

, 15, 49005, ; e-mail: mwave@ukr.net

$1 \cdot 10^{10} \text{ 1/}^3$   $1 \cdot 10^{13} \text{ 1/}^3$ .

$1 \cdot 10^{10} \text{ 1/}^3$   $1 \cdot 10^{13} \text{ 1/}^3$ .

This paper considers the efficiency of azimuthally symmetric microwave cavities in assessing the electron density in a low-temperature plasma. In free-space low-temperature plasma diagnostics, the shape of the plasma area under study usually does not have any pronounced azimuthal symmetry. So the use of partially open microwave cavities, whose design allows arbitrarily shaped plasma blobs to penetrate inside them, seems to be more efficient. The choice of a coaxial quarter-wave and a biconical microwave cavity for low-temperature plasma characterization in the absence of magnetic fields is substantiated. The aim of this work is to compare the maximum possible sensitivity of the resonance parameters of a quarter-wave cylindrical and a biconical cavity to a variation in the electron density of a low-temperature plasma. Using the finite-element method, electrodynamic processes in a coaxial quarter-wave and a biconical microwave cavity filled with a low-temperature plasma were

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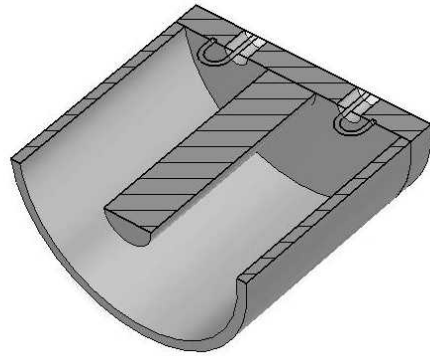
simulated. The effect of a variation in the plasma parameters on the complex coefficients of reflection and transmission of electromagnetic waves in the microwave cavities under study was estimated. The simulation was run for the plasma electron density ranging between  $10^{10} \text{ m}^{-3}$  and  $10^{13} \text{ m}^{-3}$ . The efficiency of the use of measuring systems based on the microwave cavities under study in low-temperature plasma electron density measurements was demonstrated. The maximum possible sensitivity of the resonance frequencies of the coaxial quarter-wave cavity to a variation in the plasma electron density was compared to that of the biconical cavity. It was shown that the expected maximum possible sensitivity of the resonance parameters of the biconical microwave cavity is almost twice that of the coaxial quarter-wave cavity.

[1].

[2].

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$$1 \cdot 10^{10} \text{ l} / ^3 \quad 1 \cdot 10^{13} \text{ l} / ^3$$

$$0,996 \quad 0,75.$$

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[3].

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011 111,

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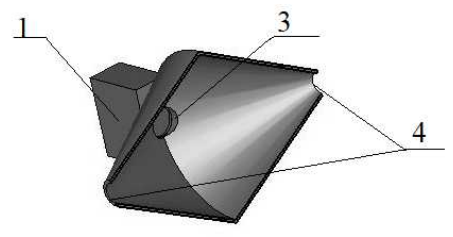
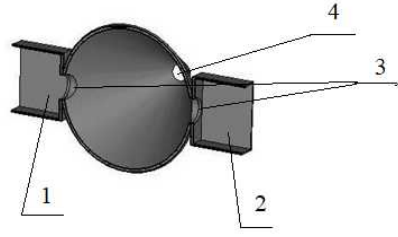
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4.



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[4]

N,

[4]

$$f_p = \sqrt{\frac{Ne^2}{4 \cdot 2m_e \cdot 0}}$$

N -

; 0 -

; -

; m\_e -

$$= 1 - \frac{f_p^2}{f^2},$$

f\_p -

; f -

(  
).

[5].

