IMPEDANCE CHARACTERISTICS OF A CIRCULARLY POLARIZED SLOT ANTENNA ON A SECTORAL CYLINDRICAL CAVITY

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ABSTRACT

This paper presents the analysis of the impedance characteristic of a sectoral cylindrical cavity-backed perpendicular slots antenna excited by a probe. To realize the impedance characteristics of antenna, the integral equations of the unknown magnetic currents over the pair of slots and electric current at the feed probe have been established base on the field equivalent principle and enforcing the boundary condition. The Galerkin's method of moment will be applied to obtain the unknown coefficients for evaluating the unknown electric current densities at the probe. Finally, the numerical result of the reflection as the impedance characteristics of this antenna is demonstrated as a function of frequency. It is found that such result, the slot length and cavity size must be varied to find the optimum condition at which is under investigations.

1. INTRODUCTION

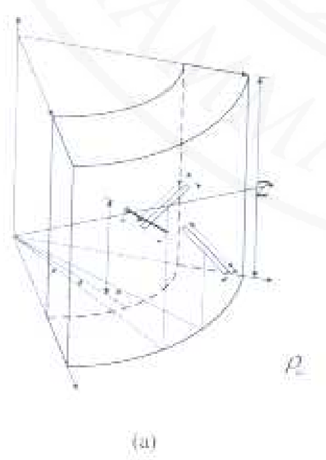
A slot array antenna excited by a probe has the advantage of a simple feeding system and high-power handling. A concentric sectoral cylindrical cavity-backed perpendicular slots array antenna excited by probe is an attractive one. A simple feed is utilized in each element and when multiple elements are combined into a circular array, the structure becomes a compact cylindrical antenna that provides a high-gain omnidirectional pattern and yields a circular polarization of radiated power. The structure can be easily fed from the power divider. It is important to investigate characteristics of an individual antenna, particularly from the simplest structure, before investigating the complicated structure as and array. Hence, antenna with one pair of perpendicular slots is focused on first.

Most substantial works related to the sectoral cylindrical structure have focused on the concentric sectoral cylindrical waveguide. Lin and Omar [1] have determined the cut-off wavelength of this structure. The equivalent parameters for the slot on a sectoral waveguide were reported by Lue et al. [2]. Fan and Jin [3] obtained a radar cross section of cylindrically slotted waveguide array antenna. Latest, Wongsan et al. presented the impedance characteristic of axial slot antenna on a sectoral cylindrical cavity excited by a probe [4]. As far as we know, there is no information about the perpendicularly slot pair on the sectoral cylindrical cavity, which yields circularly polarized radiation. Since impedance is an important characteristic that determines the efficiency of the antenna, this paper focuses on the impedance characteristics of a sectoral cylindrical cavity-backed perpendicularly slots antenna excited by a probe. The input impedance at the feed probe is estimated by solving the system of integral equations which was formulated by enforcing the boundary condition that the tangential magnetic field inside and outside the cavity are continuous through a pair of slot aperture and the source model is considered at the feed probe. Using the aids of the Dyadic Green's function in conjunction with the Method of Moment (MoM), the input impedance is obtained.

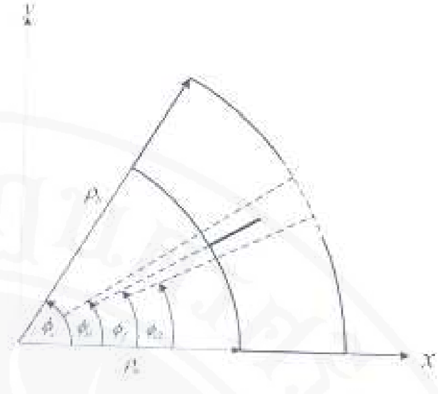
2. ANALYSIS

2.1. Model

Figure.1 shows the analysis model. The structure of a circularly polarized slot antenna on a sectoral cylindrical cavity consists of perpendicular slot pair on outer surface of cylindrical cavity. The slots in a pair are excited with orthogonal phases to provide the circularly polarized radiation. Figure 1(a) shows the perspective view of the circular polarized slot antenna on a sectoral cylindrical cavity. The slot length and width are and, respectively. Each slot in a pair is separated, along z-plane by distance so that the phase quadrature is obtained. The azimuthal spacing between each slot is denoted by. The slot pair is oriented at clockwise with the horizontal line of the cylindrical surface. The cross-section view of the antenna is show in Figure 1(b). The inner and outer radian of the concentric conducting cylindrical cavity is and, respectively, and this cavity is enclosed of the conducting surface at an angle. The excitation probe is located at the center of the inner surface of the cavity (). The center of each slot pair is located at an angle. Each slot in a pair is offset from the position in opposite direction so that phase quadratures between these slots are obtained.



