

Read Chapter 6:

Problem 1:

A plane wave in air is normally incident at a planar interface between air and muscle tissue. Find the percentage of incident power absorbed by the muscle tissue at (a) 100 MHz, (b) 915 MHz, (c) 2.45 GHz. Use the parameters in the following table for muscle tissue (m (f) subscript refers to muscle (fat))

Frequency f(MHz_)	Muscle and skin tissues		Fat and bone tissues	
	$(\epsilon_m)_r$	σ_m (S-m ⁻¹)	$(\epsilon_f)_r$	σ_f (S-m ⁻¹)
100	71.7	1.37	7.45	0.05
915	51.0	1.60	5.6	0.10
2450	47.0	2.21	5.5	0.10

Problem 2:

Consider a plane wave incident at the surface of the body of a pig (assumed to be planar boundary). The body of the pig can be approximately represented by a layer of fat tissue of certain thickness followed by a muscle tissue (assumed to be of infinite extent). For a newly born piglet the fat layer is so thin that it can be neglected (air muscle interface only). For a grown up pig, the fat layer thickness can range from 2 to 5 cm and must be taken into account. You may assume 4 cm fat layer thickness for a mature pig and use the parameter in the above table. Calculate the (i) percentage of power dissipated in the fat layer, (ii) the power transmitted into the muscle tissue, and the depth of penetration into the muscle tissue of newly born piglet at:

- (a) 915 MHz,
- (b) 2.45 GHz,
- (c) repeat (a) and (b) for a mature pig.

Problem 3: 5.1

Problem 4: 5.7

Problem 5: 5.20

Problem 6: 5.28

Problem 7: 5.30

Problem 8: 5.33