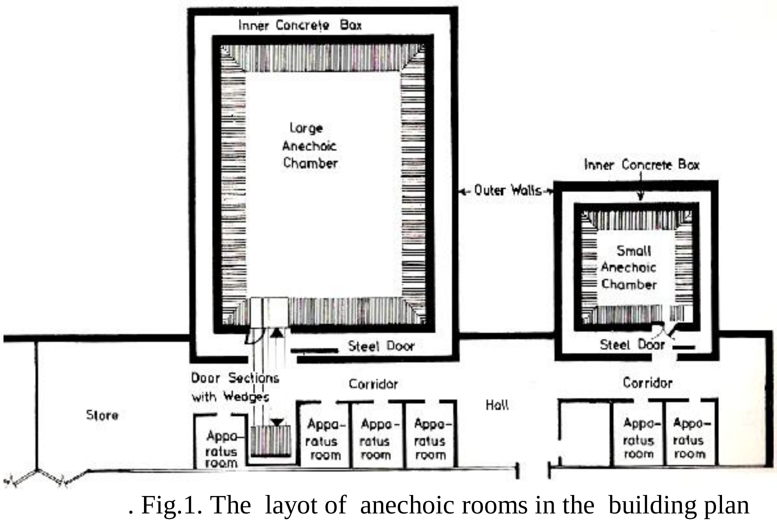
Abstract: *This paper presents the experimental results obtained by atomic force microscopy of NdFeB permanent magnets of high power audio devices.*
Atomic force microscopy revealed the advantages of using type NdFeB crowded permanent magnets compared to the ferrite permanent magnets.
The diffractograms, using X-ray diffraction analysis revealed microstructure of NdFeB crowded permanent magnets.
This paper presents the experimental results obtained by measuring the parameters of high power audio devices equipped with crowded NdFeB permanent magnets in the anechoic chamber.
Keywords: anechoic chamber, permanent magnets,audio devices.

1. GENERAL INTRODUCTION

Acoustic Laboratories are built special rooms and have two anechoic rooms located in separate buildings .By analyzing the spectrum of the noise anechoic chamber SC ELCOMP S.A. Bucharest is noted that the source of vibration produces an increase of level vibration level in area 100-250Hz.The layot of anechoic rooms in the building plan is presented in figure 1:



. Fig.1. The layot of anechoic rooms in the building plan

2. THE CONSTRUCTION OF THE ANECHOIC CHAMBER

Anechoic room from the company SC ELCOMP . S.A. Bucharest has the dimensions : 14 · 6 · 3.5 m and allows for testing audio devices between 20-20000Hz frequencies .

The materials are made walls and floor of the room are very important. The best insulation materials are wool from Australia , tuff , minet , fiberglass and dacron .
The cones lining the walls of the anechoic chamber SC ELCOMP . S.A. Bucharest are made of tuff.

3. EXPERIMENTAL RESULTS OBTAINED IN DETERMINING THE PARAMETERS OF HIGH POWER AUDIO DEVICE EQUIPPED WITH NdFeB PERMANENT MAGNET CROWDED WITH MODIFIED GEOMETRY IN ANECHOIC ROOM

Audio devices to measure parameters were used software: FEM , WT3 , Brüel & Kjær .Audio devices have been installed in anechoic chamber and the instrumentation was installed outside the room.

The settings were made directly by the program. Frequency and phase diagrams permeted the evaluation of the audio device performances.

The setting of the fundamental frequency diagram for a particular degree of accuracy is shown in the figure 5:

Fig. 2. The setting of the fundamental frequency diagram

Figure 2: Representation of the zone in relation to end fitting orientation for the feeder pipe connection

