1. Weakest in-cell power level is P(R), while the co-channel interference level is P(D), where \( D/R = (3N)^{1/2} \) and \( N = 13 \). So \( P(D)/P(R) = (D/R)^{-n} = (3N)^{-n/2} = (39)^{-n/2} \) is \(-28 \text{ dB}\) or \((n/2)10\log(39) = 28\) and \( n = 5.6/\log(39) = 3.52\)

2. For l.o.s.: \( G_1G_2\lambda^2/(4\pi d)^2 \) For l.o.s. + ground reflection: \( G_1G_2h_1^2h_2^2/d^4 \) so we need the ratio \( P_{lv}/P_{end} = [ G_1G_2\lambda^2/(4\pi d)^2 ] / [ G_1G_2h_1^2h_2^2/d^4 ] = \lambda^2 d^2 / h_1^2h_2^2(4\pi)^2 \) expressed in dB or \( 20 \log \left[ \lambda d / 4\pi h_1h_2 \right] \). At 1.1 GHz, \( \lambda = (3/11) \text{ m} \), so

\[
P_{lv}/P_{end} \text{ in dB} = 20 \log \left[ \frac{(3/11)(8800)}{4\pi(2.2)(13)} \right] = 16.5 \text{ dB}
\]

3. The GOS spec is met if \( \text{erlb}(12, 7.5) < 0.02 \).

4. \( D = (4\pi/P)(dP/d\Omega)_{\text{max}} \)

If the northerly radiation intensity is \( (dP/d\Omega)_N \), the southern one is then \( 0.5(dP/d\Omega)_N \) and the total radiated power is \( P = 0.45 \text{ (dP/d\Omega)}_N + (0.75)(0.5)(dP/d\Omega)_N = 0.825 \text{ (dP/d\Omega)}_N \), while \( (dP/d\Omega)_{\text{max}} = (dP/d\Omega)_N \), so \( D = 4\pi/0.825 = 15.23 \)

5. The noise threshold = \( kTBF + \text{SNR} = -80.0 \text{ dBm} + \text{SNR} = \gamma \) needs to be at most at the level such that \( z = (\gamma - \mu)/\sigma = [\gamma - (-45 \text{ dBm})]/(5.5 \text{ dB}) \) is such that \( Q(z) = 0.98 \). From the given data, \( z = -2.054 \) so that \( \text{max SNR} = -(2.054)(5.5) + 80 - 45 = 23.7 \text{ dB} \)