Wireless Communication Systems

HW4

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1.

We simulate the BER for QPSK with Selective combining, Maximal Ratio Combining, Equal Gain combining and Direct combining. The fading gain is generated by the Rayleigh random number, the number of diversity branches L=1~4, and the symbol energy to noise ratio E_s/N_0=1, 3, 5, 7, 9. The Fig 1.1~1.4 demonstrate Selective combining(SC), Maximal Ratio Combining(MRC), Equal Gain combining(EGC) and Direct combining(DC) respectively.

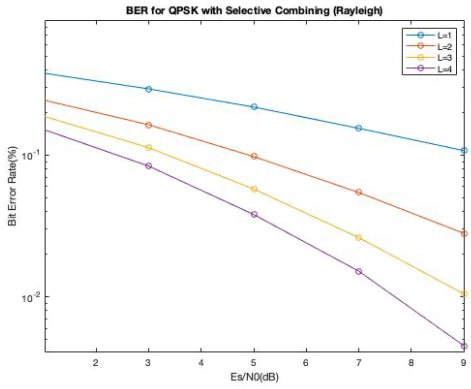

Fig 1.1: Selective combining for Rayleigh fading

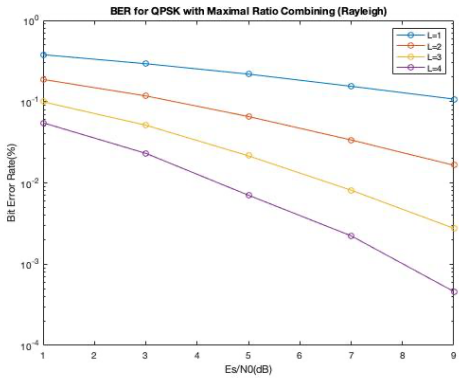

Fig 1.2: Maximal Ratio combining for Rayleigh fading

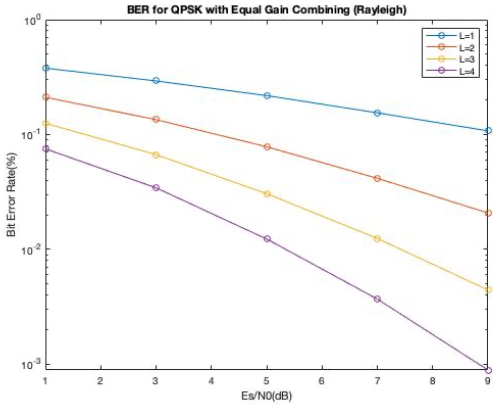

Fig 1.3: Equal Gain combining for Rayleigh fading

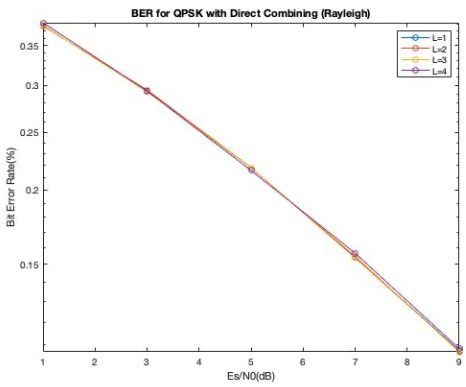

Fig 1.4: Direct combining for Rayleigh fading

2.

Same as 1, we simulate the BER for QPSK with Selective combining, Maximal Ratio Combining, Equal Gain combining and Direct combining. The fading gain is generated by the Rician random number with K=1, the number of diversity branches L=1~4, and the symbol energy to noise ratio E_s/N_0=1, 3, 5, 7, 9. The Fig 1.1~1.4 demonstrate

Selective combining(SC), Maximal Ratio Combining(MRC), Equal Gain combining(EGC) and Direct combining(DC) respectively.

