Faculty of Engineering & Technology
Department of Electrical & Computer Engineering
ENEE4113-COMMUNICATIONS LAB

Exp 10: Amplitude shift keying (ASK)

Pre Lab #3

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Date:
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Part 1: ASK modulation:

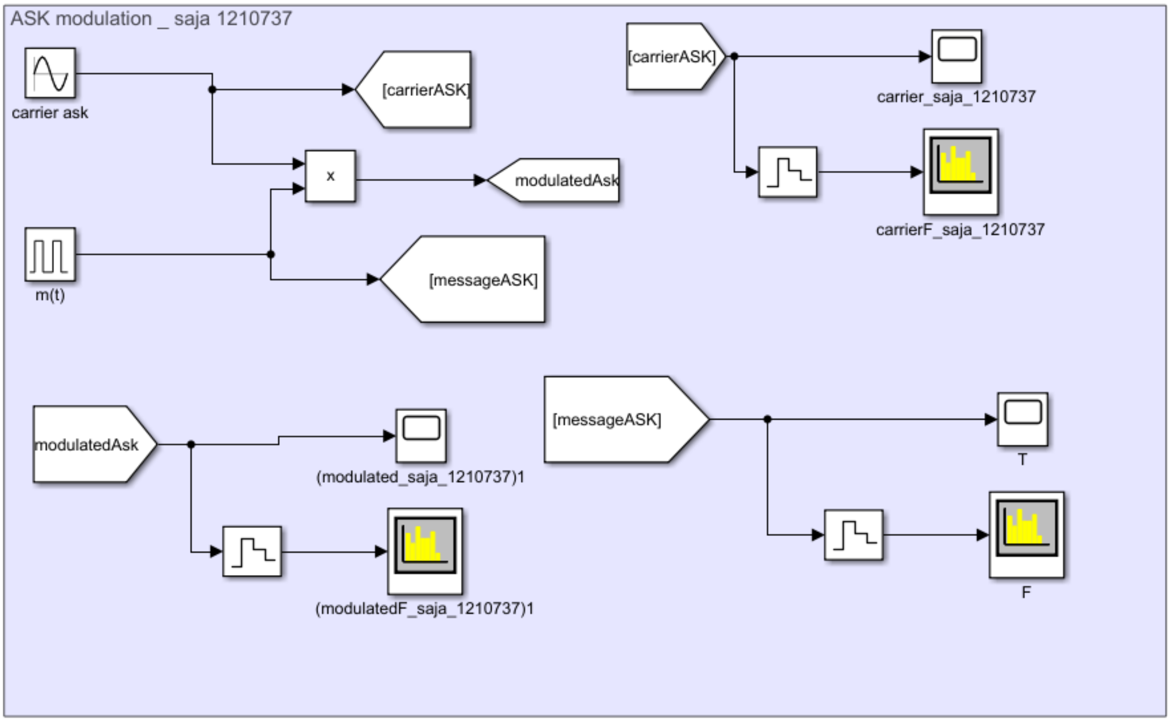

Figure1 : ASK modulation block diagram

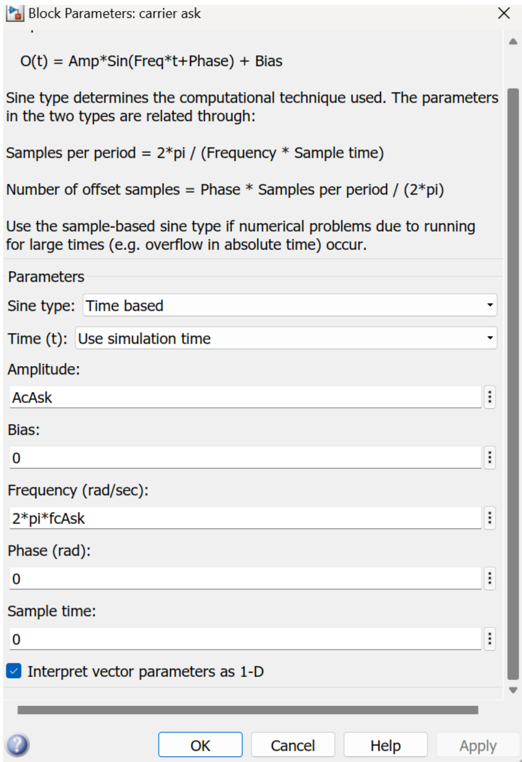

Figure 2:Carrier parameter setting

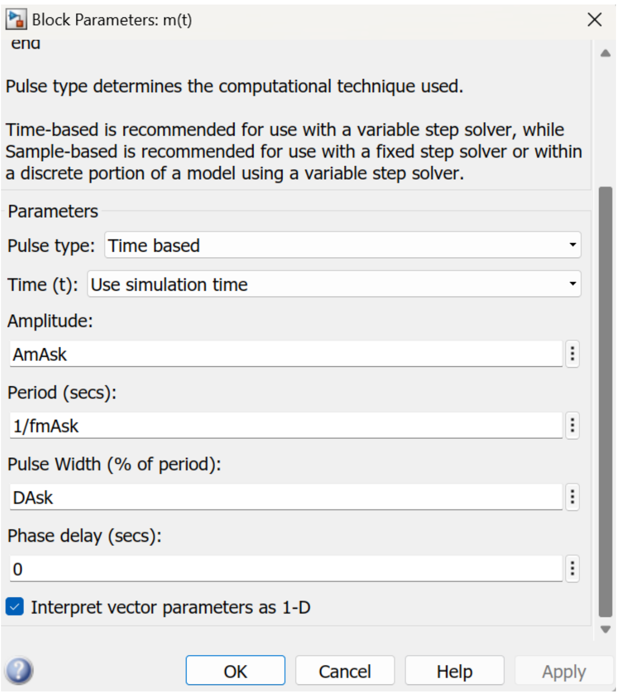

Figure 3: message signal parameter setting

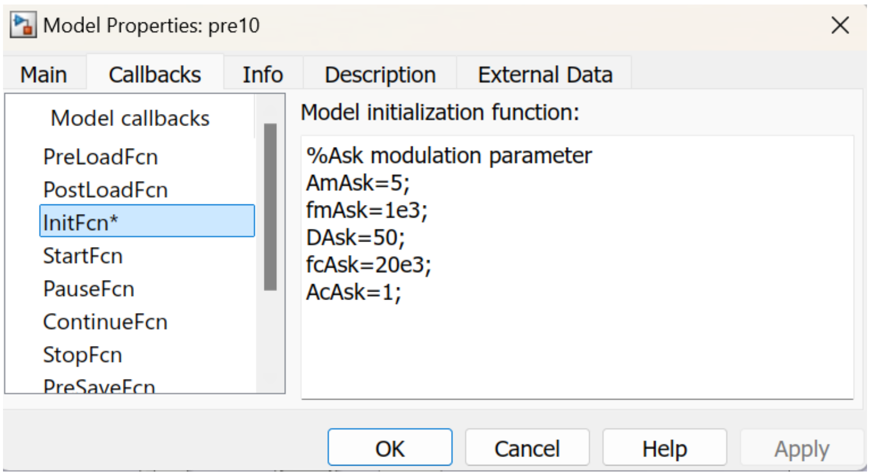

Figure 4: Model parameter @ Am=5, D=50% & f=1KHz in time domain

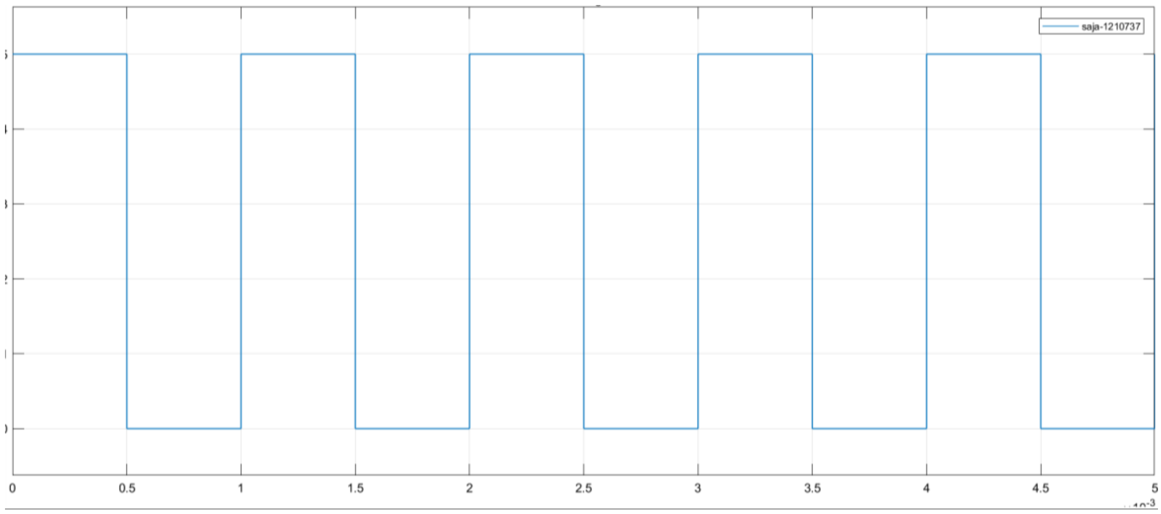

Figure 5: message signal in time domain

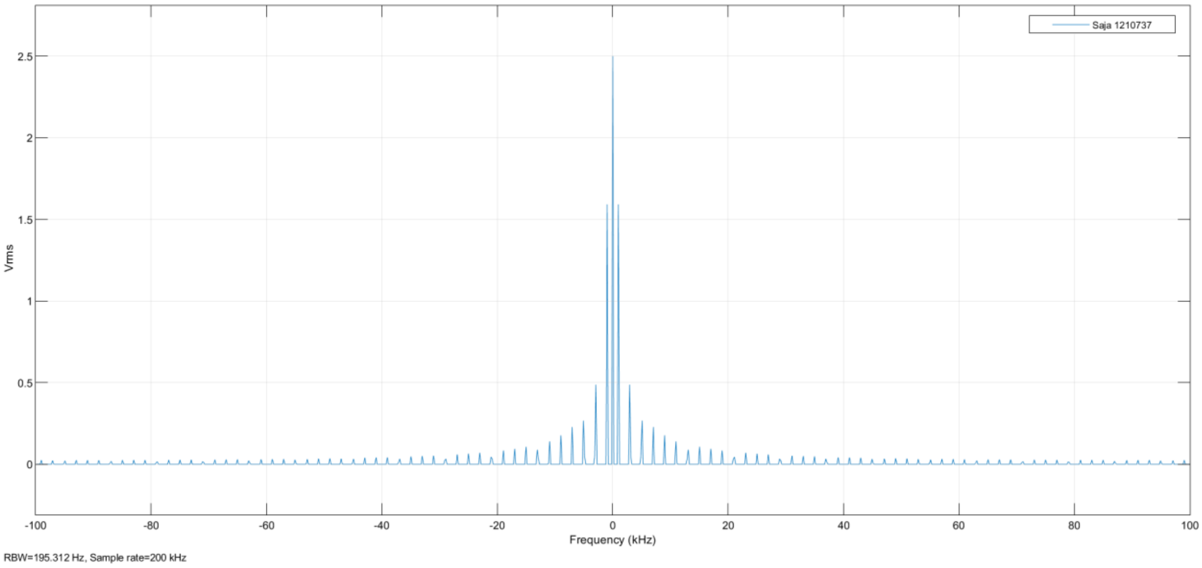

