SCHOLARLY REVIEW JOURNAL

E-ISSN: 2996-8380
Published by Leadership & Innovation Lab

SUMMER 2026

APPENDIX 1

Equations used to calculate specific attenuation

Specific attenuation γR (dB/km) is calculated from the rainfall R (mm/h) using the equation below, where k and α are coefficients of linear of horizontal path

$$R = kR^{\alpha}$$

Using the frequency dependent coefficients and estimating the specific rain attenuation at 25 mm/hr, we found that the trend between frequency bands is that higher frequencies will experience the more prevalent rain attenuation.

Table 1

Table of frequency dependent coefficients

Frequency band	**Frequency range** / GHz	**Specific attenuation at** 25 mm/hr **(horizontally polarised)**	**Specific attenuation at** 25 mm/hr **(vertically polarised)**
S-Band	1-2	0.0000387-0.000154	0.0000352-0.000139
C-Band	4-8	0.000648-0.000581	0.00457-0.0189
X-Band	8-12	0.00457-0.0183	0.00400-0.0168
Ku-Band	12-18	0.0188-0.0369	0.0168-0.0336
K-Band	18-27	0.0750-0.124	0.0690-0.113
Ka-Band	27-40	0.186-0.350	0.167-0.310

SCHOLARLY REVIEW JOURNAL

E-ISSN: 2996-8380
Published by Leadership & Innovation Lab

SUMMER 2026

V-Band	40-75	0.350-0.844	0.310-0.774

Note: The frequency dependent coefficients for horizontally and vertically polarised RF waves (IEEE bands) are given. The frequency dependent coefficients were organised in order of increasing frequency.

Table 2

Table of frequency dependent coefficients

Frequency (GHz)	k_H	α_H	k_H	α_H
1	0.0000259	0.9691	3.08E-05	0.8592
10	0.01217	1.2571	0.01129	1.2156
20	0.09164	1.0568	0.09611	0.9847
30	0.2403	0.9485	0.2291	0.9129
100	1.3671	0.6815	1.368	0.6765
300	1.6286	0.6296	1.6286	0.6262
1000	1.3795	0.6396	1.3822	0.6365

Note: The frequency dependent coefficients for horizontally and vertically polarised RF waves (IEEE bands) are given. All frequencies here were used for calculations in Figure 4 (ITU, 2003).