|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Attack | Flute.wav | | Speech.wav | | Newsound.wav | |
| NC | BER | NC | BER | NC | BER |
| Noise addition  AWGN 20 dB | 0.5837 | 0.4512 | 0.5494 | 0.4912 | 0.6443 | 0.3789 |
| Re sampling  44.1-22.05-44.1 KHz | 1.000 | 0 | 0.9802 | 0.0225 | 1.000 | 0 |
| LPF  Cut off frequency 11.025 KHz | 0.6922 | 0.3340 | 0.7503 | 0.2676 | 0.8173 | 0.2041 |
| Re quantization  16-8-16 bits/sample | 0.9626 | 0.0420 | 0.6913 | 0.3447 | 0.9888 | 0.0127 |
| Echo  Delay 0.5s | 0.5410 | 0.5029 | 0.5064 | 0.5195 | 0.5272 | 0.5049 |
| Reverse | 0.5182 | 0.5176 | 0.5308 | 0.4951 | 0.5124 | 0.5225 |
| Mp3 compression  32 kbps | 0.5092 | 0.5205 | 0.5559 | 0.4805 | 0.5368 | 0.4873 |
| Mp3 compression  64 kbps | 0.5257 | 0.5078 | 0.5440 | 0.5000 | 0.5456 | 0.4883 |
| Mp3 compression  128 kbps | 0.5553 | 0.4814 | 0.5396 | 0.4893 | 0.5590 | 0.4707 |

Table: A Novel Robust Zero-Watermarking Scheme Based on Discrete Wavelet Transform