

REFERENCES

- [1] Guifu Zhang,j.Vivekanandan and Eward Brandes, "A method for estimating Rain Rate and Drop Size distribution from Polari metric Radar Measurements", *IEEE Transactions on Geosciences and remote sensing*,vol.39,No.4,April 2001.
- [2] Martin loffer-mang, Jurg joss, "An optical Disdrometre for measuring size and velocity of hydrometers", *Journal of Atmospheric and oceanic technology*, Volume 17, 130-139.
- [3] Remko Uijlenhoet, "Rain drop size distributions and radar reflectivity-rain rate relationships for radar hydrology", *Hydrology and earth system sciences*, vol.5(4),615-627,2001.
- [4] Animesh Maitra, Kaustav Chakravarty, Sheershendu Bhattacharya & Srijibendu Bagchi, "Propagation studies at Ku-band over an earth-space path at Kolkata", *Indian Journal of Radio Space Physics*, Vol. 36, October, 2007, pp. 363-368.
- [5] J. S. Mandeep, J. E. Allnutt, "Rain Attenuation Predictions at Ku- band in South East Asia Countries", *Progress In Electromagnetics Research*, PIER 76, 65-74, 2007.
- [6] S. I. S. Hassan, J.S. Mandeep, Fadzil Ain, Kiyoshi Igarashi, Kenji Tanaka, Mitsuyoshi Iida, "Measurement of Tropospheric Scintillation from Satellite Beacon at Ku-Band In South East Asia," *IJCSNS International Journal of Computer Science and Network Security*, vol. 7, pp. pp. 251-254, 2007.
- [7] H. Mustafa, S. I. S. Hassan, J. S. Mandeep, M. F. Alan, and H. A. Khedher, "Study of the Effect of Simulated Rain on the Offset Parabolic Antenna at Ku-Band with Different Elevation Angles", *International Journal of Antennas and Propagation*, Volume 2007, Article ID 87525, 5 pages, doi:10.1155/2007/87525.
- [8] J. S. Mandeep, "Equatorial Rainfall Measurement On Ku-Band Satellite Communication Downlink", *Progress In Electromagnetics Research*, PIER 76, 195-200, 2007.

- [9] Sarath Kumar K, Vijaya Bhaskara Rao S, D Narayana Rao, "Prediction of Ku Band Attenuation Using Experimental Data and Simulations for Hassan, India", *IJCSNS International Journal of Computer Science and Network Security*, VOL.8 No.4, April 2008.
- [10] J. S. Mandeep, S. I. S. Hassan, and K. Tanaka, "Rainfall effects on Ku-band satellite link design in rainy tropical climate", *Journal Of Geophysical Research*, Vol. 113, D05107, Doi:1029/2007JD008939, 2008.
- [11] J. S. Mandeep, "Comparison of rainfall models with Ku-band beacon measurement" *Acta Astronautica* 64 (2009) 264–271.
- [12] Animesh Maitra and Arpita Adhikari, "Scintillations of Ku Band Satellite Signal Related to Rain Attenuation at a Tropical Location".
- [13] Animesh Maitra, and Kaustav Chakravarty, "Rain Depolarization Measurements on Low Margin Ku-Band Satellite Signal at a Tropical Location", *IEEE Antennas and Wireless Propagation Letters*, VOL. 8, 2009.
- [14] XU kai, Xiang shunxiang, and Huang Linshu, "Measuring and Analyzer of Rain Attenuation for Satellite Communication in Ku band", *IEEE*, 978-1-4244-4076-4/09/\$25.00 ©2009
- [15] Fabrizio Cuccoli, and Luca Facheris, "Ndsa Measurements between Two Leo Satellites in Ku and K Bands for the Tropospheric Water Vapour Estimate: Performance Evaluation At Global Scale", *IEEE*, 978-1-4244-3395-7/09/\$25.00 ©2009, vol 296.
- [16] Kaustav Chakra arty, and Animesh Maitra, "Observations of Rain Drop Size Distribution and Rain Attenuation of a Satellite Signal at a Tropical Location", *IEEE*, 978-1-4244-481974/09/\$25.00 ©2009.
- [17] Mohammed Ali Hussein, "Scintillation Effect on Satellite Communications within Standard Atmosphere", Anbar *Journal of Engineering Sciences AJES*-2009, Vol. 2, No. 2.

