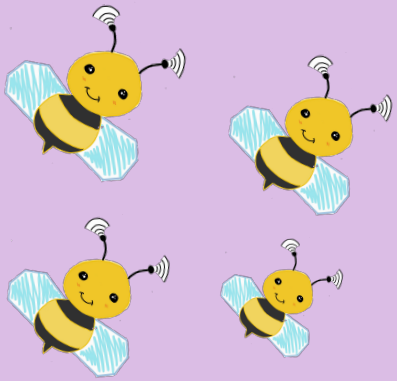
SCEL

Preliminary Design Review



Team Bumblebee

Spring 2020

Advisor : Dr. Anthony Kuh

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Presentation Overview

- Block Diagrams
  - Power
  - Signal/Communication
- Team Progress
- Problems
- Current PCB Design
- New PCB Layout
- Gantt Chart
- Upcoming Tasks

Block Diagram - Power

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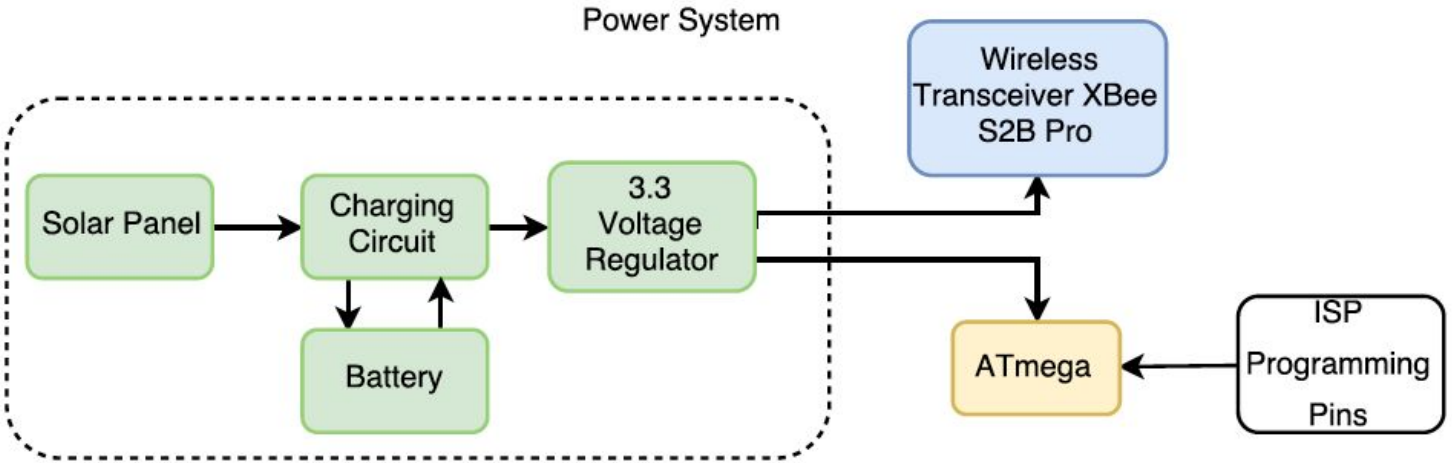