(a)



(b)

Figure 1. Antenna configuration. (a) Perspective view. (b) Cross-sectional view.

2.1. Formulations

To realize the impedance characteristics of the antenna, the integral equation of the unknown magnetic currents over the slot and electric current at the feed probe must be established. These equations are formulated base on the field equivalent principle and enforcing thought the boundary condition as follows:

(i) Tangential magnetic fields are continuous through the aperture of slot pair.

(ii) The delta gap source is considered at the bottom of the feed probe.

The equivalent model corresponds to the antenna configuration in Figure 2.

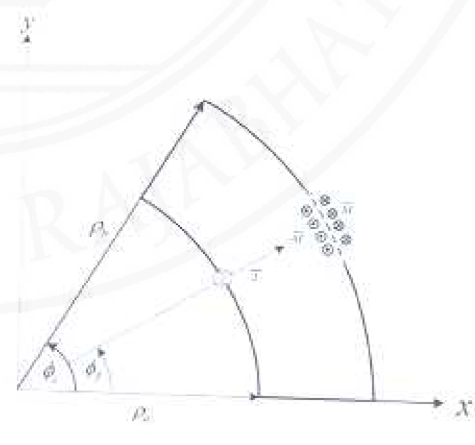


Figure 2. Equivalent analysis model.

Applying the Galerkin's method of moments, the following linear equations for unknown coefficient and are obtained.

$$a_s\left(Y_{ss}^{in}+Y_{ss}^{out}\right)+b_f\alpha_{sf}^{in}=0, \quad (1)$$

$$a_s\beta_{fs}^{in}+b_f Z_{ff}^{in}=-1, \quad (2)$$

where, the reaction coefficients , , and are give as the double inner products of testing function, dyadic Green's function and basis function as follows:

$$Y_{ss}^{out}=j\omega\varepsilon_0\iint\iint m_s\cdot\overline{\overline{G}}_{HM}^{out}\cdot m_s dS_s dS_s \quad (3)$$

$$Y_{ss}^{in}=j\omega\varepsilon_0\iint\iint m_s\cdot\overline{\overline{G}}_{HM}^{in}\cdot m_s dS_s dS_s \quad (4)$$

$$\alpha_{sf}^{in}=\iint\iint m_s\cdot\overline{\overline{G}}_{HJ}^{in}\cdot j_f dL_f dS_s \quad (5)$$

$$\beta_{fs}^{in}=\int_f^{l_w}\iint j_f\cdot\overline{\overline{G}}_{EM}^{in}\cdot m_s dS_s dL_f \quad (6)$$

$$Z_{ff}^{in}=j\omega\mu_0\int_f\iint j_f\cdot\overline{\overline{G}}_{EM}^{in}\cdot j_f dL_f dL_f \quad (7)$$

The dyadic Green's functions inside and outside the concentric conducting cylindrical cavity enclosed by the conducting surface for electric and magnetic fields due to the magnetic and electric current source are derived [5] to fulfill the requirement of the integral equations. The results are

$$\overline{\overline{G}}_{EJ}^{in}(\overline{R},\overline{R}')=-\frac{1}{k^2}\hat{z}\hat{z}\delta(\overline{R}-\overline{R}')+\sum_{n,m}\frac{(2-\delta_0)}{\phi_c}\left\{\begin{array}{l}\dfrac{1}{k_h^2 I_h k_{gh}\sin(k_{gh}z_d)}\begin{bmatrix}\overline{M}_{h,odd}(z_d-z)\overline{M}_{h,odd}\\(z)\overline{M}_{h,odd}(z)\overline{M}_{h,odd}(z_d-z)\end{bmatrix}\\-\dfrac{1}{k_e^2 I_e k_{ge}\sin(k_{ge}z_d)}\begin{bmatrix}\overline{N}_{e,even}(z_d-z)\overline{N}_{e,even}(z)\\\overline{N}_{e,even}(z)\overline{N}_{e,even}(z_d-z)\end{bmatrix}\end{array}\right\}, \quad (8)$$