Figure 6:message signal in frequency domain

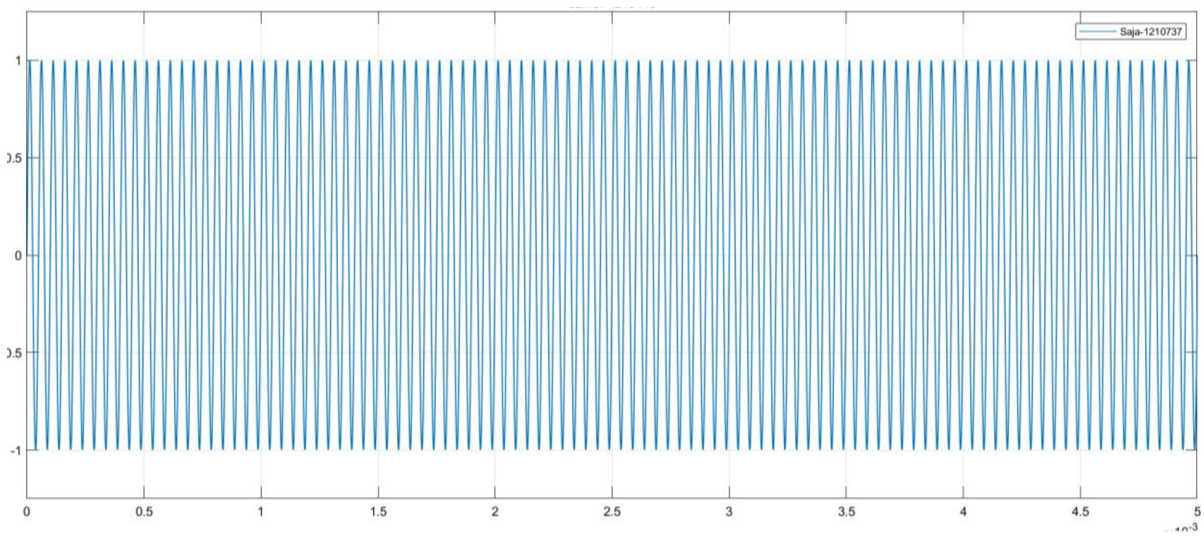

Figure 7:carrier signal in time domain

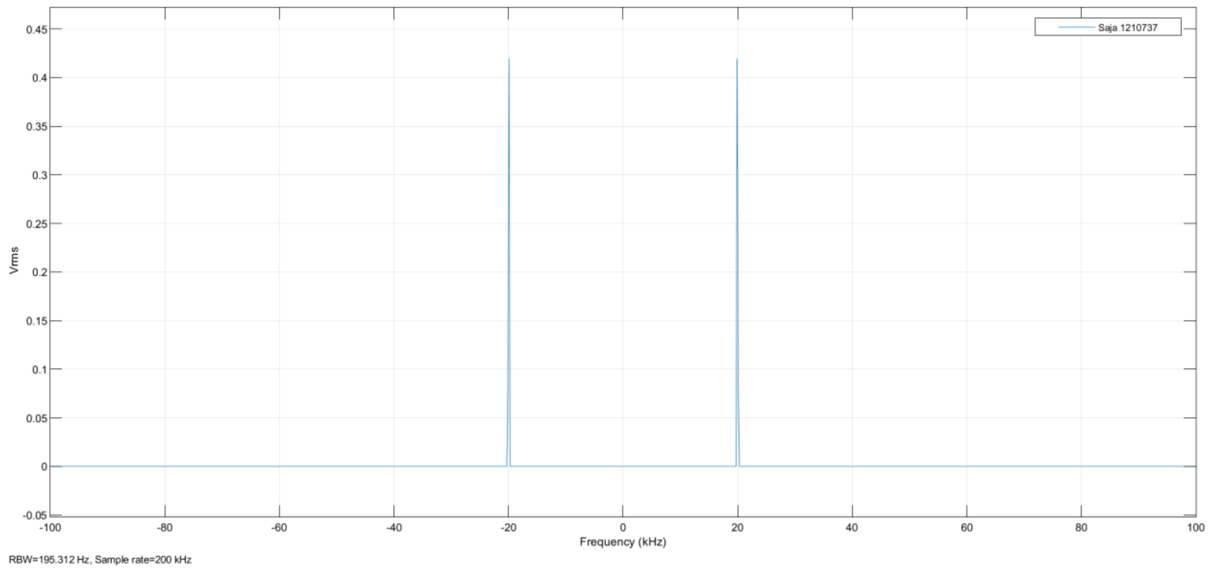

Figure 8: carrier signal in frequency domain

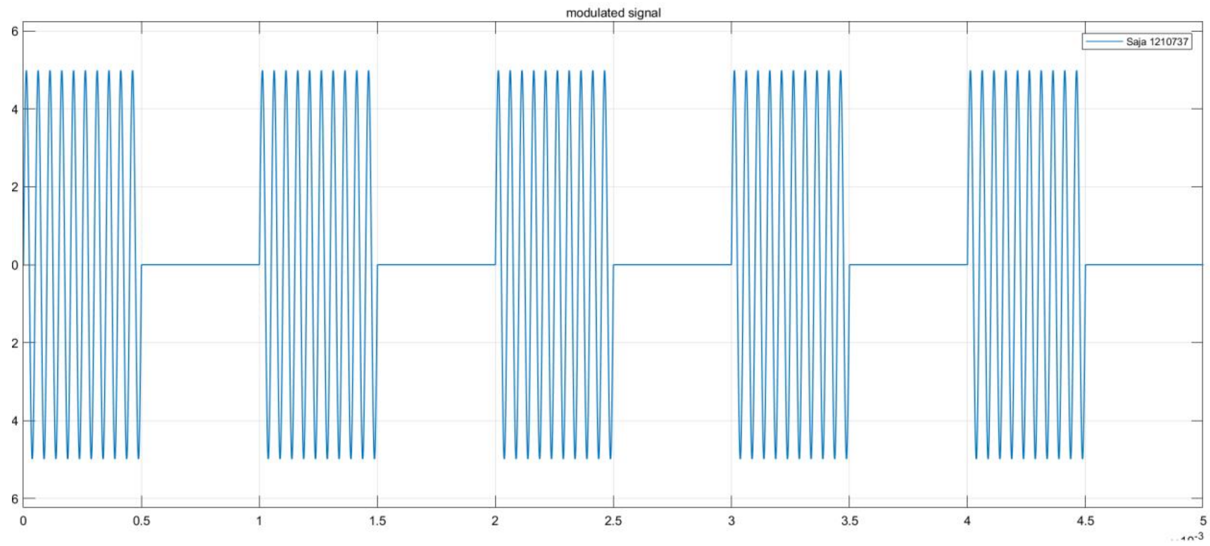

Figure 9: ASK Modulated signal @ Am=5, D=50% & f=1KHz in time domain

In Time Domain: having a consistent 1 kHz signal that oscillates between +5 and -5 units with a 50% duty cycle, meaning the signal is "on" for 0.5 ms and "off" for 0.5 ms within each 1 ms period.

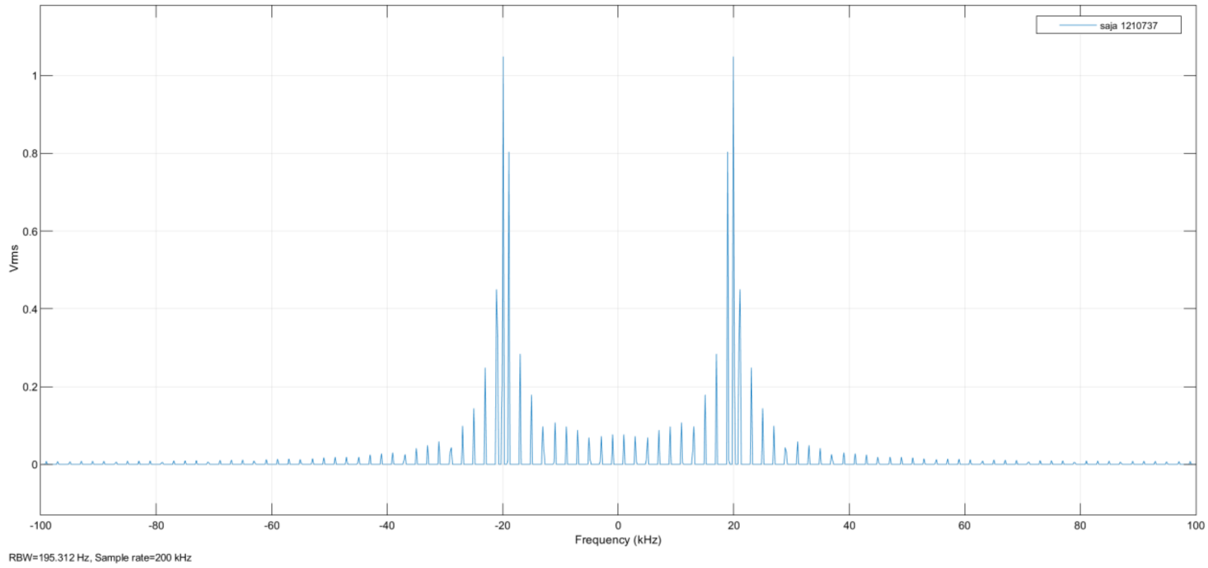

Figure 10: ASK Modulated signal @ Am=5, D=50% & f=1KHz in frequency domain

In Frequency Domain: The signal's main energy is concentrated around 20 kHz, with sidebands appearing at multiples of the carrier frequency due to the 50% duty cycle.

