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Document typeArticle • [Hybrid Gold Open Access](#) • [Green Open Access](#)**Source type**

Journal

ISSN

16936930

DOI

10.12928/TELKOMNIKA.v20i4.23766

Publisher

Universitas Ahmad Dahlan

Original language

English

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Ku-band specific attenuation coefficients for high-throughput satellites in equatorial region

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Ku-band have a larger attenuation during heavy rain in the equatorial region. Despite that, Ku-band has been identified as a frequency band in high-throughput satellite systems (HTS) for broadband satellite communication. The available rain fade prediction models are still not able to accurately predict rain attenuation in the equatorial region. The models depend on the specific attenuation parameters produced based on the international telecommunication union radiocommunication sector (ITU-R) instead of the measured value. Direct measurement of specific attenuation is more accurate but difficult to obtain because the correlation of rainfall rate and satellite signal loss due to rain must be obtained simultaneously. This paper aims to derive new

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Kourogioras, C.I. , Karagiannis, G.A. , Panagopoulos, A.D. (2013) *2013 7th European Conference on Antennas and Propagation, EuCAP 2013*

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specific attenuation frequency-dependent coefficients for Ku-band using the semi-empirical method. The Malaysia East Asia Satellite 3 (MEASAT-3) satellite data was collected using a 13 m antenna located at Cyberjaya, Selangor while the rainfall data was collected by the nearby hydrological station. The specific attenuation was obtained from correlations of the direct measurement of rain attenuation and rainfall rate. The new frequency-dependent coefficients for Ku-band specific attenuation values are $k = 4.6690$ and $\alpha = 0.1941$. The newly acquired specific attenuation coefficients have improved the rain attenuation model prediction for the equatorial region. © This is an open access article under the CC BY-SA license.

Author keywords

Equatorial region ; High-throughput satellite ; Ku-band; Rain attenuation ; Specific attenuation

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References (25)

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-
- ☐ 1 Thompson, P., Evans, B., Castenet, L., Bousquet, M., Mathiopoulos, T. Concepts and Technologies for a Terabit/s Satellite Supporting future broadband services via satellite (2011) *The Third International Conference on Advances in Satellite and Space Communications*, pp. 12-19. Cited 36 times. [1] in [Online]. Available https://www.thinkmind.org/articles/spacomm_2011_1_30_30130.pdf

-
- ☐ 2 Gayrard, J.-D.
Terabit satellite: Myth or reality?

(2009) *Proceedings - 2009 1st International Conference on Advances in Satellite and Space Communications, SPACOMM 2009*, art. no. 5194576, pp. 1-6. Cited 34 times.
ISBN: 978-076953694-1
doi: 10.1109/SPACOMM.2009.17

[View at Publisher](#)

-
- ☐ 3 Nebuloni, R., Capsoni, C., Luccini, M., Luini, L.
Assessment of rain fade mitigation techniques for high throughput satellites by a time series synthesizer

(2015) *2015 9th European Conference on Antennas and Propagation, EuCAP 2015*, art. no. 7228701. Cited 4 times.
ISBN: 978-889070185-6
-

