Design of Full-band Waveguide T-junction Power Dividers

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Design of Full-band Waveguide T-junction Power Dividers

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Design of Full-band Waveguide T-junction Power Dividers

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Abstract

Waveguide power dividers are employed in high-power microwave devices, particle accelerators, amplifier, power combiners, waveguide multiplexers, monopulse antenna comparators, and array antenna feed networks. This letter presents the structures of new designs of $E$- and $H$-plane power dividers with high output ratio that operates over the full rectangular waveguide band. The first design is about a $H$-plane $T$-junction power divider using a septum, two small cavities and an input matching transformer. The second design is a new compact $E$-plane $T$-junction with only a simple and compact transition structure at the junction and does not have any other matching structures.
The third design is an $E$-plane junction with rounded corners and a smoothly tapered septum. Output ratios of up to 10 are realised by offsetting the septum. We were able to design all the designs of power dividers operating over the full band of the WR-10 waveguide that has reflection coefficient of less than -20 dB over 75-110 GHz.

* A thesis for the degree of Master in FEB 2018.

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I. Introduction

Power divider is a kind of significant microwave passive components, which are widely used in multiplexers, transmitters and receiver modules and array feed networks[1,2]. Although power divider is mainly used for the power distribution and synthesis, it is also used as a power tuner and the input terminal of the duplexer. Power divider can be divided into two major categories of waveguide cavity and microstrip, the waveguide cavity power divider is wide popularity for its low loss, high power capacity and transmission bandwidth and so on, but it also has some shortcomings, including its volume is too large, high cost to process, not easy integration. Microstrip power dividers with low cost, small volume, stable performance, easy to integrate the advantages of other active circuit, widely used in the field of system integration and miniaturization of microwave, but the lack of transmission power and the insertion loss too big also affects its application. The important working parameters of power divider include input port reflection coefficient, the phase between output ports, the insertion loss in work-band, the isolation of ports, the size of device and other technical indicators. At present, the research of waveguide power divider has achieved fruitful results. And full waveguide-band 1:1 power dividers have been investigated for $H$-plane[3] and $E$-plane[4] geometries. Literature on wideband power dividers with high output ratio is quite limited. Power dividers operating at the full waveguide band can be designed using a $Y$-junction and impedance matching steps, In space-limited applications, a more compact T-junction power divider is
preferred. In some applications, a branching type $T$-junction power divider can be advantageous [5-6]. A symmetric $E$-plane $T$-junction power divider can be designed using a septum in the junction or a matching section in the input waveguide. Gómez and co-workers [7] presented an $E$-plane gamma-junction power divider with output ratios of up to 10, while Huang and co-workers [8] investigated an $E$-plane $T$-junction power divider with output ratios of up to 4. A waveguide $E$-plane $T$-junction power divider without a septum or an input matching section shows input reflection coefficient of $-15 \text{ dB}$ to $-10 \text{ dB}$. The use of a thin septum in the junction provides a good impedance matching only over a narrow bandwidth. Wideband performance in a $T$-junction power divider can be obtained by using a wedge-shaped wave-branching structure in the junction and continuous 5 or stepped impedance transformers 6 in the output waveguides. And the $H$-plane $T$-junction waveguide power divider has been investigated in [2] using irises in input and output waveguides, in [9] using multiple posts in input and output waveguides, in [10] using a partial-height post, in [11, 12] using septum and matching iris and in [13] using a junction waveguide with an increased height.

All of existing designs, however, do not cover the full waveguide band with reflection coefficient of less than $-20 \text{ dB}$. Some of them are not suitable for split-block fabrication especially at high millimeter-wave frequencies. In this paper, we present three new designs of one $H$-plane and two $E$-plane of $T$-junction waveguide power divider that covering the full W-band (75–110 GHz) and suitable for split-block fabrication. The proposed power divider is structurally
simple and can easily be fabricated using split-block technique or metal casting.

