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Availability Assessment of Free-Space-Optics Links with Rain Data from Tropical Climates (Article)

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Abstract

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Rainfall in tropical environments acts as a dominant parameter for estimating the availability of free-space optics (FSO). Long fades are caused by precipitation in particular heavy rains, and this precipitation increases atmospheric attenuation due to rain and reduces the availability of optical power from FSO links. In this paper, the link availability of an FSO system is estimated under the impact of rain in a tropical climate. The influence of rain on the propagation of FSO signal is investigated based on experimental and statistical analyses of rain-rate measurements under tropical conditions. Rain-rate data are measured in Malaysia for three years and used to estimate the availability of FSO links. Models developed in Malaysia are used to predict atmospheric attenuation due to rain. Long-term statistical measurements of rain data can enable good estimation of link availability. Based on the prediction model and measured rain-rate data, the FSO link budget is analyzed, and the link availability as a function of distance is predicted. Carrier class availability limits the FSO link to a few hundred meters only, whereas enterprise class availability can exceed FSO links over a few kilometers long. © 1983-2012 IEEE.

Author keywords

Availability free-space optics rain attenuation rain rate

Indexed keywords

Engineering controlled terms: Availability Budget control Electromagnetic wave attenuation Optical communication
Optical fiber communication Optical fibers Optical losses Optical receivers
Precipitation (meteorology) Space optics Tropics

Compendex keywords Attenuation Free space optics Optical attenuators Rain attenuation Rain rates

Engineering main heading: Rain

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References (27)

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- 1 Khalighi, M.A., Uysal, M.
Survey on free space optical communication: A communication theory perspective
(2014) *IEEE Communications Surveys and Tutorials*, 16 (4), art. no. 6844864, pp. 2231-2258. Cited 301 times.
<http://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=9739>
doi: 10.1109/COMST.2014.2329501
[View at Publisher](#)
-
- 2 Nadeem, F., Kvicera, V., Awan, M.S., Leitgeb, E., Muhammad, S.S., Kandus, G.
Weather effects on hybrid FSO/RF communication link
(2009) *IEEE Journal on Selected Areas in Communications*, 27 (9), art. no. 5342328, pp. 1687-1697. Cited 93 times.
doi: 10.1109/J SAC.2009.091218
[View at Publisher](#)
-
- 3 Achour, M.
Simulating atmospheric free-space optical propagation: Part I, rainfall attenuation
(2002) *Proceedings of SPIE - The International Society for Optical Engineering*, 4635, pp. 192-201. Cited 37 times.
doi: 10.1117/12.464100
[View at Publisher](#)
-
- 4 Kim, I.I., McArthur, B., Korevaar, E.J.
Comparison of laser beam propagation at 785 nm and 1550 nm in fog and haze for optical wireless communications
(2001) *Inf. Technol.*, 2000, pp. 26-37. Cited 7 times.
-
- 5 Kim, I.I., Korevaar, E.
Availability of Free Space Optics (FSO) and hybrid FSO/RF systems
(2001) *Proceedings of SPIE - The International Society for Optical Engineering*, 4530, pp. 84-95. Cited 106 times.
doi: 10.1117/12.449800
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-
- 6 Ijaz, M., Ghassemlooy, Z., Pesek, J., Fiser, O., Le Minh, H., Bentley, E.
Modeling of fog and smoke attenuation in free space optical communications link under controlled laboratory conditions
(2013) *Journal of Lightwave Technology*, 31 (11), art. no. 6497447, pp. 1720-1726. Cited 49 times.
doi: 10.1109/JLT.2013.2257683
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