- ☐ 4 Vilhar, A., Kelmendi, A., Hrovat, A.
Satellite propagation experiment in Ljubljana: Beacon measurements at Ka- and Q-band
(2017) 2017 11th European Conference on Antennas and Propagation, EUCAP 2017, art. no. 7928740, pp. 3300-3304. Cited 5 times.
ISBN: 978-889070187-0
doi: 10.23919/EuCAP.2017.7928740
[View at Publisher](#)
-
- ☐ 5 Cuervo, F., Lam, H.Y., Din, J.B., Castro, J.R., Schmidt, M., Schonhuber, M.
The JOANNEUM RESEARCH SatCom Ka and Q band campaigns in Europe and Malaysia
(2017) 2017 11th European Conference on Antennas and Propagation, EUCAP 2017, art. no. 7928869, pp. 1476-1480. Cited 10 times.
ISBN: 978-889070187-0
doi: 10.23919/EuCAP.2017.7928869
[View at Publisher](#)
-
- ☐ 6 Elshami, I.F., Din, J., Yin, L.H., Elgayar, A.I.
Characterization of concurrent Ku band tropospheric scintillation and rain attenuation in Malaysia ([Open Access](#))
(2019) Indonesian Journal of Electrical Engineering and Computer Science, 15 (2), pp. 956-961. Cited 5 times.
<http://ijeecs.iaescore.com/index.php/IJEECS/article/download/19122/12845>
doi: 10.11591/ijeecs.v15.i2.pp956-961
[View at Publisher](#)
-
- ☐ 7 Yussuff, A.I.O., Koleoso, I.E., Khamis, N.H.H.
Investigating rain attenuation models for satellite links in tropical Nigeria
(2018) Indonesian Journal of Electrical Engineering and Informatics, 6 (1), pp. 61-69. Cited 3 times.
<http://section.iaesonline.com/index.php/IJEEI/article/download/263/pdf>
doi: 10.11591/ijeei.v6i1.263
[View at Publisher](#)
-
- ☐ 8 Damascena Dias, W., Carleti, M., Souza Lima Moreira, S., Leonel Mendes, L.
Evaluation of Rain Attenuation Models in Satellite Links under Tropical and Equatorial Climates
(2018) IEEE Latin America Transactions, 16 (2), pp. 358-367. Cited 6 times.
<http://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=9907>
doi: 10.1109/TLA.2018.8327387
[View at Publisher](#)
-
- ☐ 9 Aguilar, A., Butler, P., Collins, J., Guerster, M., Kristinsson, B., McKeen, P., Cahoy, K., (...), Crawley, E.
Tradespace exploration of the next generation communication satellites ([Open Access](#))
(2019) AIAA Scitech 2019 Forum. Cited 5 times.
ISBN: 978-162410578-4
doi: 10.2514/6.2019-0768
[View at Publisher](#)

- ☐ 10 El Bakkali, M., Gaba, G.S., Tubbal, F.E., Amrani El Idrissi, N.E.
High Gain Patch Antenna Array with Parasitic Elements for CubeSat Applications

(2018) *2018 IEEE Indian Conference on Antennas and Propagation, InCAP 2018*, art. no. 8770879. Cited 6 times.
<http://ieeexplore.ieee.org/xpl/mostRecentIssue.jsp?punumber=8765672>
ISBN: 978-153867060-6
doi: 10.1109/INCAP.2018.8770879

[View at Publisher](#)

- ☐ 11 Jaswar, F.D., Rahman, T.A., Hindia, M.N., Ahmad, Y.A.
Design of an adaptive CubeSat transmitter for achieving optimum signal-to-noise ratio (SNR) ([Open Access](#))

(2017) *IOP Conference Series: Materials Science and Engineering*, 270 (1), art. no. 012016. Cited 3 times.
<http://www.iop.org/EJ/journal/mse>
doi: 10.1088/1757-899X/270/1/012016

[View at Publisher](#)

- ☐ 12 Jaswar, F., Al-Samman, A.M., Abdul Rahman, T., Ahmad, Y.A.
Design and validation of an adaptive CubeSat transmitter system ([Open Access](#))

(2019) *AEU - International Journal of Electronics and Communications*, 108, pp. 118-126. Cited 2 times.
<http://www.elsevier.com/aeue>
doi: 10.1016/j.aeue.2019.05.019

[View at Publisher](#)

- ☐ 13 Narayanasamy, A., Ahmad, Y.A., Othman, M.
Nanosatellites constellation as an IoT communication platform for near equatorial countries ([Open Access](#))

(2017) *IOP Conference Series: Materials Science and Engineering*, 260 (1), art. no. 012028. Cited 10 times.
<http://www.iop.org/EJ/journal/mse>
doi: 10.1088/1757-899X/260/1/012028

[View at Publisher](#)

- ☐ 14 (2009) *Current status of Quasi-Zenith Satellite System*. Cited 3 times.
[14] Japan Aerospace Exploration Agency, Sep. [Online]. Available
<http://www.unoosa.org/documents/pdf/icg/activities/2009/icg4/05-1.pdf>

