621.391

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ANALYSIS OF MULTIPATH RADIO CHANNEL CAPACITY

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Summary. *The method of multipath frequency-selective radio channel capacity estimation is offered in the research. This method is based on the channel amplitude-frequency response usage.*

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C

ρ $F,$

[3]

$$C(\rho) = F \log_2(1+\rho).$$ (1)

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, .
,
,

ρ . $p(\rho)$
/

$$C = \int\limits_{0}^{\infty} C(\rho)\, p(\rho)\, d\rho.$$ (2)

[2], $p(\rho)$ N-

$$p(\rho, \rho_0) = \begin{cases} \dfrac{N^N}{\rho_0^N \cdot (N-1)!}\, \rho^{N-1} \exp\left(-\dfrac{N}{\rho_0}\rho\right), \rho \geq 0 \\ 0, \rho < 0 \end{cases},$$ (3)
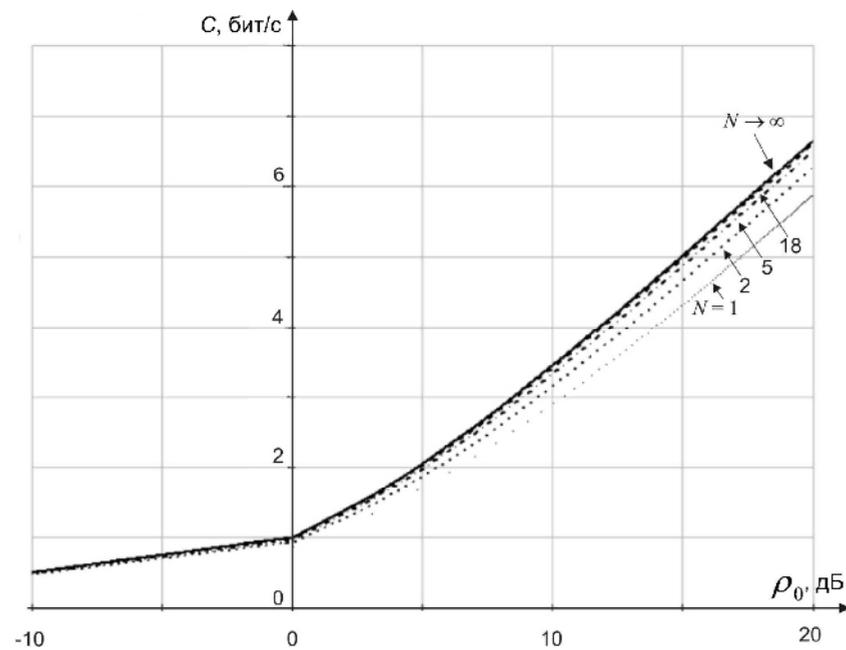
ρ – / , ρ_0 – / .

(1), (2) (3)
N- :

$$C = \int\limits_{0}^{\infty} F \log_2(1+\rho) \frac{N^N}{\rho_0^N \cdot (N-1)!}\, \rho^{N-1} \exp\left(-\frac{N}{\rho_0}\rho\right) d\rho.$$ (4)

.1. ($F = 1$).

1 –
/

, 18-

/ ρ_0.

(1), $\rho = \rho_0$.

802.11 (Wi-Fi),

18- [4],

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[1],

/ ρ ,

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1. , ,

( ).

2. ,

, $g(t)$.

3. ,

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$\left|H(f)\right|^2$.

4. , ,

F ,

$\left|H(f)\right|^2$,

H_i^2 ($i -$):

$$H_i^2 = \frac{1}{F} \int_{(i-1)F}^{iF} \left|H(f)\right|^2 df .\qquad(5)$$

5. ,

P_S.

6. H_i^2,

P_{S_i}:

$$P_{S_i} = P_S \cdot H_i^2 .\qquad(6)$$

7. / ρ_{0j},

.

8. (6) , ,

, / (

).

N_0:

$$N_{0j} = \frac{P_s}{F \cdot \rho_{0j}}.\qquad(7)$$

9. N_{0j},

:

$$P_{nj} = N_{0j} \cdot F.\qquad(8)$$

10. ， ρ_{0j}
／ :

$$\rho_{i,j} = \frac{P_{si}}{P_{nj}}.\qquad(9)$$

11. ／ ，

ρ .

12.
／ $\rho_{\ j}$ ρ_0 $\rho_{i,j}$, $\rho_{i,j} > \rho$,
，
K_j :

$$\rho_{\ j} = \frac{1}{N}\sum \rho_{i,j}, \rho_{i,j} > \rho\ ,\qquad(10)$$

$$K_j = \frac{M}{M},\qquad(11)$$

$M\ -$ ， ，

$M\ = \dfrac{F}{F}\ -$ ，

F .