In the following we present the design principle of the proposed power divider, results of a parametric analysis and optimum dimensions of the proposed power divider. We have employed the widely-used commercial simulation software Microwave Studio™ by CST, the accuracy of which has been proven in numerous publications worldwide.
II. \textit{E-and H-plane Power Divider}

2.1 Review of the Waveguide Power Divider

In this section, existing power divider structures are reviewed. First, the \textit{T}-junction power divider concept is explained, followed by basic geometry of \textit{E-} and \textit{H-plane} \textit{T}-junction waveguide power dividers. Representative existing designs of the \textit{E-} and \textit{H-plane} \textit{T}-junction power dividers are reviewed.

2.2 A Basic Power Divider

The most basic form of a power divider is a simple "\textit{T}" connection, which has one input and two outputs as shown in Fig. 2.1. If the "\textit{T}" is mechanically symmetrical, a signal applied to the input will be divided into two output signals, equal in amplitude and phase. The arrangement is simple and it works, with limitations.

\begin{figure}[h]
\centering
\includegraphics[width=0.5\textwidth]{2way_power_divider}
\caption{Basic 2way power, simple "\textit{T}"}
\end{figure}
2.3. Waveguide *E-T* and *H-T* Junction

In *E-T* junction[15], axis of the side wall is parallel to the *E* field, the same is shown in the Fig2.2. In *H-T* junction, axis of the side wall is parallel to the *H* field, the same is shown in the Fig 2.3. In *H*-plane tee, when two inputs are fed into port-1 and port-2 of the arms(collinear), output at port-3 will be in phase and also additive in nature. On the other side, if input is fed at port-3, the waves get split equally into port-1 and port-2 with in-phase and will have same magnitude.

![Fig. 2.2 Waveguide E-T junction and the electronics field distribution](image1)

(a) *E*-T module (b) electronics field distribution[15]

![Fig. 2.3 Waveguide H-T junction and the electronics field distribution](image2)

(a) *H*-T module (b) electronics field distribution[15]
2.4. The $H$-plane Septum Power Divider in the Rectangular Waveguide

Fig. 2.4 shows a typical design of an $H$-plane $T$-junction power divider operating over the full waveguide bandwidth [14]. A power-dividing septum is employed in the junction region. An inductive iris is used for impedance matching at the input guide. The output power ratio is controlled by displacing the septum from the center position. Sharp interior corners are rounded for fabrication by milling operation. Fig. 2.5 shows the input reflection coefficient of the power divider, which is less than $-22$ dB over $1.1f_c$ to $1.9f_c$. Output power divider ratio versus the frequency for various values of septum offset. Primary disadvantage of this design is that the septum and the iris will meet with fabrication difficulties at high millimeter frequencies. For example, the dimension of WR-10 waveguide (75-110GHz) is 2.54 x 1.27 mm and the thickness of the septum and the iris will be 0.2 mm, which is too small for milling operation.

Fig. 2.4 (a) The $H$-plane septum power divider in the rectangular waveguide  (b) Cross section of the power divider[14]
Fig. 2.5 Input reflection coefficient (a) and output power ratio (b) of the power divider of Fig. 2.4[14]
2.5. **K-Band Rectangular Waveguide Power Dividers**

This case described the design structure of the full bandwidth of *E*-plane power divider[16]. For simple structure and easy to calculate, this power divider used symmetric structure. Fig. 2.6 shows the 3D simulation model of power dividers. Main designing task in realization of waveguide Tee, is impedance matching at junction. Due to sudden discontinuity at junction higher order modes are generated in waveguide. Generation of higher order modes is responsible for storing energy near junction. This increases reactive part of impedance. To cancel this reactive part of impedance they designed a septum that load waveguide with opposite reactive part as it is at junction. Use iris in side arms to transform resistive part of side arm waveguide to main waveguide. The simulation results show that it can be noted that the novel power divider operates with 22GHz to 34GHz, and return loss less than −20dB. Similarly an *E*-Plane tee was designed at k-band with center frequency 28 GHz.