- [18] Uthpala Premarathne, and Kithsiri Samarasinghe, "Analysis of Short Term Scintillation Effects of Ku Band Satellite Links in Sri Lanka", *IEEE*, 978-1-4244-7202-4/10/\$26.00 ©2010.
- [19] J. S. Mandeep, R. M. Zali, "Analysis and comparison model for measuring tropospheric scintillation intensity for Ku-band frequency in Malaysia", *Earth Sci. Res. S J.* Vol. 15, No. 1, July, 2011: 13-17
- [20] John M.Wallace and Peter V.Hobbs, "Atmospheric Science An Introductory Survey", second edition, *International Geophysics Series*, Volume 92,2006.
- [21] Thomas G. Konrad, "Statistical Models of Summer Rain showers Derived from Fine-Scale Radar Observations". *J. Appl. Meteor.*, 1978, **17**, 171–188, doi: http://dx.doi.org/10.1175/1520-0450(1978)017<0171:SMOSRD>2.0.CO;2
- [22] Robert K. Crane,"Space-time structure of rain rate fields", *Journal of Geophysical Research: Atmospheres* (1984–2012), Volume 95, Issue D3, pages 2011–2020, 28 February 1990.
- [23] J Goldreich," Two-dimension visualization of rain cell structures", *Radio Science*, vol 35(3) 713–729, 2000.
- [24] M K Yau and R R Rogers, "An inversion problem on inferring the size distribution of precipitation areas from rain gage measurements", *Journal of Atmospheric Sciences*, 41(3), 439–447, 1984.
- [25] L F'eral, F Mesnard, H Sauvageot, L Castanet, and J Lemorton, "Rain cells shape and orientation distribution in South-West of France" *Phys. Chem. Earth B*, 25(10-12):1073–1078, 2000.
- [26] J Mass, "A simulation study of rain attenuation and diversity effects on satellite links", *COMSAT Technical Review*, 17(1):159–187, 1987.

- [27] G H Bryant, I Adimula, C Riva, and G Brussaard, "Rain attenuation statistics from rain cell diameters and heights". *International Journal of Satellite Communications*, 19:263–283, 2001.
- [28] C Capsoni, F Fedi, C Magistroni, A Paraboni, and A Pawlina, "Data and theory for a new model of the horizontal structure of rain cells for Propagation applications", *Radio Sci.*, 22(3):395–404, 1987.
- [29] L F'eral, H Sauvageot, L Castanet, and J Lemorton, "Hycell a new hybrid model of the rain horizontal distribution for Propagation studies: 1. Modeling of the rain cell", *Radio Science*, 38(3):1056, 2003a.
- [30] A D Panagopoulos, P-D M Arapoglou, and P G Cottis, "Satellite communications at Ku, Ka, and V bands: Propagation impairments and mitigation techniques", *IEEECommunications Surveys and Tutorials*, 6(3):2–14, 2004.
- [31] R A Houze, "Cloud Dynamics", Academic, San Diego, California, 1993.
- [32] R Gunn and G D Kinzer, "The terminal velocity of fall for water", *Journal of Meteorology*, 6,243–248, 1949.
- [33] A.B.Bhattacharya, D.K.Thripathi, A.Nag And M.Debnath,"Measurement Of Rain Drop Size Distribution From Radar Reflectivity And Associated Rain Attenuation Of Radio Waves", *International Journal Of Engineering Science And Technology*, Vol.3No.5, may 2011.
- [34] A F Spilhaus," Raindrop size, shape, and falling speed". *Journal of Meteorology*, 5,108–110, 947.
- [35] H R Pruppacher and K V Beard," A wind tunnel investigation of the internal circulation and shape of water drops falling at terminal velocity in air", *Quart. J. R. Met. Soc.* 96:247–256, 1970.
- [36] H R Pruppacher and R L Pitter, "A semi-empirical determination of the shape of cloud and rain drops", *Journal of Atmospheric Sciences*, 28:86–94, 1971.

