AV343 – Final project
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In this final project you will use Matlab to demodulate a real world dataset containing a BASK signal transmission with data frames. Details of this transmission is as follows.

Frame format:
For the dataset given to you, each frame consists of 40 data bits, preceded by a 13 bit Barker sequence, preceded by 20 bits of alternating 1s and 0s. The 40 data bits are obtained by the 8 bit ASCII coding of 5 characters (say for example "HELLO", quotations not part of the data being transmitted). Note that each character is converted to the ASCII code and the bits are transmitted with the MSB first and then proceeding to the LSB. So for the evaluation dataset the first 20+13+40 bits of each frame looks like (with the example characters being HELLO)
1,0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,1,1,1,1,1,0,0,1,1,0,1,0,1,0,0,1,0,0,0,0,1,0,0,0,1,0,1,0,1,0,0,1,1,0,0,0,1,0,0,1,1,0,0,0,1,0,0,1,1,1,1,1

Signalling format:
BASK or on-off keying with a bit rate of approximately 1 kbits/sec. The center frequency used for BASK modulation is approximately 433.9 MHz.

Dataset:
The BASK transmission is received using an RTL-SDR. The RTL-SDR is used to produce a sequence of I-Q samples. The I and Q samples are obtained from an RTL-SDR operating at a center frequency of 433.9 MHz with a sampling rate of 2.048 MHz. This means that the I and Q samples are obtained from a passband of one sided bandwidth of 2.048 MHz centered at 433.9 MHz. The I and Q samples are given to you in the form of a ".mat" file containing a matrix with the first column containing the I samples and the second column the Q samples. Each row corresponds to a particular sample.

Objectives:
The main objective is to decode at least one frame and show the decoded characters as output. Each team should also draw the block diagram of the system that the team is going to implement. The complete specification of each block should also be given – what input and output are, its format, and what the input-output relationship is.

A note about final evaluation:
For the final evaluation, the dataset given to you would be different in the sense that the data bits would be different and the noise level would be different. The data bits would be obtained by the ASCII encoding of 5 characters. Your implementation should be able to handle this variation. Your implementation will be evaluated on the basis of simplicity of implementation, general robustness to ISI, noise, and synchronization issues. So just decoding the frame does not ensure that you will get a perfect score.