IIA Project GF3 Audio-Modem
Weekend Challenge
Issued 9 May at 5:30 pm

- Each of you has been given two files:
    - "grXfile.csv" contains the modulated file as seen after the ISI channel
    - "grXchannel.csv" contains the channel coefficients
- Please ensure that you have the correct file and let me know if you got another group's channel or data file…
- The file was modulated as binary data and preceded by a header that contains a '\0' terminated string with the file name, and another '\0' terminated string with the file size (number of bytes.) After the second '\0' it's raw file data for the number of bytes specified in the file size string.
- Bytes were mapped to QPSK constellations 2 bits at a time (starting from the most significant 2 bytes and ending with the least significant 2 bytes) using Gray coding (anti-clockwise starting from pi/4 bit pairs 00, 01, 11, 10).
  Note: I am not 100% confident about the ordering of the Gray coding. You may want to check 00 10 11 01 just in case…
  Note 2: if any of you write "Grey" like some lecturers in Cambridge who feel that they prefer to use British spelling, please aware that Professor Bob Gray in Stanford who came up with this mapping spells his name "Gray" irrespective of which continent he happens to be on… Please don't join the those misinformed lecturers who want to impose British spelling on his family name.
- A DFT size of 1024 was applied with a cyclic prefix of length 32. Information is only mapped to frequency bins 1 to 511. Frequency bins 513 to 1023 contain the reverse ordered conjugate complex values of frequency bins 1 to 511. Frequency bins 0 and 512 contain 0 (no information, value 0.) This all ensures that the output of the OFDM modulator is a real (baseband) vector.
- 2 bit groups were added at the end of the data to complete an integer factor of 511. Those extra 2 bit groups are all 00.
- A cyclic prefix of 32 was appended before each DFT block and the resulting blocks of 1056 values were concatenated into one long signal.
- This signal was fed through an ISI channel consisting of an FIR with the impulse response you have been given. The FIR operates a linear convolution with the input signal.
- Very low power noise was added.
- Those of you in Groups 2,3,4 have a slightly harder challenge that requires a little bit of hacking once you recover the file. This hint may come in handy (you'll hopefully understand once you recover the file): "Mono Unsigned 8 bit 8000 Hz"