- [37] G Brussaard," Rain-induced crosspolarisation and raindrop canting," *Electronics Letters*, vol10 (20), 411–412, 1974.
- [38] B. Bossa and E. Villermaux, "Single-drop fragmentation determines size distribution of Raindrops", *Nature Physics*, vol5, 697 702, 2009.
- [39] A D Panagopoulos, P-D M Arapoglou and P G Cottis, "Satellite communications at Ku, Ka, and V bands Propagation impairments and mitigation techniques", *IEEE Communications Surveys and Tutorials*, 6(3):2–14, 2004.
- [40] L. S. Kumar, Y. H. Lee, J. X. Yeo, and J. T. Ong, "Tropical Rain Classification and Estimation of Rain From Z-R (Reflectivity-Rain Rate)Relationships", *Progress In Electromagnetics Research B*, Vol. 32, 107-127, 2011.
- [41] A. Adhikari, S. Das, A. Bhattacharya, and A. Maitra, "Improving Rain Attenuation Estimation: Mod-Elling Of Effective Path Length Using Ku-Band Measurements At A Tropical Location *Progress In Electromagnetics Research B*, Vol. 34, 173-186, 2011.
- [42] J. S. Man deep, S. I. S. Hassan, "60- to 1-Min Rainfall-Rate Conversion: Comparison of Existing Prediction Methods with Data Obtained in the Southeast Asia Region" *American Meteorological Society*, DOI: 10.1175/2007JAMC1600.1, © 2008.
- [43] Hassan Dao, Md. Rafiqul Islam and Khalid Al-Khateeb, "Modification of Itu-R Rain Fade Slope Prediction Model Based On Satellite Data Measured At High Elevation Angle", *IIUM Engineering Journal*, Vol. 12, No. 5, 2011: Special Issue -1 on Science and Ethics in Engineering.
- [44] Rafiqul MD Islam, Yusuf A Abdurrahman and Tharek A Rahman, "An improved ITU-R rain attenuation prediction model over terrestrial microwave links in tropical region", *EURASIP Journal on Wireless Communications and Networking*, 2012, 2012:189.

- [45] Guifu Zhang, J. Vivekananda, and Edward Brandes, "A Method for Estimating Rain Rate and Drop Size Distribution from Polarimetric Radar Measurements", *IEEE Transactions on Geoscience and Remote Sensing*, Vol. 39, No. 4, April 2001.
- [46] T. A. Seliga and V. N. Bringi, "Potential use of radar differential reflectivity measurements at orthogonal polarizations for measuring precipitation," *J. Appl. Meteorol.*, vol. 15, pp. 69–76, 1976.
- [47] Sanjeev Suresh, M Ganesh Madhan, "An Experimental Study of Rain Attenuation at Ku Band Frequencies for an Earth Space Path over Chennai", *International Symposium on Devices MEMS*, Intelligent Systems & Communication (ISDMISC) 2011.
- [48] C. R. Williams and K. S. Gage, "Raindrop size distribution variability estimated using ensemble statistics", *Ann. Geophys.*, 27, 555–567, 2009.
- [49] L. D. Emilianiz, J. Agudelo, E. Gutierrez, J. Restrepo and C. Fradique-Mendez, "Development of Rain -Attenuation and Rain-Rate Maps for Satellite System Design in the Ku and Ka Bands in Colombia", *IEEE Antennas and Propagation Magazine*, Vol. 46, No. 6, December 2004.
- [50] Nadirah Binti Abdul Rahim, Md Rafiqul Islam, Saad Osman Bashir, JS Mandeep), Hassan Dao, "Analysis of Long Term Tropospheric Scintillation from Ku-Band Satellite Link in Tropical Climate", *International Conference on Computer and Communication Engineering*, (ICCCE 2012), 3-5 July 2012, Kuala Lumpur, Malaysia.
- [51] O. Fi'ser, "Z-R (Radar Reflectivity-Rain rate) relationships derived from Czech Distrometer data" *Proceedings of ERAD* (2004): 233–236c Copernicus GmbH 2004.
- [52] Shun-Peng Shih and Yen-Hsyang Chu, "Ka Band Propagation Experiments of Experimental Communication Payload (ECP) on ROCSAT-1 Preliminary Results," *TAO, Supplementary Issue*, 145-164, March 1999.
- [53] Animesh Maitra and Arpita Adhikari, "Ku-Band Signal Depolarization over Earth-Space Path in Relation to Scattering of Raindrops at a Tropical Location," *IEEE* 978-1-4244-6051-9/11©2011.