Block Diagram - Signal/Communication

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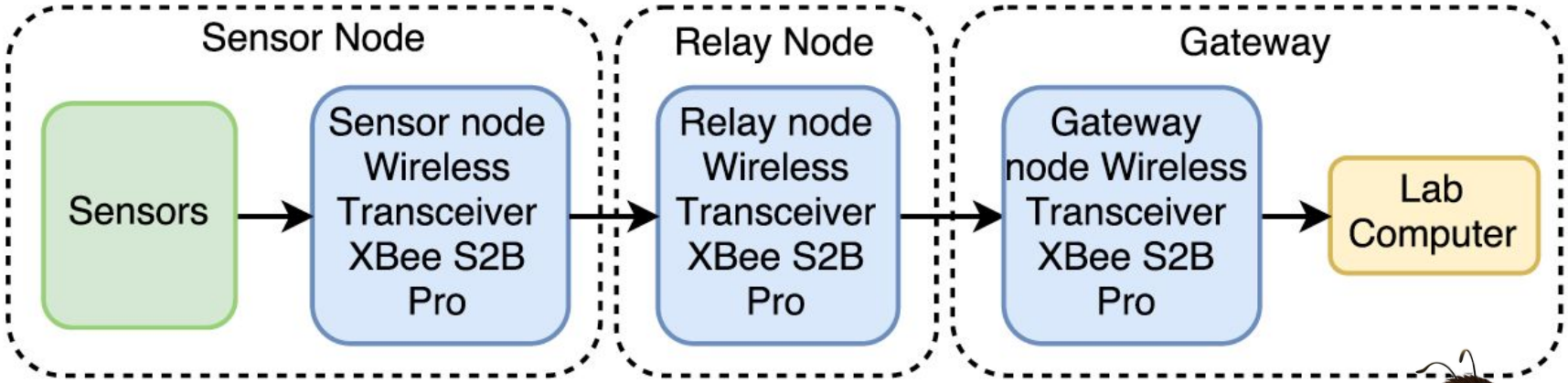

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Team Progress

- XBee Range Testing
  - Holmes Hall line of sight
  - McCarthy Mall
- Modified PCB Layout
- Ordered first PCB

Range Testing - Results

	AVERAGE LINE	AVERAGE LINE	AVERAGE LINE	AVERAGE LINE	AVERAGE LINE	AVERAGE LINE	AVERAGE LINE	AVERAGE LINE	AVERAGE LINE	AVERAGE LINE OF SIGHT	AVERAGE LINE
Distance (ft)	**local**		**remote**		**sent**	**received**	**Tx Error**	**Packets Lost**	**percentage**	**other variables**	**date**
30	-44		-44.33333333		15	15	0	0	100	Sunny, light wind	2/3
60	-58.66666667		-58.33333333		15	15	0	0	100	Sunny, light wind	2/3
90	-65.33333333		-67		15	15	0	0	100	Sunny, light wind	2/3
120	-6		-70.33333333		15	15	0	0	100	Sunny, light wind	2/3
150	-68.66666667		-70.66666667		15	15	0	0	100	Sunny, light wind	2/3
180	-75		-81.66666667		15	15	0	0	100	Sunny, light wind	2/3
210	-74.33333333		-76		15	15	0	0	100	Sunny, light wind	2/3
240	-76		-72		15	15	0	0	100	Sunny, light wind	2/3
270	-78.66666667		-76.33333333		15	15	0	0	100	Sunny, light wind	2/3
300	-78		-73.66666667		15	15	0	0	100	Sunny, light wind	2/3
330	-73.66666667		-73.66666667		15	15	0	0	100	Sunny, light wind	2/3
360	-78.33333333		-78		15	15	0	0	100	Sunny, light wind	2/3
390	-83		-81.66666667		15	15	0	0	100	Sunny, light wind	2/3

	AVERAGE MCC/	AVERAGE MCC/	AVERAGE MCC/	AVERAGE MCC/	AVERAGE MCC/	AVERAGE MCC/	AVERAGE MCC/	AVERAGE MCC/	AVERAGE MCC/	AVERAGE MCCARTHY MALL	
Distance (ft)	**local**		**remote**		**sent**	**received**	**Tx Error**	**Packets Lost**	**percentage**	**other variables**	**date**
90	-77.33333333		-77.33333333		15	15	0	0	100	windy, raining	2/10
175	-75.33333333		-72		15	15	0	0	100	windy, raining, students passing	2/10
244	-7		-80.33333333		15	15	0	0	100	windy, raining	2/10
324	-7		-86.33333333		15	15	0	0	100	windy, raining	2/10
403	-7		-8		15	15	0	0	100	windy, raining	2/10
477	-7		-8		15	15	0	0	100	windy, raining	2/10

