

## Variable Slope, Multi-Octave Radio Frequency Filters (#7680)

Current radio frequency filters cannot provide arbitrary slope over multiple octaves

Producing lab simulations of observed radio frequency (RF) phenomenon requires fabrication of RF filters that support variable per-decade slopes rather than multiples of 10 dB over a multi-octave frequency range. Existing technology supports intermediate-value slopes but only over a small fraction of an octave.

### Photonics technology enables a multi-octave, continuously variable slope filter

This technology uses photonic components to create a variable slope, multi-octave low-pass/high-pass filter that could be used to modify an RF signal to remove noise, minimize distortion, or enhance signal quality for high-frequency communications. The system filters multi-octave RF signals using a photonics up-converter that can operate on an RF signal that spans a fractional octave in relation to the optical carrier. The slope can be continuously varied before the RF signal is extracted from the combined signal.

### Benefits/Advantages

- **Customizable:** The combined signal may be applied to a standard low-pass, band pass, or high-pass optical filter. The filter can be implemented with any number of poles for a maximum defined-slope, and the choice of pass type may be made according to the desired slope direction.
- **Variable:** By moving the optical carrier up and down in frequency through the transition band, the slope of the RF signal can be continuously varied.
- **Versatile:** The technology can be used as is or it can augment existing RF lab equipment.

### Potential Commercial Applications

Potential uses include:

- Two-way encrypted radio products
- Military radios/telephones that require voice-recognition quality audio
- Encoding/decoding voice signals in telephony-related Bluetooth devices such as wireless headsets and mobile phones
- Simulating observed RF transmission or RF coupling phenomenon that requires an unusual spectrum shaping

**Reginald Alan Ratcliff**

Principal Research Engineer - Georgia Tech Research Institute

## **Patent/IP Information**

Patent application has been filed

[63/317662](#)

## **Publications**

**For more information about this technology, please visit:**

<https://licensing.research.gatech.edu/technology/variable-slope-multi-octave-radio-frequency-filters>