

**Dust Storm Attenuation Modeling Based on Measurements in Sudan**

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IEEE TRANSACTIONS ON ANTENNAS AND PROPAGATION  
 Volume: 65 Issue: 8 Pages: 4200-4208  
 DOI: 10.1109/TAP.2017.2715369  
 Published: AUG 2017  
 Document Type: Article  
 View Journal Impact

**Abstract**

Microwave (MW) and millimeter-wave (mmW) propagation are severely affected by dust storms and sand storms in arid and semi-arid areas. Electromagnetic waves may suffer from attenuation due to suspended particles during a dust storm. This paper proposes an empirical model to predict the attenuation due to dust storms based on a one-year measurement of visibility, humidity and their effects on MW links in Sudan. Signal strength variations on two operational MW links at 14 and 22 GHz as well as visibility were monitored simultaneously. The model is developed empirically using measured attenuation and measured storm characteristics (e.g., visibility, dielectric constant, frequency, and moisture content). The predicted attenuation from the proposed empirical model is compared with the attenuation at frequencies ranging from 7.5 to 40 GHz measured at different locations, and good agreement is found. Additionally, this method is characterized by simplicity and capability to predict reliable dust storm attenuation for a wide range of frequencies and moisture levels.

**Keywords**

**Author Keywords:** Attenuation; dust storm; microwaves (MWs); millimeter waves (mmWs)  
**KeyWords Plus:** MICROWAVE ATTENUATION; PROPAGATION; SAND; PARTICLE

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**Funding**

Funding Agency	Grant Number
Research Management Center, International Islamic University Malaysia	

View funding text

**Publisher**

IEEE-INST ELECTRICAL ELECTRONICS ENGINEERS INC, 445 HOES LANE, PISCATAWAY, NJ 08855-4141 USA

**Journal Information**

**Impact Factor:** Journal Citation Reports

**Categories / Classification**

**Research Areas:** Engineering; Telecommunications  
**Web of Science Categories:** Engineering, Electrical & Electronic; Telecommunications

**Document Information**

**Language:** English  
**Accession Number:** WOS:000407397600039  
**ISSN:** 0018-926X  
**eISSN:** 1558-2221

**Other Information**

**IDS Number:** FD2XH  
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