$$\overline{\overline{G}}_{EM}^{in}(\overline{R},\overline{R}')=\sum_{n,m}\frac{(2-\delta_0)k}{\phi_c}\left\{\begin{array}{l}\dfrac{1}{k_h^2 I_h k_{gh}\sin(k_{gh}z_d)}\begin{bmatrix}\overline{N}_{h,odd}(z_d-z)\overline{M}_{h,odd}(z)\\\overline{N}_{h,odd}(z)\overline{M}_{h,odd}(z_d-z)\end{bmatrix}\\-\dfrac{1}{k_e^2 I_e k_{ge}\sin(k_{ge}z_d)}\begin{bmatrix}\overline{M}_{e,even}(z_d-z)\overline{N}_{e,even}(z)\\\overline{M}_{e,even}(z)\overline{N}_{e,even}(z_d-z)\end{bmatrix}\end{array}\right\}, \quad (9)$$

slot

probe

$$\overline{\overline{G}}_{HJ}^{in}(\overline{R},\overline{R}')=\sum_{n,m}\frac{(2-\delta_0)k}{\phi_c}\left\{\begin{array}{l}\dfrac{1}{k_h^2 I_h k_{gh}\sin(k_{gh}z_d)}\begin{bmatrix}\overline{M}_{h,odd}(z_d-z)\overline{N}_{h,odd}(z)\\\overline{M}_{h,odd}(z)\overline{N}_{h,odd}(z_d-z)\end{bmatrix}\\-\dfrac{1}{k_e^2 I_e k_{ge}\sin(k_{ge}z_d)}\begin{bmatrix}\overline{N}_{e,even}(z_d-z)\overline{M}_{e,even}(z)\\\overline{N}_{e,even}(z)\overline{M}_{e,even}(z_d-z)\end{bmatrix}\end{array}\right\}, \quad (10)$$

$$\overline{\overline{G}}_{HM}^{in}(\overline{R},\overline{R}')=-\frac{1}{k^2}\hat{z}\hat{z}\delta(\overline{R}-\overline{R}')+\sum_{n,m}\frac{(2-\delta_0)}{\phi_c}\left\{\begin{array}{l}\dfrac{1}{k_h^2 I_h k_{gh}\sin(k_{gh}z_d)}\begin{bmatrix}\overline{N}_{h,odd}(z_d-z)\overline{N}_{h,odd}(z)\\\overline{N}_{h,odd}(z)\overline{N}_{h,odd}(z_d-z)\end{bmatrix}\\-\dfrac{1}{k_e^2 I_e k_{ge}\sin(k_{ge}z_d)}\begin{bmatrix}\overline{M}_{e,even}(z_d-z)\overline{M}_{e,even}(z)\\\overline{M}_{e,even}(z)\overline{M}_{e,even}(z_d-z)\end{bmatrix}\end{array}\right\}, \quad (11)$$

where

$$\overline{M}_{h,odd}(z_d-z)\overline{M}_{h,odd}(z)=\begin{bmatrix}\dfrac{\upsilon^2}{\rho\rho'}B_\upsilon(k_h\rho)B_\upsilon(k_h\rho')\sin(\upsilon\phi)\\\times\sin(\upsilon\phi')\sin k_{gh}(z_d-z)\sin(k_{gh}z')\end{bmatrix}, \quad (12)$$

$$\overline{M}_{h,odd}(z)\overline{M}_{h,odd}(z_d-z)=\begin{bmatrix}\dfrac{\upsilon^2}{\rho\rho'}B_\upsilon(k_h\rho)B_\upsilon(k_h\rho')\sin(\upsilon\phi)\\\times\sin(\upsilon\phi')\sin(k_{gh}z)\sin k_{gh}(z_d-z')\end{bmatrix}, \quad (13)$$