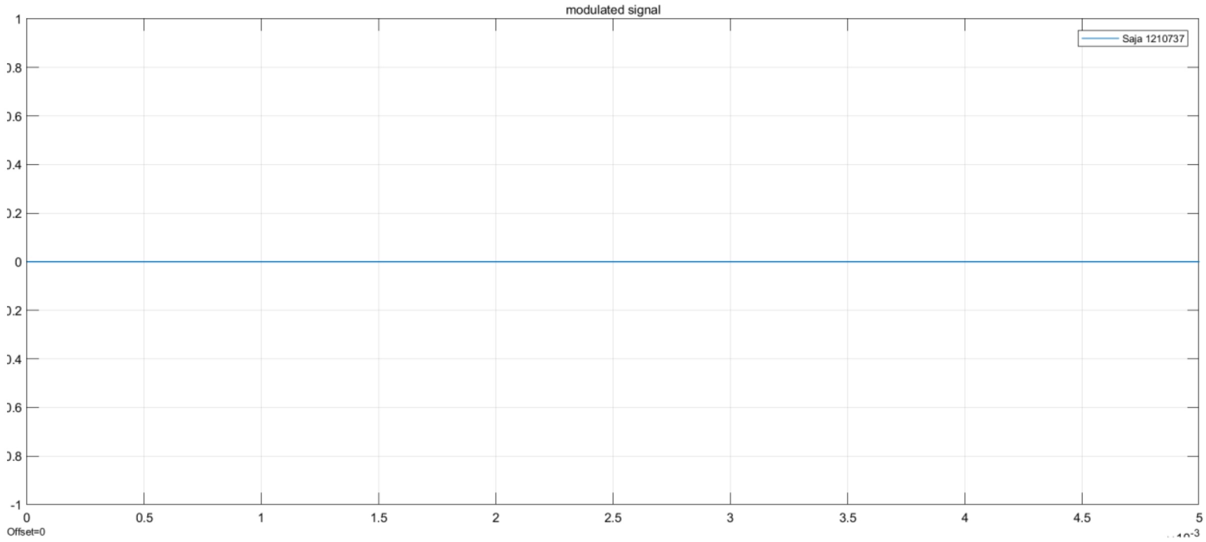

Figure 11:Ask modulated signal @ DC signal =0 in time domain

In Time Domain: The output signal is a flat line at 0 volts, indicating no transmission.

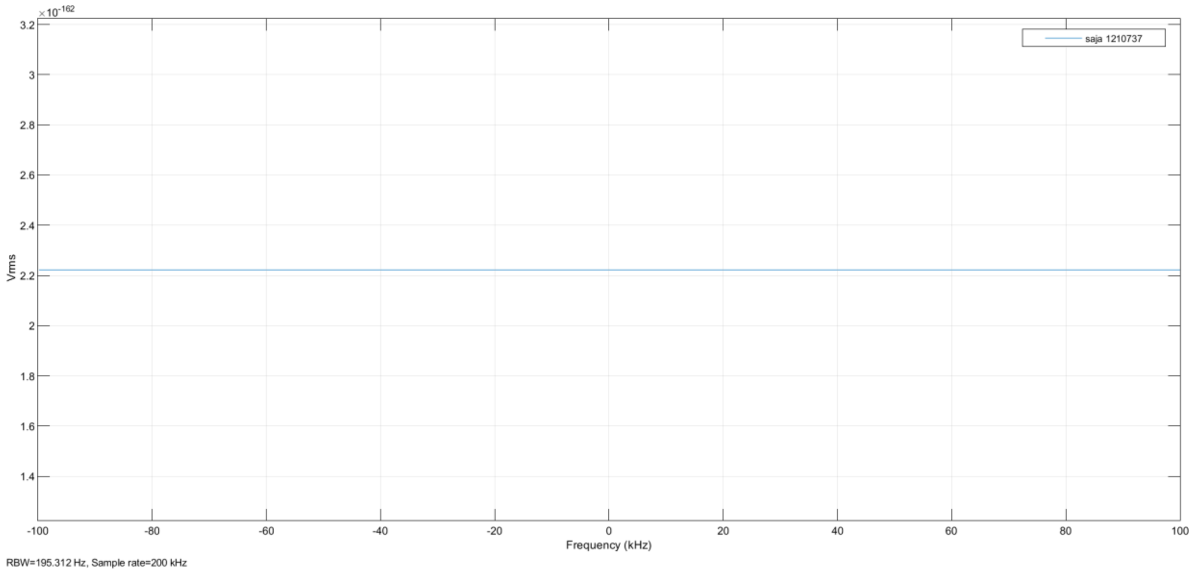

Figure 12: Ask modulated signal @ DC signal =0 in frequency domain

In Frequency Domain: There is no frequency content in the signal, meaning no energy is being transmitted at any frequency, including the carrier frequency.

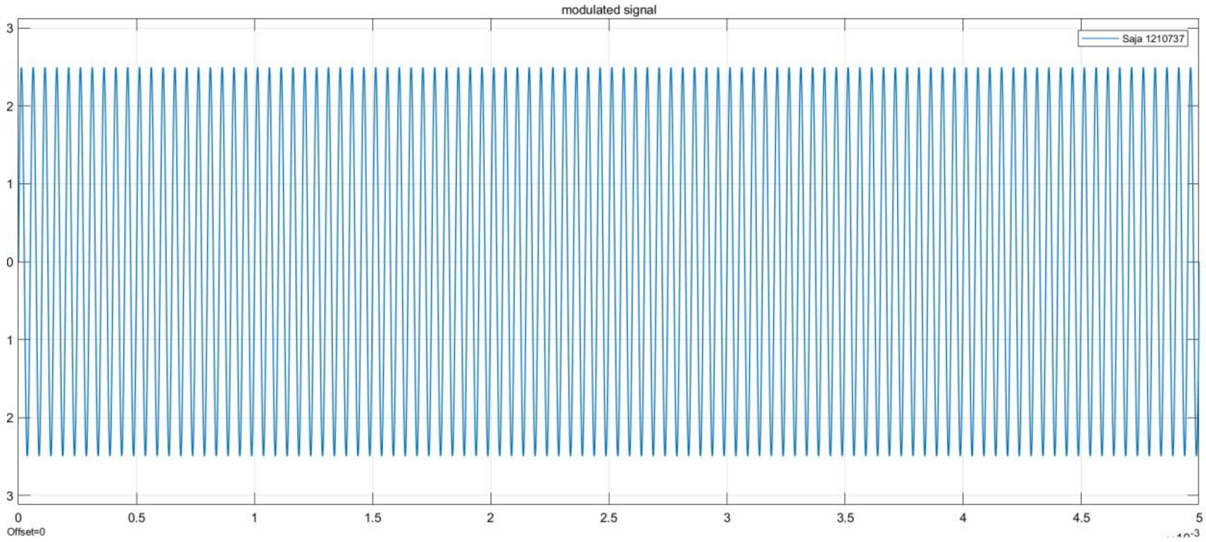

Figure 13:Ask modulated signal @ DC signal =2.5 in t

In Time Domain**:** The output signal is a continuous carrier wave with a fixed amplitude (determined by the 2.5V DC signal). There is no variation in amplitude, so the signal does not encode any data.

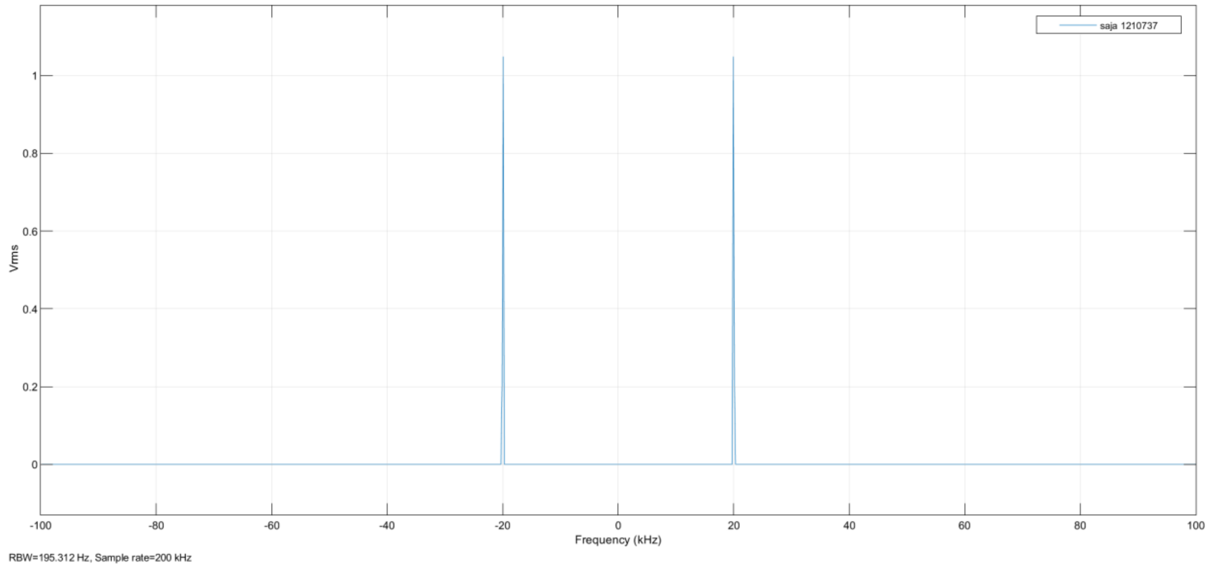

Figure 14:Ask modulated signal @ DC signal =2.5 in f

In Frequency Domain: The signal consists primarily of a single frequency component at the carrier frequency (20 kHz), with no sidebands or additional spectral content.

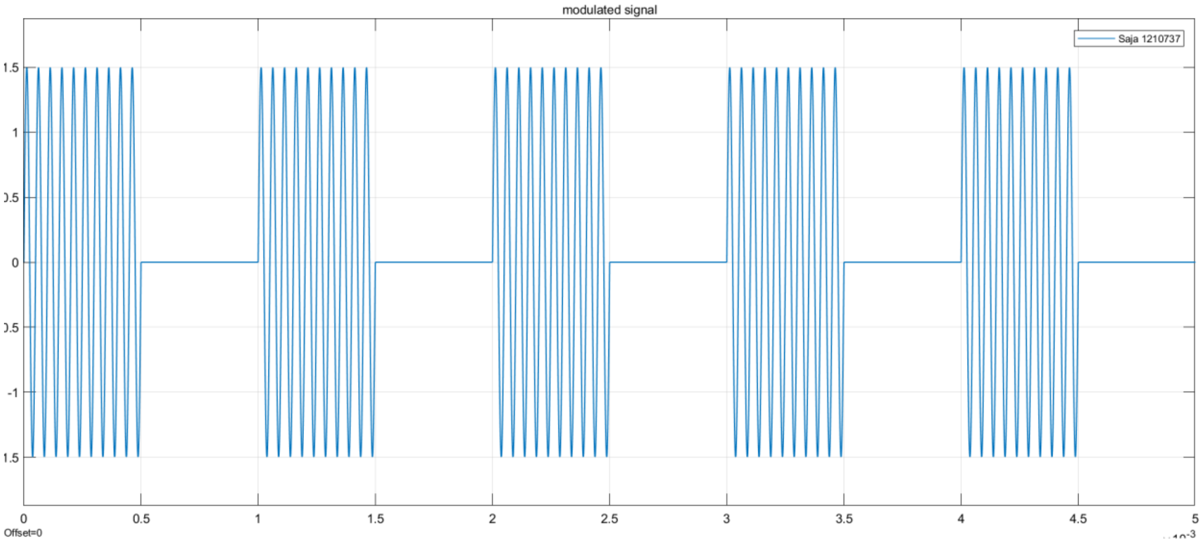

Figure 15: ASK Modulated signal @ Am=1.5, D=50% & f=1KHz in time domain

In Time Domain: The shape of the signal in the time domain remains the same, but the amplitude is lower because of decrees the amplitude for the message .

