**深 圳 大 学 实 验 报 告**

**课程名称： 现代通信原理**

**实验项目名称： 实验七**

**学院： 电子与信息工程学院**

**专业： 电子信息工程**

**指导教师： 陈真**

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**实验时间： 2023.04.13-2023.04.20**

**实验报告提交时间： 2023年4月20日**

**教务部制**

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| **实验目的与要求：**  微信截图_20230508225529 |
| **内容和步骤：**   1. **Generate a random 0/1 sequence (10 digits) and transform it to a bipolar symbol sequence (symbol duration time is Tb=0.001), plot the generated symbol sequence**   In the experiment, we set Tb=0.001 and sample 100 points for each symbol. The codes are shown in the following figure.  微信截图_20230508230042  Before adding noise, we should perform pulse forming for the binary sequence. We let it pass through roll-off system. The codes are shown in the following figure.  微信截图_20230508230118  微信截图_20230508230050  微信截图_20230508230133  The following figure shows the original bipolar signal waveform and the waveform after pulse forming.  微信截图_20230508230509   1. **Add noise to the symbol sequence as received signal (for simplicity, can use randn() directly), plot the received signal**   We use randn() function to add the noise. Here we use a variable “noise\_intense” to measure the intensity of the noise. At first, we set it 0.1. The codes are shown in the following figure.  微信截图_20230508230143  The following figure shows the waveform added noise. We can observe that compared to the original waveform, it fluctuates a lot at each sample point.  微信截图_20230508230522   1. **Match filter the received signal and plot the filtered signal**   Utilizing the roll-off system is symmetric, in order to reduce the effect of the noise, the receiver should match filter the received signal by convolution received signal with transmission roll-off system. Then, we down sample the signal. We plot the filtered signal and the sampled received signal to observe the influence of the action of match filter. The codes are shown in the following figure.  微信截图_20230508230157  微信截图_20230508230205  The following figure shows the result. We observe that compared to the signal added noise, it becomes more smooth and stable which indicates that the action of “match filter” eliminate the effect of noise in this case.  微信截图_20230508230534   1. **Based on the filtered signal, decide on the signal and compared it to the transmitted signal**   Since it is a bipolar signal, the Vd=0. The codes are shown in the following figure.  微信截图_20230508230214  The following figure shows the received signal waveform which is the same as the original signal waveform. That proofs noise’s effect is so small that not influence the accurate of the received signal waveform (no BER).  微信截图_20230508230540  Next, we change the noise\_intense to 1 as shown in the following figure. We explore whether “match filter” function well.  微信截图_20230508234302  The following figures show all the result. We observe that the signal added more intenser noise is not similar to the original signal (distortion). And the received signal waveform is different with the original signal (has BER). That indicates when the noise in the channel is too intense, although it perform “match filter”, the received signal waveform still be distorted. In order words, “match filter” is effective when the noise is acceptable. However, if the noise is too strong, “match filter” loses its performance.  微信截图_20230508234314  微信截图_20230508234320 |
| **实验结论：**   1. The whole experiment process can be presented by the following chart   微信截图_20230508235610   1. The match filter is to reduce the effect of noise in the channel. But if the noise is too intense, the match filter will lose its effective performance and the received signal waveform will be distorted. |
| **指导教师批阅意见：**    **成绩评定：**  **指导教师签字：**  **年 月 日** |
| **备注：** |

注：1、报告内的项目或内容设置，可根据实际情况加以调整和补充。

2、教师批改学生实验报告时间应在学生提交实验报告时间后10日内。