Subjective annoyance from exposure to low frequency noise of semiconductor manufacturing in the packaging and testing processes

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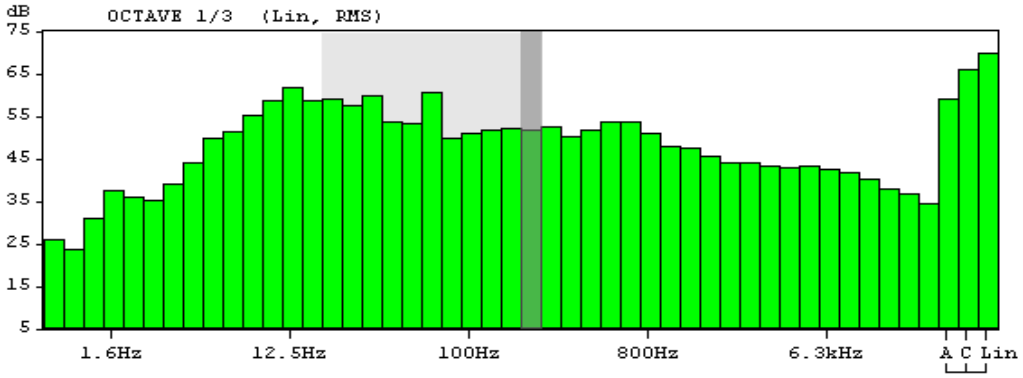
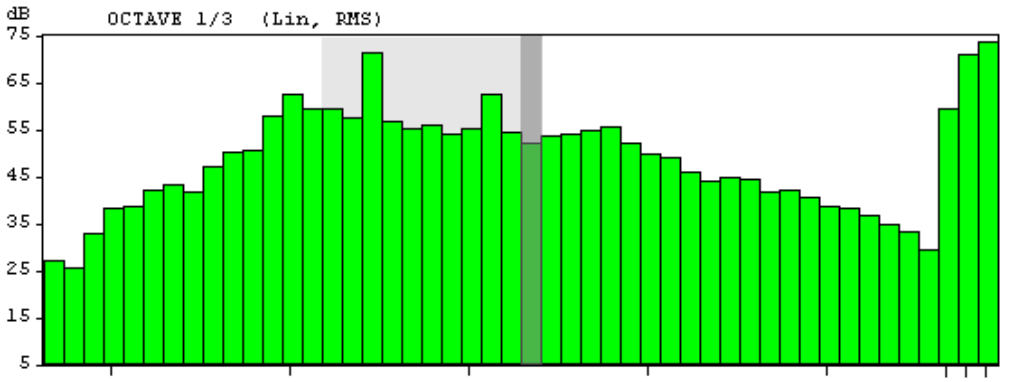
Background/Aim:
Subjective annoyance from exposure to low frequency noise is more prevalence due to bulk machine or facility installation in indoor acoustic quality assessment. The purpose of this study is to propose criteria for the judgment of low frequency noise annoyance in the integrated circuit (IC) industry based on RC Mark II noise rating by octave-band frequency analysis.
Methods:
On-site survey of octave-band frequency in the range of 1 Hz - 16000 Hz was measured by sound analyzer in according to the locations of workers' complaint. All these data were utilized to figured out A-weighted, C-weighted sound pressure levels (20 Hz -20000 Hz), room criteria (RC) and sound pressure of LF (16-63 Hz), MF (125- 500 Hz), and HF (1000-4000 Hz).