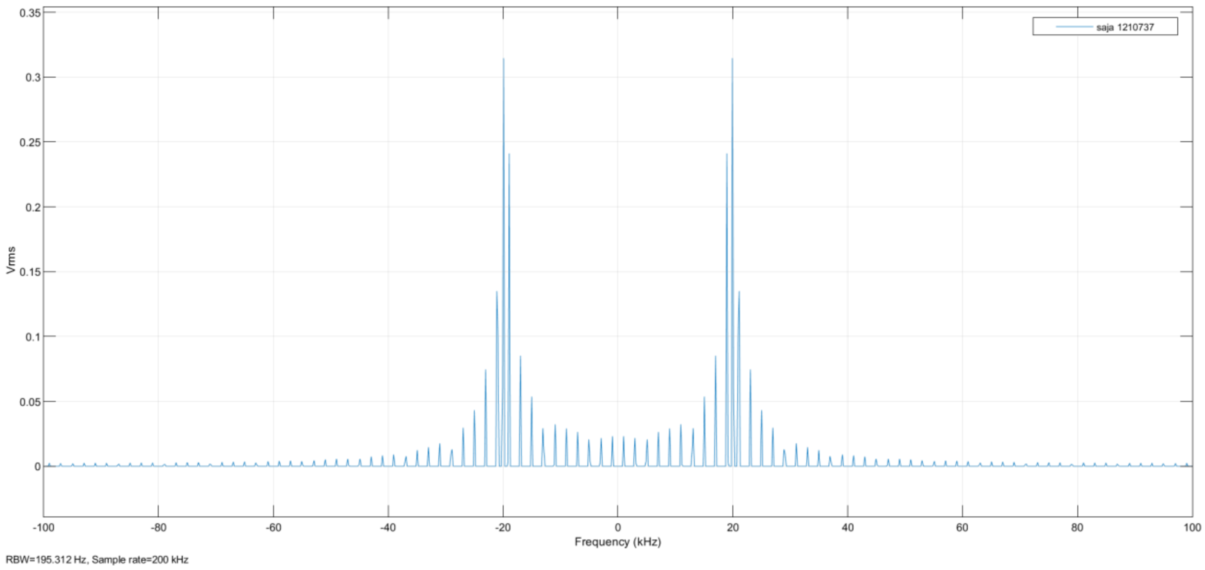

Figure 16:ASK Modulated signal @ Am=1.5, D=50% & f=1KHz in frequency domain

In Frequency Domain: The spectral components (frequencies) of the signal decrease in magnitude, but the bandwidth remains unchanged.

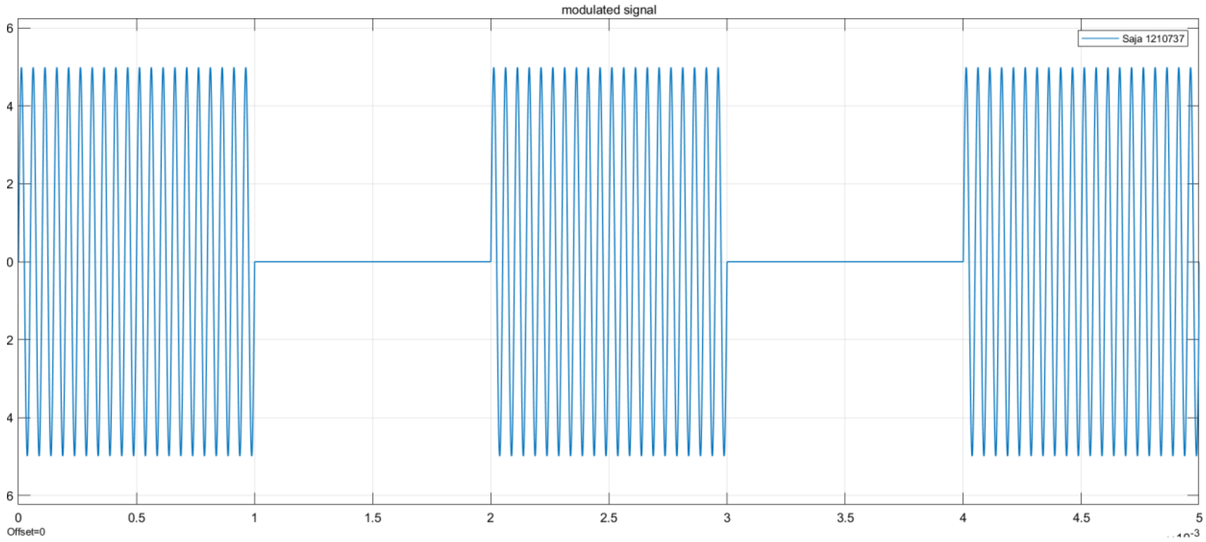

Figure 17: ASK Modulated signal @ Am=5, D=50% & f=0.5KHz in time domain

In Time Domain: The signal stretches out with slower oscillations, resulting in fewer cycles over a given time period.

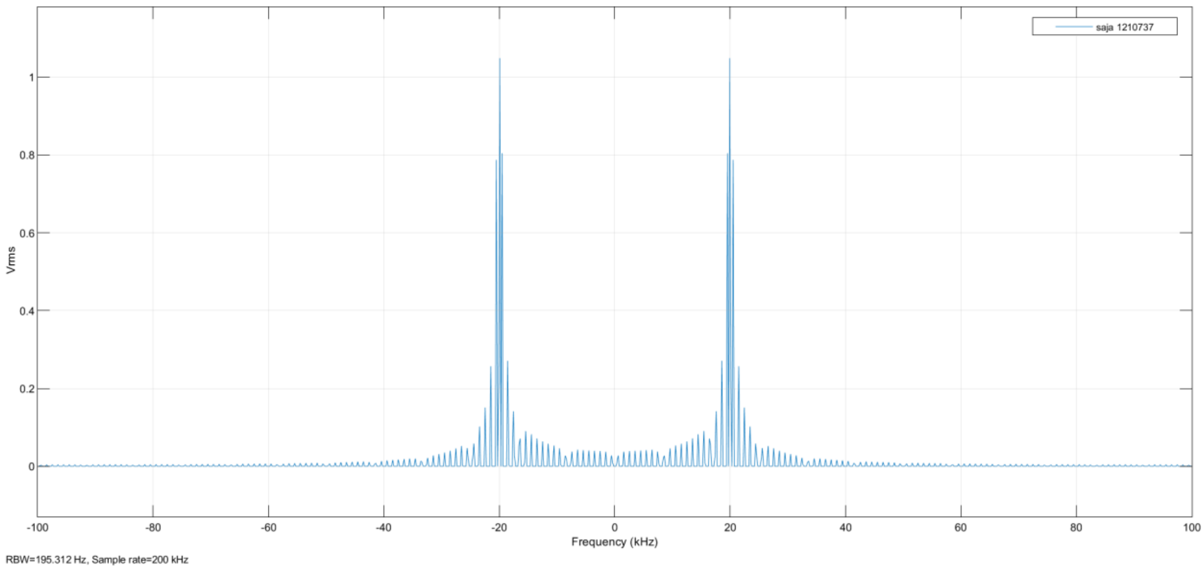

Figure 18: ASK Modulated signal @ Am=5, D=50% & f=0.5KHz in f domain

The ASK modulated signal has an amplitude of 5, the carrier to baseband data ratio of 50% and a 0. 5kHz frequency also distributes in a very clear and distinguishable high-low-high-low form in the time domain. As can be seen in the frequency domain there is a high reclaimed frequency at 0. 5kHz with The side bands are symmetrical which show that the signal has been modulated.

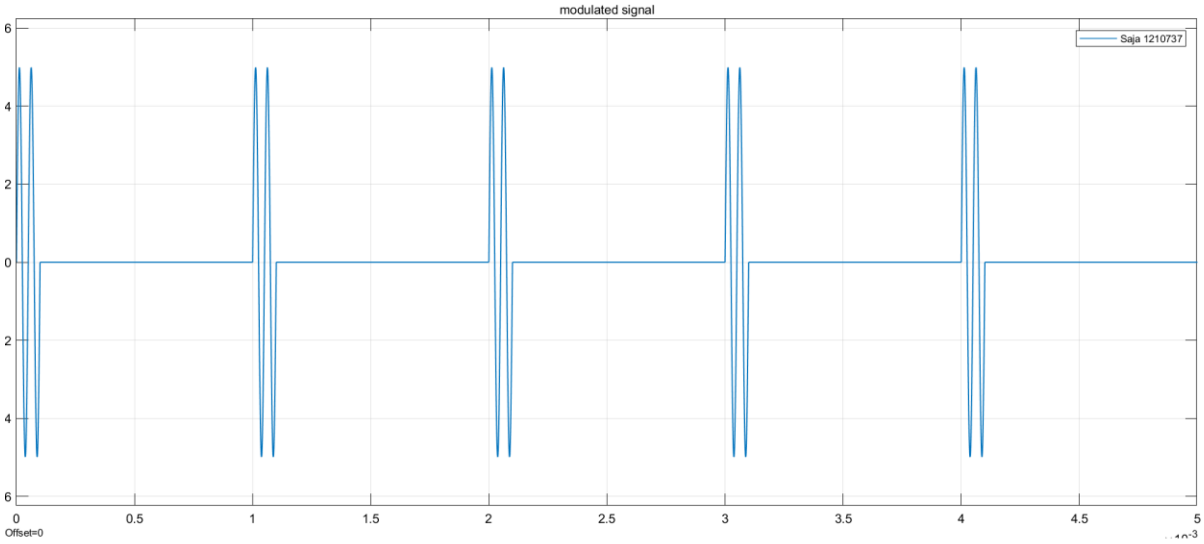

Figure 19:ASK Modulated signal @ Am=5, D=10% & f=1KHz in t domain

In Time Domain: The signal becomes more pulsed with shorter "on" times, resulting in lower average power.

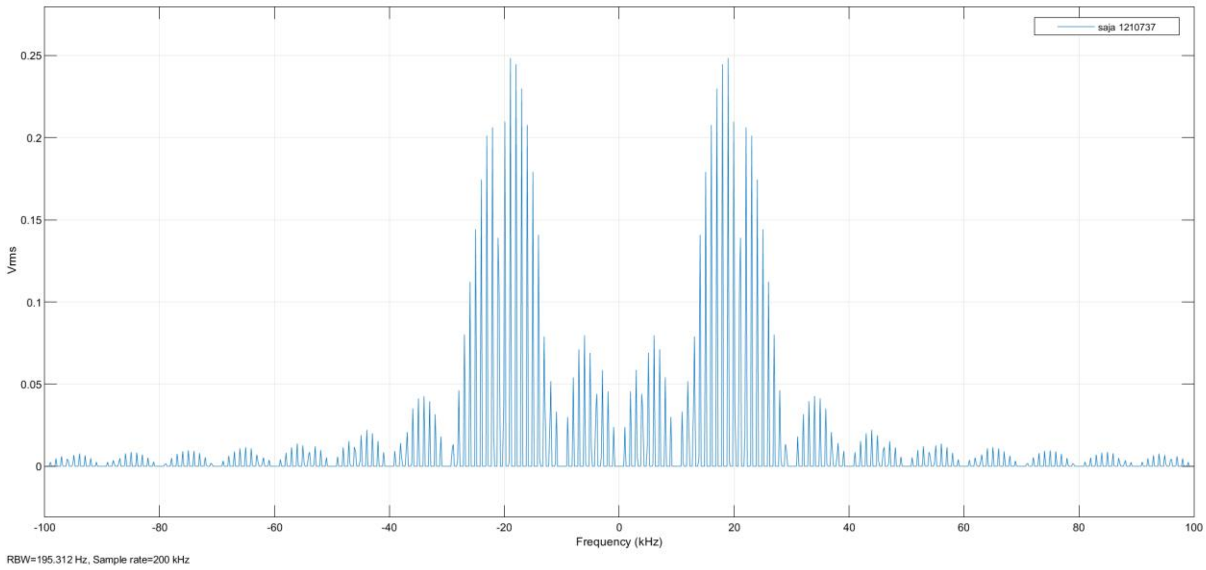

Figure 20:ASK Modulated signal @ Am=5, D=10% & f=1KHz in f domain

In Frequency Domain: The signal's bandwidth increases, with more harmonics and wider spectral spreading.

modulated signal has a high frequency carrier. The binary signal when ASK modulated, gives a zero value for Low input for 90 % of the signal while it gives the carrier output for High input for 10%.