- [54] A. B. Bhattacharya, D. K. Tripathi, A. Nag, and M. Debnath, "Measurements of rain drop size distribution from radar reflectivity and associated rain attenuation of radio waves", *International Journal of Engineering Science and Technology (IJEST)*, Vol. 3, No. 5, May 2011, ISSN: 0975-5462.
- [55] A J Townsend and R J Watson, "The linear relationship between attenuation and average rainfall rate for terrestrial links", *IEEE Transaction on Antennas and Propagation*, 59(3):994–1213, 2011.
- [56] L Castanet. "Fade mitigation techniques for new SatCom systems At Ka and V Bands", *PhD thesis*, Department of Electromagnetism and Radar, university of Toulouse, 2001.
- [57] Robert K. Crane, "Attenuation due to Rain-A Mini-Renew", Tutorial Papers and Reviews, *IEEE Transactions on Antennas and Propagation*, September 1975.
- [58] R. R. Rogers, "Statistical Rainstorm Models: Their Theoretical and Physical Foundations". *IEEE Transactions on Antennas and Propagation*, July 1976.
- [59] J. Joss and A. Waldvogel, "Precipitation measurement and hydrology In: Radar in Meteorology. D. Atlas (ED.)", *Am. Meteorol. Soc.*, Boston, pp. 557-606, 1990.
- [60] A Tokay, a Kruger, and W F Krajewski, "Comparison of drop size distribution measurements by impact and optical disdrometers", *Journal of Applied Meteorology*, 40:2083–2097, 2001.
- [61] E A Baltas and M A Mimikou, "The use of the Joss-type disdrometer for the derivation of Z-R relationships". *Proceedings of ERAD*, pages 291–294, 2002.
- [62] D Brawn and G Upton, "Estimation of an atmospheric gamma drop size distribution using disdrometer data", *Atmospheric Research*, 87:66–79, 2008.
- [63] J S Marshall and W McK Palmer, "The distribution of raindrops with size". *Journal of meteorology*, 5:165–166, 1948.

- [64] G Feingold and Z Levin," The lognormal fit to raindrop spectra from frontal convective Clouds in Israel". *Journal of Climate and Applied Meteorology*, 25:1346–1363, 1986.
- [65] C W Ulbrich, "Natural variations in the analytical form of the raindrop size distribution". *Journal of Climate and Applied Meteorology*, 22:1764–1775, 1983.
- [66] J Testud, S Oury, R A Black, P Amayenc, and X Dou, "The concept of "normalized" distribution to describe raindrop spectra A tool for cloud physics and cloud remote sensing". *Journal of Applied Meteorology*, 40:1118–1140, 2001.
- [67] ITU-R, Recommendation ITU-R, P.837-6, 02/2012, "Characteristics of precipitation for Propagation Modeling," P Series, Radio wave Propagation.
- [68] ITU-R, Recommendation ITU-R, P.839-4, 09/2013, "Rain height model for prediction methods", P Series, Radio wave Propagation.
- [69] ITU-R, Recommendation ITU-R, P.530-12, "Propagation data and prediction methods required for the design of terrestrial line-of-sight systems."
- [70] ITU-R, Recommendation ITU-R, P.618-11, 09/2013, "Propagation data and Prediction methods required for the design of Earth-space telecommunication systems," P Series, Radio wave Propagation.
- [71] ITU-R, Recommendation ITU-R, P.838-3, "Specific attenuation model for rain for use in prediction methods," P Series, Radio wave Propagation.
- [72] Arun k verma and K K Jha, "Rain drop size distribution model for Indian regions", *International journal of Radio and Space physics*, vol 25, february1996, pp 15 -21.
- [73] K.I. Timothy and S.K. Sarkar, "Generalized mathematical model for raindrop size distribution (RSD) for application in radio wave Propagation and meteorological studies", *Electronics Letters* 8th May 1997 Vol. 33 No. 70.
- [74] Tat-Soon Yeo, Pang-Shyan Kooi, Mook-Seng Leong and Le-Wei Li, "Tropical Raindrop Size Distribution for the Prediction of Rain Attenuation of Microwaves in the