Cursor: f[25]=200Hz Lev=52.1dB
Markers: f0=20Hz f1=200Hz
Block RMS = 67.0dB



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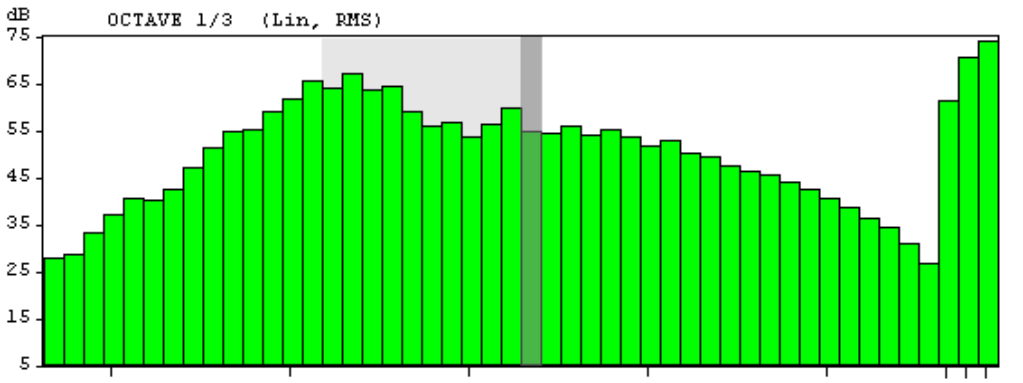

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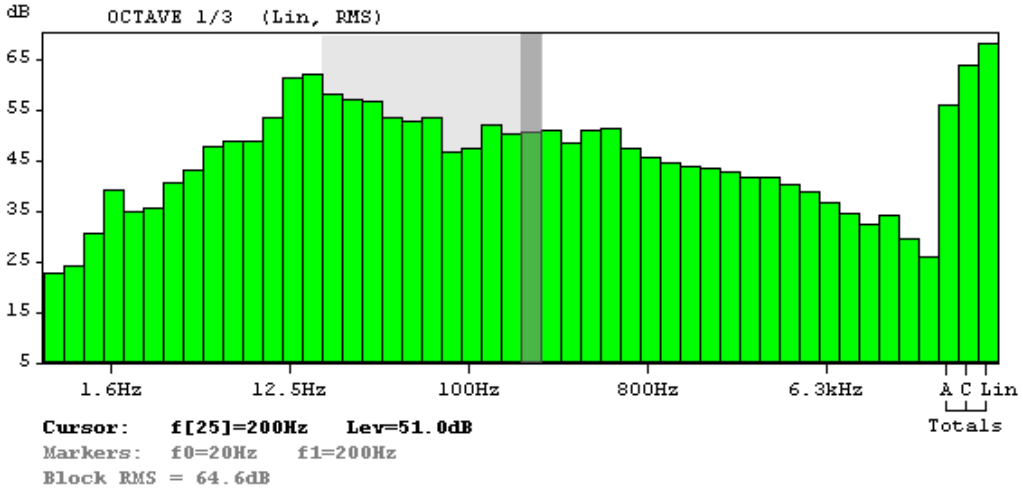
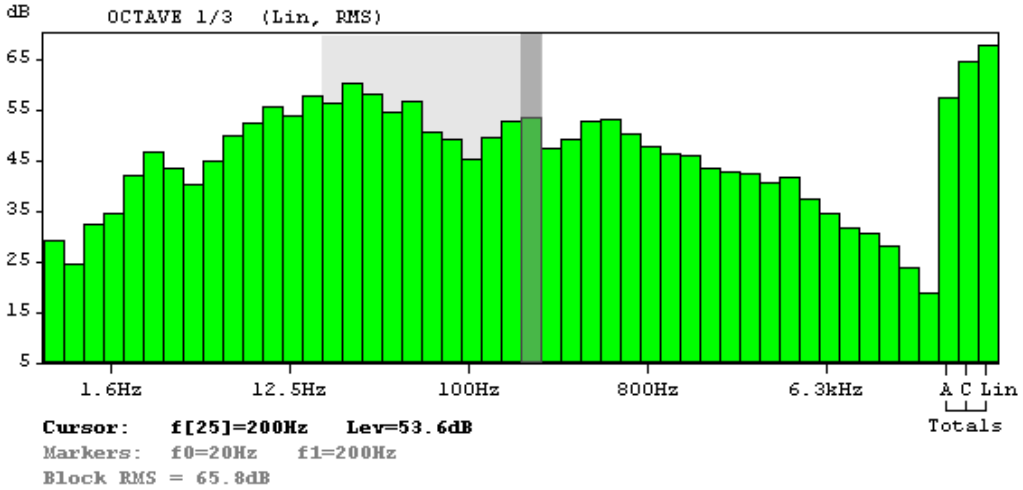
Markers: f0=20Hz f1=200Hz
Block RMS = 72.5dB