Part 2: ASK Demodulation method 1:

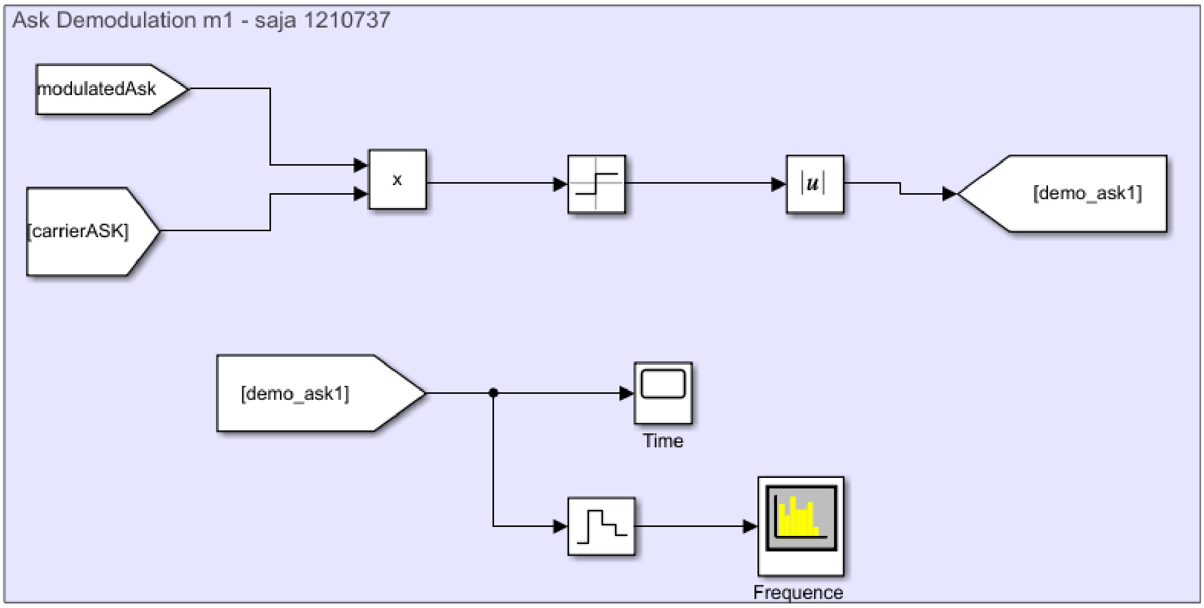

Figure 21: Ask Deomdulation method 1 block diagram

The carrier signal is multiplied with the modulated signal then passed to the signum function that gives the positive amplitudes a value of 1 and zero for zero amplitudes which transfers the positive values of group of sin to a dc value of 1 and zero for zero values which outputs the message signal.

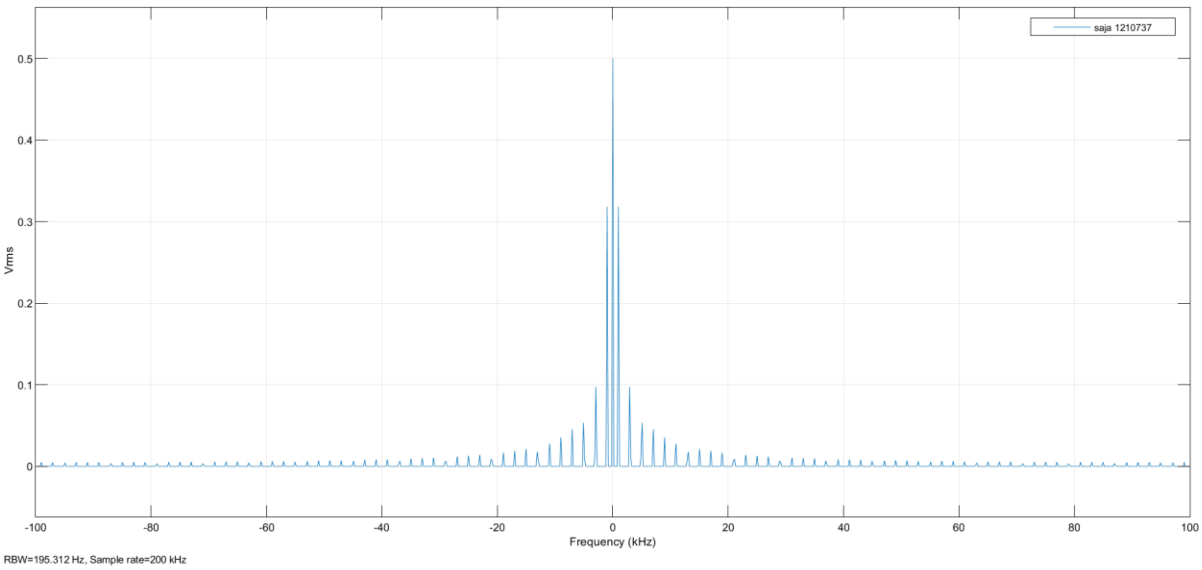

Figure 22: Demodulated signal method 1@ Am=5, D=50% & f=1KHz in f

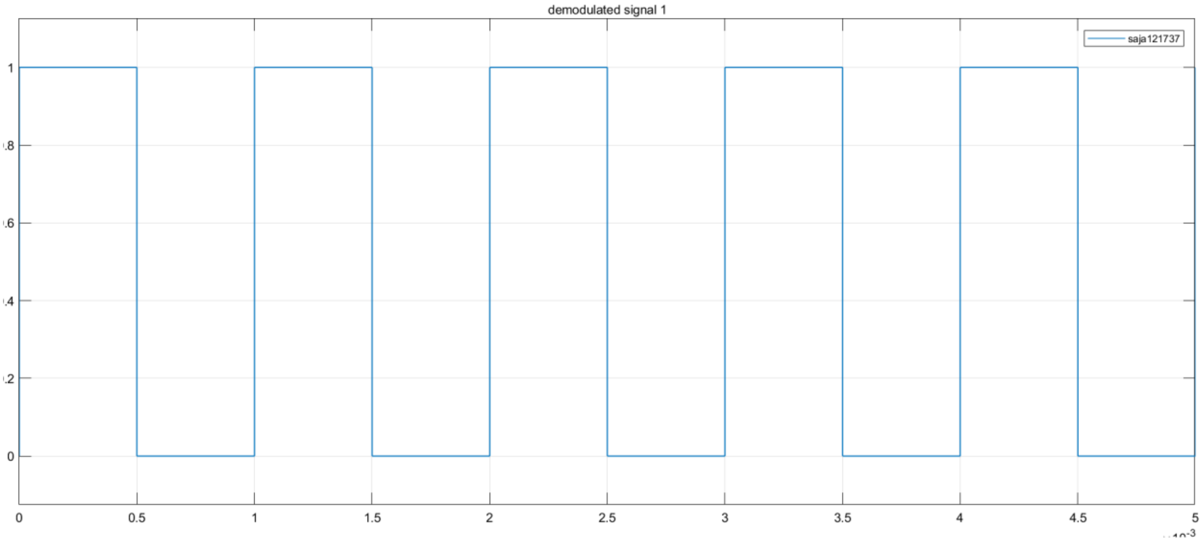

Figure 23:Demodulated signal method 1@ Am=5, D=50% & f=1KHz in t

Note that the Demodulated signal is smellier to the original signal but with different amplitude.