$$\overline{N}_{e,even}(z)\overline{N}_{e,even}(z_d-z)=-\frac{1}{K^2}\left\{\begin{array}{l}k_{ge}\dfrac{\partial B_\upsilon(k_e\rho)}{\partial\rho}\sin(\upsilon\phi)\sin(k_{ge}z)\\\times\dfrac{\partial}{\partial z'}\begin{bmatrix}\dfrac{\partial B_\upsilon(k_e\rho')}{\partial\rho'}\sin(\upsilon\phi')\cos k_{ge}\\(z_d-z')\end{bmatrix}\end{array}\right\}, \quad (14)$$

$$\overline{N}_{e,even}(z_d-z)\overline{N}_{e,even}(z)=-\frac{1}{K^2}\left\{\begin{array}{l}k_{ge}\dfrac{\partial}{\partial z}\begin{bmatrix}\dfrac{\partial B_\upsilon(k_e\rho)}{\partial\rho}\sin(\upsilon\phi)\cos k_{ge}\\(z_d-z')\end{bmatrix}\\\times\dfrac{\partial B_\upsilon(k_e\rho')}{\partial\rho}\sin(\upsilon\phi')\sin(k_{ge}z')\end{array}\right\}, \quad (15)$$

$$\overline{M}_{e\upsilon n}(z_d - z)\overline{N}_{e\upsilon n}(z) = \frac{1}{K}\left\{ -\left[\frac{k_{gh}\upsilon^2}{\rho\rho'} B\upsilon(k_h\rho)\sin(\upsilon\phi)\cos k_{gh}(z_d - z) \atop B_\upsilon(k_h\rho')\sin(\upsilon\phi')\cos(k_{gh}z') \right] + \left\{ \frac{\upsilon}{\rho\rho'} B_\upsilon(k_h\rho)\sin(\upsilon\phi)\cos k_{gh}(z_d - z) \atop \left[\frac{\partial}{\partial\rho'}\left(\rho'\frac{\partial B_\upsilon(k_h\rho')}{\partial\rho'}\cos(\upsilon\phi') \atop \cdot\sin(k_{gh}z') \right) + \left(\frac{\upsilon^2}{\rho'} B_\upsilon(k_h\rho')\cos(\upsilon\phi')\sin(k_{gh}z') \right) \right] \right\} \right\}, \quad (16)$$

$$\overline{M}_{e\upsilon n}(z)\overline{N}_{e\upsilon n}(z_d - z) = \frac{1}{K}\left\{ \left[\frac{\upsilon^2}{\rho\rho'} B\upsilon(k_h\rho)\sin(\upsilon\phi)\cos(k_{gh}z)\frac{\partial}{\partial z'} \atop \left(B_\upsilon(k_h\rho')\sin(\upsilon\phi')\sin k_{gh}(zd - z')\right) \right] + \left\{ \frac{\upsilon}{\rho\rho'} B_\upsilon(k_h\rho)\sin(\upsilon\phi)\cos(k_{gh}z) \atop \left[\frac{\partial}{\partial\rho'}\left(\rho'\frac{\partial B_\upsilon(k_h\rho')}{\partial\rho'}\cos(\upsilon\phi') \atop \sin k_{gh}(zd - z') \right) - \left(\frac{\upsilon^2}{\rho'} B_\upsilon(k_h\rho')\cos(\upsilon\phi') \atop \sin k_{gh}(zd - z') \right) \right] \right\} \right\}, \quad (17)$$

$$\overline{N}_{e\upsilon n}(z_d - z)\overline{M}_{e\upsilon n}(z) = -\frac{1}{K}\left\{ \frac{\partial}{\partial z}\left(\frac{\partial B_\upsilon(k_e\rho)}{\partial\rho}\sin(\upsilon\phi)\sin k_{ge}(z_d - z) \right) \atop \times\left(\frac{\partial B_\upsilon(k_e\rho')}{\partial\rho'}\sin(\upsilon\phi')\cos(k_{ge}z') \right) \right\}, \quad (18)$$

$$\overline{N}_{e\upsilon n}(z)\overline{M}_{e\upsilon n}(z_d - z) = -\frac{1}{K}\left\{ k_{ge}\frac{\partial B_\upsilon(k_e\rho)}{\partial\rho}\sin(\upsilon\phi)\cos(k_{ge}z) \atop \times\left[\frac{\partial B_\upsilon(k_e\rho')}{\partial\rho'}\sin(\upsilon\phi')\cos k_{ge}(z_d - z') \right] \right\}, \quad (19)$$