![3D simulation model](image)

**Fig. 2.6** A full bandwidth *E*-plane power divider 3D simulation model[16]
Fig. 2.7 The simulation results of the power divider[16]
III Design of \textit{H-plane} Power Dividers

3.1. Design of A Compact Power Divider with Equal Power Ratio

The structure of the proposed \textit{H-plane} T-junction waveguide power divider is shown in Fig. 3.1. It consists of an input matching section (\textit{M}), a septum (\textit{S}) dividing the input wave and two small cavities (\textit{C}_1, \textit{C}_2) for wideband impedance matching. Based on existing designs, we have come up with a design idea for the proposed power divider.

Existing designs employ a post or a septum at the junction to separate the incoming wave. A post may lead to fabrication difficulties at high millimeter-wave frequencies when it is too thin. A better choice is a septum since it is connected to the waveguide wall and amenable to fabrication by end mill machining as far as its thickness is not too small.

A septum alone does not provide good impedance matching over the full waveguide band. Existing designs employ matching structures in the output waveguides such as partial-height posts, irises and smooth tapering of the septum. Even with these matching structures full-band matching is not easy to obtain. We employ two small cavities around the septum for full-band performance. To reduce the reflection coefficient down to $-20$ dB, a short section of a reduced-height waveguide is employed.
Fig. 3.1 Structure of the proposed power divider
3.2. Design and Simulation of the $H$-plane Power Divider

Fig. 3.2 shows the dimensional parameters of the proposed power divider. The optimum design of the power divider is obtained in the following way. Starting from the base structure, we manually sweep dimensional parameters of the septum, cavities and the input transformer, from which near-final dimensions are obtained. For full-band operation with reflection coefficient of less than $-20$ dB, an automatic optimization routine provided by Microwave Studio has been utilized.

The radius $R$ of the rounded corners in Fig. 3.2 is fixed at $0.08a$, which is amenable for fabrication. Dimensional parameters for optimization are septum length $L_s$ and thickness $T_s$, cavity width $W_c$ and depth $D_c$, transformer height $H_m$ and length $L_m$. In the following, we present parametric analysis on the reflection coefficient of the power divider, where all the dimensions other than the one in question are fixed at values given in Table 3.1.

---

**Fig. 3.2** Dimensional parameters of the proposed power divider
Fig. 3.3 shows the reflection coefficient versus the normalized septum length $L_C/a$. The reflection coefficient is sensitive to the variation of the septum length, an optimum value of which is found to be $0.38a$. Fig. 3.4 shows the effect of the septum thickness on the reflection coefficient. Since smaller septum thicknesses lead to fabrication difficulties, the largest possible value $T_S = 0.09a$ has been chosen.

![Graph showing reflection coefficient versus frequency and septum length](image)

**Fig. 3.3** Reflection Coefficient versus the septum length
Fig. 3.4 Reflection coefficient versus the septum thickness

Fig. 3.5 shows variations of the reflection coefficient with the cavity width. The cavity width shifts the operating frequency while the cavity depth has a minor influence on the reflection coefficient.

Fig. 3.5 Reflection coefficient versus the cavity width
Figs. 3.6 and 3.7 show the reflection coefficient versus the length and height of the input matching waveguide section. The matching section length affects the operating frequency while the height has sensitive effects on the reflection coefficient.

![Graph showing reflection coefficient versus frequency for different matching waveguide lengths.]

**Fig. 3.6** Reflection coefficient versus the matching waveguide length

![Graph showing reflection coefficient versus frequency for different matching waveguide heights.]