13.

$\rho_{\ j}$, K_j :

$$C_j = FK_j \log_2(1+\rho_{\ j}).\qquad(12)$$

, . 2, ,
$\left|H(f)\right|^2$, , $\rho\ = 10$,
$\rho_{i,j} > \rho$, , ,
， .

$|H(f)|^2, P_{Si}, P_{n_i}$, дБ

$\rho_{_{H}} = 10$ дБ

$P_S = 1$ В^2

$P_{Si} = P_S \cdot H_i^2 = H_i^2$

$|H(f)|^2$

P_{Si}

P_{S134} P_{S135} P_{S136} P_{S137} P_{S138} P_{S139} P_{S140} P_{S141} P_{S142} P_{S143}

$\rho_{i,j} =$ 14 дБ 13,3 дБ 12 дБ 10,2 дБ 8,3 дБ 6,6 дБ 6 дБ 6,9 дБ 8,3 дБ 9,4 дБ

P_{n_j} P_{n_j} P_{n_j} P_{n_j} P_{n_j} P_{n_j} P_{n_j} P_{n_j} P_{n_j} P_{n_j}

Заштрихованные полосы не используются при вычислении пропускной способности при заданном $\rho_{_{H}}$

f, Гц

40 40,5 41 41,5 42 42,5 43 $\times 10^6$

2 –

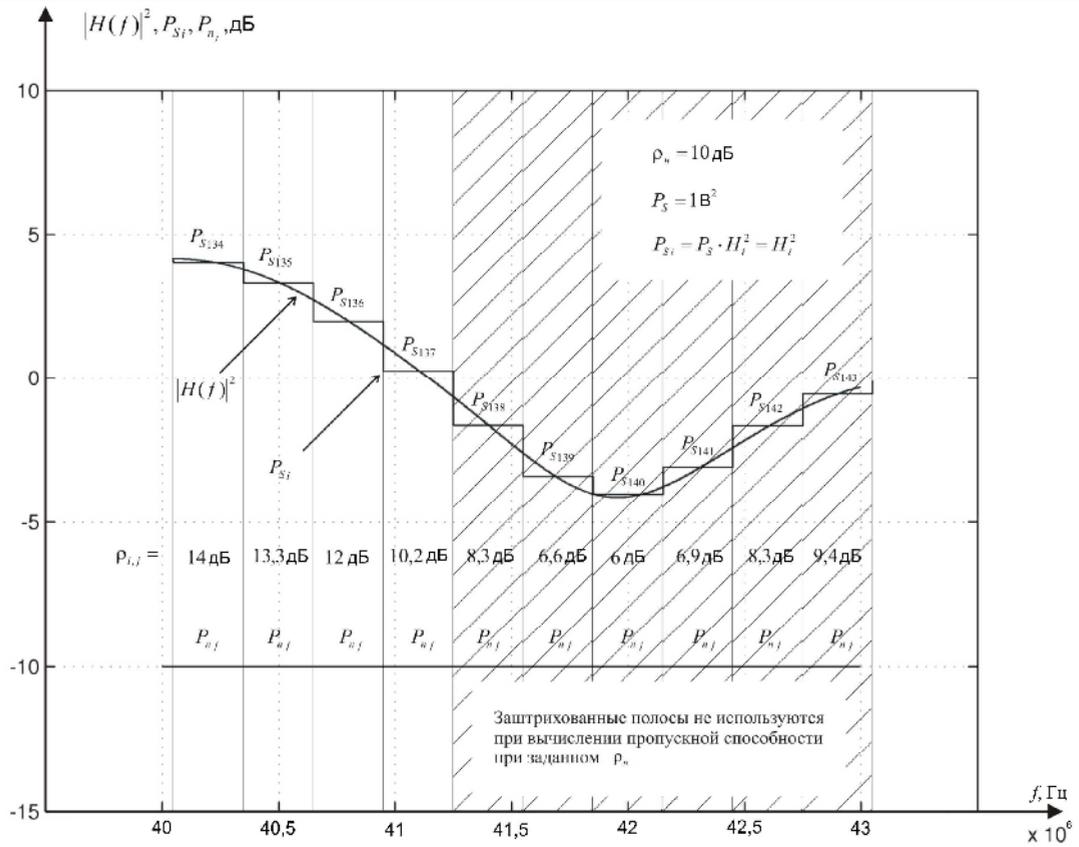. 3   ,
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–   " "
802.11 [4, с. 273];