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Problems

- PCB Order
  - Find alternative to order PCB
- TX and RX pins not declared in code
- Xbee S2C not transmitting correctly

PCB Layout: 5V Breakout

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- 5V Regulator → Breakout Board
- Connected 3V regulator straight to battery
- Added more vias

PCB Design

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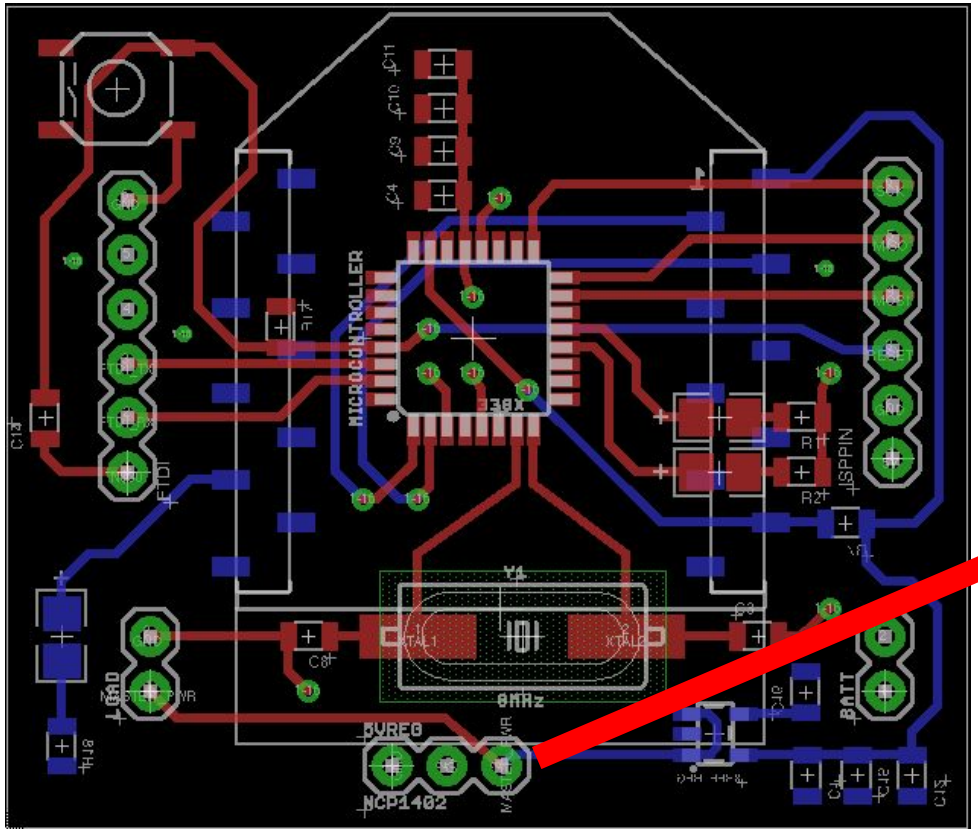
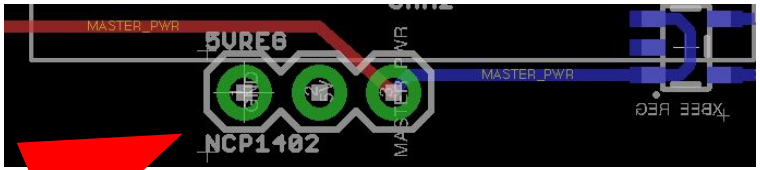
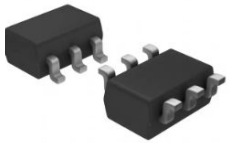