$$\overline{M}_{o\upsilon n}(z_d - z)\overline{M}_{o\upsilon n}(z) = \left[\frac{\upsilon^2}{\rho\rho'} B_\upsilon(k_h\rho)B_\upsilon(k_h\rho')\sin(\upsilon\phi) \atop \times\sin(\upsilon\phi')\sin k_{gh}(z_d - z)\sin(k_{gh}z') \right], \quad (20)$$

$$\overline{M}_{o\upsilon n}(z)\overline{M}_{o\upsilon n}(z_d - z) = \left[\frac{\upsilon^2}{\rho\rho'} B_\upsilon(k_h\rho)B_\upsilon(k_h\rho')\sin(\upsilon\phi) \atop \times\sin(\upsilon\phi')\sin(k_{gh}z)\sin k_{gh}(z_d - z') \right], \quad (21)$$

$$\overline{N}_{e\upsilon n}(z_d - z)\overline{N}_{e\upsilon n}(z) = -\frac{1}{K^2}\left\{ k_{ge}\frac{\partial}{\partial z}\left[\frac{\partial B_\upsilon(k_e\rho)}{\partial\rho}\sin(\upsilon\phi)\cos k_{ge} \atop (z_d - z') \right] \atop \frac{\partial B_\upsilon(k_e\rho')}{\partial\rho'}\sin(\upsilon\phi')\sin(k_{ge}z') \right\}, \quad (22)$$

$$\overline{N}_{e\upsilon n}(z)\overline{N}_{e\upsilon n}(z_d - z) = \left[-\frac{1}{K^2}\left\{ k_{ge}\frac{\partial B_\upsilon(k_e\rho)}{\partial\rho}\sin(\upsilon\phi)\sin(k_{ge}z) \atop \frac{\partial}{\partial z'}\left[\frac{\partial B_\upsilon(k_e\rho')}{\partial\rho}\sin(\upsilon\phi')\cos k_{ge}(z_d - z') \right] \right\} \right], \quad (23)$$

$$\overline{N}_{o\upsilon n}(z_d - z)\overline{N}_{o\upsilon n}(z) = \frac{1}{K^2}\left\{ -\left[k_{gh}\frac{\upsilon^2}{\rho\rho'}\frac{\partial}{\partial z}\left(B_\upsilon(k_h\rho) \atop \sin(\upsilon\phi)\cos k_{gh}(zd - z) \right) \atop \times\left(B_\upsilon(k_h\rho')\sin(\upsilon\phi')\sin(k_{gh}z')\right) \right] + \left\{ \frac{\upsilon}{\rho\rho'}\left[\frac{\partial}{\partial z}\left(B_\upsilon(k_h\rho)\sin(\upsilon\phi)\cos k_{gh}(zd - z)\right) \right] \atop \times\left[\frac{\partial}{\partial\rho'}\left(\rho'\frac{\partial B_\upsilon(k_h\rho')}{\partial\rho'}\cos(\upsilon\phi')\cos(k_{gh}z') \right) \atop -\frac{\upsilon^2}{\rho'} B_\upsilon(k_h\rho')\cos(\upsilon\phi')\cos(k_{gh}z') \right] \right\} \atop -k_{gh}\frac{\upsilon}{\rho\rho'}\left[\frac{\partial}{\partial\rho}\left(\frac{\partial B_\upsilon(k_h\rho)}{\partial\rho}\cos(\upsilon\phi)\cos k_{gh}(zd - z) \right) \atop -\frac{\upsilon^2}{\rho} B_\upsilon(k_h\rho)\cos(\upsilon\phi)\cos k_{gh}(zd - z) \right] \times\left[B_\upsilon(k_h\rho')\sin(\upsilon\phi')\sin(k_{gh}z')\right] \atop +\frac{1}{\rho\rho'}\left[\frac{\partial}{\partial\rho}\left(\rho\frac{\partial B_\upsilon(k_h\rho)}{\partial\rho}\cos(\upsilon\phi)\cos k_{gh}(zd - z) \right) \atop -\frac{\upsilon^2}{\rho} B_\upsilon(k_h\rho)\cos(\upsilon\phi)\cos k_{gh}(zd - z) \right] \times\left[\frac{\partial}{\partial\rho'}\left(\rho'\frac{\partial B_\upsilon(k_h\rho')}{\partial\rho}\cos(\upsilon\phi')\cos(k_{gh}z') \right) \atop -\frac{\upsilon^2}{\rho} B_\upsilon(k_h\rho')\cos(\upsilon\phi')\cos(k_{gh}z') \right] \right\}, \quad (24)$$