–   [5],   802.11
$F = 300$ (20   ,   64);

– $F = 100$;

–   , $P_S = 1$ ^{2};

–   / $\rho_0 = -10 .. 20$;

–   / $\rho_{_{H}} = 0 .. 10$;

–   ,
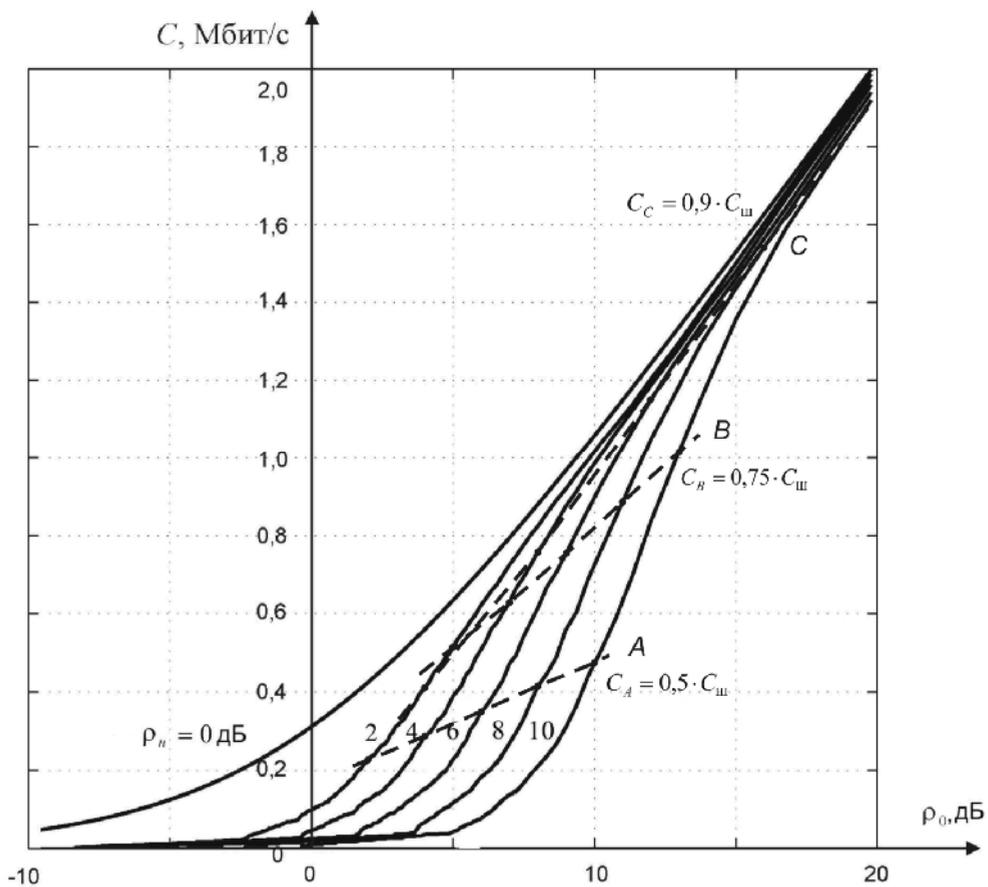
$$M = 100 \cdot 10^6 / 300 \cdot 10^3 = 334.$$

($N \to \infty$)

/ ρ_0, $\rho_{_{H}}$.

. 3

ρ_0 $\rho_{_{H}}$.

3 –

$$\rho_0, \qquad\qquad \rho \ .$$

.   ,
$\rho_0 \quad \rho \ (2, 4, 6, 8, 10 \quad)$:

$$\rho_0 = \rho \ . \tag{13}$$

.   ,
/ $\rho_0 \qquad\qquad \rho \ (2, 4, 6, 8, 10 \qquad 5, 7, 9, 11, 13$
):

$$\rho_0 = \rho + 3, \quad . \tag{14}$$

.   , ρ_0 ,
$\rho \quad (2, 4, 6, 8, 10 \qquad 4, 8, 12, 16, 20 \qquad\qquad)$:

$$\rho_0 = 2 \cdot \rho , \quad . \tag{15}$$

. 4, ρ_0 ρ ( ),

,

:

$$_A = 0,5 \cdot C \quad,$$ (16)

C – .

( ), 75%

:

$$_B = 0,75 \cdot C \quad.$$ (17)

( ),

90% :

$$_C = 0,9 \cdot C \quad.$$ (18)

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