UNIVERSITY OF WATERLOO

# TECHNOLOGY SUMMARY

## Novel Coxial tunable bandpass filter

### Reference
10160

### Inventor(s)
Dr. Raafat Mansour
Gowrish Basavarajappa

### Patent status
US patent application # 62/779,873, filled on Dec 14 2018

### Stage of development
Prototype

### Contact
Scott Inwood
Director of Commercialization
Waterloo Commercialization Office
519-888-4567, ext. 33728
sinwood@uwaterloo.ca
uwaterloo.ca/research

## Background

Tunable bandpass filter is one of the vital components of frequency reconfigurable (or frequency agile) wireless systems which facilitate effective utilization of allotted frequency spectrum. Frequency reconfigurable wireless systems can be a cost effective solution for wireless base-stations as well as for satellite & aero-space applications. In satellite application, on orbit flexible payload (or programmable payload) is one such encouraging development on the horizon. These systems inevitably require high Q (Quality factor) tunable bandpass filters with a constant absolute bandwidth over the tuning range. One of the important requirements for tunable filters in most applications is to maintain constant absolute bandwidth over the tuning range. The data rate is bandwidth dependent thus maintaining the same data rate over the tuning range requires maintaining the same bandwidth. In addition, most of communication system applications require maintaining certain isolation requirements outside the band, which cannot be satisfied if the bandwidth is changed. Thus, by maintaining a constant bandwidth over the tuning range, the achievable data rate and the filter isolation requirements remain the same over the entire tuning range, which is highly desirable.

## Description of the invention

Waterloo researchers have developed a technology that provides a configuration for a tunable filter which is capable of realizing constant absolute bandwidth and insertion loss over a wide tuning range using a single tuning mechanism. This is the first co-axial type filter that can be tuned by a single tuning element with minimum variations in absolute bandwidth and insertion loss over the tuning range, where as the majority of the competing technologies use multiple tuning mechanisms (at-least equal to the filter order) and do not present a way to realize tunable filters with a constant absolute bandwidth

## Advantages

This novel high Q tunable filter maintains a constant absolute bandwidth and insertion loss over the tuning range. In addition, the filter can be tuned by a single tuning mechanism. This proposed design has a reduced production cost compared to communication systems that use identical filters by using fewer filter units that can be easily reconfigured during production phase to fit the required frequency plan.

## Potential applications

- Antennas
- 5G communication