- ☐ 15 Lee, Y.H., Winkler, S.
Effects of rain attenuation on satellite video transmission

(2011) *IEEE Vehicular Technology Conference*, art. no. 5956732. Cited 11 times.
ISBN: 978-142448331-0
doi: 10.1109/VETECS.2011.5956732

[View at Publisher](#)

- 16 Panagopoulos, A. D., Arapoglou, P. -D. M., Cottis, P. G.
Satellite communications at KU, KA, and V bands: Propagation impairments and mitigation techniques
(2004) *IEEE Communications Surveys and Tutorials*, 6 (3), pp. 2-14. Cited 406 times.
[16]
-
- 17 Ahmad, Y.A., Ismail, A.F., Badron, K.
Two-year rain fade empirical measurements and statistics of earth-space link at Ka-band in Malaysia
(2019) *ASM Science Journal*, 12 (Special Issue 2), pp. 35-46.
<https://www.akademisains.gov.my/asmsj/>
-
- 18 Mandeep, J.S., Ng, Y.Y., Abdullah, H., Abdullah, M.
The study of rain specific attenuation for the prediction of satellite propagation in Malaysia
(2010) *Journal of Infrared, Millimeter, and Terahertz Waves*, 31 (6), pp. 681-689. Cited 23 times.
doi: 10.1007/s10762-010-9620-5
View at Publisher
-
- 19 Ismail, A.F., Badron, K., Yaccop, A.A.H., Yao, Y.D.
Determination of Ku-band specific attenuation parameters based on measurements in the tropics
(2013) *IEEE Antennas and Propagation Society, AP-S International Symposium (Digest)*, art. no. 6711662, pp. 2008-2009. Cited 8 times.
ISBN: 978-146735317-5
doi: 10.1109/APS.2013.6711662
View at Publisher
-
- 20 Al-Jumaily, A.H.J., Sali, A., Ismail, A., Mandeep, J.S., Al-Saegh, A.M.
Performance analysis of rain attenuation at Ku-band in Malaysia ([Open Access](#))
(2013) *International Conference on Space Science and Communication, IconSpace*, art. no. 6599455, pp. 160-163. Cited 3 times.
ISBN: 978-146735231-4
doi: 10.1109/IconSpace.2013.6599455
View at Publisher
-
- 21 Shrestha, S., Choi, D.-Y.
Rain attenuation statistics over millimeter wave bands in South Korea ([Open Access](#))
(2017) *Journal of Atmospheric and Solar-Terrestrial Physics*, 152-153, pp. 1-10. Cited 57 times.
<http://www.journals.elsevier.com/journal-of-atmospheric-and-solar-terrestrial-physics/>
doi: 10.1016/j.jastp.2016.11.004
View at Publisher
-

- 22 (2005) *ITU-R, Specific attenuation model for rain for use in prediction methods*, pp. 1-8. Cited 182 times.
[22] [Online]. Available
https://www.itu.int/dms_pubrec/itu-r/rec/p/R-REC-P.838-3-200503-!PDF-E.pdf
-
- 23 (2017) *ITU-R, Propagation data and prediction methods required for the design of Earth-space telecommunication systems*, 12, pp. 1-26.
[23] [Online]. Available
https://www.itu.int/dms_pubrec/itu-r/rec/p/R-REC-P.618-13-201712-!PDF-E.pdf
-
- 24 WP3M, I.-R.
(2015) *Acquisition, presentation and analysis of data in studies of tropospheric propagation P Series Radiowave propagation*
[24] Jul. [Online]. Available
https://www.itu.int/dms_pubrec/itu-r/rec/p/R-REC-P.311-15-201507-S!PDF-E.pdf
-
- 25 Kestwal, M.C., Joshi, S., Garia, L.S.
Prediction of rain attenuation and impact of rain in wave propagation at microwave frequency for tropical region (Uttarakhand, India) (Open Access)

(2014) *International Journal of Microwave Science and Technology*, 2014, art. no. 958498. Cited 57 times.
<http://www.hindawi.com/journals/ijmst/>
doi: 10.1155/2014/958498

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