

Wireless RF Audio System

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Introduction

Project Statement:

- Common problem for the audio systems in convention facility to have sub-optimum sound output.
- Causing the audience can't hear clearly what the person on the microphone is saying.

Solutions:

- Building a portable wireless audio system.
- By bringing the speakers closer to the audience, depends on the audience preferences.
- The audience has the freedom to adjust the volume of the speakers.

Goals:

- Accommodate to various hearing needs.
- The system should give an optimum sound clarity in a large convention room, E.g. lecture hall, convention facility.

Design Requirement

Functional Requirements:

- Provide clear audio signal from a transmitter to receiver device via radio frequency.
- Customizable transmission frequency to avoid noise.
- Multiple speaker output to accommodate larger venues.

Non-Functional Requirements:

- Ease of use.
- Stand alone speaker system.
- Minimal delay in data transmission.
- Scalable to match with different size of audience and size of rooms.

Operating Environment:

- Ideal use in large room size.
- E.g. Lecture halls, Convention Facilities, Medium to large sized classrooms.

Testing

Testing Objectives:

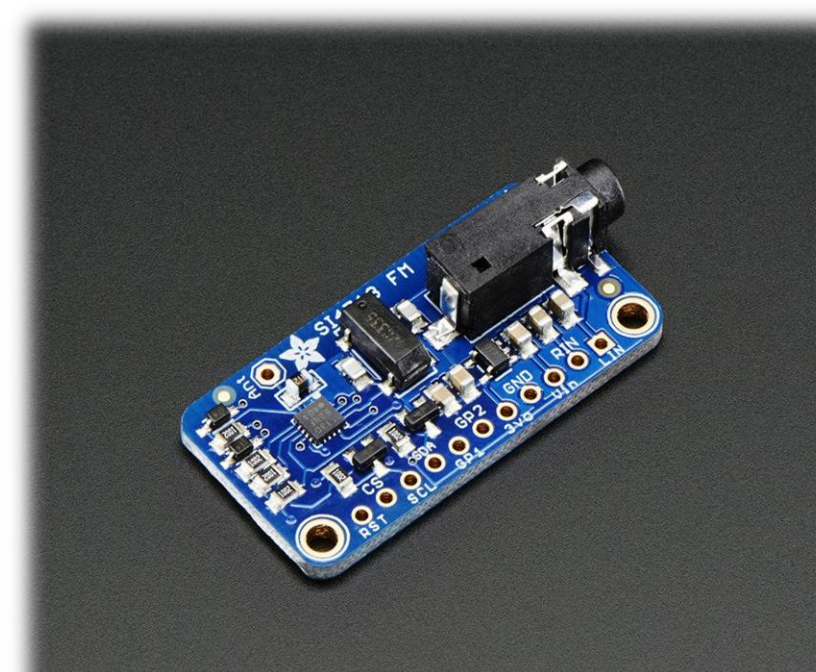
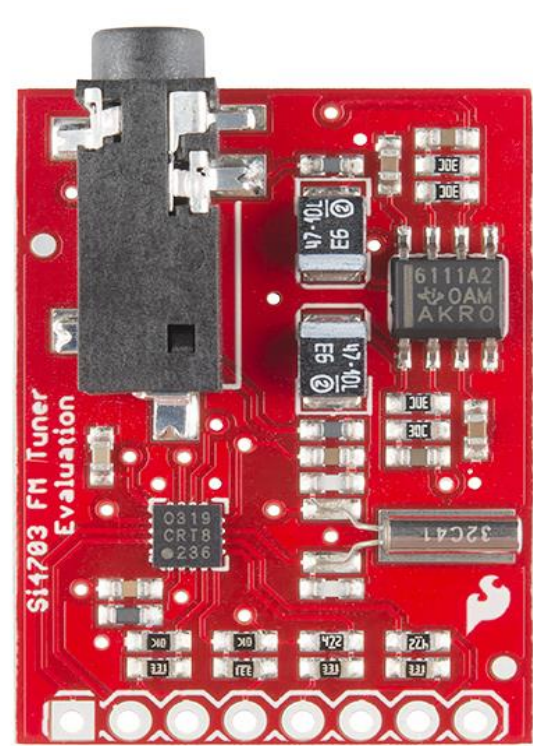
- Connectivity.
- Signal Strength.
- Proper I/O.
- Range.
- Clarity.

I/O Testing:

- Analyzing input voltages from microphone in different levels of background noise to ensure clear transmission.
- Ensuring Speaker output has no feedback and is sufficiently amplified, Calibration measurements can be made using different amplifiers.

Connectivity Testing:

- Using full FM Band, We will test the ability for connectivity at each frequency.
- Measuring the signal strength at each frequency by analyzing channel noise and traffic levels.
- Range will be analyzed at each frequency by transmitter/receiver separation.



Arduino:

- Uno R3 with Atmega 328 Microcontroller.
- Analog and Digital I/O.
- C Programming Base for Operation and control.

Receiver:

- Silicon Labs 4703 Receiver Chip.
- Seek Tuning.
- AGC (Automatic Gain Control)
- Volume Control.

Technical Details

Transmitter:

- Silicon Labs 4713 Transmitter Chip.
- Supported frequency (76-108 MHz).
- Audio Silence Detector.

Radio Frequency (RF):

- Use FM band.
- FM is a reliable source for transmitting audio waves.
- Non-directional dependent.
- No Pairing necessary.

Design Approach



Microphone:

- Receive audio signal from from the person talking.
- Convert analog signal to digital audio signal.

Audio Transmitter:

- Receive digital audio signal from the microphone.
- Sending the signal to the receiver via optimum radio frequency channel.

Audio Receiver:

- The optimum radio frequency channel is set to prepare receiving the audio signal from the transmitter.
- When the signal is received, the digital audio signal is converted to analog signal.

Speaker:

- Convert the analog audio signal to sound waves which is audible to the listeners.