Proposal
Group 13

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1 Technical Description

The customer needs a system that can transmit and receive messages from one device to another. The system is divided into two different models. However, both models will do the same task in similar setups.
The system will transmit the text messages as bits. For that reason the messages will convert to symbols, then these symbols will transfer to signal. The signals will be upsampled, then convolved with a pulse through a pulse shape filter at that point the signal will be as a baseband signal. After that the baseband signal will be modulated with the carrier signal to become a passband signal after that it will be transmitted.
At the receiver side, the received signal will be demodulated and will pass throughout the low pass filter and match filter to get back the baseband signal. Moreover, the baseband signal will be synchronized in time and phase to sample at the right time. Furthermore, the baseband signal will be converted back to symbols, then the symbols will construct the message. The technician description details can found in Table. 1

2 Project Plan

The group decided to divide the project into two tasks, every two members of the group will work on one task.
Each team ,i.e, two group members, will work on one task while the other team will work on the other task. At the same time both teams will help each other and discuss the main issues to solve them and share the upcoming ideas. By doing so we allow the group to work faster and more efficient. Furthermore, every team will test their task and the other team will ensure the matching and quality.

- Eltjon and Haitham: Transmitter task.
- Sara and Waleed : Receiver task.
- Waleed and Eltjon : Supervision task.

Specification	Value	Reason
Bandwidth	240 Hz	Given
Pulse Shape	Root Raised Cosine (beta = 0.5)	The most ISI-free practical orthogonal pulse chose n with a reasonable roll-off factor.
Carrier Frequency A	1 K Hz	The carrier frequencies are picked based on the given range to achieve maximum separation between channels, hence minimum interference.
Carrier Frequency B	6 K Hz	
RX Decision	Matched Filter	The most practical and optimal way to decide the minimum distance between the received symbol and the actual symbol.
Lost Packets	0 %	Given
RTT	4.5 Sec	Given
Packet Length	432 bits	Given
Message Length	50 ASCII	Given
Bits per Symbol	2 bits per symbol	To achieve the given RTT and increase the transmitted data per symbol.
Modulation Technique	QPSK with Gray Code	The best modulation technique to achieve the 2 bits per symbol.
Symbol Rate	320 symbols per second	Based on the given bandwidth and the RRC roll-off factor the following must hold: Rs <2*BW / (1 + beta). This also was chosen to achieve the other given specifications.
Symbol Period	3.125ms	Ts = 1/ Rs

Table 1: All of the given values (like Bandwidth, RTT, ...) are chosen to achieve the best-given performance.

3 Test Plan

3.1 During the development

The git technology will be used in order to share code between the team members. The tests in this phase will be distributed between both the transmitter team and the receiver team, so each team must test without the hardware. This is done by producing a pseudo received and transmitted signal using the random bits generator. Each development step will be tested before moving to the next one with more different inputs to make sure that everything is working as intended.

3.2 After finishing the development

All of the test cases will be retested using the real hardware inside the lab to fix any deviation from the intended software results during the development.

3.3 Before delivery

A customer demonstration will be held and all of the fixed test cases from the previous testing stage will be tested again. During this demonstration half-duplex communication will be tested then full-duplex. Also the round trip time and the unsuccessful transmissions will be checked if they comply with the requirements.

3.4 Delivery

Finally, the project will be delivered to the customer for a test and to get feedback before the final version of the project to be handed over to the customer.

4 Time Schedule

Here we can the time schedule and will end with estimate of man-hours time which is 164.Figure1

