Test Plan for **SoundSocket** Power Line Audio System

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1.1 Audio Processing Module

To verify that the audio processing module is functioning correctly, the following tests will be performed:

1) Perform a loopback test in the VHDL circuitry to verify that the audio CODEC sub-module is functioning correctly. Data is read into the system and is passed directly to the output in order to confirm proper functionality.
2) Perform a loopback test to verify that the audio CODEC sub-module and the Nios II sub-module are properly connected and functioning. Music is applied as the input to the SoundSocket transmitter, is passed to the input of the SoundSocket receiver, and is played as the output of the receiver. This effectively demonstrates the correct connection and functionality of the module.
3) The output bit rate of audio processing module should not be faster than 2 megabits/second.

1.2 OFDM Transmitter/Receiver

1. The signal generated by the OFDM transmitter matches ModelSim simulation results.
2. The signal generated by the OFDM transmitter can successfully be decoded by the OFDM receiver and data recovered.
3. The signal generated by the OFDM transmitter is successfully converted to the analog domain using the RF module as an intermediate step (necessary because of limitations of the DAC/ADC).
4. The signal is successfully recovered from the RF module and able to be decoded by the OFDM receiver.
5. The previous two tests are repeated but with two separate FPGA boards to test for phase error.
6. Repeat above tests for different data sets:
    a. Alternating 1 and 0 pattern
    b. Constant 1 pattern
    c. Constant 0 pattern
    d. Random pattern
    e. Audio signal input

1.3 RF modulation module

To verify that the RF modulation module is functioning properly, the test outlined below will test the ability of the module to modulate and demodulate signals of various bandwidths and finally our OFDM signal.

1) Test basic frequency modulation with 5 MHz carrier and various simple message signal's including sinusoids, and saw tooth's at various frequencies and then demodulate and recovery original message signal within one FPGA to test concept
2) Repeat previous test except using two FPGA boards connected to test against phase errors
3) Modulate OFDM transmitter message signal with 5 MHz carrier and successfully demodulate it for the OFDM receiver.

1.4 Isolation and coupling module

To verify that the isolation and coupling module is functioning properly, the tests outlined below are to be performed. *Note: A dedicated **power network model** capable of safely carrying B.C. Hydro power and serving as regular mains is used in this test. It has been built specifically for this experiment and is electrically equivalent to a power bar with outlets a few meters apart and no auxiliary capabilities.*

4) Initial transmission is to be tested as follows:
    a. A high frequency PWM signal (provided by dedicated testing circuitry) is driven into the signal driver, controlled by the push-button. The sub-test is passed if the test LED on the receiving end lights up in response to the pushes. The transmitter and a receiver are connected over the power network model with **no power on the lines**.
    b. A mock-up 60Hz power signal at 20V peak-to-peak is supplied to the power network model. Part a is repeated.
5) A high frequency PWM signal (identical to the one in 1.a) is driven into the signal driver, controlled by the push-button. The sub-test is passed if the test LED on the receiving end lights up in response to the pushes. The transmitter and a receiver are connected over the power network model with **real B.C. Hydro power** on the lines.

6) *Note: Due to lack of expertise, preparation and equipment, this test isn't to be performed*. If possible, use an electrostatic discharge gun to simulate a high-voltage spike (imitating a lightning strike) on the mains power lines. The test will be passed if the spike does not appear on the driver/receiver buffers and does not damage them.

1.5 Overall Sound Socket test plan

To verify the functionality of the SoundSocket, the following tests are to be performed:

1) A line-level audio source is to be connected to the SoundSocket unit. This unit will be connected directly to another SoundSocket over a power network model. This sub-test is passed if audio is transmitted and played through the speaker on the receiver side. Absence of audible distortion is important.
2) Repeat sub-test a. above, but with a mock-up 60Hz 20V peak-to-peak power signal present on the power line model.
3) To meet the Medium Priority requirement [R24-B] of the Functional Specification (transmission through real power lines), the sub-test 1a is to be repeated over:
    a. The power line model carrying real B.C. Hydro power
    b. Actual power lines of the room