

ST XAVIERS COLLEGE, MUMBAI
DEPARTMENT OF PHYSICS,



COURSE CODE: SPHY0403
MASKING OF SOUND

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Abstract:

In this project, we explored the concept of masking of Sound. Since this totally depends on the perception of human ear response, we collected the data of frequency range of masked sound for different age of people.

Keywords:

Frequency, Masked sound, bandwidth, Intensity.

Introduction:

When we listen to a soft sound and a loud sound at the same time, we may not hear the soft sound because a soft sound is masked by the loud sound. The loud sound has a greater masking effect if the soft sound lies within the same frequency range. Sound masking can be explained by analogy with light. Imagine a dark room where someone is turning a flashlight on and off. The light is very obvious and distracting. Now imagine that the room lights are turned on. The flashlight is still being turned on and off, but is no longer noticeable because it has been "masked". Sound masking is a similar process of covering a distracting sound with a more soothing or less intrusive sound. In this experiment we tried to find the frequency range of the masking sound using sound analysis software.

Discussion:

1. Apparatus: Two Frequency Generator applications, two speakers (not necessary).
2. Theory: Masking is the process by which the threshold of hearing for one sound is raised by the presence of another sound. Sound masking reduces or eliminate awareness of pre-existing sounds in a given area and can make a work environment more comfortable. The loud sound has a greater masking effect if the soft sound lies within the same frequency range, but masking also occurs when the soft sound is outside the frequency range of the loud sound.
3. Procedure:
 - Connect two frequency generator to the two different speakers and place the speakers at a fixed distance.
 - The person who is going to be chosen for the experiment is seated at the centre of the two speakers.
 - Keeping one frequency same, change the other frequency and ask the person if he's able to hear the masked frequency.
 - Repeat the process for different frequencies.
 - Repeat the whole process with different age of people.

Observations:

AGE	CENTRAL FREQUENCY (IN HZ)	F1 (IN HZ)	F2 (IN HZ)	AMPLITUDE (DB)
16	700	683	721	87.6
	800	774	824	80
	900	878	925	88.3
	1,000	984	1024	86.5
	1,500	1479	1530	88.4
	2,000	1969	2027	86
	5,000	4965	5016	95.5
	10,000	9972	10025	75.7
	15,000	14972	15020	65.9

AGE	CENTRAL FREQUENCY (IN HZ)	F1 (IN HZ)	F2 (IN HZ)	AMPLITUDE (DB)
18	700	723	689	87.6
	800	815	786	80
	900	915	885	88.3
	1000	1016	978	86.5
	2000	2018	1985	86
	5000	5044	4956	95.5
	10000	10042	9980	75.7
	15000	15043	14967	65.9

AGE	CENTRAL FREQUENCY (IN HZ)	F1 (IN HZ)	F2 (IN HZ)	AMPLITUDE (DB)
19	700	723	681	84.5
	800	831	774	78.6
	900	916	881	86.6
	1000	1022	987	84.5
	1500	1544	1489	88.3
	2000	2022	1956	80.2
	5000	5021	4975	94.5
	10000	10027	9980	77
	15000	15026	14985	59.3

AGE	CENTRAL FREQUENCY (IN HZ)	F1 (IN HZ)	F2 (IN HZ)	AMPLITUDE (DB)
19	700	722	688	84.9
	800	822	788	79.2
	900	920	880	86.6
	1000	1026	975	85.8
	2000	2026	1975	83.6
	5000	5078	4962	95.5
	10000	10083	9983	73.6
	15000	15052	14078	74.3

AGE	CENTRAL FREQUENCY (IN HZ)	F1 (IN HZ)	F2 (IN HZ)	AMPLITUDE (DB)
19	700	721	678	85
	800	825	783	82
	900	915	883	87.8
	1000	1025	976	85.5
	1500	1523	1480	84.8
	2000	2025	1986	83.5
	5000	5028	4982	94.5
	10000	10024	9990	74.6
	15000	15047	14961	65

AGE	CENTRAL FREQUENCY (IN HZ)	F1 (IN HZ)	F2 (IN HZ)	AMPLITUDE (DB)
20	700	663	731	85.2
	800	777	829	82.3
	900	867	921	87.6
	1000	981	1022	85
	1500	1476	1549	88.2
	2000	1980	2030	83.5
	5000	4980	5050	94.5
	10000	10023	9989	74.6