5V Regulator Breakout Board





5V Voltage Regulator

Part Number: ISL9111EH50Z-T7A

IC Reg Boost 5V 800mA

Function	Step-Up
Output Configuration	Positive
Topology	Boost
Output Type	Fixed
Number of Outputs	1
Voltage - Input (Min)	0.8V
Voltage - Input (Max)	4.8V
Voltage - Output (Min/Fixed)	5V
Voltage - Output (Max)	-
Current - Output	800mA (Switch)
Frequency - Switching	1.2MHz

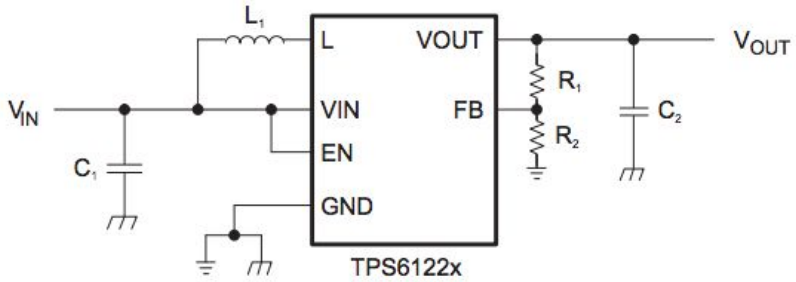
Part Number: TPS61222DCKR

IC Reg Boost 5V 200mA

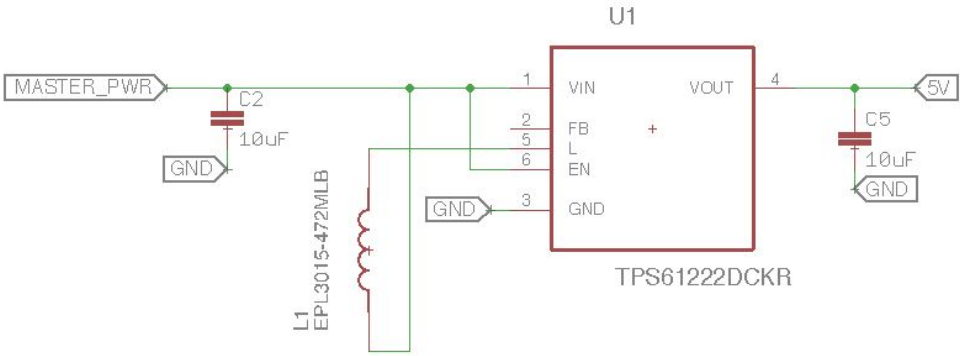
Function	Step-Up
Output Configuration	Positive
Topology	Boost
Output Type	Fixed
Number of Outputs	1
Voltage - Input (Min)	0.7V
Voltage - Input (Max)	5.5V
Voltage - Output (Min/Fixed)	5V
Voltage - Output (Max)	-
Current - Output	200mA (Switch)
Frequency - Switching	Up to 2MHz

