ITU model for indoor attenuation

This model is applicable to only the indoor environments. Typically, such appliances use the lower microwave bands around 2.4 GHz. However, the model applies to a much wider range. [3]

ITU Path Loss

$$L_{ITU} = 20\log_{10}(f) + N\log_{10}(d) + P_f(n) - 28$$

f: carrier frequency in Megahertz
d: distance between transmitter in receiver in meters
N: distance power loss coefficient
n: number of floors between transmitter and receiver
$P_f(n)$: floor loss penetration factor

Calculation of distance power loss coefficient (N): [7]

Frequency Band	Residential Area	Office Area	Commercial Area
900 MHz	N/A	33	20
1.2 – 1.3 GHz	N/A	32	22
1.8 – 2.0 GHz	28	30	22
4 GHz	N/A	28	22
5.2 GHz	30 (apartment), 28 (house)	31	N/A
5.8 GHz	N/A	24	N/A
6.0 GHz	N/A	22	17

Calculation of floor penetration factor ($P_f(n)$): [7]

Frequency Band	Number of floors	Residential Area	Office Area	Commercial Area
900 MHz	1	N/A	9	N/A
900 MHz	2	N/A	19	N/A
900 MHz	3	N/A	24	N/A
1.8 – 2.0 GHz	n	4n	15+4(n-1)	6+3(n-1)
5.2 GHz	1	N/A	16	N/A
5.8 GHz	1	N/A	22 (1 floor), 28 (2 floors)	N/A