mmWave Reconfigurable and Miniature On-Chip Filter Based on Vanadium Dioxide

Current on-chip filters are too big and non scalable

Developed for applications exceeding 30 GHz, this "combline" electromagnetic filter technology leverages the phase-change properties of Vanadium Dioxide (VO2) to adjust its passband frequency range dynamically. Heating VO2 creates a high-performance ground connection, reducing the electrical length of coupled transmission lines and thus shifting the passband to a higher frequency.

Miniature on-chip filters provide compact size, scalability and low insertion loss

This innovation addresses several challenges: it overcomes the limitations of acoustic wave filtering technology above 30 GHz, alleviates space constraints in millimeter wave (mmWave) array front-end electronics, and mitigates the high insertion loss associated with transistor-based switches in filter banks.

Summary Bullets

- VO2-based combline electromagnetic filter dynamically modulates millimeter wave 5G/6G passband frequencies above 30 GHz using phase-change properties to adjust transmission line lengths with heat.
- Compact on-chip technology streamlines control, accommodates complex shapes and multiple bands, and minimizes insertion loss, addressing spatial, acoustic wave filtering, and efficiency challenges in mmWave arrays.
- Designed for 5G and 6G networks, it enables flexible band switching above 30 GHz, addressing key technical challenges and supporting high-performance telecommunications demands.

Solution Advantages

- Compact on-chip form factor
- Simple control requirements
- Scalability to more complex filter shapes and more bands

- Low insertion loss compared to other filtering options

Potential Commercial Applications

- 5G communications systems that switch between different operating bands above 30 GHz
- 6G communications systems that require dynamic frequency band change

Inventors

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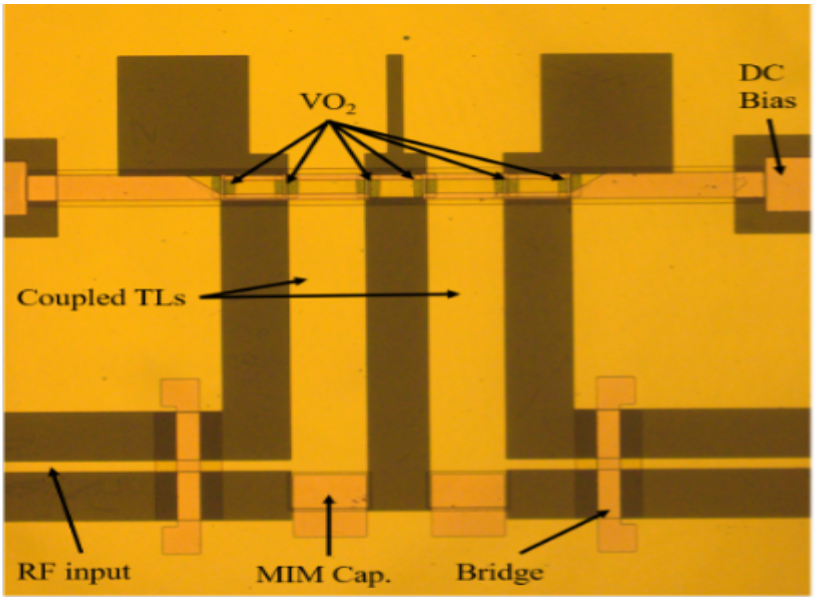
IP Status

Filed Provisional. : WO 63/550,759

Publications

Novel Compact Tunable Filter Prototype Realized with Vanadium Dioxide, IEEE Explore -

Images



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