**Experimental Data:**

**All components:**

|  |  |  |  |
| --- | --- | --- | --- |
| pre-emphasis: | low-pass: | R1= | 118.6KΩ |
|  |  | R2= | 119.3KΩ |
|  |  | C1= | 1nF |
|  |  | C2= | 503pF |
|  | high-pass: | R1= | 106.4KΩ |
|  |  | R2= | 210KΩ |
|  |  | C1= | 2nF |
|  |  | C2= | 2nF |
|  | gain: | Ri= | 1.01KΩ |
|  |  | Rf= | 28.3KΩ |
|  |  |  |  |
| de-emphasis: | low-pass: | R1= | 119.2KΩ |
|  |  | R2= | 119.3KΩ |
|  |  | C1= | 20nF |
|  |  | C2= | 10nF |
|  | high-pass: | R1= | 5.50KΩ |
|  |  | R2= | 10.90KΩ |
|  |  | C1= | 2nF |
|  |  | C2= | 2nF |
|  | gain: | Ri= | 0.955KΩ |
|  |  | Rf= | 1.483KΩ |
|  | sum: | R1= | 99.3KΩ |
|  |  | R2= | 98.8KΩ |
|  |  | Rf= | 98.8KΩ |

**Pre-emphasis filter:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **f** | **Vin** | **Vout** | **Vg** | **Vdb** |
| 100 | 1.219 | 1.656 | 1.35849057 | 2.66113254 |
| 150 | 1.219 | 3.688 | 3.02543068 | 9.61574414 |
| 200 | 1.219 | 6.215 | 5.09844135 | 14.1487485 |
| 300 | 0.125 | 1.375 | 11 | 20.8278537 |
| 400 | 0.128 | 2.062 | 16.109375 | 24.1415738 |
| **436** | 0.25 | 4.25 | 17 | 24.6089784 |
| 500 | 0.25 | 4.875 | 19.5 | 25.8006922 |
| 600 | 0.125 | 2.781 | 22.248 | 26.9458195 |
| 700 | 0.125 | 2.906 | 23.248 | 27.3277119 |
| 800 | 0.125 | 3 | 24 | 27.6042248 |
| 900 | 0.125 | 3.031 | 24.248 | 27.6935185 |
| **940** | 0.25 | 5.938 | 23.752 | 27.5140037 |
| 1000 | 0.25 | 5.875 | 23.5 | 27.4213572 |
| **1980** | 0.25 | 4.25 | 17 | 24.6089784 |
| 2000 | 0.125 | 2.125 | 17 | 24.6089784 |
| 3000 | 0.125 | 1.219 | 9.752 | 19.7818739 |
| 4000 | 0.125 | 0.7812 | 6.2496 | 15.9170444 |
| 5000 | 1.203 | 4.312 | 3.5843724 | 11.0882625 |
| 6000 | 0.375 | 0.9531 | 2.5416 | 8.10214404 |
| 7000 | 1.219 | 2.125 | 1.74323216 | 4.82710458 |
| 8000 | 1.219 | 1.594 | 1.3076292 | 2.32969223 |
| 9000 | 1.219 | 1.25 | 1.02543068 | 0.21812615 |
| **10000** | 1.188 | 1 | 0.84175084 | -1.4963288 |