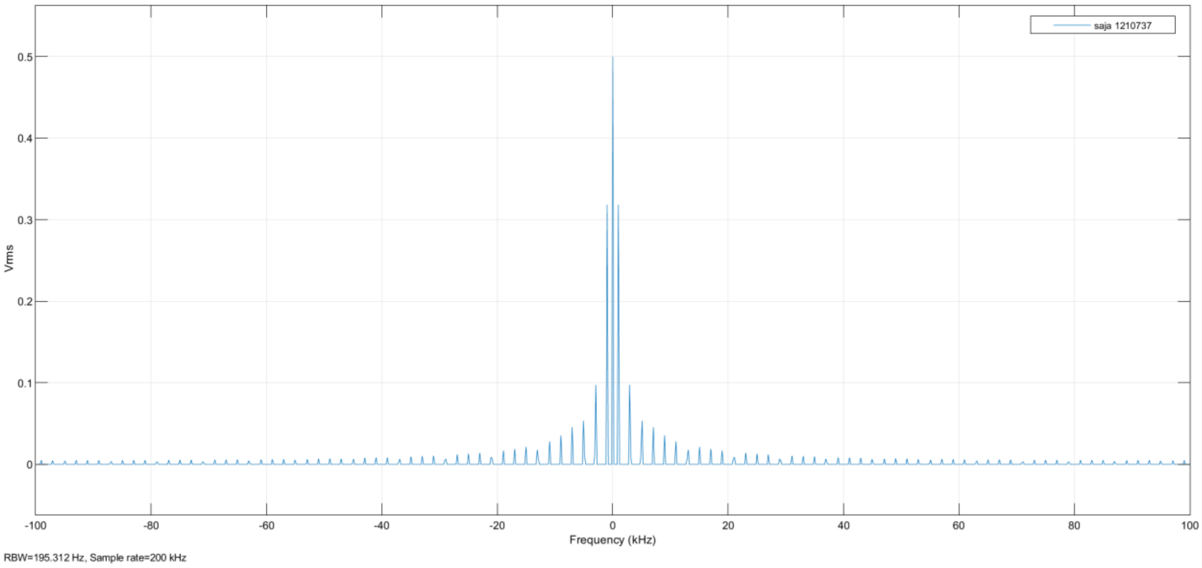

Figure 24:De-Modulated (1) signal @ Am=1.5, D=50% & f=1KHz in f

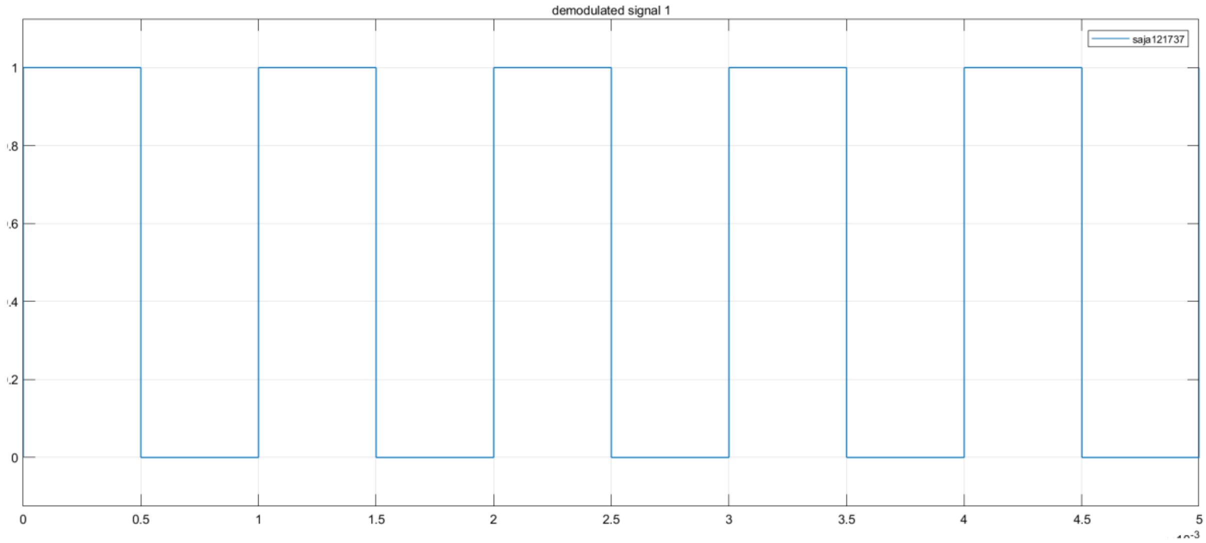

Figure 25:De-Modulated (1) signal @ Am=1.5, D=50% & f=1KHz in t

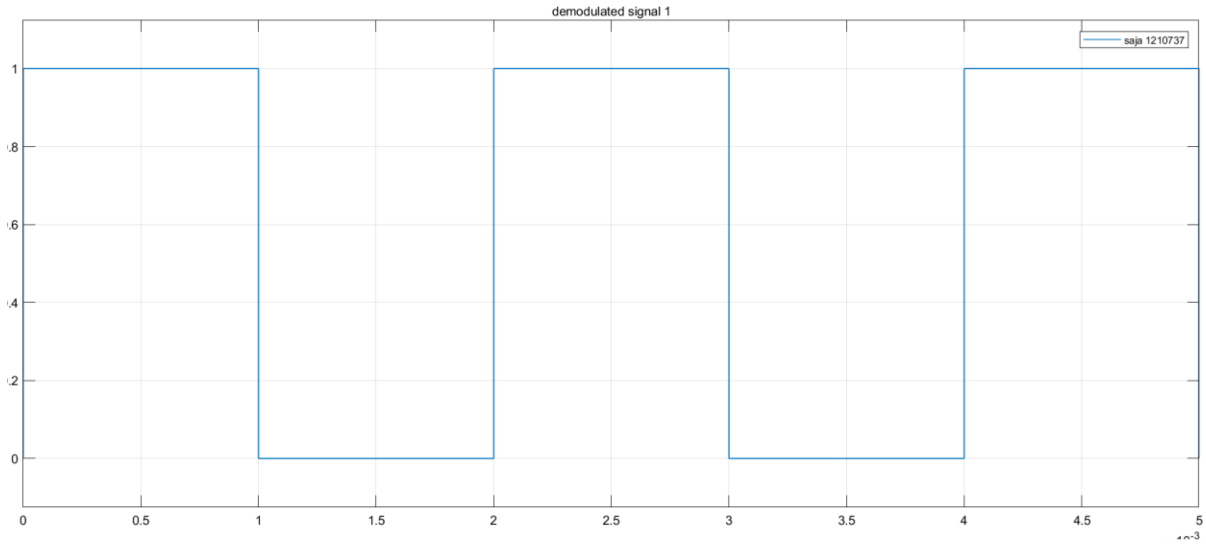

Figure 26:De-Modulated (1) signal @ Am=5, D=50% & f=0.5 KHz in t

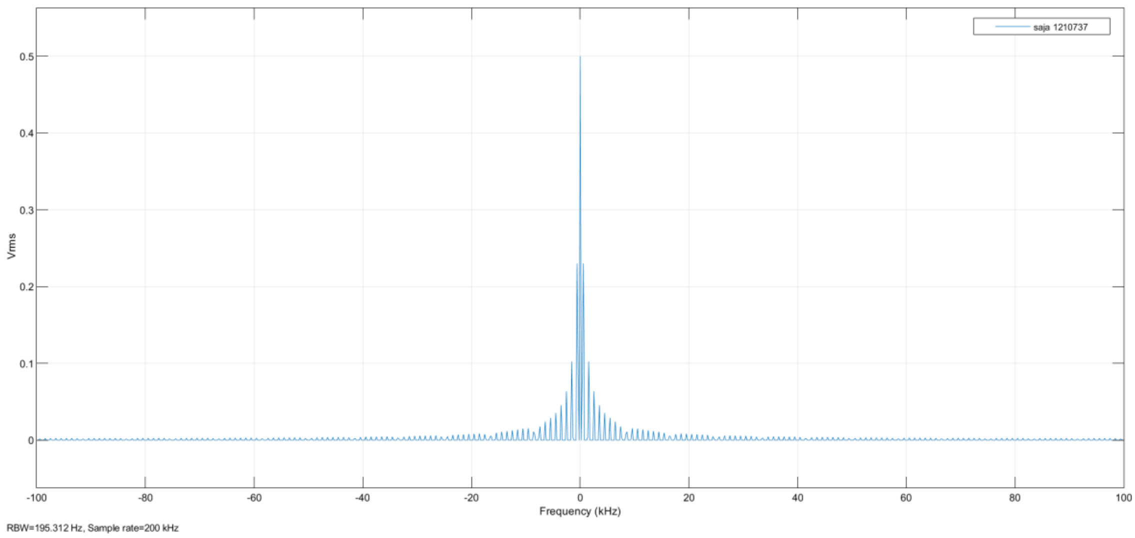

Figure 27:De-Modulated (1) signal @ Am=5, D=50% & f=0.5 KHz in f

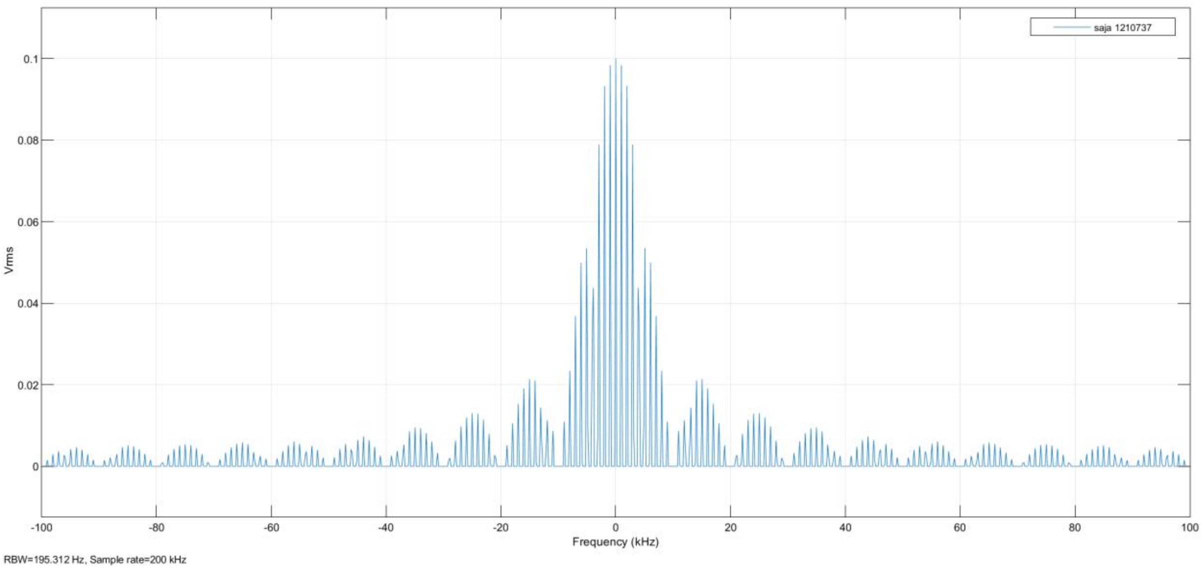

Figure 28:De-Modulated (1) signal @ Am=5, D=10% & f=1KHz in f

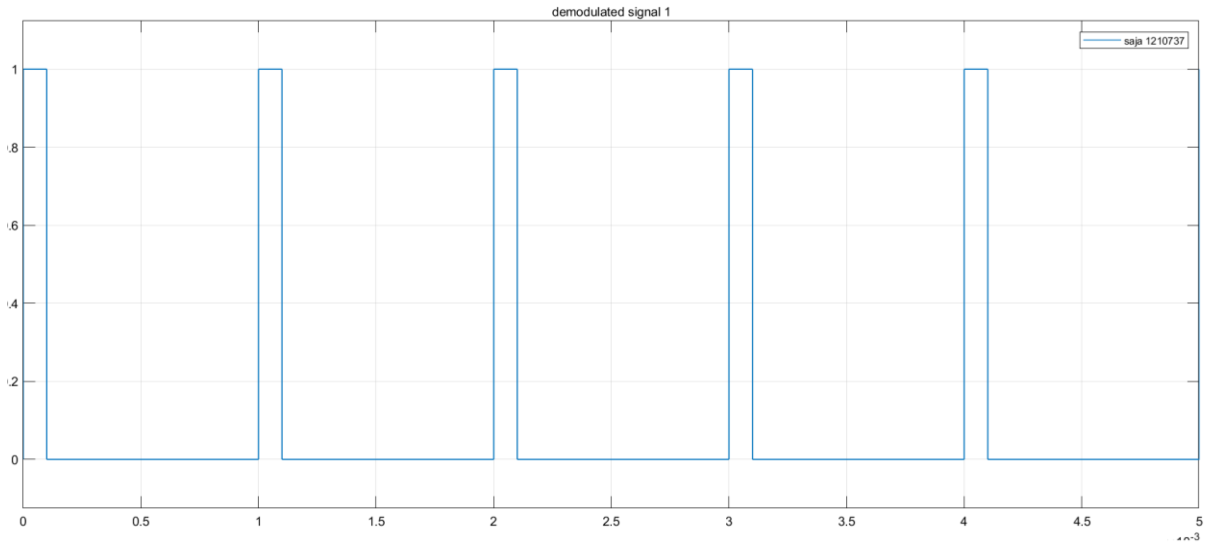

Figure 29:De-Modulated (1) signal @ Am=5, D=10% & f=1KHz in t

Part 3 :ASK Demodulation method 2:

