Exercise 10

15.2
The authorities of a primary school are concerned with the deployment of a new cellular base station within the vicinity of their building. A health and safety consultancy company has been commissioned to assess whether the school is safe within the local standards. For this purpose, the company uses an E-field probe to perform electric field measurements in the school. 7000 samples are collected, which follow a Gaussian distribution, with mean of 5.9 mVm^{-1} and a standard deviation of 1.6 mVm^{-1}. Determine of the school complies with the standards if the local standards state that the electric field level should be below 6.2 mVm^{-1} in 90% of the locations within the site under test.

15.4mod
An 802.11g WLAN link is to be established to connect two buildings in a University campus. The geometry of this site indicates that these buildings should be connected and leakage to other surrounding buildings is to be avoided. Norwegian regulatory authority states maximum 10 mW or 25 mW EIRP at 2.4 GHz or 5.2 GHz, respectively. Search relevant standards to determine the minimum strength required. Create a suitable link budget. Search from various antenna manufactures and recommend the most suitable antenna for this application, justifying your selection. What is the maximum path length then possible?

16.3
Given a two-branch selection-combining system operated with independent Rayleigh fading, estimate then calculate the diversity gain for the fade probability of 10^{-6}.

16.5
Derive an expression for the instantaneous SNR at the output of an equal gain combiner with three branches in terms of the instantaneous SNR at the inputs to each of the three branches.

16.6
Explain why an equal gain combiner must co-phase signals before combining them. If two branches are independently Rayleigh distributed with equal mean power P, what is the distribution of combined signal *without* co-phasing? What is the diversity gain in this case? What is the effective diversity order?

16.7
Discuss the advantages of using polarisation diversity over other diversity techniques.