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RF Finite Impulse Response Digital to Analog Converter for Mobile Communication Devices

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Intellectual Property Status:

Patent Pending

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Background

For mobile devices, reducing power draw and prolonging battery life are critical design objectives. Presently, current-steering digital to analog converters (DACs) require high power consumption and dynamic element matching and are vulnerable to component source mismatch. Accordingly, large rail devices and higher supply voltages are needed. Additionally, DACs do not provide quantization noise suppression and are forced to rely on RF filtering for out of band noise suppression. These power-hungry converters are complex and limit the operational performance of many wireless devices.

Invention Description

Researchers at Arizona State University have developed a new radio frequency finite impulse response DAC for use in mobile communications devices and low power sensors. The circuit features high immunity to current source mismatch, allowing the use of smaller rail devices and the downscaling of the supply voltage. The circuit is highly linear due to a single-bit sigma-delta DAC and significantly reduces power consumption due to the elimination of dynamic element matching. The circuit is suitable for adaptation to deep submicron CMOS technologies, due to use of small current sources and a reduced need for cascade impedance boosting transistors. Additionally, the circuit provides quantization noise suppression and does not depend on RF filtering for out of band noise suppression. Signal to noise ratio is improved, valuable die space is preserved, and power draw is significantly reduced. A highly efficient, high-performance RF DAC is now available.

Potential Applications

- **Mobile Communications Devices**
- **Wireless Sensors**
- **General Digital to Analog Conversion**

Benefits and Advantages

- **Reduced Power** – The circuit draws up to 50% less power than current approaches, prolonging battery life.
- **Reduced Size** – The circuit can be up to 5x smaller, preserving valuable die space.
- **Improved Performance** – Integrated noise suppression and the elimination of RF filtering allow a greater signal to noise ratio.
- **Immunity to Current-source Mismatch** – Smaller rail devices and lower supply voltages can now be used.