The diagrams, presented in the figures 3 and 5, are shown the frequency characteristics. This characteristics detemine the first resonance frequency of the mobile system.The diagrams, presented in the figures 4 and 6, are shown the phase characteristics in relation to the frequency. The resonance frequency of the elastic system is shown with the relationship 1:

$$f_o = \frac{1}{2\pi} \cdot \frac{1}{\sqrt{M \cdot C_m}} \qquad (1)$$

where: **M** is the mass of elastic system

- **C_m** - the compliance of the elastic system

From equation 1 can be deduced that the mass of the elastic system:

$$M = \frac{1}{2\pi^2 \cdot f_o^2 \cdot C_m} \qquad (2)$$

$$M_1 = \frac{1}{4\pi^2 \cdot f_{o1}^2 \cdot C_m} \qquad (3)$$

$$M_2 = \frac{1}{4\pi^2 \cdot f_{o2}^2 \cdot C_m} \qquad (4)$$

The difference of the two masses M1 and M2 is known as being 4.8g:

$$M_1 - M_2 = \frac{1}{4\pi^2 \cdot C_m} \cdot \left(\frac{1}{f_{o1}^2} - \frac{1}{f_{o2}^2} \right) \qquad (5)$$

$$M_1 - M_2 = 9{,}6 - 4{,}8 = 4{,}8g \qquad (6)$$

From here it can deduce the compliance of elastic system according to relationship:

$$C_m = \frac{1}{4\pi^2 \cdot (M_1 - M_2)} \cdot \left(\frac{1}{f_{o1}^2} - \frac{1}{f_{o2}^2} \right) \qquad (7)$$

For the above values, we obtain: $C_m = 1{,}005.10^{-5}$ m/N (8)

The usual values of the cmpliance are of the order 10^{-4} m/N.
The resonance frequency of the mobile system is:

$$f_o = 284\text{Hz} \quad (9)$$

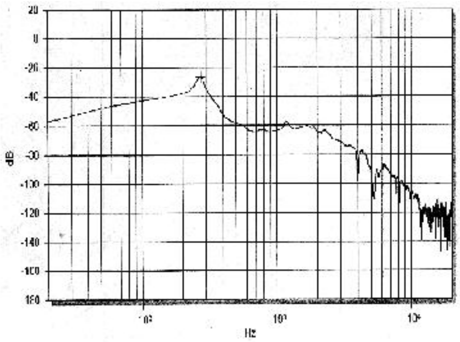


Fig. 3. The frequency characteristic for accelerometer mass 4,8g.

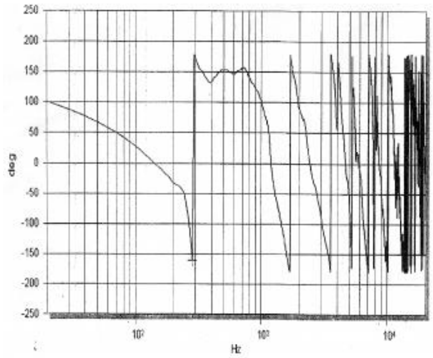


Fig. 4. The phase characteristic for accelerometer mass 4,8g

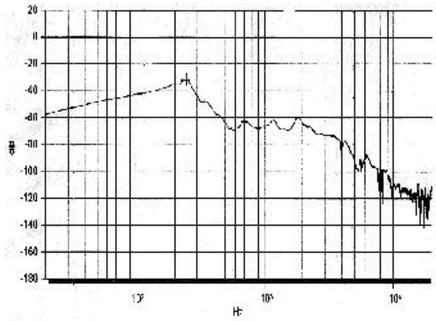


Fig.5. The frequency characteristic for accelerometer mass 9,6g.

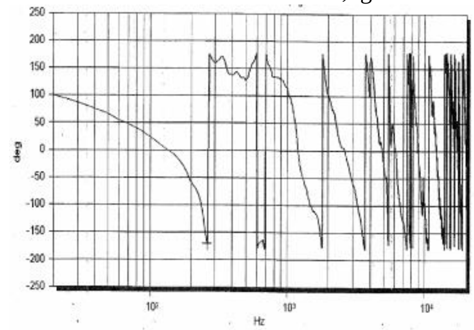


Fig. 6. The phase characteristic for accelerometer mass 9,6g

The characteristic frequency characteristic of high power audio device was tested in the anechoic chamber from SC ELCOMP S.A. Bucharest with high power audio device suspended, cone being vertically oriented from sound-absorbing surface of the room .
In these conditiones, the emission of high power audio device is good between 200Hz ... 2000Hz.
These characteristics are presented in the figures 7...12:

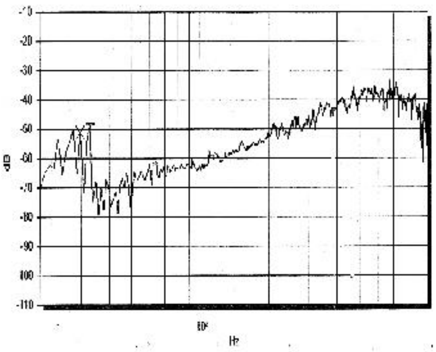


Fig. 7. The frequency characteristic between 200Hz … 2000Hz.