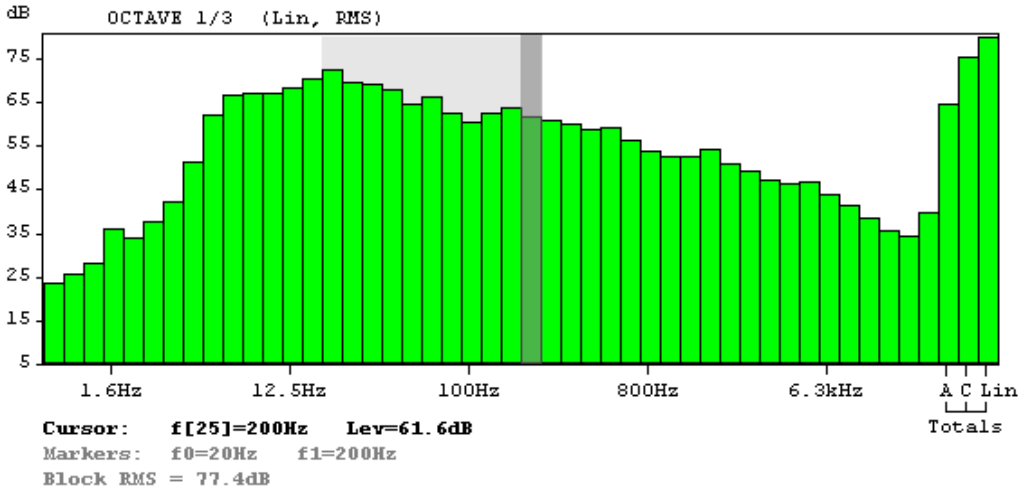
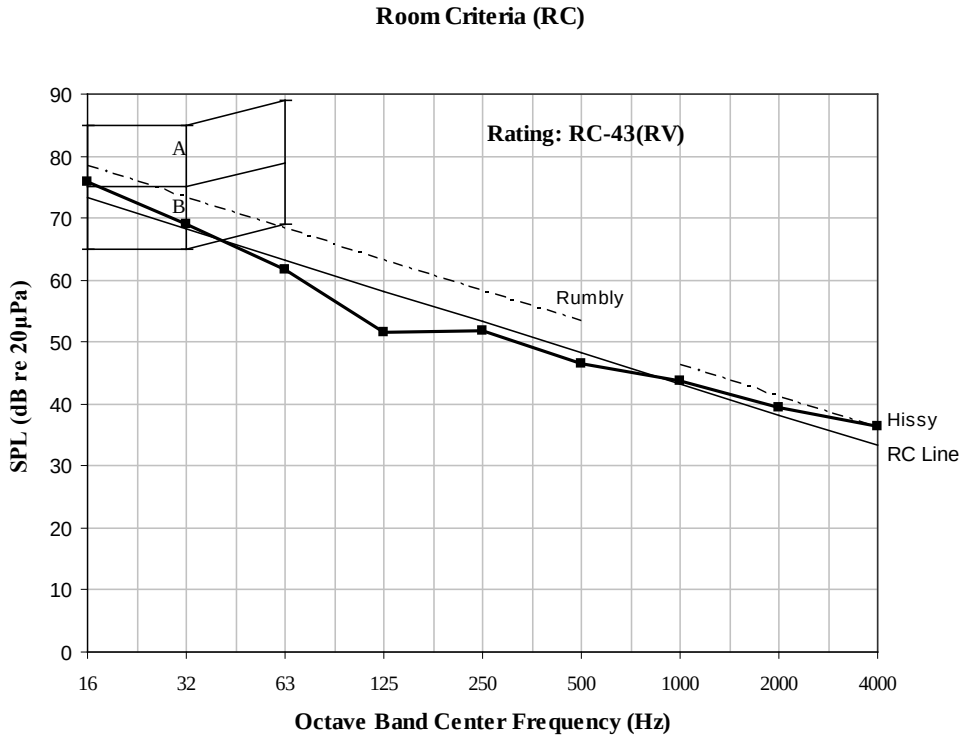
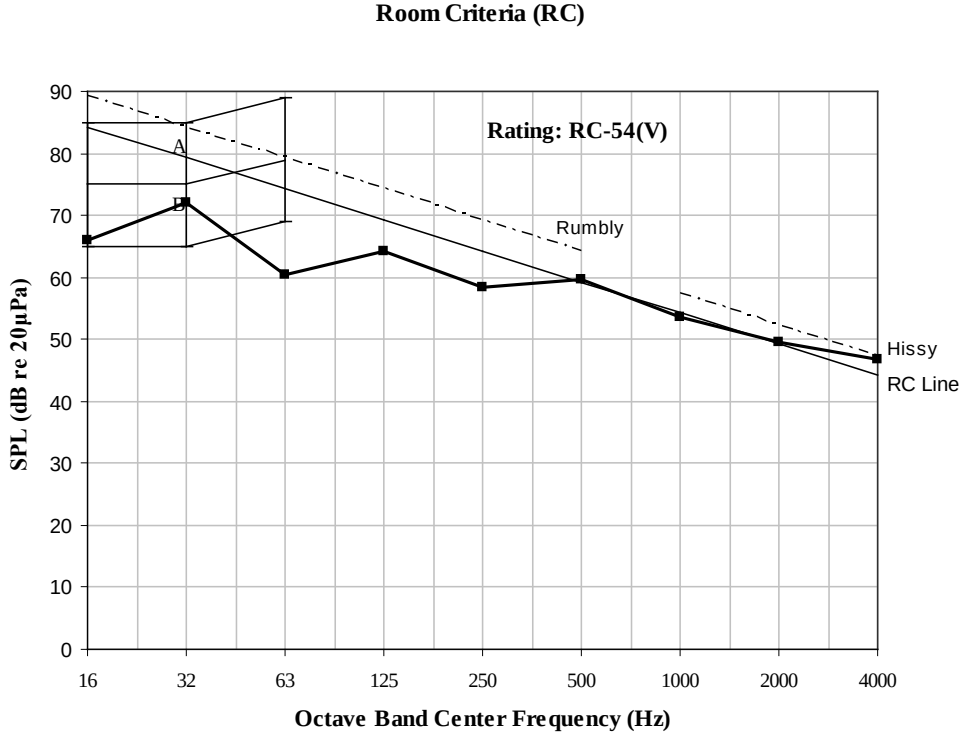


