AX5043 Power Study

A power requirements study was performed on a AX5043 transceiver chip to verify the power required matched vendor specification.

The AX5043 was tested using a modified DigitalTxRxRPi board created by Jonathan Brandenburg employing a Raspberry Pi 4 as the host. Modifications were the removal of the power indicator LED to eliminate that power requirement. It was easier given the design of the board to measure the current at the +3.3 header pin. The board trace was cut at the header and a Fluke 187 multi-meter inserted for current measurement in milliamps.

Frequency was set to 435.3 MHz with a steady carrier. Output from the output SMA connector was coupled to a 3db attenuator, then through two cables and one bridge connector to the input of a Rigol DSA815 Spectrum Analyzer. The measured loss of the attenuator and cable was 3.1 db which was added to the value indicated by the SA to obtain the output power during transmit.

Testing was performed at approximately +16, +10 and 0 dB output with the following results.

Transmitter Output (dBm)	Measured Current (mA)
15.74	56.58
10.19	30.77
0.6	14.7

Power requirements were determined to be within the manufacture's specifications.

The DigitalTxRxRPi board is configured as a differential output PA. According to the manufacture, a single ended configuration results in an approximate 1.5 dB reduction in output power at a reduction of approximately 20 mA power requirement.

Following the transmitter power test the receiver power requirement was evaluated which initially resulted in +17 mA more than the manufacture specification. After extensive debugging it was determined the addition power was the result of the AX-Radio Lab configuration output that defaulted the Data and Data Clock pins to a high state which were coupled by the board to circuits on the host Pi. Setting both the Data and Data Clock pins low in the configuration (registers PINFUNCDCLK and PINFUNCDATA) eliminated the excess current demand.

The receiver current draw was measured in five steps by altering the AX5043 PWRMODE register.

Power State	Measured Current (mA)
Idle	.478
Power Down	.177
Crystal Oscillator enabled	.637
Synthesizer running, Receive Mode	6.34
Receiver Running	10.95

The manufacture specification is 9.5 mA at 433 MHz. Therefore the measured current is within reasonable range.