MIMO-OFDM system is divided into two 2×2 MIMO-OFDM systems. Another 2×2 MIMO-OFDM system $\mathbf{Y}_{c2}=\begin{bmatrix}Y_{3,c} & Y_{4,c}\end{bmatrix}^T$ is as follows,

$$\mathbf{Y}_{c2}=\begin{bmatrix}Y_{3,c}\\ Y_{4,c}\end{bmatrix}=\begin{bmatrix}\widehat{H}_{33} & \widehat{H}_{34}\\ \widehat{H}_{43} & \widehat{H}_{44}\end{bmatrix}\begin{bmatrix}X_3\\ X_4\end{bmatrix}. \quad (\mathbf{14})$$

4.2 QRD-*M* in 2×2 MIMO-OFDM

After the partial ZF, two 2×2 MIMO-OFDM systems are generated in (**12**) and (**14**). And then, all transmission symbols $\hat{X}_1,\hat{X}_2,\cdots,\hat{X}_4$ are estimated by applying conventional QRD-*M* with $M=|S|$ to the **(12)** and **(14)**. The complexity of the proposed detection scheme is very lower than the conventional QRD-*M* which is applied to original MIMO-OFDM system in (**2**) because the QRD-*M* in the proposed detection scheme is applied to only 2×2 MIMO-OFDM system. In Table 1, the complexity of the proposed detection scheme is explained. In the calculation of the complexity, only complex multiplication is considered assuming the multiplication of two complex numbers require four multiplications.

Table 1. The complexity of the proposed detection scheme.

Scheme	Required complex multiplications
Partial ZF with LU decomposition	$\frac{28}{9}M^3+3M^2-\frac{172}{9}M-\frac{4}{3}M\log_2 M$
Conventional QRD-*M* in 2×2 system	$12\|S\|^2+8\|S\|+48$
The whole proposed detection scheme	$\frac{28}{9}M^3+3M^2-\frac{172}{9}M-\frac{4}{3}M\log_2 M+\frac{M}{2}\left(12\|S\|^2+8\|S\|+48\right)$

Table 2. The used simulation parameters.

Parameter	Value or scheme
The number of subcarriers	256
CP length	64
Modulation scheme (BER)	BPSK,
Modulation scheme (Complexity)	BPSK, QPSK and 16-QAM
Channel	7-path Rayleigh fading

5 Simulation Results

In this section, the simulation results for bit error rate (BER) performance and required complexity are shown. The used simulation parameters are explained in