

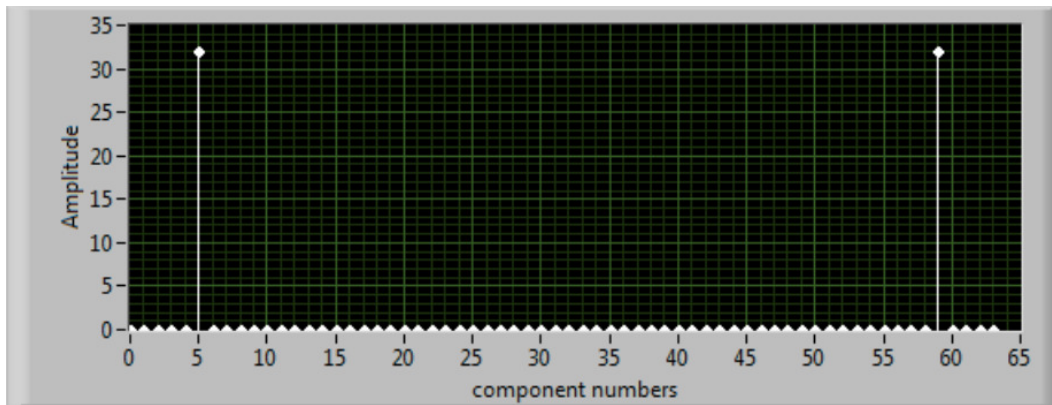
Exercise 4

Problem 1

- The sequence $x_1(n) = \{1, 1, 0, 0, 0\}$ is to be analyzed using a 5-sample DFT. Present $|X_1(m)|$ as a function of m .
- The sequence $x_2(n) = \{1, 1, 0, 0, 0, 0, 0, 0\}$ is a zero padded version of $x_1(n)$. Compute an 8 point FFT of this sequence and present $|X_2(m)|$.
- The sequence $x_3(n) = \{1, 1, 0, 0, 0, 0, 0, 0, 0, 0\}$ is also a zero padded version of $x_1(n)$. Compute the 10 point DFT and present $|X_3(m)|$ as a function of m .
- Compare $|X_1(m)|$, $|X_2(m)|$ and $|X_3(m)|$ and discuss the differences and similarities.

Problem 2

A cosine signal is analyzed with a 64-points DFT, the result is shown below. The sampling frequency is 16 kHz. What is the frequency of the signal?



Problem 3

- What is the purpose of replacing a rectangular window with for instant a Hanning window in relation with DFT calculations?
- Study the differences in the DFT results with the two window types in two cases. For the first case, the analyzed sinusoidal signal has an integer number of periods in the analysis window. For the second case, there is not an integer number of periods.