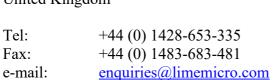
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Qspark DPD test guide

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Revision History

Version v01r01

Started: 10 January, 2017 Initial version

Package contents

The package contains the following files and folders:

|- instructions.pdf this file

|- dpd test tested version of LimeSuite

|- dpd_test/build/bin/Ban1Setup.ini LMS7 configuration file for DPD tests

|- dpd test/build/bin/Band1C.ini2 RF-qSpark v1.0 configuration file for DPD tests

|- dpd test/build/bin/lms7suite wfm/wcdma scale 075.wfm waveform file

- gateware files

|-bitstreams | Compiled bitstrem files

|-project Quartus Prime 16.1 project archive

-software CyControl software to program FX3

Required PCB modifications

- 1. Required **RF-qSpark v1.0** PCB Modifications:
 - 1.1. Change IC68, IC69 to NCV59152DSADJR4G
 - 1.2. Remove R234 and solder R249 (2.2k, can be used removed resistor).
 - 1.3. Add 10 k pull up for FPGA_SPI0_POT1_SS_5P0 line. Solder this resistor to IC19 pin 1 and 14.
 - 1.4. Solder R177 resistor (0 OHM).
 - 1.5. Solder R317 resiztor (0 OHM).
 - 1.6. Remove R319 resistor.
- 2. Required modifications to connect external DAC to LMS1:
 - 2.1. R208, R212, R216, R220, R211, R215, R219, R222 resistors has to be removed.
 - 2.2. R207, R210, R214, R218, R209, R213, R217, R221 resistors (0 OHM) has to be fitted.

Board programming

- 1. FX3 has to be programmed first:
 - 1.1. Connect USB3.0 cable
 - 1.2. Remove "FX3 FLASH BOOT" jumper J31.
 - 1.3. Reset FX3 MCU with "FX3 RST" button SW1
 - 1.4. Place "FX3 FLASH BOOT" jumper J31.
 - 1.5. Open \fx3\software\CyControl.exe
 - 1.6. Select Cypress USB BootLoader
 - 1.7. Program .img file from \fx3\firmware_img directory by selecting Programm \rightarrow FX3 \rightarrow SPI Flash
 - 1.8. Reset FX3 MCU with "FX3 RST" button SW1.
- 2. Program FPGA using Quartus Programmer and JTAG cable with .sof or .jic file (Option A):
 - 2.1. From Quartus software select Tools→Programmer
 - 2.2. Click "Add File..." button, select .sof or .jic file from \gateware\bitstreams location
 - 2.3. Click "Start button"
- 3. Program FPGA using LimeSuiteGUI (Option B):
 - 3.1. Connect to 'qSpark v1.0' board. In menu bar select 'Options→Connection Settings'. Pop-up dialog should appear.
 - 3.2. Select the device 'USB 3.0 RF-qSpark' in both LMS7 control and Stream Board dialogs. Click at 'Connect' button.
 - 3.3. Select 'Modules→ Programming'
 - 3.4. Select Device: Altera FPGA, Programming mode: Bitstream to Flash
 - 3.5. Open **.rpd** file from \gateware\bitstreams location, click program.

LimeSuiteGUI installation

- 1. Use source code provided in 'dpd_test' folder.
- 2. Follow instruction provided in LMS7002 GUI compilation guide, which is located in dpd_test/docs/lms7suite_compilation_guide.pdf'

Running DPD test on qSpark v1.0 board

- 1. Connect the LMS7002#1 output port TXRF1_A to **qSpark v1.0** on-board Skywork amplifier input named PA1 IN1
- 2. Connect the on-board **qSpark v1.0** power amplifier output PA1 OUT to power 20 dB coupler input connected to spectrum analyzer input
- 3. Run LMS7002 GUI with administrator privileges. sudo ./lms7suite
- 4. Connect to 'qSpark v1.0' board:
 - 4.1. In menu bar select 'Options→Connection Settings'. Pop-up dialog should appear.
 - 4.2. Select the device 'USB 3.0 RF-qSpark' in both LMS7 control and Stream Board dialogs. Click at 'Connect' button.
- 5. Configure 'qSpark v1.0' board:
 - 5.1. In menu bar select 'Modules→QSpark'. 'QSpark Controls' dialog should appear.
 - 5.2. In 'Controls', press 'Read settings', the file select dialog box is opened, then select 'Band1C.ini2' file that comes with this package, containing the **qSpark v1.0** settings
 - 5.3. Click 'Configure'.
 - 5.4. Calibrate the chip LMS7002#1 changing the 'Correctors' edit fields
- 6. Click 'Open' button to select LMS7 configuration file and choose 'Ban1Setup.ini' that comes with this package.
- 7. Load the waveform file 'Modules → FPGA Controls'. Choose the following file 'lms7suite_wfm/wcdma_scale_075.wfm' that comes with this package. Press button 'Custom' to load file.

- 8. View DPD test graphs:
 - 8.1. In LMS7002 GUI, navigate to 'Modules → DPD Test'
 - 8.2. Press 'Start' to start DPD
 - 8.3. Choose 'Continuous' option with checked 'Train'
 - 8.4. Press 'End' to stop DPD working, then you can change the DPD parameters such as N (memory), M (non-linearity), ND (delay), load new waveforms, etc.
 - 8.5. To calibrate ND (delay) load first the waveform 'lms7suite_wfm/sinc.wfm' that comes with this package. Change ND value. Then press 'Start'. Choose 'One step' option in DPD test dialog. Press also 'One step → Reset coefficients' to reset the DPD coefficients, if they have not been reset before. Go to next step.
 - 8.6. Press 'One step → Read'. The y_I and u_I signals in the plot should match when ND is calibrated. Otherwise, press 'End', change ND value again, then press 'Start' and repeat this step until the ND is calibrated.