**Lab 3：DSB Modulation System**

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| **Introduction**  In Lab 3, we design a Double-Sideband modulation system by using LabView. First, we need to create a modulator to obtain the signal Sm(t) using m(t) received by the input of modulator. Then, Sm(t) is through AWGN Channel. However, it is all known that AWGN Channel has noise interference in the transmission process. So, we use Sm(t) to generate white noise, which simulate the noise in the transmission process and be received by the demodulator with Sm(t). Last, the signal after demodulating is played through Play Waveform. The demodulator is about coherent demodulation.  **Lab results & Analysis**：  The following pictures are the program chart and the result of single tone signal.      The following pictures are the program chart and the result of music signal.      In theory, we can know that the case whose SNR is 30dB is the most suitable case. Next, we will analyze system performance from two aspects, including the value of SNR and the cutoff frequency.  First, we change nothing except the value of SNR. For single tone signal, when SNR is less than or equal to -15dB, the signal we can hear is noise and the signal received is noise. When SNR is greater than -15dB and less than 30dB, the single tone signal received become more and more clear and the noise received is fading away with the value of SNR increasing. After SNR is greater than or equal to 30dB, the noise received almost disappear.    ***Single tone signal***  For music signal, when SNR is less than or equal to -24dB, the signal we can hear is noise and the signal received is noise. When SNR is greater than -24dB and less than 30dB, the music signal received become more and more clear and the noise received is fading away with the value of SNR increasing. After SNR is greater than or equal to 30dB, the noise received almost disappear.    ***Music signal***  Next, we change nothing except the cutoff frequency. For single tone signal, when cutoff frequency is less than 50Hz ((50 is an estimate)), the single tone signal transferred is almost cut off. When cutoff frequency is greater than 73000Hz (73000 is an estimate), the waveform of recovered signal begin distortion.    ***Single tone signal***  For music signal, when cutoff frequency is less than 23Hz ((23 is an estimate)), the music signal transferred is almost cut off. When cutoff frequency is greater than 7000Hz (7000 is an estimate), the noise played become more and more obvious.    ***Music signal*** | |
| **Experience**  The following figures are classroom screenshots.  What should be noticed is that the number of samples of all signal generator in single tone signal experiment is different to that in music signal experiment. What’s more, we can analyze system performance from the order of LPF, the type of LPF and so on. | |
| **Score** | 97 |