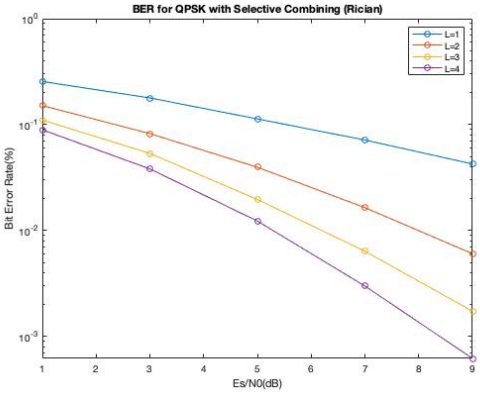

Fig 2.1: Selective combining for Rician fading with K=1

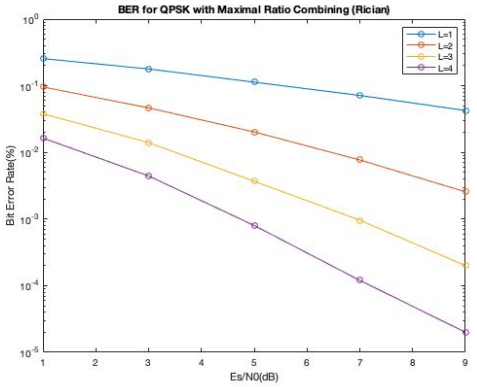

Fig 2.2: Maximal Ratio combining for Rician fading with K=1

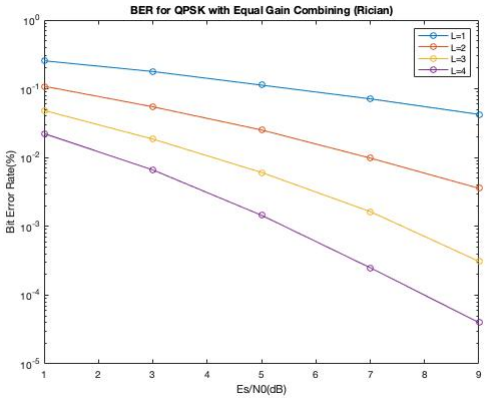

Fig 2.3: Equal Gain combining for Rician fading with K=1

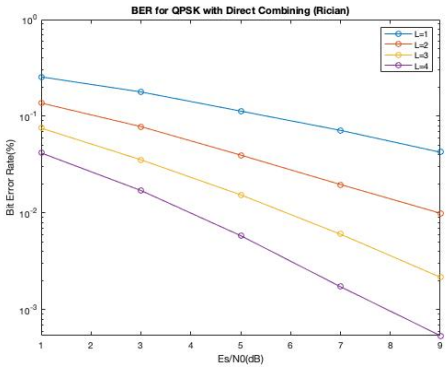

Fig 2.4: Direct combining for Rician fading with K=1

3.

In Fig3.1, we compare SC, MRC, EGC, DC for Rayleigh fading with diversity branches L=2. The performance is MRC > EGC > SC > DC.

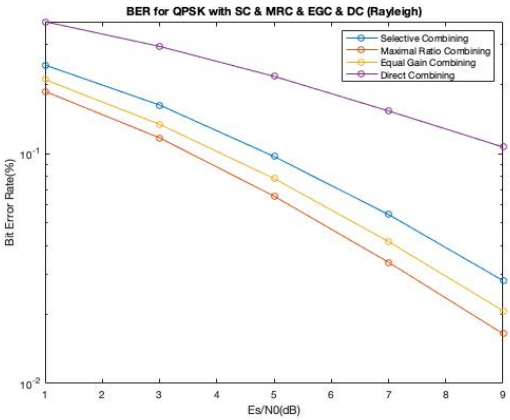

Fig 3.1: Comparison of different combining strategies for Rayleigh fading

From Fig3.2, we can obtain that the performance of diversity combining in Rician fading gain is better than that in Rayleigh fading gain.

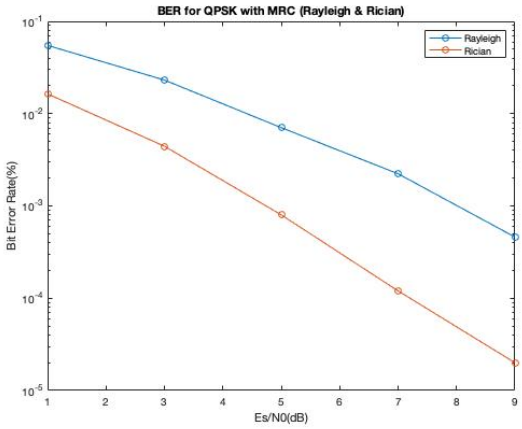

Fig 3.2: Comparison of Maximal Ratio combining between Rayleigh & Rician fading with K=1