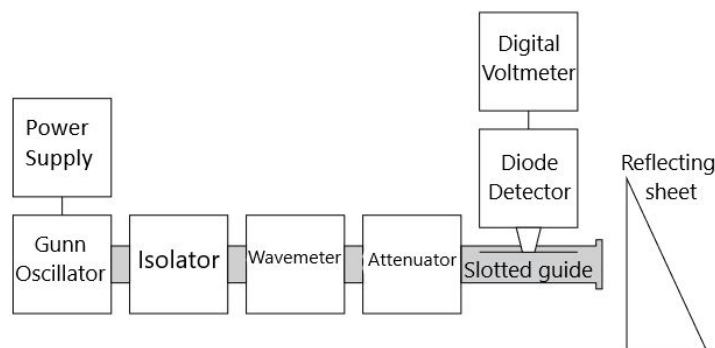
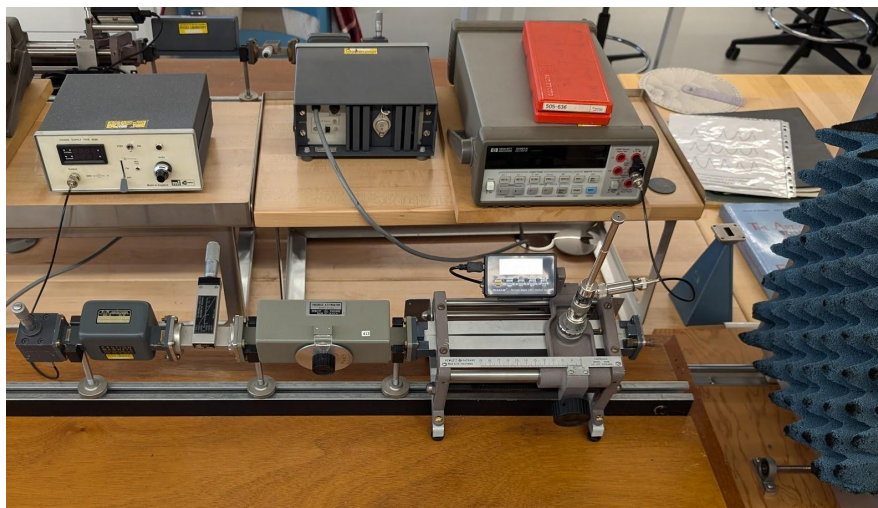


# Waveguide Interface Impedance Study

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Tools & Skills: E&M Theory, Smith Chart, Python, Data Analysis and Visualization



Experiment setup picture using the closed-end waveguide termination and diagram.

Links: [Lab Manual & Theory](#), [Lab Notebook](#)

## Goal:

To calculate the impedance of a metal rectangular waveguide with various end interface attachments from measured data.

## Outcome:

Determined the impedance of a closed, an open, and a horn end by measuring the Voltage Standing Wave Ratio (VSWR), measuring the phase of the voltage maxima, and using a Smith Chart. The horn end resulted in the best impedance match with the intrinsic waveguide impedance.

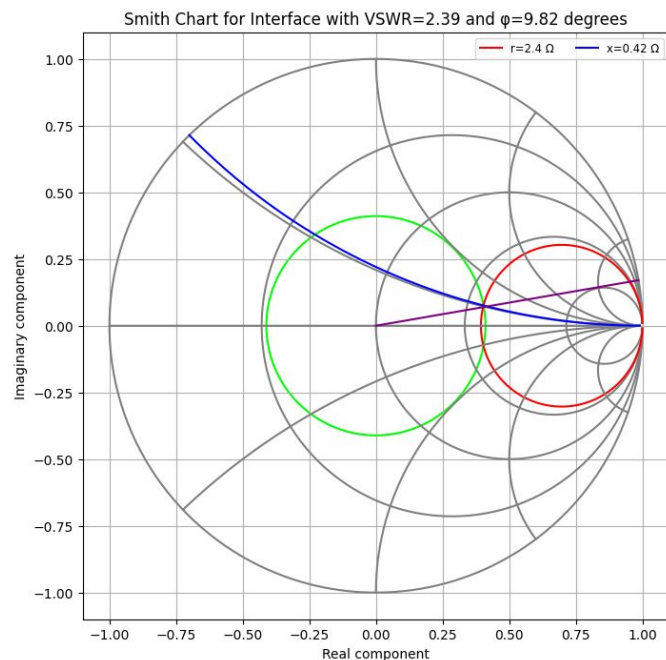
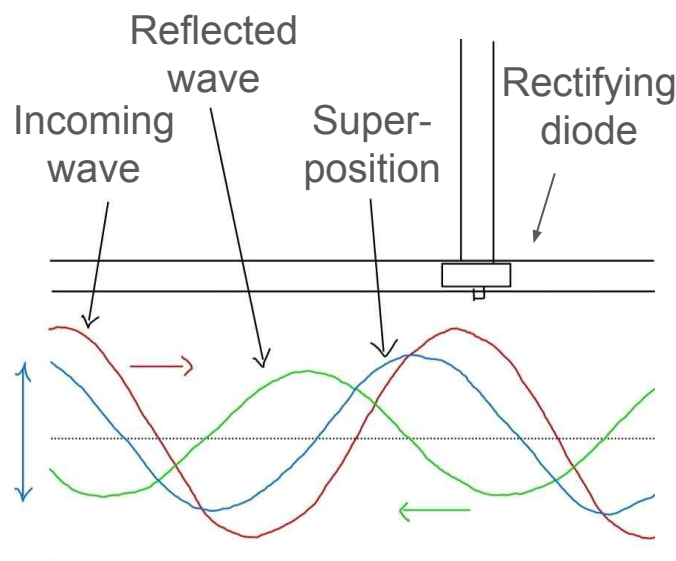
## Key Features:

### Experiment setup:

- A Gunn oscillator produces microwave power and the waveguide is slotted for a copper probe with a rectifying diode to measure voltage in the guide
- The waveguide end can be closed, open, or use a horn that is directed towards a reflective or absorbing sheet

### Process (for each interface):

- Using the closed end, measure the wavelength in the guide of the standing wave
- Calculate the fractional wavelength to the end of the guide from the nearest voltage maxima and using the wavelength in the guide
- Calculate the VSWR, the reflection coefficient, and the phase of the reflected wave to plot on the Smith Chart



Smith Chart plot of open end waveguide.