EE535: Prof. Chugg - Summary of Modulation (performance)

Format	Bit Error Probability
BPSK	$\mathrm{Q}\left(\sqrt{\frac{2E_b}{N_0}}\right)$
QPSK	$\mathrm{Q}\left(\sqrt{\frac{2E_b}{N_0}}\right)$
MPSK	$\approx \frac{1}{\log_2 M}\mathrm{Q}\left(\sqrt{\frac{2E_b}{N_0}\log_2 M \sin^2(\pi/M)}\right)$
Binary Ortho. (coherent)	$\mathrm{Q}\left(\sqrt{\frac{E_b}{N_0}}\right)$
M-QAM	$\approx \frac{1}{\log_2 M}\left[1-\left(1-\frac{2(\sqrt{M}-1)}{\sqrt{M}}\mathrm{Q}\left(\sqrt{\frac{E_b}{N_0}\frac{3\log_2 M}{M-1}}\right)\right)^2\right]$
Orthogonal (coherent)	$\frac{M}{2(M-1)}\left[1-\int_{-\infty}^{\infty}\left(1-\mathrm{Q}\left(z\sqrt{\frac{2}{N_0}}\right)\right)^{M-1}\mathcal{N}_1(z;\sqrt{E_b\log_2 M};N_0/2)dz\right]$
DBPSK (noncoh.)	$\approx \frac{1}{2}\exp\left[\frac{-E_b}{N_0}\right]$
Binary Ortho. (noncoh.)	$\frac{1}{2}\exp\left[\frac{-E_b}{2N_0}\right]$