LPWA Tutored Work Correction

Requirements:

- LoRa Modem Calculator
- LoRa Alliance Bands Allocation

Exercise1:

Considering the spreading factors listed in the table, calculate the user data bits and the CRC dedicated ones according to the four coding rates.

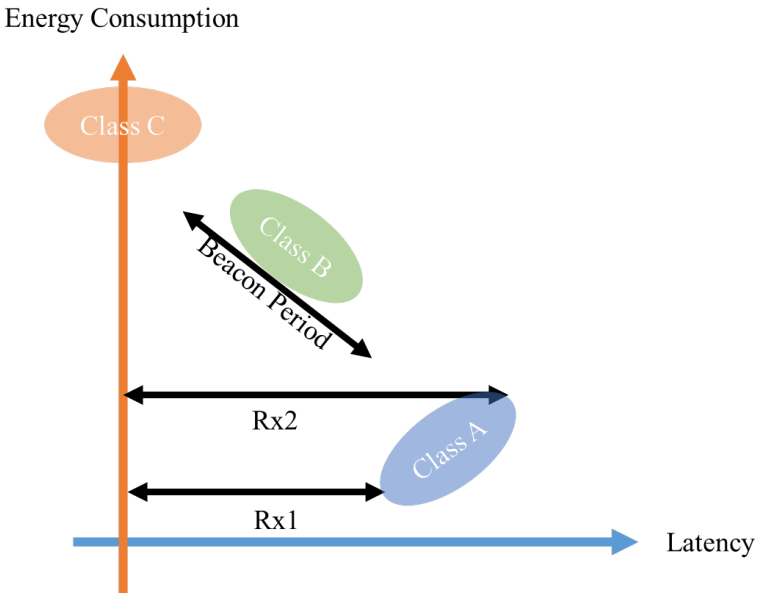
User Data = SF*(4/(4+CR))

CRC=SF-User Data

SF	Bits	Coding Rate			
		1	2	3	4
7	User Data	5.6	4.6	4	3.5
	CRC	1.4	2.4	3	3.5
9	User Data	7.2	6	5.14	4.5
	CRC	1.8	3	3.86	4.5
11	User Data	8.8	7.3	6.29	5.5
	CRC	2.2	3.7	4.71	5.5

Exercise2 :

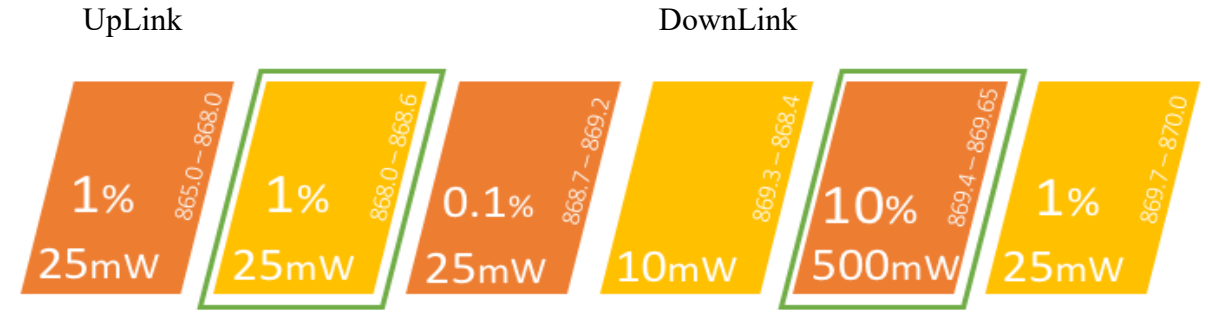
Make a graph plotting the energy consumption according to the reception latency of the LoRa compatible device classes.

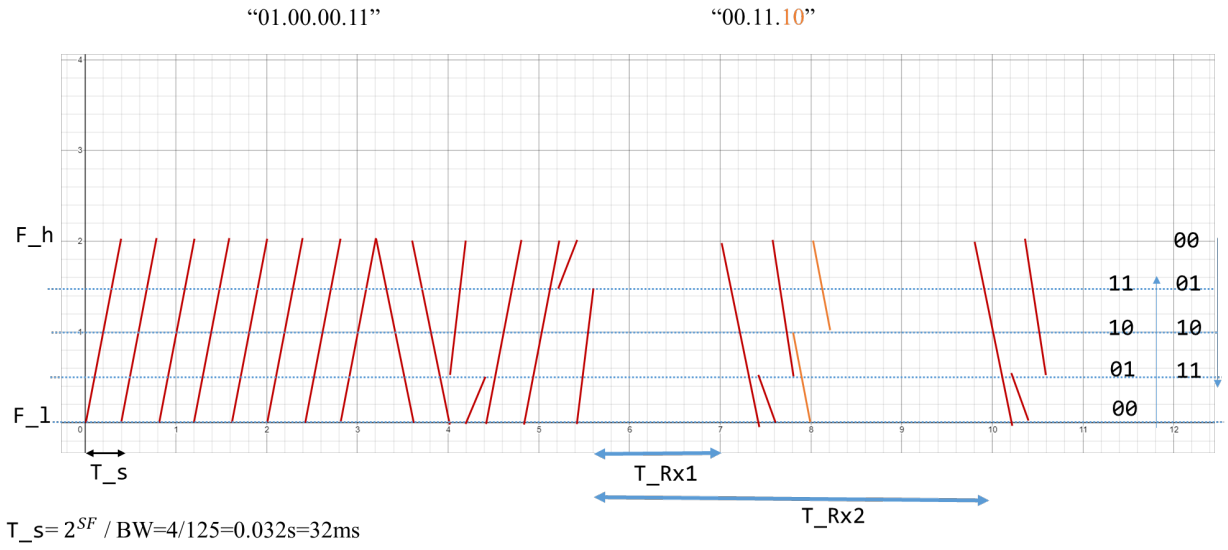


Exercise3 :

Considering a Class A device sends a payload of 8 bits “01000011” through the LoRaWAN technology. The device receives a payload of 4 bits “0011” from the gateway to acknowledge the reception. You are asked to draw the shape of the modulated RF signal to make the discussed communication. To simplify, you can use a spreading factor of 2 and 8 preambles with a bandwith of 125 KHz.

You can choose one of the following LoRa bands:





$T\_s = 2^{SF} / BW = 4/125 = 0.032s = 32ms$

Exercise4:

The objectif of this exercise is to study the EU433 and EU868 bands effect on the battery lifetime. We consider a device with lithium battery of **5000mAh** and **3.7** operating voltage. The preamble for EU433 is 5 symbols and 8 for EU868. The bandwidth is 125 KHz and the SF is 8. The playload is 10 Bytes with a coding rate is 1. The header mode is set to default and the device is sending 4 msgs per day. The duty cycle for both bands is 1%, but the power of EU433 is 13dBm and 20dBm for EU868 one.

Make the simulations to calculate the timing performance indicators then the energy-based ones

Estimated Battery life for EU433: 594Days

Estimated BL for EU868: 152

You can remark that the EU433 makes x4 of the battery lifetime compared to EU868