$$\overline{M}_{e\upsilon n}(z_d - z)\overline{M}_{e\upsilon n}(z) = \left[\left(\frac{\partial B_\upsilon(k_e\rho)}{\partial\rho}\sin(\upsilon\phi)\sin k_{ge}(z_d - z) \right) \atop \times\left(\frac{\partial B_\upsilon(k_e\rho')}{\partial\rho'}\sin(\upsilon\phi')\sin(k_{ge}z') \right) \right], \quad (25)$$

$$\overline{M}_{\upsilon mn}(z)\overline{M}_{\upsilon mn}(z_d - z) = \left[\begin{array}{l}\left(\frac{\partial B_\upsilon(k_c\rho)}{\partial\rho}\sin(\upsilon\phi)\sin(k_{gz}z)\right) \\ \times\left(\begin{array}{l}\frac{\partial B_\upsilon(k_c\rho')}{\partial\rho'}\sin(\upsilon\phi')\sin k_{gz} \\ (z_d - z')\end{array}\right)\end{array}\right], \tag{26}$$

$$\overline{N}_{\upsilon mn}(z)\overline{N}_{\upsilon mn}(z_d - z) = \frac{1}{K^2}\left\{\begin{array}{l}
-\left[\begin{array}{l}k_{gh}\frac{\upsilon^2}{\rho\rho'}B_\upsilon(k_h\rho)\sin(\upsilon\phi)\sin(k_{gh}z) \\ \frac{\partial}{\partial z'}\left(\begin{array}{l}B_\upsilon(k_h\rho')\sin(\upsilon\phi') \\ \sin k_{gh}(zd - z')\end{array}\right)\end{array}\right] \\
-\left\{\begin{array}{l}k_{gh}\frac{\upsilon}{\rho\rho'}B_\upsilon(k_h\rho)\sin(\upsilon\phi)\cos(k_{gh}z) \\ \times\left[\begin{array}{l}\frac{\partial}{\partial\rho'}\left(\begin{array}{l}\rho'\frac{\partial B_\upsilon(k_h\rho')}{\partial\rho'}\cos(\upsilon\phi') \\ \cos k_{gh}(zd - z')\end{array}\right) \\ -\frac{\upsilon^2}{\rho'}B_\upsilon(k_h\rho')\cos(\upsilon\phi')\cos k_{gh}(zd - z')\end{array}\right]\end{array}\right\} \\
+\frac{\upsilon}{\rho\rho'}\left[\begin{array}{l}\frac{\partial}{\partial\rho}\left(\frac{\partial B_\upsilon(k_h\rho)}{\partial\rho}\cos(\upsilon\phi)\cos(k_{gh}z)\right) \\ -\frac{\upsilon^2}{\rho}B_\upsilon(k_h\rho)\cos(\upsilon\phi)\cos(k_{gh}z)\end{array}\right] \\
\times\left[B_\upsilon(k_h\rho')\sin(\upsilon\phi')\cos k_{gh}(zd - z')\right] \\
+\frac{1}{\rho\rho'}\left[\begin{array}{l}\frac{\partial}{\partial\rho}\left(\rho\frac{\partial B_\upsilon(k_h\rho)}{\partial\rho}\cos(\upsilon\phi)\cos(k_{gh}z)\right) \\ -\frac{\upsilon^2}{\rho}B_\upsilon(k_h\rho)\cos(\upsilon\phi)\cos(k_{gh}z)\end{array}\right] \\
\times\left[\begin{array}{l}\frac{\partial}{\partial\rho'}\left(\rho'\frac{\partial B_\upsilon(k_h\rho')}{\partial\rho}\cos(\upsilon\phi')\cos k_{gh}(zd - z')\right) \\ -\frac{\upsilon^2}{\rho}B_\upsilon(k_h\rho')\cos(\upsilon\phi')\cos k_{gh}(zd - z')\end{array}\right]
\end{array}\right\}, \tag{27}$$

