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2011-06521
EE 286 ME 2

Using the Data Cursor function in the MATLAB figure window, determine T20 and T30.

As the sound was interrupted at 2 seconds, the power at that time is about ~4dB. The 5dB decay occurred between 2.03 and 2.05 seconds or ~2seconds, around the same time the sound was interrupted. The 20dB decay occured at around 2.156 seconds, while the 30dB decay occured at 2.236 seconds. Therefore $T_{20} \approx 156ms$ and $T_{30} \approx 236ms$.

Put the resulting plot in your documentation. Compare the new computed values with the previous room.
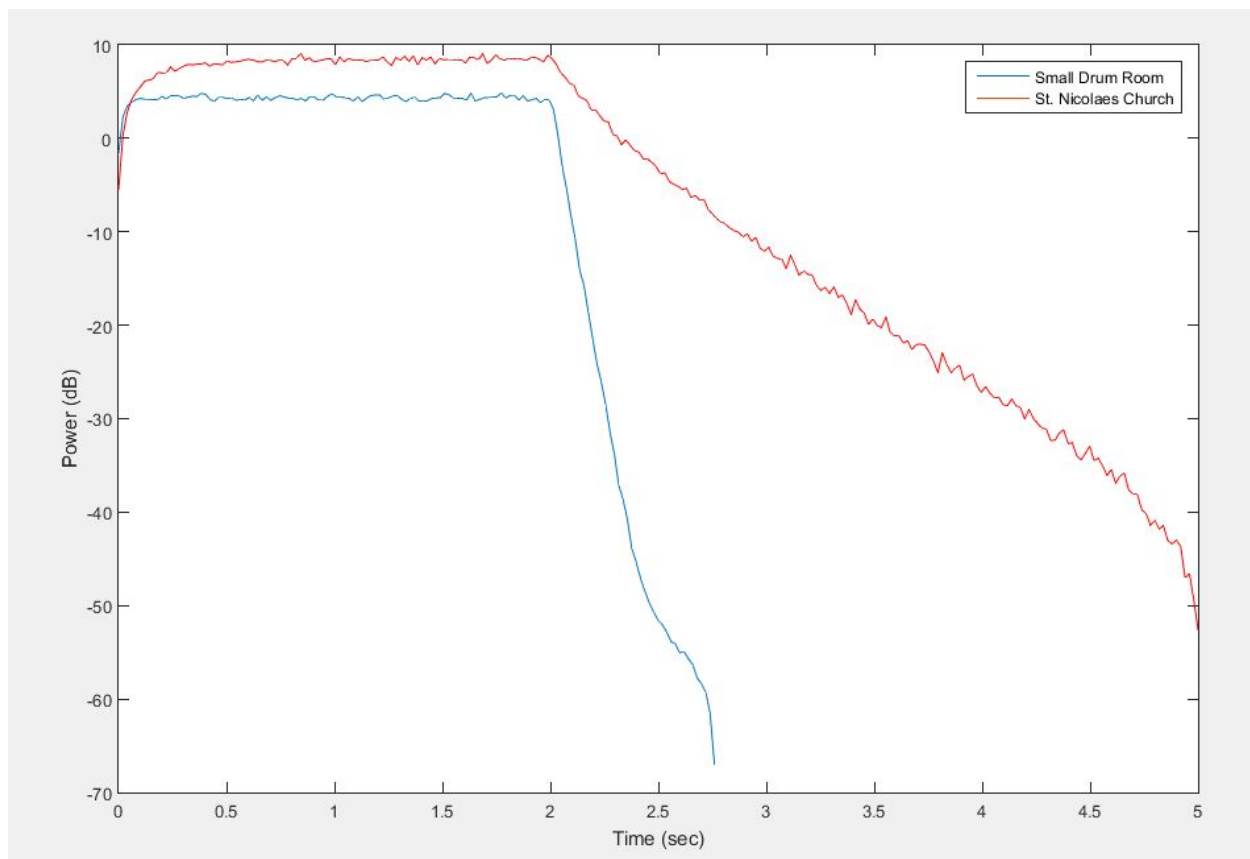

With the St. Nicolaes Church, the decay is longer and the sound is stronger. At 2 seconds, the power is at about 7.8dB. The 5dB decay occurred at 2.176sec, while the 20dB and 30dB happened at about 3sec and 3.735sec. Therefore,

