

[6, 7],

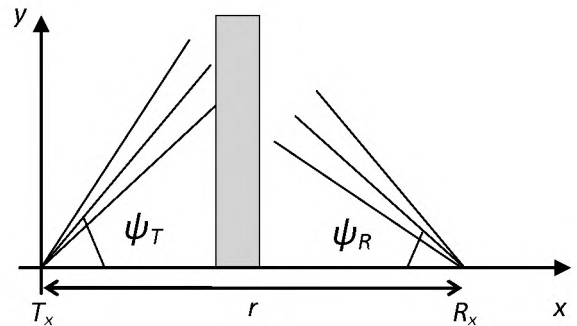
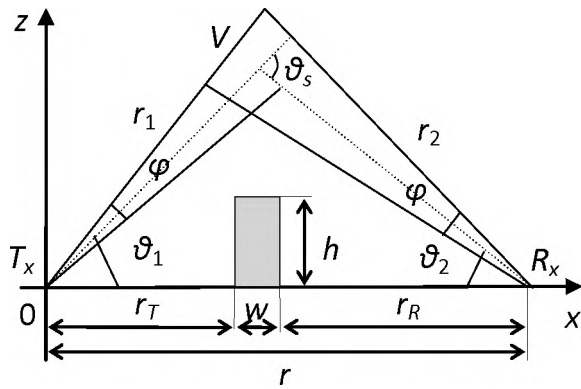
[8, 9].

MANET:

(),
 ();
 ;
 ;
 (, single input, single output, SISO),
 (, multiple input, multiple output, MIMO);
 ([10])
 ()

UV NLOS

1. Rx, θ_{12} , $\hat{\alpha}_{12}$, e_s
 2. Rx, r_{12} , w , h



1 -) UV NLOS:) ;

()

(Rayleigh)

(Mie) [5]:

$$P(\theta) = \frac{k^R}{k_S} \theta^R + \frac{k^M}{k_S} \theta^M$$

$$p = \cos \theta$$

$$k_s = k^+ + k^-$$

Heney-Greenstein,

$$P''(\theta) = \frac{[1 + 3/(1 - \theta)^2]}{16(1 + 2\theta)}$$

$$f''(\theta) = \frac{1-g}{4} \frac{1}{i^l + g^{2-2l} g^l j^l} + f \frac{0.5(\theta - 1)}{(1 + \theta)^2}$$

, g, f-

1. _____.

$$U = \arcsin[\text{rand}(1, M)], \theta_{j, \dots} = 2^j \text{rand}(1)$$

rand(1, M) -

$$0 \leq 1$$

$$f^{(\cos)}(U) = \frac{1}{2} \cos U, U \in [0, \pi/2], \\ 0, U \in [\pi/2, \pi]$$

$$= \cos^{\theta_{j, \dots}}, \sin^{\theta_{j, \dots}}, \quad = \sin^{\theta_{j, \dots}}, \sin^{\theta_{j, \dots}}, \quad = \cos^{\theta_{j, \dots}},$$

$$\theta_{j, \dots}$$

$$' = \dots, \quad = M^{\theta_{j, \dots}} \dots I-M, \theta_{j, \dots}$$

$$M, (\theta) = \begin{pmatrix} \cos \theta & 0 & \sin \theta \\ 0 & 1 & 0 \\ -\sin \theta & 0 & \cos \theta \end{pmatrix}, M, (a) = \begin{pmatrix} \cos a & -\sin a & 0 \\ \sin a & \cos a & 0 \\ 0 & 0 & 1 \end{pmatrix}$$

(MIMO MISO - multiple input,

single output)

