

| $10 \log_{10}(S/N)$ | $BER$                |
|---------------------|----------------------|
| -5dB                | 23.6%                |
| -4dB                | 18.6%                |
| -3dB                | 15.9%                |
| -2dB                | 13.1%                |
| -1dB                | 10.4%                |
| 0dB                 | 7.9%                 |
| 1dB                 | 5.7%                 |
| 2dB                 | 3.8%                 |
| 3dB                 | 2.3%                 |
| 4dB                 | 1.3%                 |
| 5dB                 | 0.6%                 |
| 6dB                 | 0.24%                |
| 7dB                 | $7.7 \cdot 10^{-4}$  |
| 8dB                 | $1.9 \cdot 10^{-4}$  |
| 9dB                 | $3.4 \cdot 10^{-5}$  |
| 10dB                | $3.9 \cdot 10^{-6}$  |
| 11dB                | $2.6 \cdot 10^{-7}$  |
| 12dB                | $9 \cdot 10^{-9}$    |
| 13dB                | $1.3 \cdot 10^{-10}$ |
| 14dB                | $6.8 \cdot 10^{-13}$ |
| 15dB                | $9.2 \cdot 10^{-16}$ |
| 16dB                | $2.3 \cdot 10^{-19}$ |
| 17dB                | $6.8 \cdot 10^{-24}$ |
| 18dB                | $1.4 \cdot 10^{-29}$ |
| 19dB                | $10^{-36}$           |
| 20dB                | $10^{-45}$           |

$$BER = \frac{1}{2} \operatorname{erfc} \sqrt{\frac{S}{N}}$$

$$\operatorname{erfc}(x) = \frac{2}{\sqrt{\pi}} \int_x^{\infty} e^{-u^2} du$$

$$BER = \frac{1}{2} \operatorname{erfc} \sqrt{\frac{W_{BIT}}{k_B T}}$$

$$T \approx 290K$$

$$k_B T \approx -174 \text{dBm/Hz}$$

$$P_N = B \cdot k_B T$$

$$B = 10 \text{MHz} = 70 \text{dB} \cdot \text{Hz}$$

$$P_N \approx -104 \text{dBm}$$

$$P_S > P_N \cdot \left( \frac{S}{N} \right)_{min}$$

$$P_S > -93.5 \text{dBm}$$

| $BER$             | $10 \log_{10}(S/N)$ |
|-------------------|---------------------|
| 30%               | -8.6dB              |
| 10%               | -0.8dB              |
| 3%                | 2.5dB               |
| 1%                | 4.3dB               |
| 0.3%              | 5.8dB               |
| $10^{-3}$         | 6.8dB               |
| $3 \cdot 10^{-4}$ | 7.7dB               |
| $10^{-4}$         | 8.4dB               |
| $3 \cdot 10^{-5}$ | 9.1dB               |
| $10^{-5}$         | 9.6dB               |
| $3 \cdot 10^{-6}$ | 10.1dB              |
| $10^{-6}$         | 10.5dB              |
| $3 \cdot 10^{-7}$ | 11dB                |
| $10^{-7}$         | 11.3dB              |
| $3 \cdot 10^{-8}$ | 11.7dB              |
| $10^{-8}$         | 12dB                |
| $3 \cdot 10^{-9}$ | 12.3dB              |
| $10^{-9}$         | 12.6dB              |
| $10^{-10}$        | 13.1dB              |
| $10^{-11}$        | 13.5dB              |
| $10^{-12}$        | 13.9dB              |
| $10^{-13}$        | 14.3dB              |
| $10^{-14}$        | 14.7dB              |
| $10^{-15}$        | 15dB                |
| $10^{-16}$        | 15.3dB              |
| $10^{-17}$        | 15.6dB              |