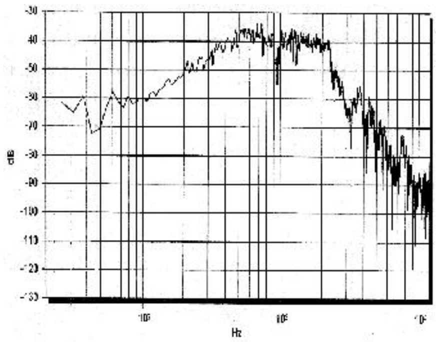


Fig. 8. The frequency characteristic constant voltage supply

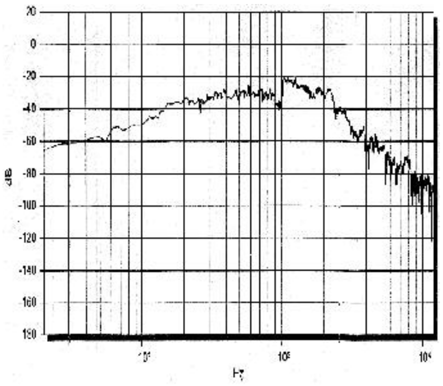


Fig. 9. The frequency characteristic constant current supply .

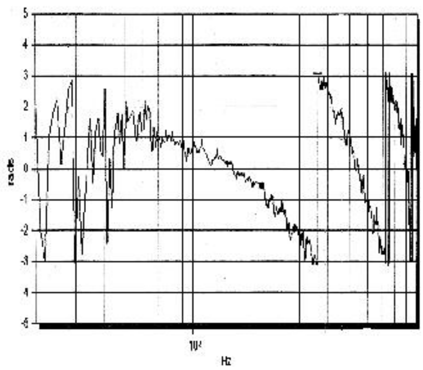


Fig. 10. The frequency characteristic between 20Hz … 1000Hz

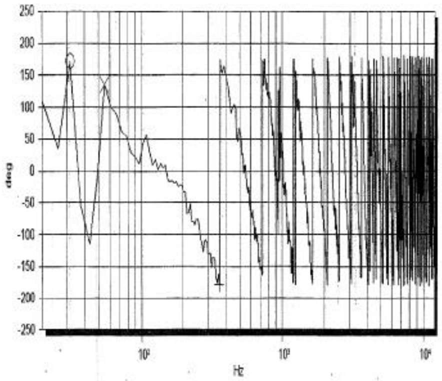


Fig. 11. The phase characteristic constant voltage supply .

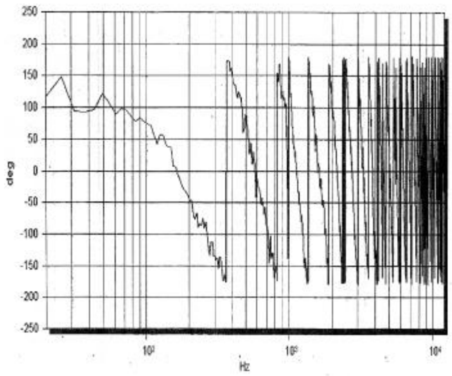


Fig. 12. The phase characteristic constant current supply

5. CONCLUSIONS

By analyzing the frequency curves represented in logarithmic scale, it is not clearly shows the corresponding peak of resonance frequency due to the rigidity of the suspension of mobile system.

We tested several high power audio devices with varying degrees of accuracy.

The accuracy level required by the practical application of high power audio device.

We conclude that the emission of audio device is relatively good between 20Hz … 20000Hz.

The fundamental frequency characteristic highlights the advantages of using NdFeB permanent magnets due to the linearity characteristics for a wide frequency range.

This wide frequency range enables a high fidelity reception.

The sudden changes of the signal in the frequency range below 70Hz is due to the influence of the structure of the building, the interference which can not be removed.

High power audio devices made with NdFeB magnetic circuits have characteristics superior to those made with barium ferrite.

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