Highly Efficient and Compact Leaky Wave Antenna Using Non-Reciprocal Metamaterials

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Non-reciprocal Metamaterial Technology:
A new concept that combines the non-reciprocal circuit with different transmission characteristics by the propagation direction and the metamaterial technology.

1. Utilization of Non-Reciprocal Metamaterial Technology to Antennas

-1 Application to the leaky wave antenna [Non-reciprocal leaky wave antenna]
  - It can be reused the radio waves by having reflecting at the end.
  - Radiation efficiency and directivity are improved

-2 Application to the travelling-wave resonator and the beam-scan antenna
  - The resonance condition is automatically satisfied not depending on the resonator size by connecting reflector on both ends.
  - Possible to change the size of resonator, keeping fixing the resonance frequency. Reduced size of antenna is possible.
  - Phase gradient of the electromagnetic field distribution on the resonator is continuously controllable by an externally applied magnetic field.
  - Small and high radiation efficiency beam-scan antenna is realized.

2. Potential Applications
- Beam-scanning antennas for microwave and/or millimeter wave radar
- Beam-scanning antennas for compact wireless communication in which highly-directivity is not required
- Antennas for wireless power transmission

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