ECE 4760: Homework 2

The DTMF frequencies vary between 697 and 1477 Hz. According the the DTMF spec:

- frequency must be within 1.5% of nominal.
- All spurous frequencies must be lower than -20 db from main tones.
- The duration of any individual DTMF tone combination sent shall not be less than 65 ms.
  The time shall be measured from the time when the tone reaches 90 % of its steady-state value,
  until it has dropped to 90 % of its steady-state value.
- The duration of the pause between any individual DTMF tone combination shall not be less than 65 ms.
  The time shall be measured from the time when the tone has dropped to 10 % of its steady-state value,
  until it has risen to 10 % of its steady-state value.

Given these specifications:

1. what DDS sample frequency is required, based on the above specs?
   A matlab program which computes spectrum versus number of samples/cycle.
   When you run the program, notice that the first large spectral errors are at approximately
   first_error_frequency = steps_per_cycle * frequency - frequency
2. Should you add a low pass filter to the DAC output? If so, what cutoff frequency?
3. How accurate is the internal PIC32 oscillator? Does it meet the frequency accuracy spec?
4. What kind of amplitude modulation will you use and why. Linear ramp? Cosine? Exponential? Hanning?
   A matlab program computes spectrum for different envelopes

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