

TCB Q&A

The following are taken from the TCB review questions and applicant's responses. Numbering retains the original format – questions where replies have been incorporated into the application documents and do not require repeating have been removed.

- 1) Attestation letter regarding KDB644545 described an 80 MHz channel that straddles the 5725MHz frequency and operational description includes support for 80 MHz channels in the DFS bands. The application test documents only support 80 MHz channels falling entirely within the 5150-5250MHz NII band and the 5725-5850 MHz DTS band. Please explain.

<Broadcom> We will add these channels by Class II when an 80MHz AP is available to perform DFS testing. All other EMC tests have been performed.

- 6) Power summary tables (NII and DTS reports). For 2x and 3x modes there is a statement that these modes were not tested as they are covered by testing 3x modes. Please explain why. Is the power per chain for 2x mode the same as 3x mode (therefore total power is less than 3x mode)? Or is total power for 2x mode the same as 3x mode (in which case the power per chain is higher and could therefore lead to higher levels of harmonic emissions).

<Lab> The justification for 3TX modes covering for 2TX and 1 TX modes has been revised to be more clear or less ambiguous, this is shown under each title where the justification applies. It is contained in new revisions of the reports already submitted.

<Broadcom> The technical description has been revised to show the power levels for the device for each channel/mode that is supported. This is done to highlight specific power levels per channel/mode that may be applicable to future Class II permissive changes to support SAR. Here is the justification for the 2Tx power levels and measurements being covered by testing performed on 3Tx modes:

- The power tables in the operational description referenced above detail the maximum power per chain for compliance and the associated composite Tx power. The highest MIMO (2Tx/3Tx) power level will be listed on the FCC certificate as in all cases the highest composite power levels is in 3Tx mode.
- The 2Tx power levels in the table have been determined by Class I permissive change evaluation/testing of the PPSD/Power and by the additional following justification/testing.
 - o Harmonic emissions were tested in a worst case 3Tx mode at power levels greater than or equal to the highest of the 1Tx/2Tx/3Tx power levels detailed in this submission. This statement applies to all 2.4GHz and 5GHz modes tested. 2Tx power levels are covered by this worst case testing at 3Tx
 - o 2Tx Band edge measurements are covered by the 3Tx measurements performed under this submission. That is the 3Tx power levels that complied with band edge are greater than or equal to the 2Tx power levels from the Class I permissive change. This applies to 2.4GHz and 5GHz.
 - o For 80MHz channels the Tx power is limited by Band edge on CH42,58,106. In these cases the 2Tx power levels will be exactly the same as 3Tx power levels. We do not differentiate transmit power for 2Tx/3Tx when the regulatory power limiting restriction is Restricted band edge.
 - o Conducted emission testing in the 5725-5850MHz band was performed for 1Tx and 3Tx modes only. The 2Tx power levels are restricted to the same power levels that 3Tx complied with.

All the power levels in the current technical description as per the above. These power levels are used in the MPE exhibit to demonstrate compliance for mobile rf exposure conditions.

- 8) Output power for STBC 3x modes in the 5150-5250 MHz bands was performed at MCS0. Please confirm that MCS0 STBC mode support three separate spatial streams. It is my understanding that MCS0-7 only supports a single spatial stream, MCS 8 - 15 support two spatial streams and MCS 16-23 support 3 spatial streams. If 3x3 STBC mode operations support only 1 or 2 spatial streams then array gain needs to be considered for PPSD measurements.

<Broadcom> STBC is only one spatial stream. However this stream can be transmitted over 2, 3... or more antennas.

[TCB] If there is only one spatial stream transmitted over multiple antennas then in effect there could be correlation since the two streams are the same information ... unless coupled with CDD. In the MIMO KDB the formula for array gain accounts for number of spatial streams and number of antennas where number of antennas > number of spatial streams:

$G_{ANT} + 10 \log(N_{ANT}/N_{SS}) \text{ dBi}$, where N_{SS} = the number of independent spatial streams of data and N_{ANT} is the number of antennas.

<Broadcom> STBC is a MIMO transmit mode which has only one spatial stream, this has always been the case as per 802.11 definitions. STBC has been defined by the FCC as un-correlated for many years. It is clearly stated in latest KDB 662911 D01 Multiple Transmitter Output v01r02 that this is un-correlated. The array gain calculation ($G_{ANT} + 10 \log(N_{ANT}/N_{SS}) \text{ dBi}$) detail is based upon using un-correlated techniques with correlated techniques and is not applicable to STBC. STBC is an independent transmit mode which we do NOT use in conjunction with any correlated techniques (e.g. TXBF). The following extract from KDB662911 applies to STBC here: If all transmit signals are completely uncorrelated with each other, Directional gain = G_{ANT}

- 9) Please confirm detector used for PSD measurements.

<Test Lab> RMS detector where R/S receiver was used, and Average Detector (power RMS averaging type) where PSA is used.

- 13) For harmonics and spurious emissions away from the band edge please explain what is meant by "Covered by testing xxx 3Tx mode at the same power level". The note needs to explain if the output power was the same total power or same power per chain. If operating at the same power per chain include a note to explain that the total power across all three chains is higher than the power level the device will operate at.

<Test Lab> Report has been revised to explain this in both DTS and NII reports. Please also see answer to question 6 above to explain that the device was tested in 3Tx mode with the output power set to the highest per-chain power to cover 1Tx and 2Tx modes.