Focused SAR processor

1. Consider a radar with the following parameters:

Range modulation
       Chirp slope: $4.189166 \cdot 10^{11}$ Hz/s
       Pulse length: 37.12 μs
       Sample rate fs: 18.96 Mhz
Other parameters
       PRF: 1679.9 Hz
       Wavelength: 5.66 cm
       Range r0, first bin: 830000 m
       Platform velocity: 7550 m/s
       Antenna length: 10 m
       Earth radius: 6378 km
       Look angle: 23 degrees

(a) How many valid range bins are found in the range compressed data, assuming as before the range record length is 10,218 bytes of which 412 are header bytes?

(b) What is the minimum fft size for range processing?

(c) What is the effective spacecraft velocity v_{eff}?

(d) What is the range bin spacing in meters? What is the range resolution? Give both slant range and approximate ground range results.

2. Download the raw data file ersdata.hw3 that we used last time. As before, the quantization level is 5 bits with average I and Q values of 15.5.

(a) Determine the approximate Doppler centroid of the data.

(b) Write a multipatch SAR processor for this data set, with patch size of 4096. Process as many patches as you can from the data set given.

(c) What is the azimuth resolution for your processor? What is the azimuth point spacing on the ground?

(d) Calculate looks to obtain approximately square pixels on the ground and display the image. Submit electronically.

Compare the image quality of the SAR processor with your unfocussed processor from the previous homework assignment.