

7.1.4: Just Noticeable Difference

Two other differences in human hearing as compared to laboratory measurements are **Just Noticeable Difference in frequency** (JND Hz) and the **Just Noticeable Difference in loudness** (JND dB). If a group of people are asked to decide if two frequencies are the same or slightly different most people can tell if the frequency is different by 1 Hz for low frequency sounds. So the JND (Hz) for a 500 Hz sound is about 1 Hz; most of us can tell the difference between 500 Hz and 501 Hz. At frequencies above 2000 Hz however, most people start having more difficulty telling two frequencies apart. For example at 4000 Hz the JND (Hz) is about 8 Hz meaning that the two frequencies must be about 8 Hz apart before the notes sound different. We can't distinguish a 4000 Hz pitch from a 4001 Hz or even a 4007 Hz pitch. Probably for this reason no musical instrument produces fundamental frequencies above 5000 Hz; we wouldn't be able to tell if the instrument was in tune.

If a group of people are asked to decide if two tones are or are not the same loudness, it turns out that the majority of them will make different decisions depending on the frequency of the note and the initial loudness. It is easier to tell if two sounds are the same loudness when they are both very loud. For example most people can tell if the SIL level changes by 0.5 dB when the sound is at 80 dB but need a change of 1.5 dB to detect a difference if the sound is at 40 dB to start with. There is also a slight difference in the perception of loudness differences at different frequencies, which is not surprising given the difference in perception at different frequencies (the phon scale, above).

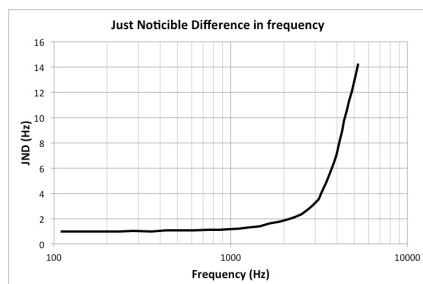


Figure 7.1.4.1

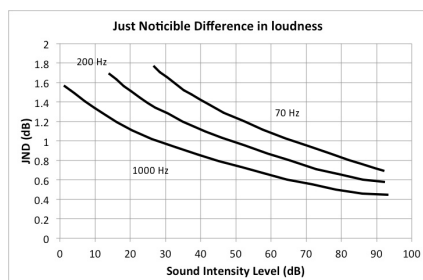


Figure 7.1.4.2

Video/audio examples:

- An [online test for JND in frequency](#). Take the test. Record your answers (we will compare everyone's response in class). What did you find out about your own Just Noticeable Difference in frequency?

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