$$T_{20} = 3 - 2.176 = 0.824 = 0.824sec$$
$$T_{30} = 3.735 - 2.176 = 1.559sec$$

Using the small drum room, plot and superimpose the reverberation profiles using the following frequencies: 250 Hz, 500 Hz, 1 kHz, 2 kHz, 4 kHz, 8 kHz. Put this in your documentation. Compare the resulting plots. What does this infer about the absorption capabilities of a room?
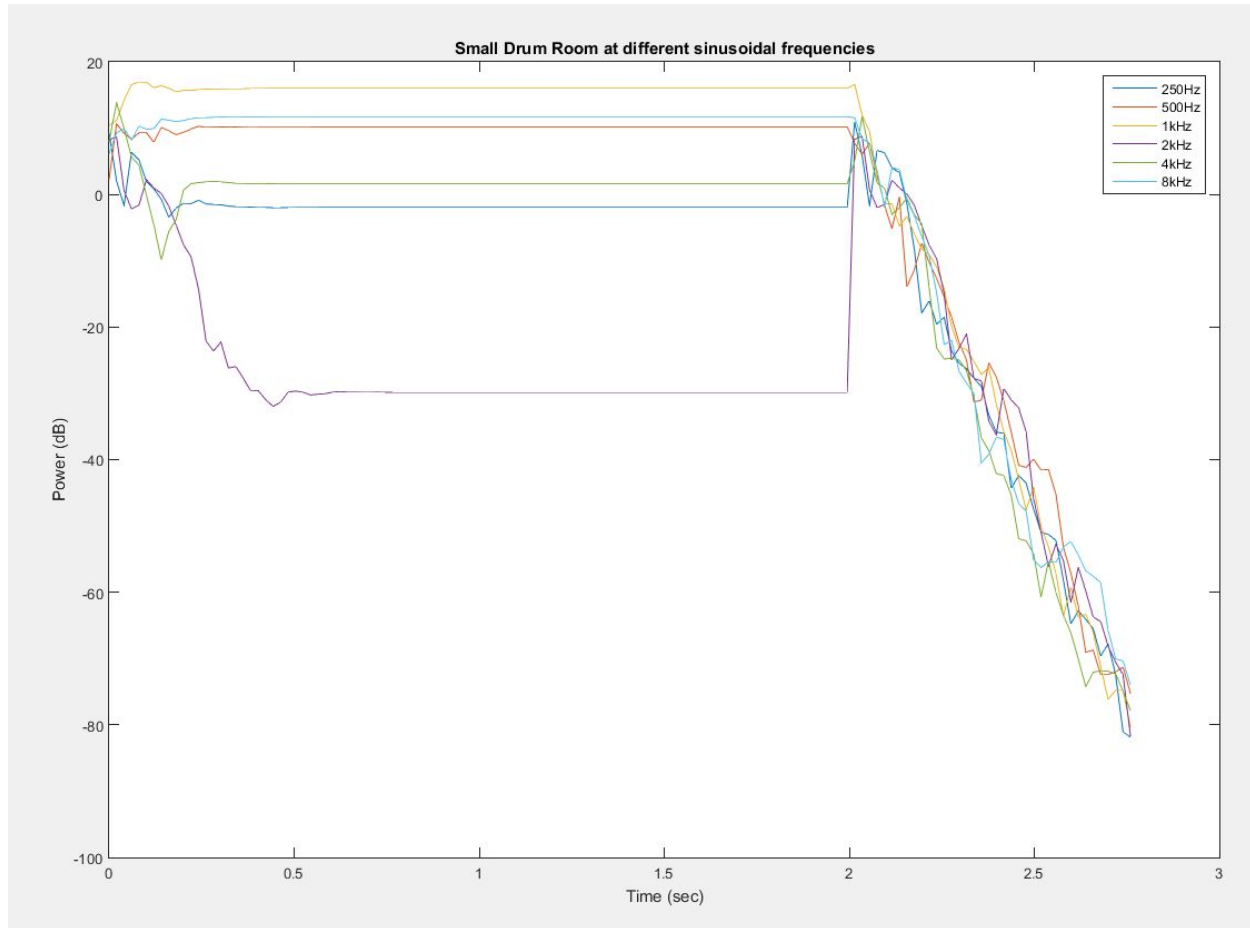
Frequency (Hz)	5dB decay (s)	20dB decay (s)	30dB decay (s)	T20 (ms)	T30 (ms)
250	2.176	2.276	2.377	**100**	**200**
500	2.035	2.156	2.297	**121**	**141**
1000	2.035	2.135	2.256	**100**	**220**
2000	2.377	2.518	2.599	**141**	**222**
4000	2.176	2.236	2.337	**60**	**161**
8000	2.057	2.216	2.256	**159**	**199**

We can see that a room's absorption capabilities differ for every frequency. We can see that there is a small difference at the T20 and T30 reverberation times at different frequencies. For the small drum room, we can see the 2kHz frequency being absorbed with its power going down to -30dB.

Given that you have a sense of the reverberation times of the two rooms, verify the effects of reverberation time on a speech signal, singing voice, and instrumental music. In terms of intelligibility, and richness or fullness of sound, recommend which room is more appropriate for the three types of audio signals.

The small drum room is better for speech since the words are not very intelligible.

Since the church has a longer reverberation time, using this for the singing voice makes it sound like a choir is singing, making it more "rich", but with those echoes the words are less intelligible.

Using the church makes the instrumental music more rich and full, sounding like multiple cellos, and with no words to worry therefore no intelligibility issues, it is the right environment to choose.