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[Modified by Julian Kapoor 12/21/2017]

I/Q Extraction Update

# Goals

The phase-based trilateration approach we are developing requires, as a first step, that accurate phase information be obtained on the CC1310 transceiver chip and made available to the datalogger for further processing.

# Problem

The TI CC1310 transceiver has a register that stores I/Q data from the radio front-end. However, in using code made available by TI, we discovered that the register containing I/Q data does not refresh itself, and we cannot get new data.

# General approach

This week’s work was an attempt to reliably obtain genuine I/Q data from the CC1310 transceiver. To do this Russell:

1. Posted on the TI E2E forum, requesting help with X. [See forum posting Y]
2. Modified example code from SmartRFStudio, and tested the modified code on two TI CC1310 Launchpads, one used as a transmitter and the other as a receiver.

# Code-level problems and solutions, and empirical testing

1. The I/Q measurements only work for the 2nd iteration of the main function. This is a weird error that I have only been able to work around (e.g. by setting a high number of samples). The only differences between the code listed (<http://www.ti.com/lit/an/swra571/swra571.pdf)> and my code are:
   1. the printf functionality
   2. the workaround for the iteration problem (if/else statement within the main function), the previous rfPacketRx example code that is not mentioned in the document, and the callback function. Originally, the code for handling the samples was meant to be in the callback function. However, I was not able to print out this data within the callback because I could not find a way to call this callback function within main() because I cannot use callback without the function parameters:

RF\_Handle h RF\_CmdHandle ch RF\_EventMask e

1. Verifying the IQ measurements: All of the measurements are the same at each runtime() which makes sense because I do not believe the CC1310 is receiving any packets (regardless of another CC1310 transmitting) while debugging the code in Code Composer Studio. My previous idea to work around this would be implementing a file write while using the CC1310 in SmartRF studio. I am aware that recording this data is probably within the scope of Peidong's side of the project.

# Planned Course of Action

There is slow improvement on finding specific coding information (e.g. the functionality of currentReadEntry) necessary for adjusting the code if the I/Q measurements are found to be incorrect. This is because of the lack of information available on the subject, the lack of specifics on all the relevant forum posts (listed below), and my relative unfamiliarity with TI RTOS. Forum Post 1. (see below) has a promising solution that could focus programming on an Arduino Uno (which I have with me) through a GPIO connection. MCE\_GPO1 is listed as the GPIO pin for the binary data signal coming from the demodulator when receiving ([http://dev.ti.com/tirex/content/simplelink\_cc13x0\_sdk\_1\_30\_00\_06/docs/proprietary-rf/html/rf-](http://dev.ti.com/tirex/content/simplelink_cc13x0_sdk_1_30_00_06/docs/proprietary-rf/html/rf-core/signal-routing.html#id1)  [core/signal-routing.html#id1](http://dev.ti.com/tirex/content/simplelink_cc13x0_sdk_1_30_00_06/docs/proprietary-rf/html/rf-core/signal-routing.html#id1) ), and the signal can be rerouted to a GPIO pin. The MCE core signal is familiar to me as the I/Q document (<http://www.ti.com/lit/an/swra571/swra571.pdf>) sets an MCE\_RFE\_OVERRIDE, and uses the override to sample a certain binary signal from the MCE into 8-bit buffers. If I am correct, I would be implementing the same I/Q extraction procedure that the document entails, but in a much less complicated manner.

# Resources and relevant Forum Posts

1. <https://e2e.ti.com/support/wireless_connectivity/proprietary_sub_1_ghz_simpliciti/f/156/t/59049>  [5](https://e2e.ti.com/support/wireless_connectivity/proprietary_sub_1_ghz_simpliciti/f/156/t/590495)

Note: Forum post 1 is interesting, as the TI employee pointed out the same synchronization issue that we came across in obtaining reliable phase information. However, the employee does not consider the RF switching method that we discussed in our last meeting.

1. [https://e2e.ti.com/support/wireless\_connectivity/proprietary\_sub\_1\_ghz\_simpliciti/f/156/t/52840](https://e2e.ti.com/support/wireless_connectivity/proprietary_sub_1_ghz_simpliciti/f/156/t/528401)  [1](https://e2e.ti.com/support/wireless_connectivity/proprietary_sub_1_ghz_simpliciti/f/156/t/528401)
2. [https://e2e.ti.com/support/wireless\_connectivity/proprietary\_sub\_1\_ghz\_simpliciti/f/156/p/52809](https://e2e.ti.com/support/wireless_connectivity/proprietary_sub_1_ghz_simpliciti/f/156/p/528097/1920625)  [7/1920625](https://e2e.ti.com/support/wireless_connectivity/proprietary_sub_1_ghz_simpliciti/f/156/p/528097/1920625)
3. [https://e2e.ti.com/support/wireless\_connectivity/proprietary\_sub\_1\_ghz\_simpliciti/f/156/p/61910](https://e2e.ti.com/support/wireless_connectivity/proprietary_sub_1_ghz_simpliciti/f/156/p/619108/2281646)  [8/2281646](https://e2e.ti.com/support/wireless_connectivity/proprietary_sub_1_ghz_simpliciti/f/156/p/619108/2281646)
4. [http://e2e.ti.com/support/wireless\_connectivity/proprietary\_sub\_1\_ghz\_simpliciti/f/156/p/62054](http://e2e.ti.com/support/wireless_connectivity/proprietary_sub_1_ghz_simpliciti/f/156/p/620543/2292997)  [3/2292997](http://e2e.ti.com/support/wireless_connectivity/proprietary_sub_1_ghz_simpliciti/f/156/p/620543/2292997)
5. [http://e2e.ti.com/support/wireless\_connectivity/proprietary\_sub\_1\_ghz\_simpliciti/f/156/p/57932](http://e2e.ti.com/support/wireless_connectivity/proprietary_sub_1_ghz_simpliciti/f/156/p/579320/2127500)  [0/2127500](http://e2e.ti.com/support/wireless_connectivity/proprietary_sub_1_ghz_simpliciti/f/156/p/579320/2127500)
6. [https://e2e.ti.com/support/wireless\_connectivity/proprietary\_sub\_1\_ghz\_simpliciti/f/156/p/49293](https://e2e.ti.com/support/wireless_connectivity/proprietary_sub_1_ghz_simpliciti/f/156/p/492932/1780750)  [2/1780750](https://e2e.ti.com/support/wireless_connectivity/proprietary_sub_1_ghz_simpliciti/f/156/p/492932/1780750)