Letter to the Editor

Comments on “Reverberation Radius in Real Rooms”

P. Jafari Shalkouhi

***Abstract* — The goal of this letter is to comment on the article "Reverberation Radius in Real Rooms" by Mijić and Mašović (2010). Mijić and Mašović measured critical distance and reverberation time in four different size rooms from 125 Hz to 4 kHz octave bands. They proposed a method for measurement of critical distance. This paper confirms that the measurements of critical distance made by Mijić and Mašović were not accurate at some frequencies.**

***Keywords* — Critical distance, reverberation time, room modes.**

I. Introduction

A point in a room where the direct sound field and reverberant sound field are equal is called a critical distance [1].

Mijić and Mašović [2] measured a critical distance and reverberation time in four different size rooms ranging from 50 m^3 to 504 m^3. The Schroeder method or impulse response method [3] was considered by the authors for measurement of reverberation time. In addition, a method which is based on recording of impulse response was proposed by Mijić and Mašović [2] for measurement of critical distance.

This letter aims to compare the measured critical distances with the measured reverberation times made by Mijić and Mašović [2] to show the accuracy of the proposed method.

II. Discussion

Table 1 shows the measured reverberation times and critical distances made by Mijić and Mašović [2] in room 1 with the volume of 303 m^3. By comparing the measured reverberation times and critical distances at 125 Hz with the measured reverberation times and critical distances at 250 Hz it can be seen that when a reverberation time is increased, a critical distance is increased too (see Table 1). While, when a reverberation time is increased, a critical distance will decrease because the effect of reverberant field on the direct field will be more considerable compared with when a reverberation time is decreased or when the average absorption coefficient is increased.

The measured reverberation times and critical distances obtained by Mijić and Mašović [2] in room 2 with the volume of 50 m^3 are shown in Table 2. The measured reverberation times at 1000 Hz and 2000 Hz are 0.43 sec. while the measured critical distances at 1000 Hz and 2000 Hz are 1.09 m and 1.51 m respectively (see Table 2). While in reality, when reverberation time remains unchanged, critical distance will remain unchanged too. In addition, at 4000 Hz reverberation time is higher than 2000 Hz while critical distance at 4000 Hz is higher than 2000 Hz too that seems not reasonable.

Table 1: Measured reverberation time and critical distance in room 1 [2].

frequency (Hz)	*RT*	*measured r_c*
125	**1.58**	**0.53**
250	**1.88**	**0.84**
500	1.80	0.97
1000	1.69	1.38
2000	1.49	2.02
4000	1.32	3.06

Table 2: Measured reverberation time and critical distance in room 2 [2].

frequency (Hz)	*RT*	*measured r_c*
125	0.73	0.50
250	0.60	0.56
500	0.52	0.78
1000	**0.43**	**1.09**
2000	**0.43**	**1.51**
4000	**0.45**	**1.77**

Table 3 indicates the measured reverberation times and critical distances made by Mijić and Mašović [2] in room 3 (volume=166 m^3). Reverberation time at 1000 Hz is higher than 500 Hz while, critical distance at 1000 Hz is higher than 500 Hz too according to Table 3. But it is questionable because when reverberation time is increased critical distance will decrease.

Moreover, the measured reverberation times and critical distances obtained by Mijić and Mašović [2] in room 4 with the volume of 504 m^3 are shown in Table 4. According to Table 4 reverberation times at 250 Hz, 500 Hz and 1000 Hz are 1.51 sec, 2.11 sec and 2.37 sec respectively. In other words, reverberation times are increased from 250 Hz to 1000 Hz octave bands while; critical distances are increased from 250 Hz to1000 Hz octave bands too which is not reasonable.

Department of Environmental Engineering, Graduate School of the Environment and Energy, Science and Research Branch, Islamic Azad University, Tehran, Iran (e-mail: pedram121212@yahoo.com).

TABLE 3: MEASURED REVERBERATION TIME AND CRITICAL DISTANCE IN ROOM 3 [2].

frequency (Hz)	*RT*	*measured r_c*
125	0.55	0.51
250	0.50	1.14
500	**0.39**	**1.99**
1000	**0.40**	**2.63**
2000	0.39	3.49
4000	0.35	4.99

TABLE 4: MEASURED REVERBERATION TIME AND CRITICAL DISTANCE IN ROOM 4 [2].

frequency (Hz)	*RT*	*measured r_c*
125	2.43	0.84
250	**1.51**	**1.20**
500	**2.11**	**1.24**
1000	**2.37**	**1.51**
2000	2.29	2.12
4000	1.86	3.36

III. CONCLUSION

The measurements of critical distance made by Mijić and Mašović [2] were not accurate at some frequencies and the reason may be due to the inadequate measurement positions selected by them. It means that Mijić and Mašović [2] selected eight different positions in each room for impulse response recording while the effect of room modes in a room with the volume of 50 m^3 is more considerable compared with a room with the volume of 504 m^3. Hence, in small spaces more measurement positions must be selected compared to large volumes.

Therefore, it can be stated that a comparison of critical distance measurement results with reverberation time measurement results will show the accuracy of critical distance measurement.

REFERENCES

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