Schematic: IC Reg Boost 5V

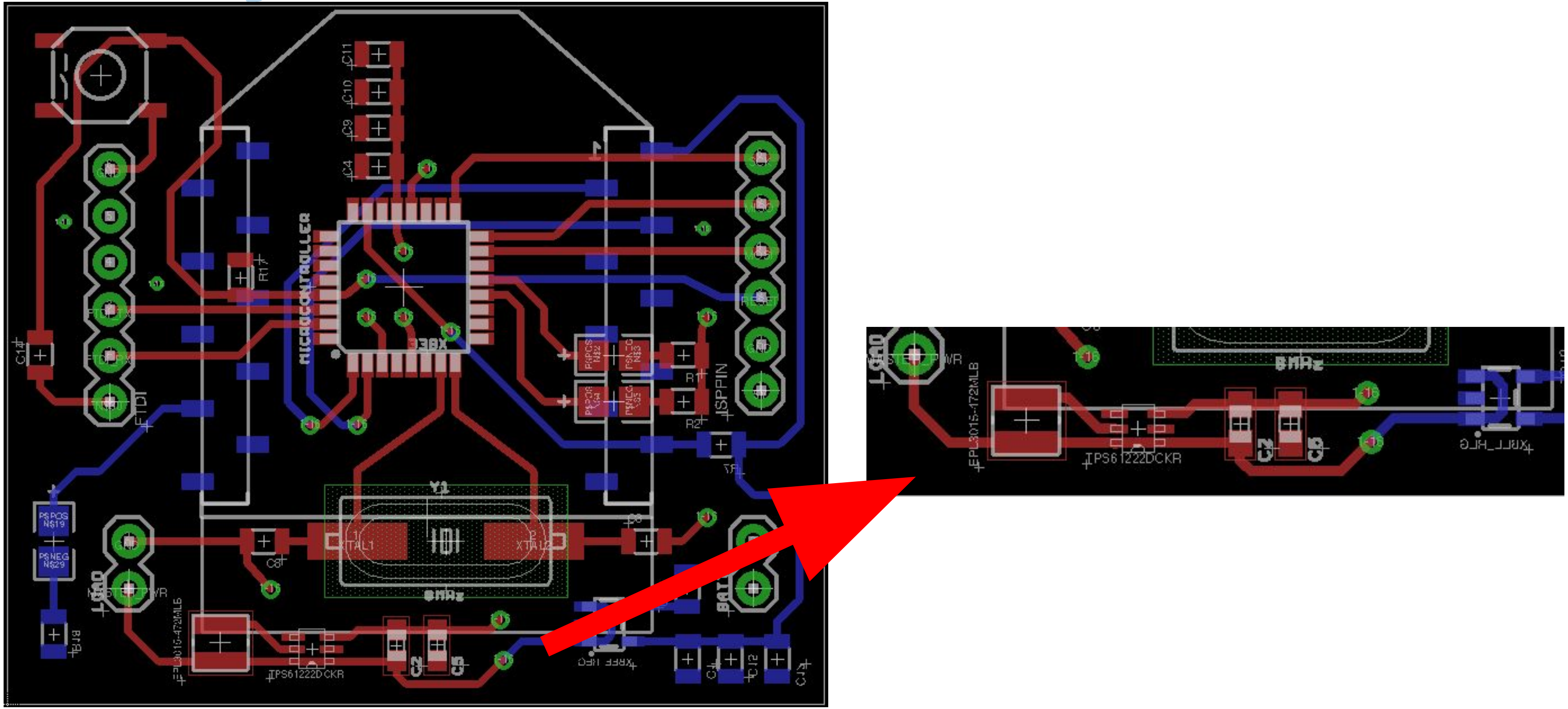
Datasheet Schematic



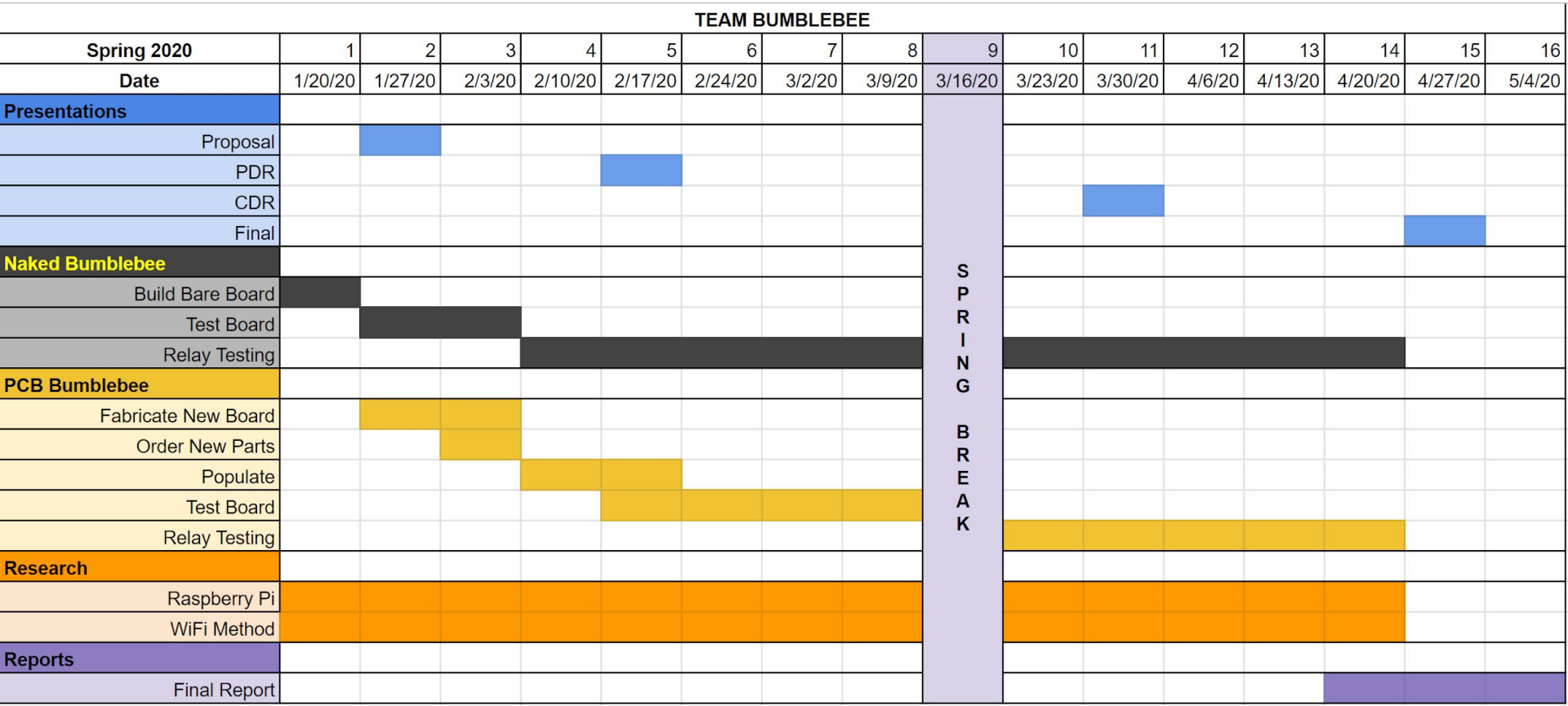
EAGLE Schematic



PCB Design


MICROCONTROLLER
Y1
8MHz
XTAL1
XTAL2
ISPPIN
FTDI
C11
C10
C9
C4
C8
C14
R1
R2
C2
C5
C12
C13
BAT
MASTER_PWR
TPS61222DCKR
EPL3015-472MLB

Gantt Chart


TEAM BUMBLEBEE
Spring 2020
1
2
3
4
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8
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11
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13
14
15
16
Date
1/20/20
1/27/20
2/3/20
2/10/20
2/17/20
2/24/20
3/2/20
3/9/20
3/16/20
3/23/20
3/30/20
4/6/20
4/13/20
4/20/20
4/27/20
5/4/20
Presentations
Proposal
PDR
CDR
Final
Naked Bumblebee
Build Bare Board
Test Board
Relay Testing
PCB Bumblebee
Fabricate New Board
Order New Parts
Populate
Test Board
Relay Testing
Research
Raspberry Pi
WiFi Method
Reports
Final Report
SPRING BREAK

Upcoming Tasks

- Fabricate two PCBs and populate
  - Test 2 different parts: Breakout board, new 5V Voltage Regulator
- Continue range testing with Xbee S2C Pro
- Debug Xbee S2C code, start range testing
  - Compare the two Xbee's results
- Research possible alternatives than Xbee
  - Ex: Raspberry Pi,... etc.