- 10–40 GHz Band", *IEEE Transactions on Antennas and Propagation*, Vol. 49, No. 1, January 2001.
- [75] K. Isaiah Timothy, Jin Teong Ong and Emily B. L. Choo, "Raindrop Size Distribution Using Method of Moments for Terrestrial and Satellite Communication Applications in Singapore", *IEEE Transactions on Antennas and Propagation*, Vol. 50, No. 10, October 2002.
- [76] Gamantyo Hendrantoro and Isztar Zawadzki, "Derivation of Parameters of Y –Z Power law Relation From Raindrop Size Distribution Measurements and Its Application in the Calculation of Rain Attenuation From Radar Reflectivity Factor Measurements", *IEEE Transactions on Antennas and Propagation*, Vol. 51, No. 1, January 2003.
- [77] Carlo Capsoni, Lorenzo Luini, Carlo Riva, "A New Global Prediction Model of Rain Attenuation That Separately Accounts For Stratford and Convective Rain".
- [78] A. Maitra, "Rain Attenuation Modeling From Measurements of Rain Drop Size Distribution in the Indian Region", *IEEE Antennas and wireless Propagation letters*, Vol. 3, 2004.
- [79] Robert K. Crane, "Attenuation due to Rain-A Mini-Renew", *IEEE Transactions on Antennas and Propagation*, September 1975.
- [80] R. R. ROGERS, "Statistical Rainstorm Models: Their Theoretical and Physical Foundations", *IEEE Transactions on Antennas and Propagation*, July 1976.
- [81] Robert K. Crane, "Prediction of Attenuation by Rain", *IEEE*, 0090-6778/80/0900-1717\$00.75 © 1980.
- [82] Torleiv Maseng and Petter M. Bakken, "A Stochastic Dynamic Model of Rain Attenuation", *IEEE Transactions on communications*, Vol. Com-29, No. 5, May 1981.
- [83] Yoshio Karasawa and Takashi Matsudo, "One-Minute Rain Rate Distributions in Japan Derived from AMeDAS One-Hour Rain Rate Data", *IEEE Transactions on geoscience and remote sensing*, Vol. 29, No 6, November 1991.

- [84] Wei Zang, Seppo I. karhu and Erkki T. Salonen, "Predictions of Radiowave Attenuations Due to a Melting Layer of Precipitation", *IEEE Transactions on Antennas and Propagation*, Vol. 42, No. 4, April 1994.
- [85] K. I. Timothy, Sanjay Sharma, M. Devi, A. K. Barbara, "Tropical raindrop size distribution (RSD): Prediction and modeling its effects on microwave Propagation", *Antennas and Propagation*, 4-7 April 1995 Conference Publication No. 407,© IEE 1995.
- [86] A. Paraboni, C. Capsoni and F. Zaccarini, "The Horizontal Structure Of Rain And Its Impact On The Design Of Advanced Satellite Systems At Centimetre And Millimetre Wavelengths", *SBMO/IEEE MTT-SIMOC'95 Proceedings*, 0-7803-2674-1/95/\$4.00 © 1995 IEEE.
- [87] L. Raynaud, L. Chenerie, J. Lemorton, "Improved Modelling Of Propagation And Backscattering Of Millimetre Waves In The Melting Layer", *National Conference on Antennas and Propagation*: 30 March 1 April 1999, Conference Publication No. 461, © IEE, 1999.
- [88] David A. De wolf, "On the Laws-Parsons distribution of raindrop sizes", *Radio Science*, Volume 36, Number 4, Pages 639-642, July/ August 2001.
- [89] A. D. Panagopoulos and J. D. Kanellopoulos, "Differential Rain Attenuation Statistics on Two Converging Terrestrial Links", *IEEE* 07803-7330-8/02\$17.00 © 2002 730.
- [90] Margarita Baquero, Sandra Cruz-Pol, V. N. Bringi and V. Chandrasekar, "Rain-Rate Estimate Algorithm Evaluation and Rainfall Characterization in Tropical Environments Using 2DVD, Rain Gauges and TRMM data".
- [91] M. A. Awang and J. Din, "Comparison of the Rain Drop Size Distribution Model in Tropical Region", 2004 RF and Microwave Conference, October 5 6, Subang, Selangor, Malaysia.
- [92] Yong-Ho Park, Joo-Hwan Lee, Nyamjav Jambaljav and Jeong-Ki Pack, "Empirical Study on the Rain Drop-Size Model for Rain Attenuation Calculations".