AGE	CENTRAL FREQUENCY (IN HZ)	F1 (IN HZ)	F2 (IN HZ)	AMPLITUDE (DB)
20	700	729	682	82.5
	800	824	784	84
	900	921	878	86.5
	1000	1023	985	85
	1500	1531	1467	88.7
	2000	2026	1988	83
	5000	5025	4974	94
	10000	10021	9980	69.5
	15000	15024	14978	60.2

AGE	CENTRAL FREQUENCY (IN HZ)	F1 (IN HZ)	F2 (IN HZ)	AMPLITUDE (DB)
20	700	725	680	85.5
	800	819	781	81.6
	900	921	891	86.4
	1000	1020	975	85.8
	1500	1542	1442	86
	2000	2027	1976	85
	5000	5014	4941	90
	10000	10020	9984	70.4
	15000	15041	14980	63.5

AGE	CENTRAL FREQUENCY (IN HZ)	F1 (IN HZ)	F2 (IN HZ)	AMPLITUDE (DB)
29	700	721	683	85.2
	800	818	785	82.3
	900	920	883	87.6
	1000	1020	987	85
	1500	1521	1484	88.2
	2000	2023	1980	81
	5000	5054	4973	95
	10000	10035	9980	74.3
	15000	15042	14975	66

AGE	CENTRAL FREQUENCY (IN HZ)	F1 (IN HZ)	F2 (IN HZ)	AMPLITUDE (DB)
39	700	724	683	85.2
	800	821	776	82.3
	900	912	882	87.6
	1000	1028	974	85
	1500	1536	1460	88.2
	2000	2023	1928	83.5
	5000	5042	4968	94.5
	10000	10032	9975	74.6
	15000			65

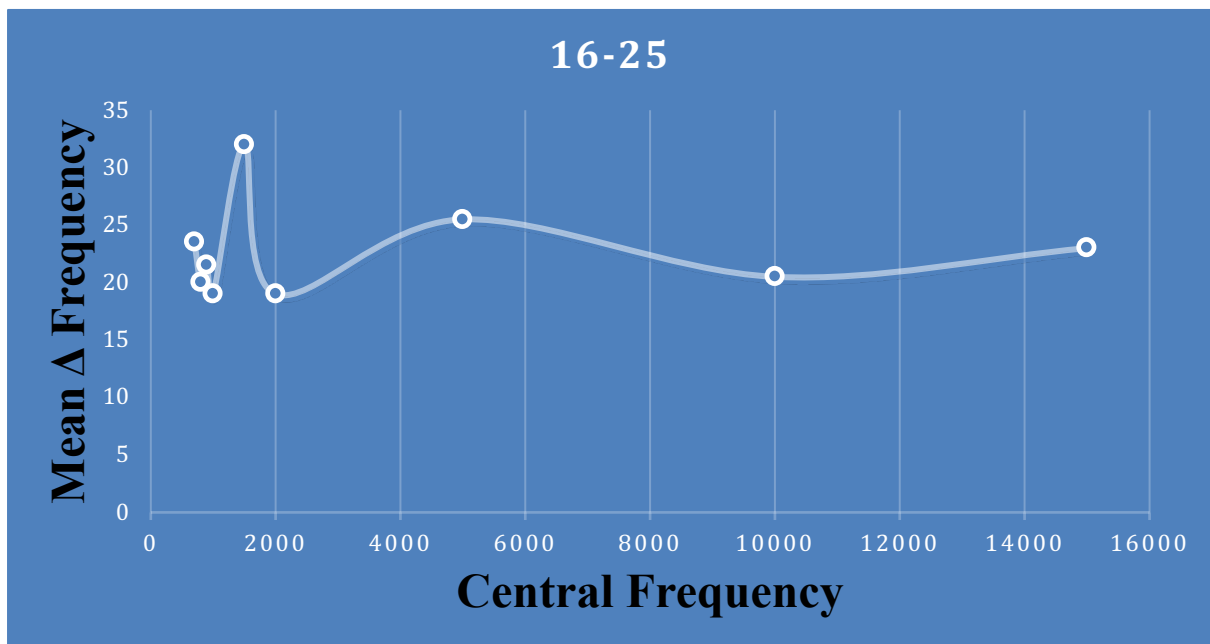
AGE	CENTRAL FREQUENCY (IN HZ)	F1 (IN HZ)	F2 (IN HZ)	AMPLITUDE (DB)
47	700	683	725	85.2
	800	781	822	82.3
	900	873	928	87.6
	1000	971	1039	85
	1500	1481	1542	88.2
	2000	1973	2036	83.5
	5000	4992	5020	94.5
	10000	9972	10022	74.6
	15000			65