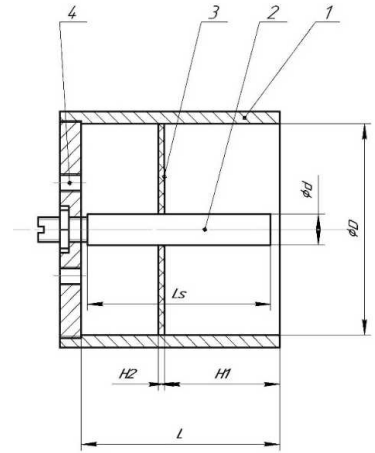
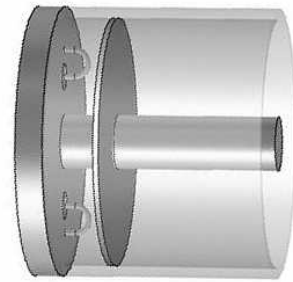
[6, 7].

$$1 \cdot 10^{10} \text{ 1/ }^3, \quad 1 \cdot 10^{13} \text{ 1/ }^3.$$

0,994 0,870.

0,01

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3

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$$H1 = L/2.$$

4,6 5,2 ,

$L_s=50$  ;  
 $H_2=1$  .

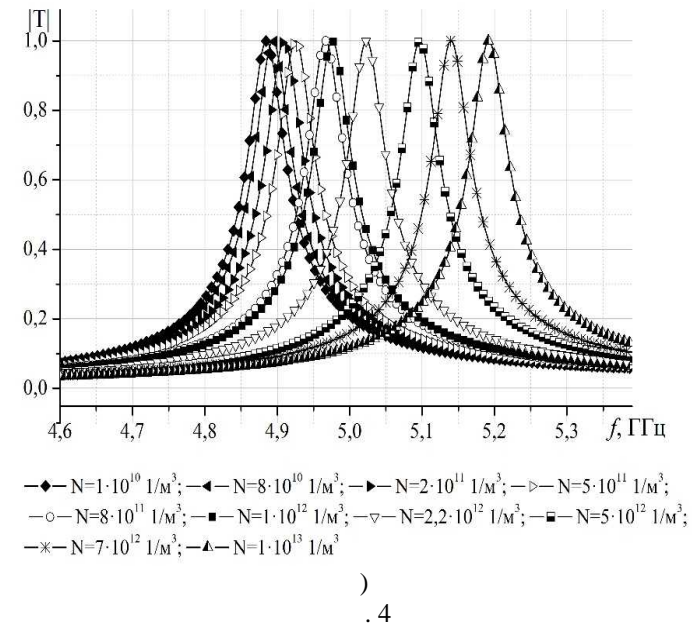
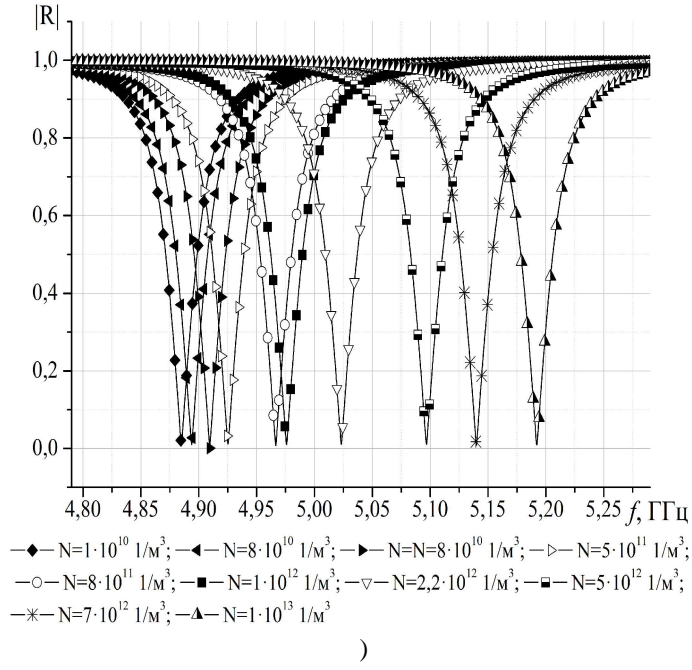
$D=50$  ;  
 $d=10$  ;  $H_1=25$  ;

