**3.1 Low-Pass filter**

Themeasurement result for low-pass filter is shown below

|  |  |  |
| --- | --- | --- |
| Frequency | Input signal amplitude, [Vppk] | Output signal amplitude, [Vppk] |
| 1 MHz | 9.6 | 0.200 |
| 100 kHz | 10.1 | 0.237 |
| 50 kHz | 10.3 | 0.470 |
| 10 kHz | 10.1 | 2.21 |
| 5 kHz | 10.1 | 4.1 |
| 1 kHz | 10.7 | 9.8 |
| 500 Hz | 10.7 | 10.5 |

The calculated data is shown below.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Frequency | Transfer function magnitude | Expected transfer function magnitude | Transfer function magnitude  [dB] | Expected transfer function magnitude  [dB] |
| 1 MHz | 0.020833 | 0.001621 | -33.6248 | -55.8058 |
| 100 kHz | 0.023465 | 0.016205 | -32.5915 | -35.807 |
| 50 kHz | 0.045631 | 0.032397 | -26.8148 | -29.7898 |
| 10 kHz | 0.218812 | 0.159985 | -13.1986 | -15.9184 |
| 5 kHz | 0.405941 | 0.30835 | -7.83075 | -10.2191 |
| 1 kHz | 0.915888 | 0.851041 | -0.76315 | -1.40099 |
| 500 Hz | 0.981308 | 0.955561 | -0.16389 | -0.39484 |

We can see that the H value increases from 0 to 1, which agrees with the theory.

**3.2 High-Pass filter**

Themeasurement result for high-pass filter is shown below

|  |  |  |
| --- | --- | --- |
| Frequency | Input signal amplitude, [Vppk] | Output signal amplitude, [Vppk] |
| 1 MHz | 9.6 | 9.8 |
| 100 kHz | 10.1 | 10.1 |
| 50 kHz | 10.1 | 10.1 |
| 10 kHz | 10.1 | 9.8 |
| 5 kHz | 10.1 | 9.2 |
| 1 kHz | 10.5 | 4.2 |
| 500 Hz | 10.7 | 2.29 |
| 100 Hz | 10.7 | 0.51 |

The calculated data is shown below.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Frequency | Transfer function magnitude | Expected transfer function magnitude | Transfer function magnitude  [dB] | Expected transfer function magnitude  [dB] |
| 1 MHz | 1.02 | 1.00 | 0.18 | -1.1 × 10-5 |
| 100 kHz | 1.00 | 1.00 | 0 | -0.00114 |
| 50 kHz | 1.00 | 1.00 | 0 | -0.00456 |
| 10 kHz | 0.97 | 0.99 | -0.26 | -0.113 |
| 5 kHz | 0.91 | 0.95 | -0.81 | -0.434 |
| 1 kHz | 0.40 | 0.52 | -7.96 | -5.595 |
| 500 Hz | 0.21 | 0.29 | -13.4 | -10.61 |
| 100 Hz | 0.048 | 0.06 | -26.4 | -24.21 |

We can see that the H value decreases from 1 to 0, which agrees with the theory.

**3.3 Band-Pass filter**

Themeasurement result for high-pass filter is shown below

|  |  |  |
| --- | --- | --- |
| Frequency | Input signal amplitude, [Vppk] | Output signal amplitude, [Vppk] |
| 1 MHz | 10.3 | 1.21 |
| 500 kHz | 10.3 | 3.02 |
| 100 kHz | 10.3 | 8.8 |
| 50 kHz | 10.1 | 9.6 |
| 10 kHz | 10.1 | 10.1 |
| 5 kHz | 10.3 | 4.2 |
| 1 kHz | 10.7 | 2.33 |
| 500 Hz | 10.3 | 1.21 |

The calculated data is shown below.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Frequency | Transfer function magnitude | Expected transfer function magnitude | Transfer function magnitude  [dB] | Expected transfer function magnitude  [dB] |
| 1 MHz | 0.12 | 0.154 | -18.60 | -16.224 |
| 100 kHz | 0.29 | 0.299 | -10.66 | -10.498 |
| 50 kHz | 0.85 | 0.848 | -1.37 | -1.427 |
| 10 kHz | 0.95 | 0.961 | -0.44 | -0.345 |
| 5 kHz | 1.00 | 0.995 | 0.00 | -0.0416 |
| 1 kHz | 0.41 | 0.527 | -7.79 | -5.57 |
| 500 Hz | 0.22 | 0.295 | -13.24 | -10.60 |

We can see that the H value firstly increases from 0 to 1 and then decreases from 1 to 0, which agrees with the theory.

**3.4 Band-reject filter**

Themeasurement result for high-pass filter is shown below

|  |  |  |
| --- | --- | --- |
| Frequency | Input signal amplitude, [Vppk] | Output signal amplitude, [Vppk] |
| 1 MHz | 10.3 | 10.3 |
| 500 kHz | 10.3 | 9.8 |
| 300 kHz | 10.3 | 9 |
| 200 kHz | 10.3 | 8 |
| 100 kHz | 10.3 | 5.1 |
| 50 kHz | 10.1 | 2.49 |
| 10 kHz | 10.1 | 1.67 |
| 5 kHz | 10.3 | 4 |
| 1 kHz | 10.5 | 9.8 |
| 500 Hz | 10.7 | 10.5 |

The calculated data is shown below.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Frequency | Transfer function magnitude | Expected transfer function magnitude | Transfer function magnitude  [dB] | Expected transfer function magnitude  [dB] |
| 1 MHz | 1.00 | 0.988 | 0.00 | -0.10 |
| 500 kHz | 0.95 | 0.954 | -0.43 | -0.41 |
| 300 kHz | 0.87 | 0.886 | -1.17 | -1.05 |
| 200 kHz | 0.78 | 0.786 | -2.19 | -2.09 |
| 100 kHz | 0.50 | 0.529 | -6.11 | -8.53 |
| 50 kHz | 0.25 | 0.276 | -12.16 | -11.17 |
| 10 kHz | 0.17 | 0.098 | -15.63 | -20.21 |
| 5 kHz | 0.39 | 0.280 | -8.22 | -11.04 |
| 1 kHz | 0.93 | 0.850 | -0.60 | -1.41 |
| 500 Hz | 0.98 | 0.955 | -0.16 | -0.40 |