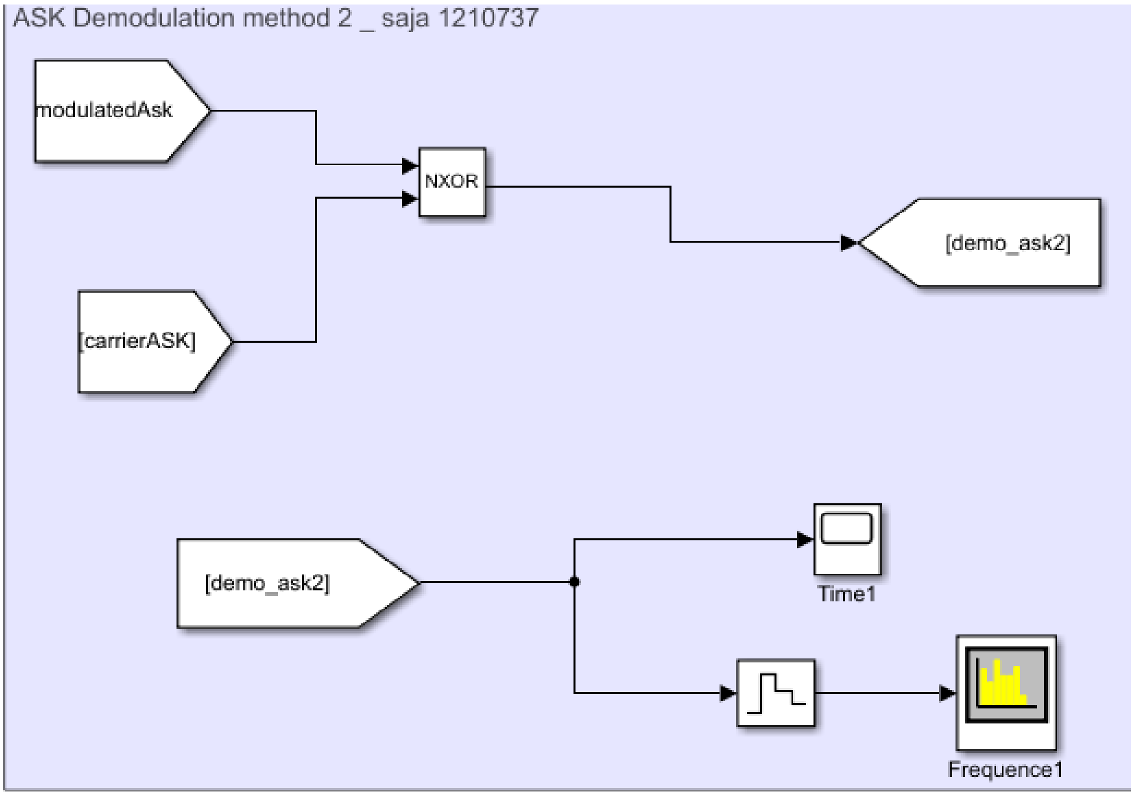

Figure 30: ASK Demodulation method 2 block diagram

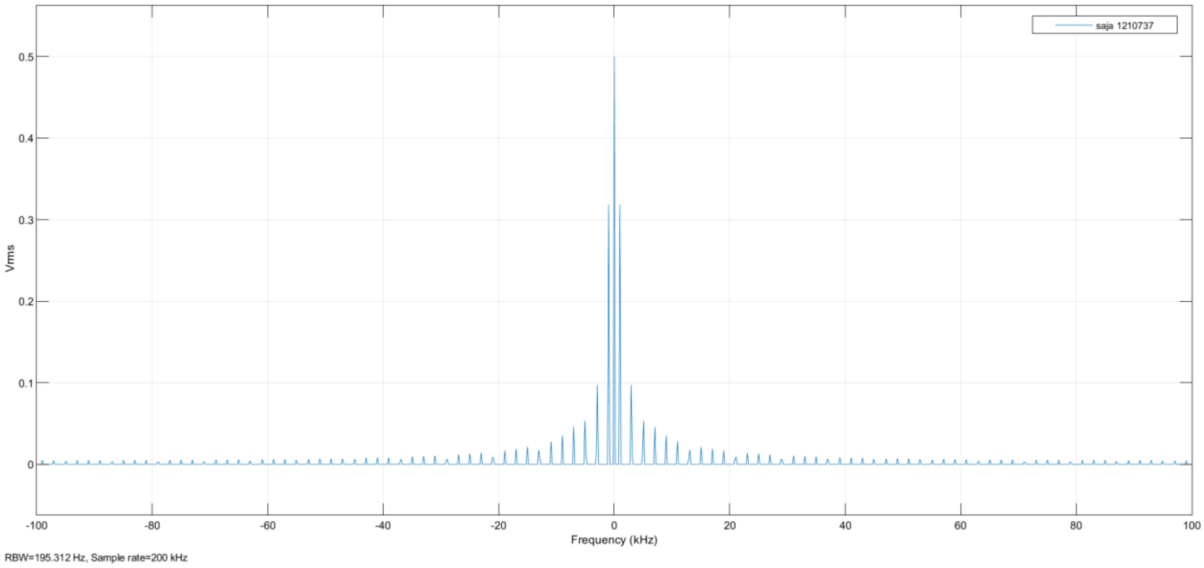

Figure 31:Demodulated signal method 2@ Am=5, D=50% & f=1KHz in f

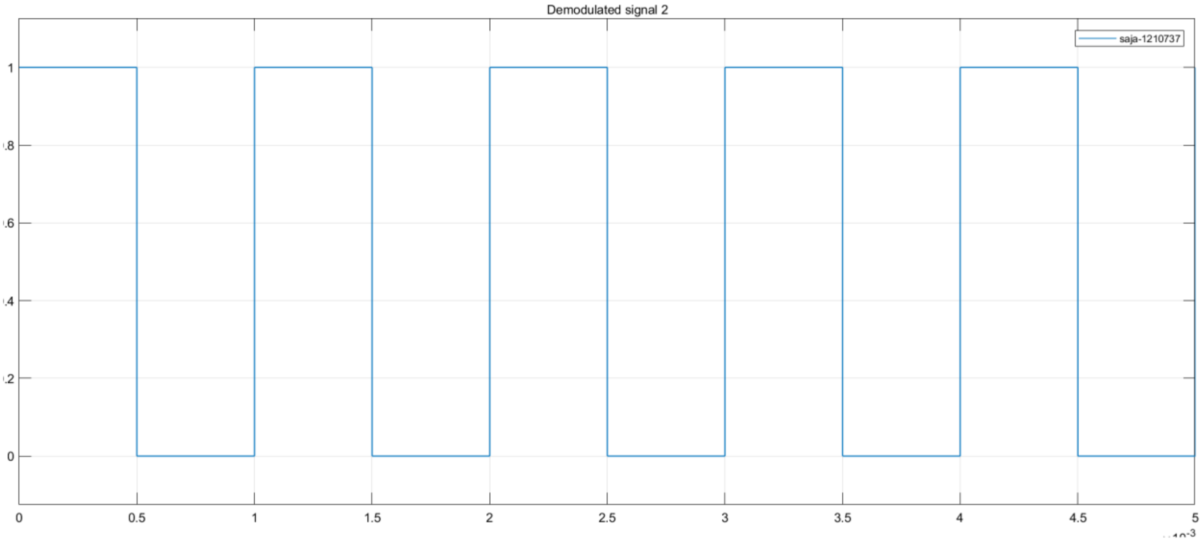

Figure 32:Demodulated signal method 2@ Am=5, D=50% & f=1KHz in t

Note that the Demodulated signal is smellier to the original signal but with different amplitude.