**De-emphasis filter:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **f** | **Vin** | **Vout** | **Vg** | **Vdb** |
| **99** | 1.219 | 0.862 | 0.707137 | -3.009929 |
| **100** | 1.219 | 0.875 | 0.7178015 | -2.879913 |
| 130 | 1.219 | 0.5625 | 0.4614438 | -6.717624 |
| 150 | 1.219 | 0.425 | 0.3486464 | -9.152296 |
| 200 | 1.219 | 0.2563 | 0.2102543 | -13.5451 |
| **300** | 4.062 | 0.375 | 0.0923191 | -20.69417 |
| 400 | 4.062 | 0.2312 | 0.0569178 | -24.89504 |
| **500** | 4.062 | 0.1594 | 0.0392418 | -28.12503 |
| 600 | 5.062 | 0.1562 | 0.0308574 | -30.21282 |
| **700** | 5.062 | 0.1406 | 0.0277756 | -31.12674 |
| 800 | 5.062 | 0.1344 | 0.0265508 | -31.51846 |
| **900** | 5.062 | 0.1345 | 0.0265705 | -31.512 |
| **910** | 4.062 | 0.1109 | 0.0273018 | -31.27617 |
| 940 | 4.062 | 0.1125 | 0.0276957 | -31.15175 |
| 1000 | 4.062 | 0.1172 | 0.0288528 | -30.79625 |
| 2000 | 5.062 | 0.4063 | 0.0802647 | -21.90951 |
| **3000** | 5.062 | 0.875 | 0.1728566 | -15.24628 |
| 4000 | 5.062 | 1.5 | 0.2963256 | -10.56462 |
| 5000 | 4.062 | 1.812 | 0.4460857 | -7.011635 |
| **6000** | 5.062 | 3.094 | 0.6112209 | -4.276037 |
| **6600** | 4.062 | 2.875 | 0.7077794 | -3.002041 |
| 7000 | 5.062 | 3.938 | 0.7779534 | -2.180929 |
| 7674 | 4.062 | 3.5 | 0.8616445 | -1.293437 |
| **8000** | 5.062 | 4.562 | 0.9012248 | -0.903337 |
| 9000 | 5.062 | 5.188 | 1.0248913 | 0.2135565 |
| **10000** | 4.062 | 4.625 | 1.1386017 | 1.1274364 |

**Combination of Pre-emphasis and De-emphasis filter**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **f** | **Vin** | **Vout** | **Vg** | **Vdb** |
| 100 | 1.219 | 1.141 | 0.93601313 | -0.5743612 |
| **120** | 1.25 | 1.25 | 1 | 0 |
| **150** | 1.25 | 1.281 | 1.0248 | 0.21278233 |
| 200 | 1.219 | 1.234 | 1.01230517 | 0.10622908 |
| 300 | 1.219 | 1.188 | 0.97456932 | -0.2237453 |
| 400 | 1.219 | 1.062 | 0.87120591 | -1.1975838 |
| **500** | 1.219 | 0.9531 | 0.78187039 | -2.1373047 |
| **600** | 1.219 | 0.8438 | 0.69220673 | -3.1952837 |
| **700** | 1.094 | 0.703 | 0.64259598 | -3.8412399 |
| 800 | 1.094 | 0.7031 | 0.64268739 | -3.8400045 |
| **900** | 1.094 | 0.75 | 0.68555759 | -3.2791212 |
| **1000** | 1.094 | 0.871 | 0.79616088 | -1.9799833 |
| **1300** | 1.219 | 1.062 | 0.87120591 | -1.1975838 |
| **1500** | 1.219 | 1.219 | 1 | 0 |
| **1800** | 1.219 | 1.438 | 1.17965546 | 1.43510361 |
| **2000** | 1.094 | 1.456 | 1.3308958 | 2.48288106 |
| **2500** | 1.219 | 1.812 | 1.48646432 | 3.44308975 |
| **3000** | 0.609 | 1.031 | 1.69293924 | 4.57282745 |
| **4000** | 1.094 | 1.844 | 1.68555759 | 4.53487189 |
| **5000** | 1.219 | 2.031 | 1.66611977 | 4.43412436 |
| **6000** | 1.219 | 1.875 | 1.53814602 | 3.73995133 |
| **7000** | 1.203 | 1.656 | 1.3765586 | 2.7758941 |
| **8000** | 1.203 | 1.469 | 1.22111388 | 1.73512337 |
| **9000** | 1.203 | 1.281 | 1.06483791 | 0.54567005 |
| **10000** | 1.203 | 1.094 | 0.90939318 | -0.8249661 |