

**Non-Confidential Description - PSU No. 2898**  
**“High-Selectivity Electromagnetic Bandgap Device and Antenna System”**

**Keywords:**

Tunable Antenna Systems

**Links:**

[US Patent 7,042,419](#)

[Inventor Website](#)

**Inventors:**

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**Background**

Current antenna systems with either electrical or mechanical frequency tuning options are known to exist however, none are known that provide system selectivity using a very narrowband. All of the previous tunable antennas, including the narrowband options, possess bandwidths far in excess of what can be achieved through the normal use of a narrowband Electromagnetic Bandgap (EBG) device and antenna element in combination.

**Invention Description**

The present invention enables the creation of an antenna system possessing generally narrow bandwidths such that adjacent signals will be screened out, thus providing radio system selectivity. An antenna possesses an overall wider bandwidth, but when combined with an EBG of lesser bandwidth, the net effect of the system will be nearly that of the EBG alone. In practice, the bandwidth of operation is defined as the frequency range where the reflection phase is between -90 and 90 degrees. Using this principle, as the operating frequency with which the antenna is being driven leaves the band defined by -90 and 90 degree operation, the in-phase reflection property is lost and perfect electrical conductor (PEC) behavior returns, short-circuiting the antenna and quenching antenna operation. The out-of-band gain quenching characteristics of this narrowband EBG negate antenna gain off of resonance thereby creating an antenna system with an overall narrow bandwidth. An EBG tuning mechanism is also employed to provide frequency agility and adjustment to the antenna system.

**Advantages/Applications**

- Enhanced system selectivity through improved narrowband response
- EBG optimization for narrow bandwidths
- Increased radio frequency agility
- Adjustability
- Suitable for Low Frequency Applications