. 4

[R] ( . 4, )

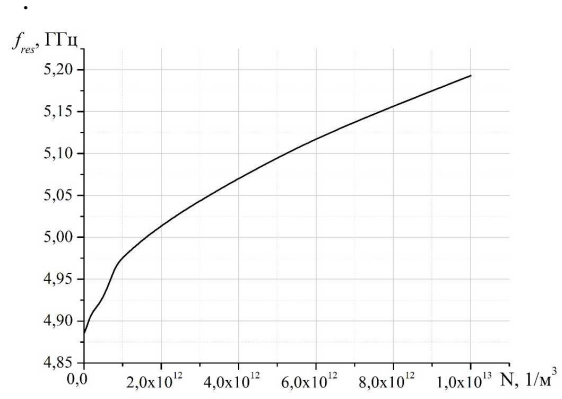
[T]

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. 5

$f_{res}$   
N



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$1 \cdot 10^{10} 1/3$

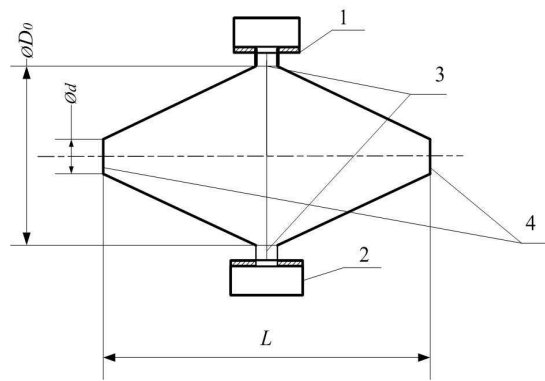
$1 \cdot 10^{13} 1/3$

0,307

$10^6 1/3$

30,5

. 6



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. 6,

$L$

$1 \quad 2 \quad D_0$

« ».

1.

2,

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4,

$D_0=50$



$d=6$

$L=76$

8 10

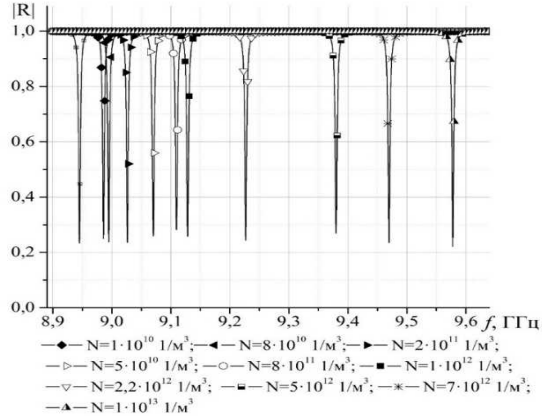
$-H_{011}$

3

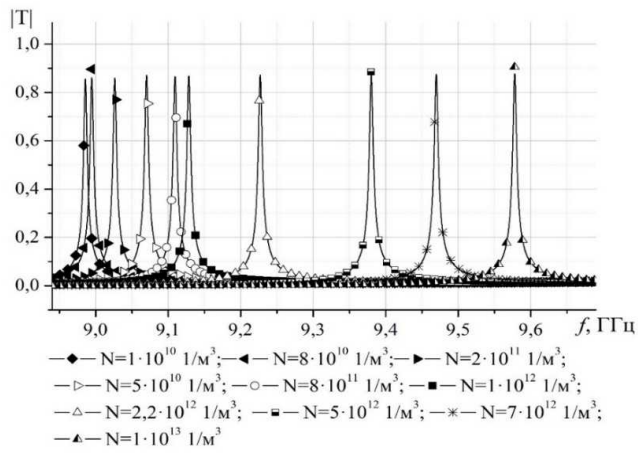
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.7

$1 \cdot 10^{10} 1/М^3$      $1 \cdot 10^{13} 1/М^3$

8,94    9,56

0,62

$f_{res}$