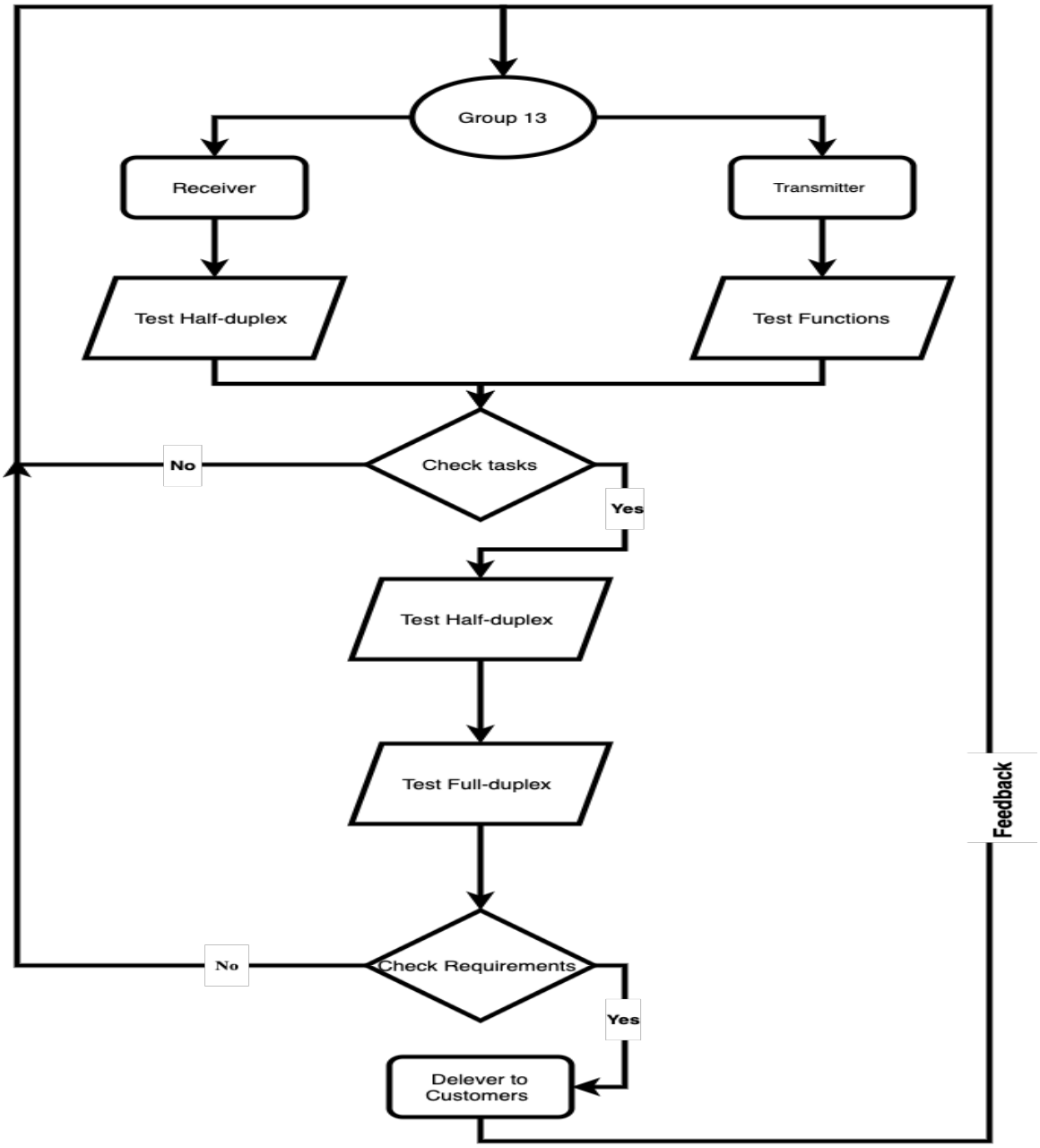

Figure 1: Execution Chart

Table 2: Dead-lines and deliveries

Week	Date	Subject
4	24 September	Status Report 1
4	24 September	Time Report 3
5	27 September	Transmitter
5	27 September	Receiver
5	1 October	Status Report 2
5	1 October	Time Report 4
6	4 October	First version of the code
6	4 October	Test and Optimise the Code
6	8 October	Status Report 3
6	8 October	Time Report 5
7	12 October	Finish the Code
7	15 October	Test Report
7	15 October	Deliver the code
7	15 October	Time Report 6
8	18 October	Experience Report

5 Estimate of man-hours

Evry gruop member will work 12 hours weekly. Since the project should be delever after 5 weeks, the estimated of total hor to the group for this project is 240 hours.

6 Proposed price

The estimated price bide will be as bellow:

Table 3: Price

Direct Cost	800 SEK x 240h	192.000 SEK
One Year Warranty Cost	192.000 SEK x 0,05	9.600 SEK
Overhead Cost	192.000 SEK x 0,15	28.800 SEK
Profit	192.000 SEK x 0,20	38.400 SEK
Total Price	268.800 SEK	