

Free-Space Optical Music Link

Purpose

Create a free-space optical link using our laser light show driver circuits that can play musical tones remotely.

Equipment Required

| | |
|--|--------------------------|
| Completed laser light show driver circuit | LM741 Op Amp |
| ALS-PT204-6C phototransistor | Red LED |
| Speaker (nominally 1W, 8 ohm) | 3904 or 3906 transistors |
| Various resistors and capacitors as needed | Oscilloscope |
| Triple Power Supply | Computer and cable |

Prelab

Design a circuit that will enable musical tones created by the laser light show driver (controlled by the computer) to be broadcast via an optical link to a photo receiver and then amplified and buffered to drive a speaker. In your lab notebook, prepare for grading at VERY START of lab:

- 1) a functional circuit diagram.
- 2) a chip layout diagram with pin-outs of chips and components clearly marked.

In both circuits, clearly identify where the input to your circuits is coming from in your laser light show circuit, i.e. how your optical transmitter integrates into your laser light show circuit.

See links on class web page for function and specifications of components.

****We will do most of pre-lab in class together.****

Procedure

- 1) Build your circuit (one circuit per person)
 - a. Put a photo transmitter circuit into your laser light show driver circuit.
 - b. Put a photo receiver about 2" from your photo transmitter on your board.
 - c. Aim photo transmitter at photo receiver.
 - d. Tune angle of photo receiver towards photo transmitter.
 - e. Build receiver circuit (bias, amplifier, and voltage buffer/emitter follower)
 - f. Verify that photo receiver is blinking (use any laser show text file and settings)
- 2) Run test tone using simpleSine.ino
 - a. Use Laser show VI version 7 with 15 for period, 50 frame repeats.
 - b. Monitor output of receiver (output of voltage buffer) on oscilloscope.
 - c. Tune angles of photo transmitter and receiver to maximize efficiency of link.
 - d. Tune gains of laser light show driver to maximize dynamic range of transmitter.
 - e. Measure frequency of tone.
- 3) Run final test using pinkPanther.ino
 - a. Verify that the music stops when light is blocked.
 - b. Have TA or instructor sign lab book to verify your circuit is working.

Conclusion

1. Include in your write-up all the design considerations in choosing circuit elements and configurations, including gains, resistor and capacitor values, voltage levels and ranges, PNP versus NPN transistors in emitter follower. Explain the measured tone frequency (2e).