and

$$\overline{\overline{G}}^{om}_{HM}(\overline{R}, \overrightarrow{R}') = \hat{\phi}\hat{z}c_h\int_{-\infty}^{\infty}d\xi\sum_{n=-\infty}^{\infty}e^{j(n\bar{\phi}-\xi\bar{z})}\cdot\frac{n\xi}{k_0 h\rho_s}\frac{H_n^{(2)}(h\rho_s)}{H_n'^{(2)}(h\rho_s)}, \tag{28}$$

where

$$h = \left\{\begin{array}{ll}|h| & ;|\xi| < k_0 \\ -j|h| & ;|\xi| > k_0\end{array}\right\}, \tag{29}$$

$$c_h = \frac{jY_0}{(2\pi)^2\rho_h}. \tag{30}$$

The following basis/testing functions on the slot and on the feed probe are used, assuming the slots are narrow.

$$\vec{m}_s(\overline{R}') = \hat{\phi}\hat{z}\frac{1}{w_s}\sin\frac{\pi}{l_s}\left(R'(\phi', z') - \frac{l_s}{2}\right), \tag{31}$$

$$\vec{j}_j(\overline{R}') = \hat{\rho}\sin\frac{\pi}{2l_j}\left(\rho' - \rho_a + l_j\right), \tag{32}$$

where andare the length and the width of slots in pair, and are the local co-coordinates originating from the center of the slot along the length and the width.

To determine the input impedance of the probe in the cavity, Galerkin's method developed by Collin [6] is utilized in this paper. We expand the current along the probe in terms of the sinusoidal basis function in (32) and choose at so that. Hence we will have. Then input impedance can be found as

$$Z_{in} = \frac{V_{in}}{I_{in}} = \frac{V_{in}}{(\rho = \rho_a)} = \frac{V_{in}}{b_f}, \tag{33}$$

where denotes the input voltage source, which is a unity delta gap source model. The input current, is the unknown electric current along the probe, and is the input impedance of the probe. The other impedance characteristics such as return loss and standing wave ratio can be readily realized subsequently.

3. RESULTS

From the antenna parameters illustrated in Table 1, the result of the reflection for various frequencies is shown in Figure.3. The result can be improved by changing the slot length and the cavity size at which is under investigations.

Table 1. *Antenna parameters used in the model*

Antenna Parameters	Size
Inner cylindrical radius (ρ_a)	0.908λ
Outer cylindrical radius (ρ_b)	1.575λ
Angle of sectoral cylinder (ϕ_c)	60°
Sectoral cylindrical cavity length (z_d)	2.0λ
Slot pairs location in ϕ direction (ϕ_s)	0°
Slot pairs location in z direction (z_s)	0.5λ
Slot length (l_s)	0.5λ
Slot width (w_s)	0.33λ
Probe location in ϕ direction (ϕ_f)	30°
Probe location in z direction (z_f)	0.5λ
Probe length (l_f)	0.25λ

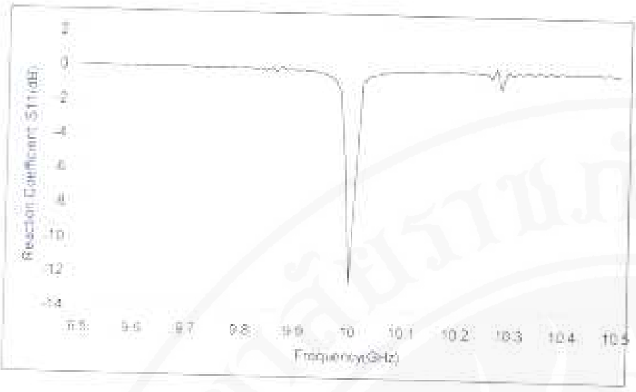


Figure 3. Reaction characteristics of the antenna

4. CONCLUSION

Impedance characteristics of a circularly polarized slot antenna on a sectoral cylindrical cavity are investigated by using method of moment. The integral equations are constructed by imposing the boundary condition at the slots and feed probe. Dyadic Greens functions derived from the boundary condition at the cavity are very useful tool for helping in solving integral equations. Entire domain basis functions with Galerkin's method of moments were selected to find the unknown currents. The result of the reflection as the impedance characteristics is illustrated. To improve the result of the impedance characteristics, the slot length and cavity size must be varied to find the optimum condition at which is under investigations.

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