Fig. 14 BER performances of DVB-T2 LDPC codes $N = 270$ with $\mathcal{S}$ threshold and without threshold $\mathcal{S}$.

The system with LDPC codes cannot reduce the error when $f_d T_s \geq 0.195$ and all the code rate have same perfomance with the system without channel coding. The results show channel coding cannot reduce the errors and error-floor if the system is experienced in high speed.

Fig. 13 shows the performances of DVB-T2 LDPC codes $N = 270$ on a high-speed flying devices with a maximum speed of 2450 km/h. We simulate the system with a maximum SNR γ = 35 dB and maximum LDPC iteration at 50. We assumed the channel model h = [1 0.7 0.5 0.3]. When the system experienced at 70 km/h, the system wihout channel coding cannot achieve BER 10^{-4}, but LDPC codes with $R_e = \frac{37}{45}$ can achieve BER 10^{-4} and can reduce the error-floor. When the system experienced at 160 km/h, the system wihout channel coding cannot achieve BER 10^{-3}, but LDPC codes with $R_e = \frac{4}{9}$ and $R_e = \frac{37}{45}$ can achieve BER 10^{-3} and can reduce the error-floor. When the system experienced at 400 km/h, LDPC codes with $R_e = \frac{4}{9}$ and $R_e = \frac{37}{45}$ can achieve BER 10^{-2} and can reduce the error-floor. Systems with high speed such as 2450 km/h have high errors. Even systems with LDPC codes unable to fix errors significantly. The results show channel coding can reduce errors and error-floor when the system is moving with low speed. When the system is moving with high speed, e.g. 2450 km/h, the channel coding cannot reduce the errors and error-floor.

B. Performance with Threshold $\mathcal{S}$

Fig. 14 shows the performances of the DVB-T2 LDPC codes $N = 270$ with threshold $\mathcal{S}$ and without threshold $\mathcal{S}$ on multipath rayleigh slow fading and fast fading. In fast fading, we use a speed of v = 400 km/h. The curve of the system without $\mathcal{S}$ threshold is increasing at SNR γ = 15 dB and is unstable in slow fading. In fast fading, the system curve without using $\mathcal{S}$ threshold is increasing at SNR γ = 15 dB and continue to rise without decreasing. This is due to the σ is closer to 0, which produces infinite LLR and causes unstable jumping error.

IV. Conclusion

This paper has proposed a high-speed flying devices system with the optimal threshold $\mathcal{S}$ for practical applications helped by DVB-T2 LDPC codes such that multimedia transmission from the high-speed flying devices is possible for BER less than 10^{-2}. This paper confirmed that the DVB-T2 LDPC codes $N_{\text{LDPC}} = 270$ can provide good communication performances of flying devices with speed up to 2450 km/h. The proposed optimal threshold $\mathcal{S}$ with LDPC codes can improve performance and reduce error-floor at $f_d T_s$ below 0.055. The maximum achievable speed that cause error-floor less than 10^{-2} is 400 km/h. This paper has also found that the optimal threshold cannot be set too small $\mathcal{S} < 0.1$, because it causes the infinite value of the LLR. On the other hand, if the treshold $\mathcal{S} > 0.875$, the demapper just introduce additional errors. Therefore, the optimal threshold $\mathcal{S}$ should be carefully searched. The results of this paper are expected to contribute to the development of communication systems in high-speed flying devices by sending multimedia data in real-time.

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