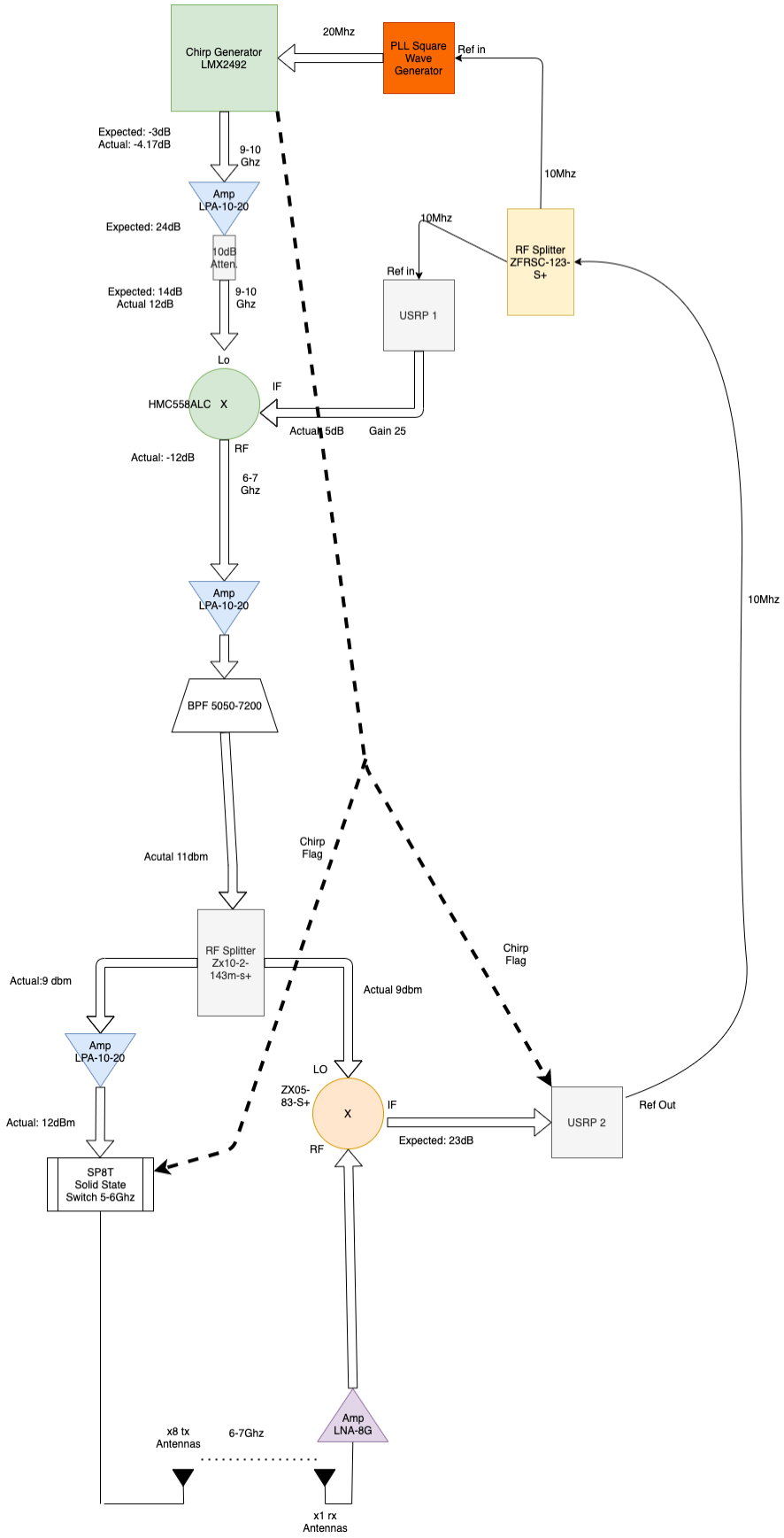
RF-Protect

GAN

Radar

The following is the design for the radar used to evaluate RF Protect. This device operates on 6-7Ghz chirps.

Hardware Schematic:


Chirp Generator LMX2492
20Mhz
PLL Square Wave Generator
Ref in
Expected: -3dB
Actual: -4.17dB
9-10 Ghz
10Mhz
Amp LPA-10-20
Expected: 24dB
10dB Atten.
10Mhz
RF Splitter ZFRSC-123-S+
Ref in
USRP 1
Expected: 14dB
Actual 12dB
9-10 Ghz
Lo
HMC558ALC X
IF
Actual 5dB
Gain 25
Actual: -12dB
RF
6-7 Ghz
Amp LPA-10-20
10Mhz
BPF 5050-7200
Acutal 11dbm
Chirp Flag
RF Splitter Zx10-2-143m-s+
Chirp Flag
Actual:9 dbm
Actual 9dbm
Amp LPA-10-20
LO
ZX05-83-S+
X
IF
USRP 2
Ref Out
Actual: 12dBm
Expected: 23dB
RF
SP8T Solid State Switch 5-6Ghz
Amp LNA-8G
x8 tx Antennas
6-7Ghz
x1 rx Antennas

Operating Instructions for Radar:

1. Power on all devices (Radar, Amps).
2. Make sure clocks between all the oscillators are properly synchronized to 10Mhz. (USRP REFOUT)
3. Set functional generator frequency to 20 Mhz with 3volt peak to peak.
4. Load FMCW_New_switch.tcs config file into the chirp generator. This can be done using the TICS pro software for the evaluation board found here https://www.ti.com/tool/TICSPRO-SW. Verify that the chirp generator is working by checking that the onboard LED light is on.
5. Turn on USRP 1 downconverter. For a 6-7Ghz chirp, make sure you use a CONST signal of 3 Ghz to downconvert. Use gain settings in the hardware schematic.
6. Turn on Raspberry pi switching software. (If debugging make sure you recompile before running in C)
7. Run the GNU radio script on USRP 2 in order to sample the radar beat frequency. The file is called USRP_Rx_Samples.grc.

Radar Instructions Post-Processing:

RF-Protect Tag

Hardware Schematic:

The following describes the tag design for RF-Protect that spoofs FMCW based sensing.

Tag Software Instruction (Experimental):

Prepare:

1. Change .dat filename in parse_switch_seq.py python script
2. Change .txt filename in parse_switch_seq.py python script

3. copy (sftp pi@192.168.10.10) the txt file onto RPi desktop

Run Experiment

1. Start gnuradio script lftx_test.grc
2. Wait for gnuradio to say "waiting for connection"
3. Start the python script parse_switch_seq.py
4. Start the gnuradio script USRP_Rx_Samples.grc to begin collection radar data
5. Wait for data collection to start
6. Press enter on the python script
7. Stop both the lftx_test.grc and the USRP_Rx_Samples.grc collections

Tag Software Instruction (Post-Processing):