Or

2. _____ ()

$$A_s = \frac{\ln}{s}$$

$\Lambda(s)$, $r_{+i} = (x_{+i}, y_{+i}, z_{+i})$ 0 1;

$$= z_{+i} > A_s,$$

$i, i \neq 1$; $r_0 = r_T = (x_T, y_T, z_T)$ -

3. _____

0

$$= 2 \int_0^{\cos \theta} P(\Lambda) d\Lambda, \Lambda^{(s)}$$

0 1, $\Lambda(s)$

$$\begin{aligned} & \sqrt{1 - \sin^2 \theta} \left(\cos^i \theta - \sin^i \theta \right) + \cos \theta_i, \\ & \sqrt{1 - \sin^2 \theta} \left(\cos^i \theta + \sin^i \theta \right) + \cos \theta_i, \\ & \sqrt{1 - \sin^2 \theta} \end{aligned}$$

4. _____

$$p_2 = \exp(- \dots)$$

$$r_R = (x_R, y_R, z_R)$$

5. _____ (survival probability)

$$= (1 - \dots)^{\circ} \dots = j' (80)^{\wedge}$$

$$r' = (x' y' z');$$

6. _____ (arrival probability)

$$/ = \dots \circ 1 / \circ 2 / \circ \text{obstacle}(r_i, r_R).$$

(MIMO SIMO - single input, single FOV,

output)

[10], (arrival probability)

$$\text{obstacle}(r_i, r_R).$$

2020-0029 «

-

».

1. Xu Z. and Sadler B.M., «Ultraviolet communications: potential and state-of-the-art», IEEE Commun. Mag., vol. 46, no. 5, pp. 67-73, May 2008.
2. Arnon S. and Kedar D. Non-line-of-sight underwater optical wireless communication network, J. Opt. Soc. Am. A 26530-9, 2009.
3. Konstantinov I.S., Vasilyev G.S., Kuzichkin O.R., Surzhik D.I., Lazarev S.A. Numerical and Analytical Modeling of Wireless UV Communication Channels for the Organization of Wireless Ad-Hoc Network // IJCSNS - International Journal of Computer Science and Network Security - 2018. - Vol. 18, No. 8, pp. 98-104. : http://paper.riksns.org/07_book/201808/20180815.pdf (open access).
4. Konstantinov I.S., Vasilyev G.S., Kuzichkin O.R., Kurilov I.A., Lazarev S.A. Modeling and Analysis of the Characteristics of Ultraviolet Channels under Different Conditions of Radiation Propagation for the Organization of Wireless AD-HOC Network // JARDCS - Journal of Advanced Research in Dynamical and Control Systems - 2018. - 07-Special Issue, pp. 1853-1859. : <http://jardcs.org/abstract.php?archiveid=5147>.
5. Xu Z., H. Ding, B.M. Sadler, and Chen G., «Analytical performance study of solar blind non-line-of-sight ultraviolet short-range communication links» Optics Letters, vol. 33, no. 16, pp. 1860-1862, Aug. 2008.
6. Hou W., Liu C., Lu F., Kang J., Mao Z., Li B. Non-line-of-sight ultraviolet single-scatter path loss model. - Phonon Network Communications, Oct 05, 2017. - DOI 10.1007/s11107-017-0737-5.
7. Ding H., Chen G., Majumdar A., Sadler B. and Xu Z. Modeling of non-line-of-sight ultraviolet scattering channels for communication IEEE J. Sel. Areas Commun. 271535-44, 2009.
8. Drost R.J., Moore T.J. and Sadler B.M. UV communications channel modeling incorporating multiple scattering interactions, J. Opt. Soc. Am. A28686-95, 2011.
9. Elshimy M.A. Communications Through Non-Line-of-Sight Solar-Blind Ultraviolet Scattering Channels, Ph. d. thesis, McMaster University, 2015.
10. Zhang H., Yin H., Jia H., Yang J. and Chang S. Study of effects of obstacle on non-line-of-sight ultraviolet communication links, Opt. Express 1921216-26, 2011.

K.
 .: 8(915) 751-66-47
 E-mail: vasilievgleb@yandex.ru

.
 E-mail: Kuzichkin@bsu.edu.ru

.
 E-mail: arzerum@mail.ru

.
 E-mail: m.baknin@yandex.ru