Figure 1. Frequency analysis in six workplaces

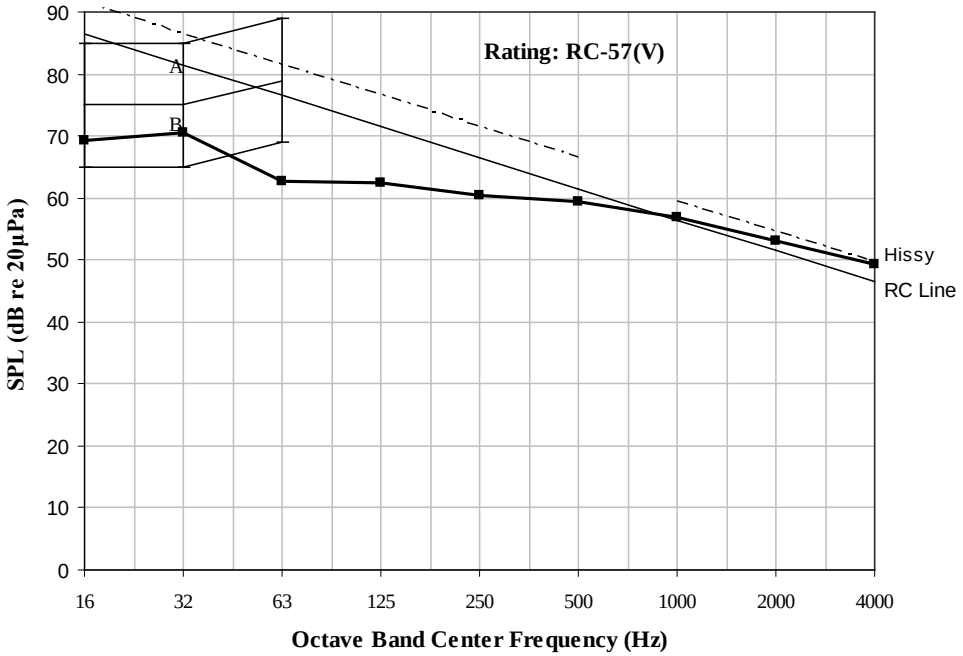
Result:

The difference between C-weighted and A-weighted sound pressure levels greater than 8 dB and low frequency noise (its spectrum in 16Hz - 63Hz) above 65 dB indicated significantly subjective annoyance of exposed worker in six workplaces of IC factory (HR, IQC, TAB, OP, TA, TAB S.T).