- [93] Bruce, R.A. "The Satellite Communication Application Handbook", 2nd ed, Artech House, Inc, 2004.
- [94] Reddy, V.G, "Atmospheric Constraints in HF/UHF/Satellite Communications in the Indian Sub-Continent", *Doctoral Thesis, Department of Physics, Sri Venkateswara University*, 2004.
- [95] Agarwal, S.K, "Earth Station Antenna", Broadcast and Cable sat, an *ADI Media Publication*, 2007.
- [96] Satellite Magazine(2005), "Basics of C & Ku band Transmissions & LNB's, Satellite & Cable TV Magazine', March 2005.
- [97] Tata sky User Manual, Installation of DTH Antenna, 2007.
- [98] Rahim, A.R., Leong, L.C., Chan, K.S., and Pang, J.F, "Data Acquisition Process in Optical Tomography: Signal Sample and Hold Circuit", *Instrument Society Journal of India* IISc, Bangalore 2005.
- [99] LabVIEW 11.0 Version user manual, *National Instruments*, 2011.
- [100] LabVIEW SignalExpress user manual, National Instruments, August 2011.
- [101] D Atlas and C W Ulbrich, "Path- and area-integrated rainfall measurements by microwave attenuation in the 1-3 cm band", *Journal of Applied Meteorology*, 16(4): 327–332, 1977.
- [102] M Montopoli, F S Marzano, and G Vulpiani, "Analysis and synthesis of raindrop size distribution time series from disdrometer data", *IEEE Transactions on Geoscience and Remote Sensing*, 46(2):466–478, 2008.
- [103] T Oguchi, "Electromagnetic wave Propagation and scattering in rain and other hydromEteors", *Proceedings of The IEEE*, 71(9):1029–1078, 1983.

- [104] K.Aydin and Y-M Lure, "Millimeter wave scattering and Propagation in rain: A computational study at 94 and 140 GHz for oblate spheroidal and spherical raindrops", *IEEE Transactions Geosciences And Remote Sensing*, 29(4):593–601, 1991.
- [105] P W Barber and S C Hill, "Light Scattering by Particles: Computational Methods", World Scientific Publishing, Singapore, 1990.
- [106] P C Waterman, "Scattering by dielectric obstacles", Alta Freq, 38:34–35, 1969.
- [107] A Ishimaru, "Electromagnetic Wave Propagation, Radiation, and Scattering", *PrenticeHall*, Washington, 1991.
- [108] C C Chuang and K V Beard," A numerical model for the equilibrium shape of electrified Raindrops", *Journal of the Atmospheric Sciences*, 47(11):1374–1389, 1990.
- [109] T Oguchi, "Effects of incoherent scattering on microwave and millimeter wave communications through rain", *Electronics Letters*, 27(9):759–761, 1991.
- [110] M O Ajewole and T Oguchi, "Effects of multiple scattering on communication at millimeter and centimeter wavelengths in tropical rainfall conditions", *Electronics Letters*, 37 (2):121–123, 2001.
- [111] A J Townsend, R JWatson, and D D Hodges, "Analysis of the variability in the raindrop size distribution and its effect on attenuation at 20-40 GHz", *IEEE Antennas and Wireless Propagation Letters*, 8:1210–1213, 2009.
- [112] K V Beard and C Chuang, "A new model for the equilibrium shape of raindrops". *Journal of the Atmospheric Sciences*", 44(11):1509–1524, 1986.
- [113] V K Katsambas and J D Kanellopoulos, "Rain attenuation and cross-polarization effects in interference between adjacent satellite and terrestrial dual polarized systems", *Antennas and Propagation Society International Symposium*, 2003. IEEE, 4:920–923, 2003.

