

Project 1: 5.8 GHz RF Signal Generator



ECE 6361: Microwave Design Lab

Objective

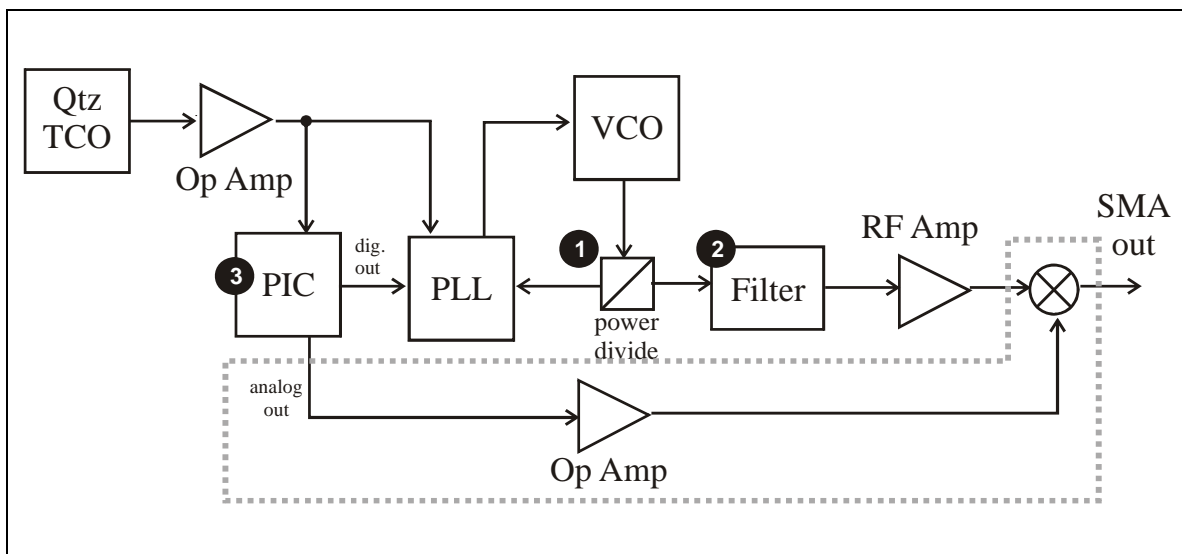
The student team will produce a device capable of generating a CW signal in the 5.8 GHz ISM band capable of FCC Part 15-compliant frequency hopping.

Design Specifications

Each student team is expected to design and build a CW signal board in the 5.8 GHz band that is capable of Part 15-compliant frequency hopping. The key design targets are

- Operation within the 5.725 – 5.850 GHz ISM (unlicensed) band; no measurable out-of-band signal
- +7 dBm of output power (5 mW)
- Uses at least 75 frequency channels, spaced 1 MHz apart
- Maximum 0.4s dwell time on 1 carrier frequency during a 30s interval
- Self-contained design on a single circuit board (may be driven by external DC power supply in the laboratory)

A high-level diagram of the signal generator is shown below:



There are 3 design components that must be present:

1. Wilkinson power divider
2. Low or bandpass filter (remove harmonics)
3. Frequency-hopping algorithm

The diagram above includes an optional segment for waveform modulation. A team may receive full credit for Project 1 without this optional segment.

There is a list of supplies online for building this project. Ask the instructor for these components when ready to fabricate the circuit board. Connectors and basic surface-mount capacitors, resistors, and inductors are available from the lab manager. If a team would like to use additional components, please clear the component with the course instructor. Once cleared, the components may be purchased (likely out-of-pocket) by the team.

Due to the complexity of this particular project board, students will be allowed 1 circuit board rev through an external board manufacturer – complete with solder mask. Please coordinate this purchase through the lab manager. Other test boards and segments for this design must use the in-house circuit fabrication facilities at Georgia Tech. *Schedule in advance.*

Grading

Grading for the student teams is based on three parts:

1. **Written Report** – The base score of this project will be based on the written documentation of the group’s project design and implementation. Key grading points for good design documentation:
 - a. Technical Correctness
 - b. Thorough Design Methodology
 - c. Clear, *Concise* Writing
 - d. Professional Content
 - e. References

Design documentation should strive for succinct repeatability.

2. **Compliance Test** – Each team must demonstrate to the course instructor that their final device complies with the project specifications. Various project score deductions will be assessed to a team depending on how far “out-of-spec” a final device performs. Compliance may only occur immediately after a scheduled lecture.
3. **Peer Evaluation Forms** – Download the peer evaluation forms from the course site and fill them out for each team member. Various project score adjustments may be assessed to a team depending on peer-assessment of individual team member effort. Form feedback is kept confidential.