**Title:**
Tunable Antennas for Increasing SNR in 5G Handsets

**Speaker:**
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**Abstract:**
Drastic increase in channel capacity (and hence the data rate) is the biggest attraction of 5G and hence the antennas in the handsets require serious rethinking to deliver on this promise. While MIMO provides a direct multiplier for the channel capacity, beam-steering and shaping deliver higher SNRs. However both approaches increase the price tag substantially because MIMO requires multiple radio chains while beam steering and shaping require multiple antenna elements driven by phase or switching networks. There is yet another pot one can tap into to increase the SNR at a lower increment in the price tag and that is tunable narrow-band antenna elements. Regardless of the 5G implementation (low band or high band), some form of MIMO and beam steering/shaping will be needed to reach the channel capacity requirements and the tunability is simply an additional improvement at the antenna element side to further increase the SNR. The science behind this argument is presented in the literature and hidden in the fact that the maximum value of the (antenna efficiency) x (instantaneous bandwidth) factor is constant for a given volume occupied by the antenna and regardless of the antenna. Therefore, it is possible to realize a higher efficiency antenna by shrinking the instantaneous bandwidth, and, in order to still cover the original frequency band of operation, the antenna is tuned in frequency across the band. Due to MIMO and/or beam steering/tuning, the 5G handset antenna modules will need control signals from the baseband processor and the same control mechanism is used to tune the individual antenna elements to the particular sub-bands that are being used. A tunable 4G handset antenna was successfully demonstrated in 2013 and a similar approach for 5G handsets will be presented.