AGE	CENTRAL FREQUENCY (IN HZ)	F1 (IN HZ)	F2 (IN HZ)	AMPLITUDE (DB)
54	700	672	730	85.2
	800	770	829	82.3
	900	872	926	87.6
	1000	980	1023	85
	1500	1476	1525	88.2
	2000	1984	2023	83.5
	5000	4974	5027	94.5
	10000	9975	10025	74.6
	15000			65

AGE	CENTRAL FREQUENCY (IN HZ)	F1 (IN HZ)	F2 (IN HZ)	AMPLITUDE (DB)
75	700	682	722	85.2
	800	785	821	82.3
	900	880	920	87.6
	1000	982	1019	85
	1500	1482	1527	88.2
	2000	1960	2032	83.5
	5000	4982	5029	94.5

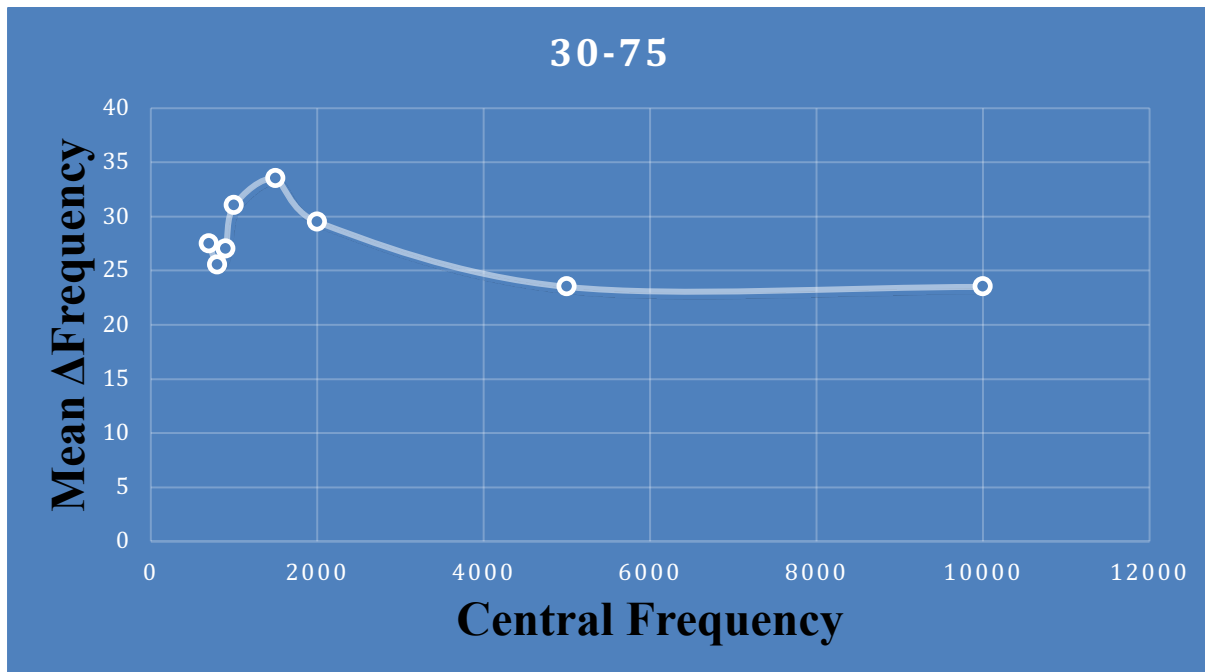
For Age Group 16-30 Years:

CENTRAL FREQUENCY	DELTA F MEAN
700	23.5
800	20
900	21.5
1,000	19
1,500	32
2,000	19
5,000	25.5
10,000	20.5
15,000	23



For Age Group 30-75 Years:

CENTRAL FREQUENCY	DELTA F MEAN
700	27.5
800	25.5
900	27
1,000	31
1,500	33.5
2,000	29.5
5,000	23.5
10,000	23.5
15,000	27.5



Conclusion:

- The particular value of the masked frequency is different for different people (based on the hearing ability of an individual).
- This analysis can be used to design various kinds of earphones as per the age group
- This is very important phenomena to be aware of during music production and sound deciding so that the recorded sounds are heard independently