The Impact of Adjacent Channel Interference in Multi-Radio Systems using IEEE 802.11

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***Abstract*—A promising approach for improving the capacity of Wireless Mesh Networks is by making use of multiple non-overlapping RF channels. Multi-channel protocols have the advantage that several devices can transmit in parallel within a collision domain on distinct channels. When using IEEE 802.11b/g/a most protocol designers assume 3 and 12 non-overlapping channels, respectively. However, this simplified assumption does not hold. We present results from measurements that show that the number of available non-interfering channels depends on the antenna separation, PHY modulation, RF band, traffic pattern and whether single- or multi-radio systems are used. The problem is caused by Adjacent Channel Interference (ACI) where nearby transmitters "bleed over" to other frequencies and either cause spurious carrier sensing or frame corruption. For nearby transceivers, as in the factory defaults of multi-radio devices, this results in at most two non-interfering channels, one within 2.4 GHz and the other within the 5 GHz band. Only if the distance between the antennas is increased, non-interfering channels within the bands themselves become available. Moreover, our comparison of single- and multi-radio systems allows us to isolate ACI from board crosstalk and radiation leakage of which only the multi-radio systems seem to suffer. Finally, we show how a packet-level simulator can be improved to realistically incorporate ACI. With the help of this simulator more confident statements about the performance of various multi-channel protocols can be made.**

***Index Terms*—Wireless Networks, Multi-Radio, Multi-Channel, Cross-Channel, Adjacent Channel Interference, Measurements**