- [114] Harris, R.A, "Radio waves Propagation modeling for SATCOM services at Ku-Band and above", *European Space Agency publication Division*, Noordwijk, Netherlands.
- [115] Oort, A.H and E.M.Rasmusson, "Atmospheric circulation statics N.O.A.A", *professional paper* 5, 1977,pp:323.
- [116] Olsen, R.L., Rogers, D.V., and D. B. Hodge (1978), "The aR relation in the calculation of rain attenuation," *IEEE Transaction on Antenna and Propagation*, Vol. AP-26, pp.318-329, Mar. 1978.
- [117] Fedi. F, "Rainfall characteristics across Europe", *Alta Freq.*, volume 48(4), pp: 158-166, 1979.
- [118] Laws, J.O and Parsons, D.A," The Relation of Raindrop sizes to Intensity", *Trans Amer. Geophys. Union*, Vol. 24, 432-460, 1943.
- [119] Ray, P. S, "Broadband complex refractive indices of ice and water". Appl. Opt., 11, 1836-1844. 1972.
- [120] Moupfouma.F, "Improvement of a rain attenuation prediction method for terrestrial Microwave Links", *IEEE Transactions on Antennas and Propagation*, Vol. Ap-32, No. 12,1984.
- [121] Dissanayake, A., J. Allnut, and F. Haidara, (1997), "A Prediction Model that Combines Rain Attenuation and Other Propagation Impairments along Earth Satellite Paths", *IEEE Transactions on Antennas and Propagation, Vol.45, No 01, pp. 1546-1558.*
- [122] N A Crook, "Sensitivity of moist convection forced by boundary layer processes to Low-level thermodynamic fields", *Monthly Weather Review*, 124:1767–1785, 1996.
- [123] J R Holton, J A Curry, and J A Pyle, "Encyclopedia of Atmospheric Sciences", volume 3, Elsevier, 2003.

- [124] M G Lawrence, "The relationship between relative humidity and the dew point temperature in moist air", *American Meteorological Society*, 86:225–233, 2005.
- [125] E Salonen and S Uppsala," New prediction method of cloud attenuation", *ElectronicsLetters*, 1991.
- [126] C A Doswell-III and E N Rasmussen, "The effect of neglecting the virtual temperature correction on CAPE calculations", *American Meteorological Society*, 9:625–629, 1994.
- [127] M M J L Van de Kamp, "Climatic radio wave Propagation models for the design of satellite communication systems" *PhD thesis*, University of Eindhoven, 1999.
- [128] B Gremont, M Filip, P Gallois, and S Bate, "Comparative analysis and performance of two predictive fade detection schemes for ka-band fade countermeasures", *IEEE Journal On Selected Areas in Communications*, 17(2):180–192, 1999.
- [129] Gibson J. D, "The Communication Handbook", second edition, CRC Press, LCC, 59-1 to 59-16, 2002.
- [130] Yoshio, Matsuichi, Y., and Jeremy E.A., "A New Prediction Method for Trorpospheric Scintillation on Earth-Space Paths", *IEEE Trans. Antennas Propag* Vol. 36 No. 1.
- [131] Green J.L, Winkler, R.H., Warnock, J.M., Clark, W.L., Gage, K.S., and Van Zandt T.E., "Observation of enhanced clear air turbulence associated with convective clouds", *Proc. 18th Conf. Radar Meet*.
- [132] ITU-R, Recommendation ITU-R, P.453-10, "The radio refractive index: its formula and refractivity data", P Series, Radio wave Propagation.