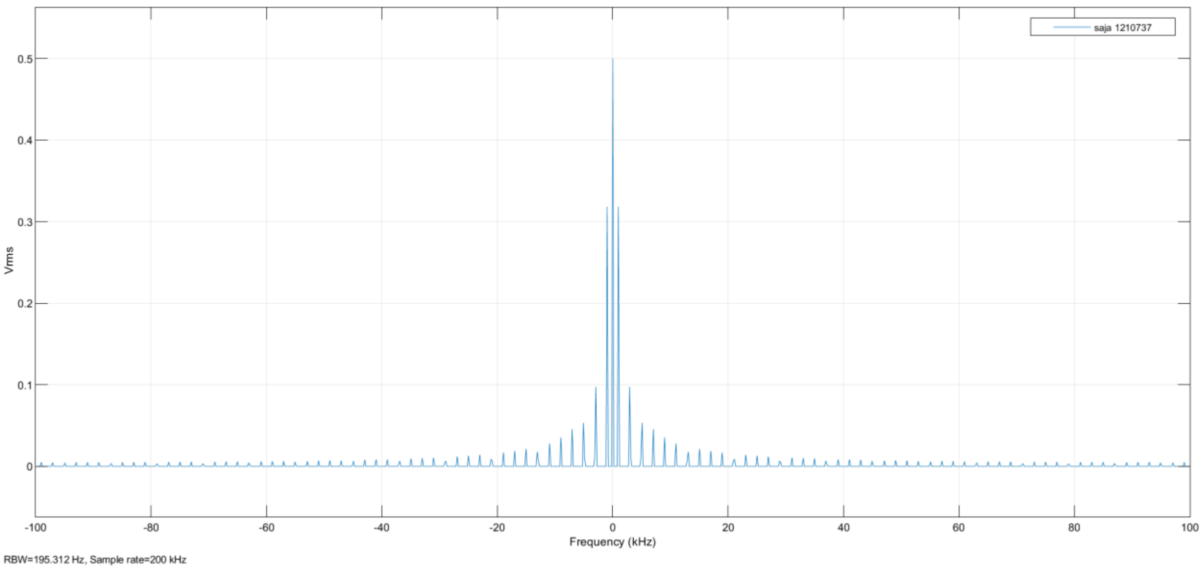

Figure 33:De-Modulated (2) signal @ Am=1.5, D=50% & f=1KHz in f

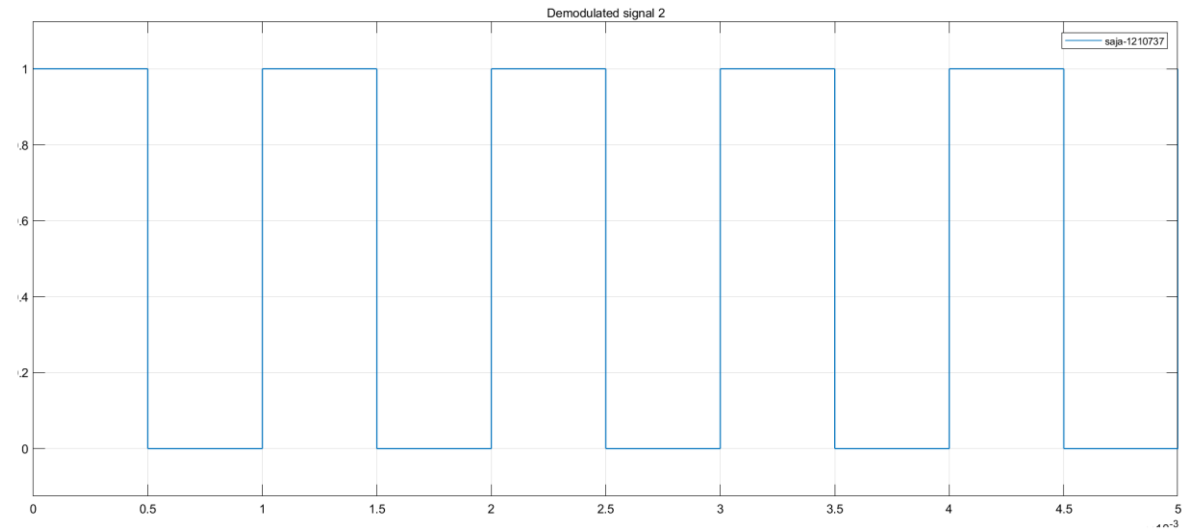

Figure 34:De-Modulated (2) signal @ Am=1.5, D=50% & f=1KHz in t

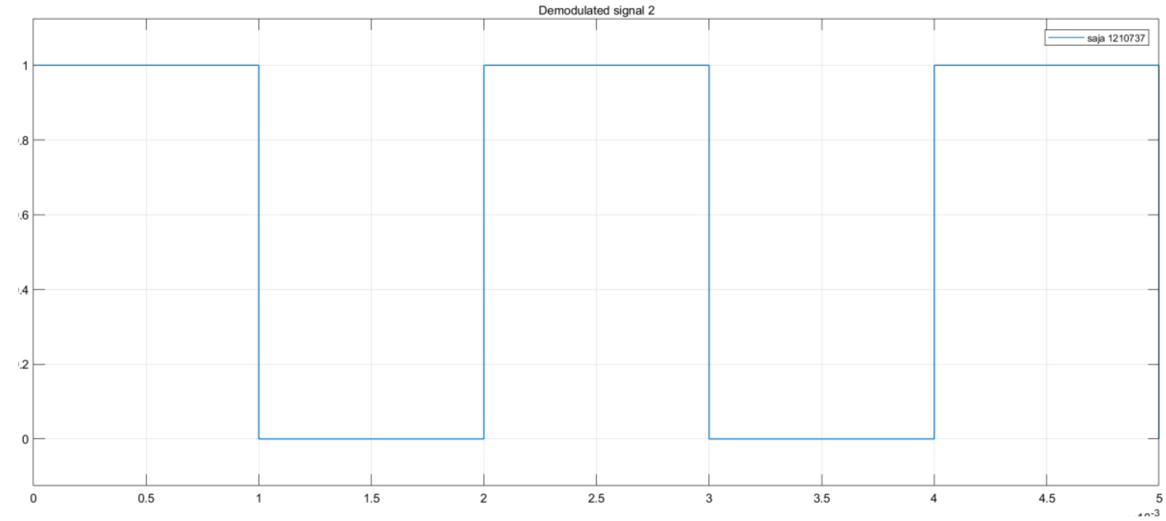

Figure 35:De-Modulated (2) signal @ Am=5, D=50% & f=0.5 KHz in t

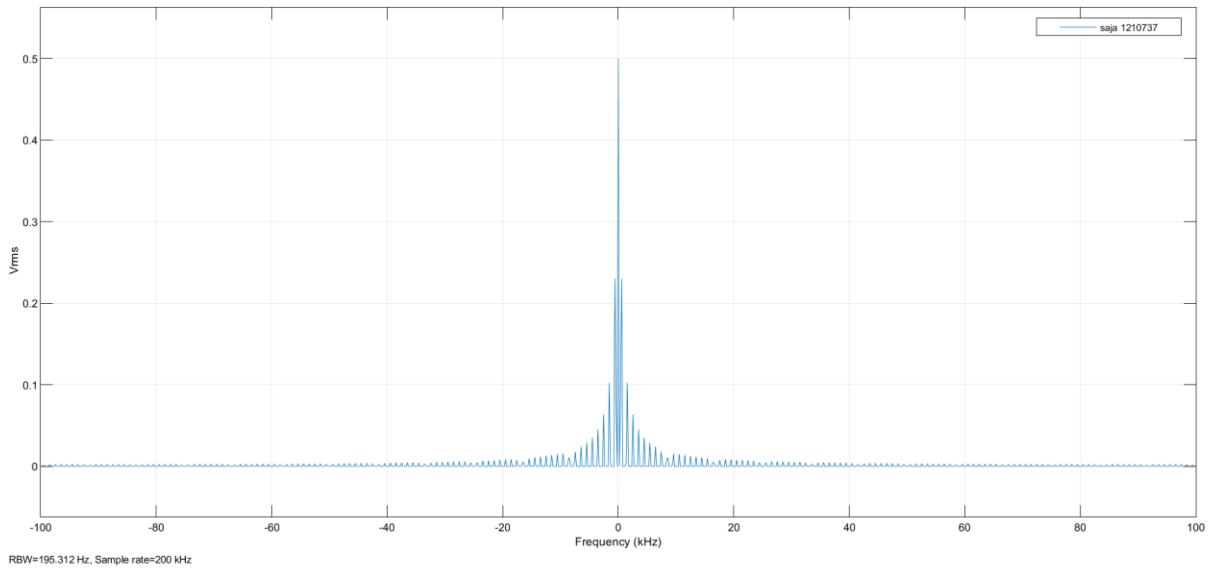

Figure 36:De-Modulated (2) signal @ Am=5, D=50% & f=0.5 KHz in f

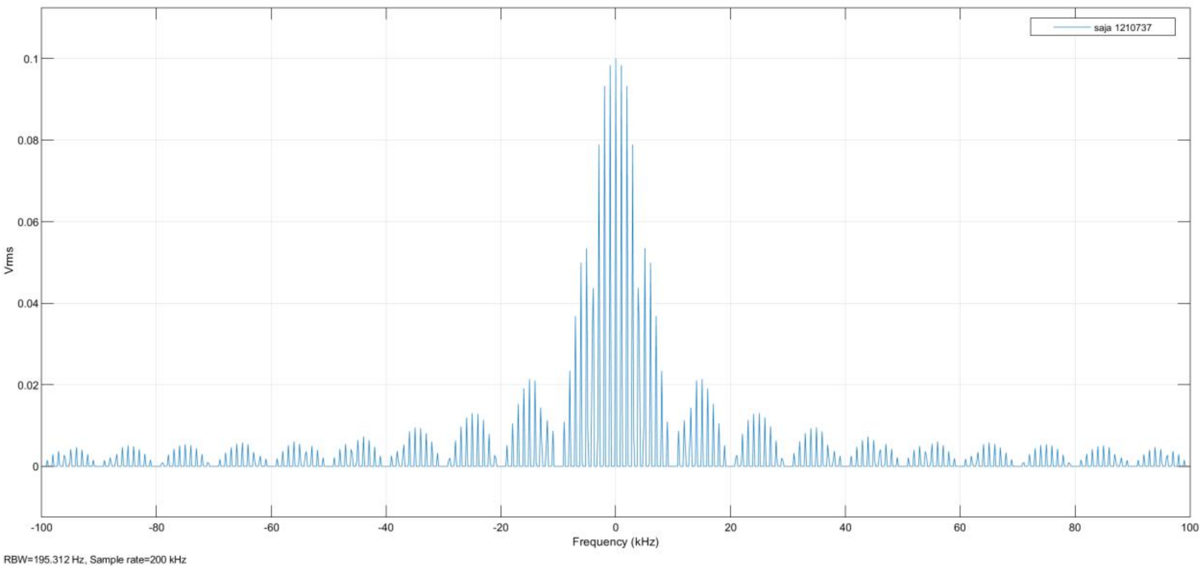

Figure 37:De-Modulated (2) signal @ Am=5, D=10% & f=1 KHz in f

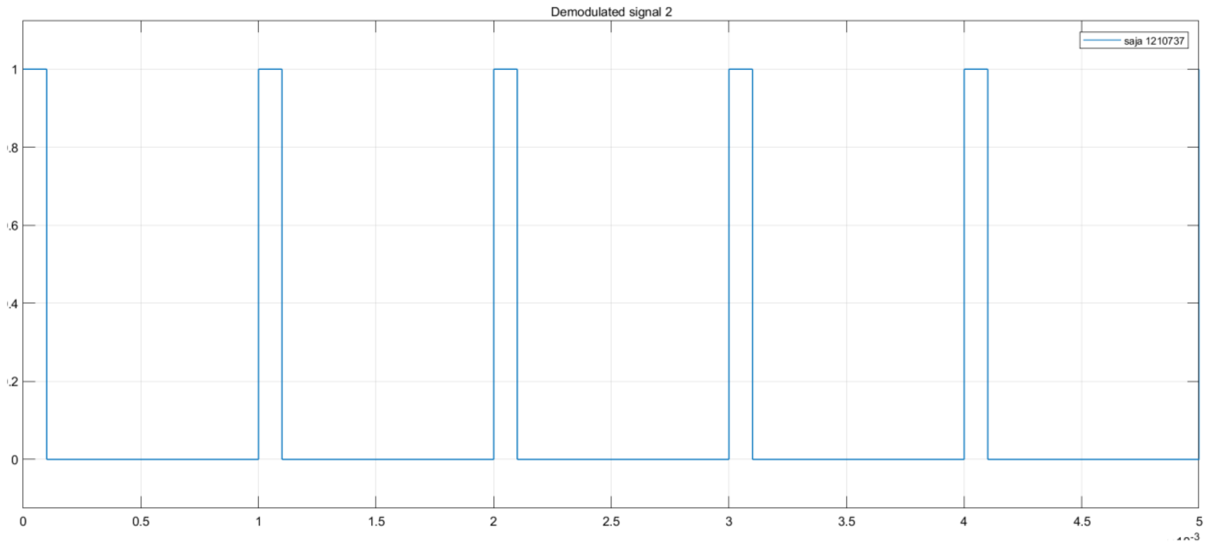

Figure 38: De-Modulated (2) signal @ Am=5, D=10% & f=1 KHz in t

The outcomes from the second demodulation method align with those from the first, validating the reliability of the system. This indicates that the amplitude of the pulse signal does not influence the demodulated output. However, the duty cycle does affect the shape and structure of the pulse: increasing the duty cycle lengthens the duration of the pulse at amplitude 1 while reducing the duration of the zero segments, as the duty cycle indicates the "on" portion of the signal, and vice versa .

Furthermore, the frequency value affects the signal's period. A decrease in frequency results in a longer period, meaning the signal takes more time to complete a cycle, which reflects the inverse relationship between frequency and period (F = 1/T). Conversely, increasing the frequency reduces the period .

Demodulation primarily categorizes the signal based on a threshold: values above this threshold are classified as 1, while those below it are classified as 0, resulting in a pulse signal that consists solely of 1s and 0s .

In both the time and frequency domains, the demodulated signal takes the form of a pulse or square wave, consistent with the original signal type. In the frequency domain, it manifests as a series of delta functions, corresponding to the theoretical spectrum of a pulse function, which is represented as a series of delta functions proportional to the sinc function.