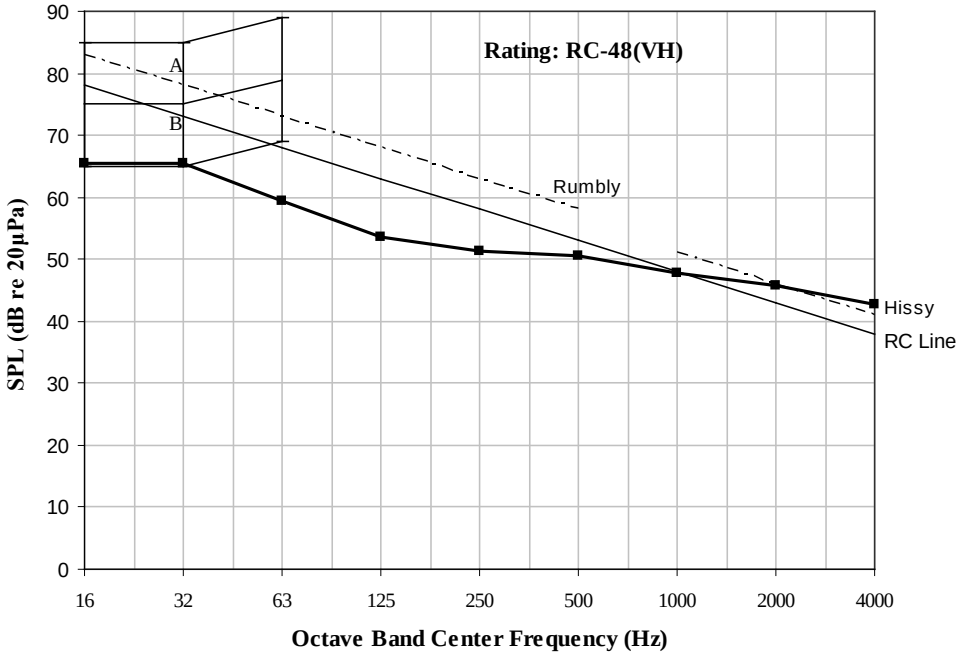


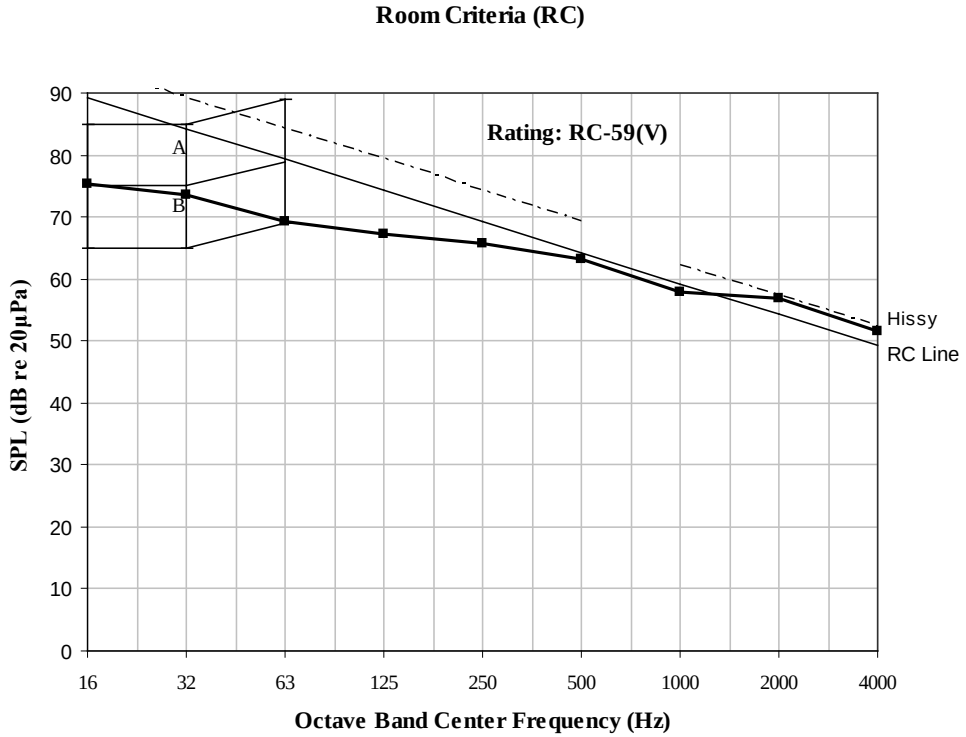


Room Criteria (RC)



Room Criteria (RC)





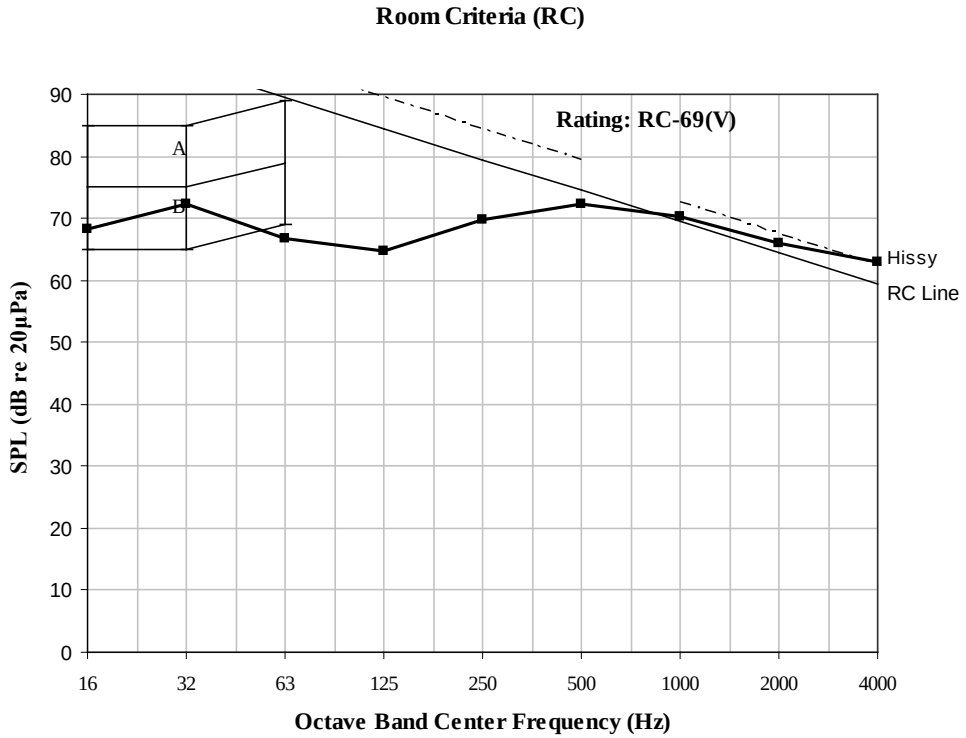


Figure 2. Results of RC analysis

Conclusion:

In this study, the following criteria were proposed to find the source of workers' annoyance caused by exposure to low-frequency noise.

1. C-weighted sound pressure level is 10 dB greater than A-weighted sound pressure level.
2. Noise in the low frequency range (16Hz - 63Hz) is greater than 65 dB.
3. LF ≥MF ≥HF.

Location	RC	L_A	L_C	(L_C-L_A)
1F HR-office	43	49.2	70.0	21.0
1F IQC	54	71.2	73.2	11.4
3F TAB office	57	61.7	70.8	9.1
1F OP office	48	53.1	65.2	12.1
2F TA east	59	64.7	75.4	10.7
1F TAB S.T.	50	56.0	66.0	10.0

Table 1. The measurements of RC ,LA, LC, LF, MF, HF