- [133] D Atlas, C W Ulbrich, F D Marks Jr., E Amitai, and C R Williams, "Systematic variation of drop size and radar-rainfall relations", *Journal of Geophysical Research*, 104(D6):6155–6169, 1999.
- [134] C Capsoni, L Luni, A Paraboni, and C Riva, "Stratiform and convective rain discrimination deduced from local P(R)", *IEEE Transactions on Antennas and Propagation*, 54(11):3566–3569, 2006.
- [135] D Hodges, R J Watson, and G Wyman, "Attenuation time series models for Propagation forecasting", *IEEE Transactions on Antennas and Propagation*,54(6):1726-1733,2006.
- [136] B R Arbesser-Rastburg and paraboni, "Europen research on Ka band Propagation", *proc. IEEE*,85:843-852,1997.
- [137] E Matricciani, "physical-mathematical model of the dynamics of rain attenuation based on rain rate time series and a two layer vertical structure of precipitation", Radio science,31(2):281-295,1996.
- [138] G.Drufuca, "Rain attenuation statistics for frequencies above 10GHz from rain gauge observations", *J.Rech.Atoms*,1(2):399-411,1974.
- [139] MMJL van de kamp, "Short term predictions of rain attenuation using two samples", *Electronics Letters*, 38(23):1476-1477, 2002b.
- [140] L Dossi, "Real-Time prediction of attenuation for applications to fade countermeasures in satellite communications", *Electronics Letters*, 26(4):250-251,1990.
- [141] R C Srivastava, D Atlas and R S Sekhon, "Doppler radar characteristics of precipitation at vertical incidence", *Review of Geophysics and Space Physics*, 11(1):1–35, 1973.
- [142] Jeffery Travis and Jim Kring, "LabVIEW for Everyone: Graphical Programming Made Easy and Fun", 3rd Edition, Prentice Hall, 2006.

[143] Rick Bitter, Taqi Mohiuddin, Matt Nawrocki, "LabVIEW Advanced Programming Techniques" *CRC Press LLC*,2006



- 1. **Govardhani.Immadi**, Sarat K Kotamraju, Habibulla Khan, M.Venkata Narayana "Rain Rate-Radar Reflectivity Relationship for Drop Size Distribution and Rain Attenuation Calculation of Ku Band Signals", *International journal of engineering and technology*, ISSN: 0975-4024 Vol 6 No 2 Apr-May 2014 pp:815-824(**SCOPUS INDEXED**)
- 2.**Govardhani.Immadi**, Sarat K Kotamraju, Habibulla Khan, M.Venkata Narayana, M.Jaya Krishna PoojaonImplementation of Data Logging as a Part of Propagation Impairment Studies of Ku Band Satellite Signal with the Establishment of Low Cost Experimental Setup", *International journal of Applied engineering research* ISSN 0973-4562 Volume 9, Number 3 (2014) pp. 355-367(**SCOPUS INDEXED**).
- 3.**Govardhani.Immadi**, M.Venkata Narayana, Sarat K Kotam aju, HabibullaKhan,K.Rajkamal, "Dual-Band Antenna for GPS Applicationson Spiral shape ", *IEEE Proceedings of International Conference on Advanced Research in Engineering And Technology*, inVijayawada,india,February,8-9,2013.
- 4.**Govardhani.Immadi,** Sarat K Kotamraju, Habibulla Khan, M.Venkata Narayana, Hemavasavi.K, K. Pooja Naga Sai and N. Sirisha, "Estimation of Ku Band Satellite Signal Propagation Impairment Due to Rain in Tropical Environment Using ITU-R" *International Journal of AppliedEngineering Research* ISSN 0973-4562 Volume 9, Number 20 (2014) pp. 7149-7168(**SCOPUS INDEXED**)
- 5.**Govardhani.Immadi**, Sarat K Kotamraju, M.Venkata Narayana, Habibulla Khan, Sreemadhuri.A, K.Sravya chowdary, P.Vineela," Measurement of Tropospheric scintillation using Ku Band satellite beacon data in Tropical Region", *ARPN Journal of Engineering and Applied Sciences*, VOL.10,No.4,March 2015,1568-1572(**SCOPUS INDEXED**).
- 6.**Govardhani.Immadi**, Sarat K Kotamraju, M.Venkata Narayana, K.Rajkamal, Habibulla Khan, G.Viswanth and I.Avinash "Measurement of rain attenuation for Ku band satellite signal in tropical environment using DAH, SAM models" *ARPN Journal of Engineering and Applied Sciences*, VOL.10, No.4, March 2015, 1717-1722 (**SCOPUS INDEXED**).