

Wireless Open-Source/Open-Architecture Command and Control System - Mid Range II P11208

Mission Statement:

To create a wireless data transmission channel over a distance of at least 100m from a controller to a mobile receiver.

Team Members:

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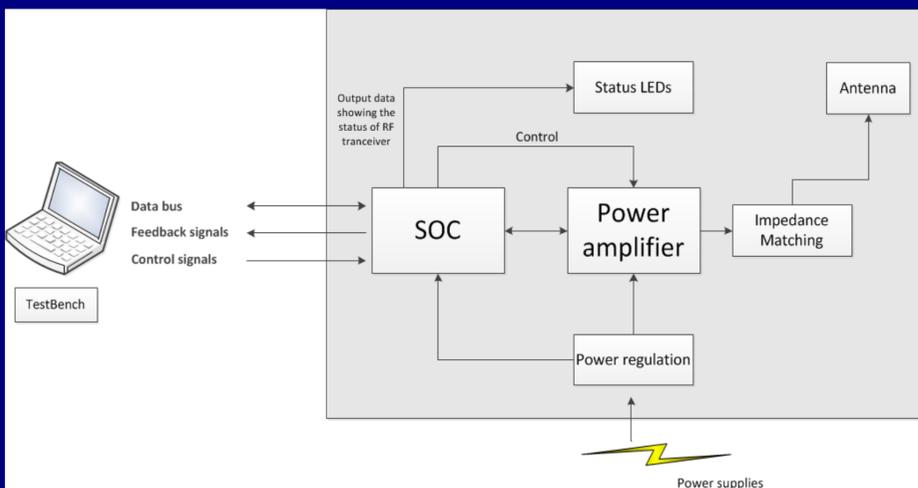
Background:

This project, sponsored by Harris Corporation, is part of the WOCCS family which is comprised of six teams. This project's design is intended to be interchangeable among the three RF team solutions to allow the final device to be used in multiple settings and distances.

Engineering Specifications:

Engr. Spec. #	Importance	Source	Specification (description)	Unit of Measure	Marginal Value	Ideal Value	Comments/Status	Verification Method
ES1	1	CN7, CN8	Mass	kg	<0.3	0.2	Determined from IM Meeting	Measure
ES2	3	CN1, CN6	Configurable by licensed electronic technician	Binary	OK	OK	TBD	Demonstration
ES4	9	CN2, CN5	Authorized Transmit Frequency	Binary	OK	OK	FCC Regulation	Inspection
ES5	9	CN2, CN5	Number of available channels	units	15	25		Demonstration
ES6	9	CN2, CN4	Transmitter Power Output (TPO)	watt	Nose Floor +86.246dBm	<30dBm	FCC Regulation	Measure or Calculation
ES7	9	CN5	Data Rate	kbps	>40	56		Demonstration
ES8	9	CN2, CN4	Range	m	>100	200	TBD	Demonstration
ES9	9	CN5	Regulatory Agency Compliance	Binary	OK	OK	FCC Regulation	Inspection
ES10	3	CN4	Bit Error Rate (BER)	%	<0.12	0.001		Demonstration
ES12	1	CN9	Printed Documentation/Manual	Binary	NOK	OK		Inspection
ES13	9	CN1	Meet interface specifications as defined in the System Interface Specifications document	Binary	OK	OK	Determined from IM Meeting	Inspection
ES14	3	CN7	Width	cm	9 +/- 0.127	9	Determined from IM Meeting	Measure
ES15	3	CN7	Length	cm	7 +/- 0.127	7	Determined from IM Meeting	Measure
ES16	3	CN7	Height	cm	<3	-	Determined from IM Meeting	Measure
ES18	1	CN10	Price per board	\$	<300	-	Determined from RF Meeting	Inspection

System Architecture:



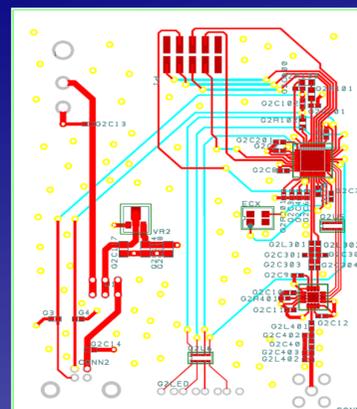
The selection of the SoC was also towards the use of the IEEE 802.15.4 ZigBEE protocol. This protocol allows for a mesh network to be formed for a wide number of devices to be used. After consideration of the application needs, a simpler point-to-point protocol, the TI Simplicity Protocol, was implemented. With this protocol, the engineering specifications were met.

Design Selection:

After investigating different concept possibilities, a Texas Instruments (TI) system-on-chip (SoC) was implemented. The SoC incorporates a 2.4GHz transceiver, USB 2.0 compatible UART, and a 8051 MCU into a 6mm by 6mm QFN40 package.

The choice of 2.4GHz for wireless transmission results in the use of a smaller antenna for improved portability, but decreases the transmission range significantly. Consequently, a TI CC2591 power amplifier was selected to ensure the range requirements were met.

PCB Layout:

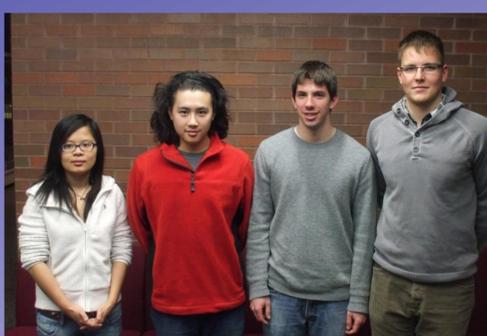
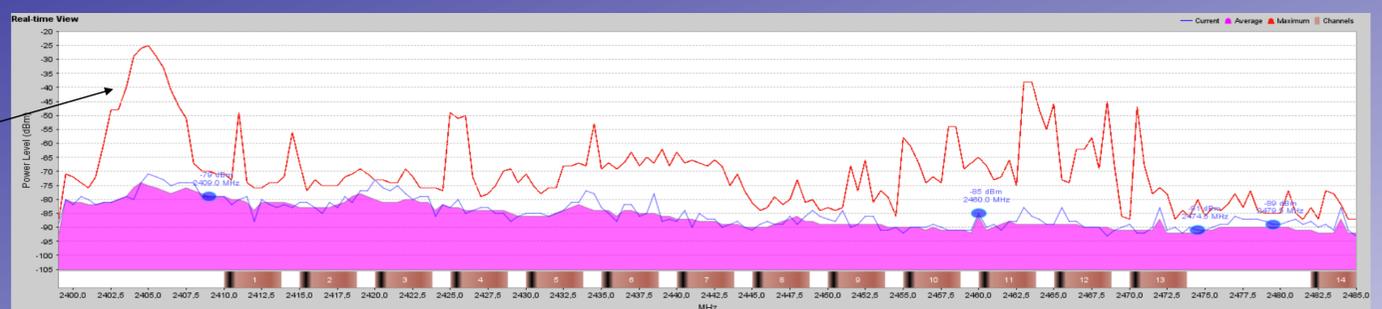


Test Results/Conclusions:

- Design error while creating the PCB layout (chip footprints "mirrored")
- Time consuming work around needed (20+ hours per board): Unable to produce 10 predicted boards

- Test Results: Proof of Concept, modified design ready for mass production
- Direct applications to be developed in the future: Telemetry data, control data, video feeds,...

2.4GHz transmission power spectrum for a single channel. Output power within FCC regulations.



Special Thanks To:

Harris Corporation
Philip Bryan, Project Guide
Leo Farnand, Project Guide
Vincent Burolla, Project Guide
Jeffrey G. Lonneville, Lab Technician
Christine Fisher, Program Coordinator