**Fig. 3.7** Reflection coefficient versus the matching waveguide height
Based on the foregoing parametric analysis, we obtain near-optimum dimensions of the power divider, from which the final values are obtained with automatic optimization by the simulation software. Fig. 3.8 shows the reflection coefficient of the proposed power divider, which is less than –20 dB at 75–110 GHz in all cases \((b/a = 0.40, 0.50, 0.60)\). As mentioned earlier in the introduction, simulation by Microwave Studio has been widely proven to be accurate that we expect the design to be in close agreement with measurement when the proposed power divider is fabricated and tested.

![Reflection Coefficient of the Proposed Power Divider](image)

**Fig. 3.8** Reflection coefficient of the proposed power divider with Normalized dimensions
Table 3.1 shows the final dimensions of the proposed power divider. Standard WR-series waveguide have the ratio $b/a$ of the waveguide height to width ranging from 0.405 to 0.512. Dimensions in Table 3.1 are given for three values of $b/a$ (0.40, 0.50 and 0.60). They are normalized with respect to the waveguide broad-wall width so that they can readily be applied to other standard waveguides.

A design for a specific ratio of $b/a$ can be obtained from Table 3.1 by interpolation.

**Table 3.1** Normalized dimensions of the proposed power divider

<table>
<thead>
<tr>
<th>$b/a$</th>
<th>$L_5/a$</th>
<th>$T_5/a$</th>
<th>$W_0/a$</th>
<th>$D_0/a$</th>
<th>$L_M/a$</th>
<th>$H_M/a$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.40</td>
<td>0.39</td>
<td>0.09</td>
<td>0.43</td>
<td>0.14</td>
<td>0.48</td>
<td>0.36</td>
</tr>
<tr>
<td>0.50</td>
<td>0.38</td>
<td>0.09</td>
<td>0.42</td>
<td>0.14</td>
<td>0.47</td>
<td>0.42</td>
</tr>
<tr>
<td>0.60</td>
<td>0.39</td>
<td>0.08</td>
<td>0.54</td>
<td>0.08</td>
<td>0.43</td>
<td>0.50</td>
</tr>
</tbody>
</table>
3.3 Design of A Compact H-plane Power Divider with Variable Power Ratio

Output power ratios P2/P3 of up to 10 are achieved by offsetting the septum as shown in Fig.3.9. The offset is dictated by the smallest septum tip that can accurately be fabricated. Fig.3.10 shows the reflection coefficient of different distance between septum and the output port. Table 3.2 shows the dimensions of the proposed power divider of offsetting septum offset/a from 0 to 0.31.

![Fig. 3.9 Structure of the proposed power divider](image)

- 18 -
Fig. 3.10 Reflection coefficient of the proposed power divider versus septum

Fig. 3.11 Output power ratio of the proposed power divider versus septum
Table 3.2  Dimensions of the proposed power divider with offset

<table>
<thead>
<tr>
<th>Offset</th>
<th>DC1</th>
<th>LS1</th>
<th>TS1</th>
<th>WC1</th>
<th>DC2</th>
<th>LS2</th>
<th>TS2</th>
<th>WC2</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.38</td>
<td>0.09</td>
<td>0.43</td>
<td>0.14</td>
<td>0.48</td>
<td>0.36</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.12</td>
<td>0.40</td>
<td>0.11</td>
<td>0.43</td>
<td>0.14</td>
<td>0.47</td>
<td>0.42</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.24</td>
<td>0.42</td>
<td>0.14</td>
<td>0.43</td>
<td>0.14</td>
<td>0.47</td>
<td>0.42</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.31</td>
<td>0.44</td>
<td>0.20</td>
<td>0.43</td>
<td>0.14</td>
<td>0.56</td>
<td>0.42</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
IV Design of $E$-plane Power Dividers

4.1. Design of a Compact Power Divider with Equal Power Ratio

Fig 4.1 shows the structure of the proposed power divider. The input waveguide $G_1$ (Port 1) and two output waveguide ports $G_2$ (Port 2) and $G_3$ (Port 3) have the broad-wall dimension of $a$ and the narrow-wall dimension of $b$. At the junction center, we place a small symmetric section of a reduced-height waveguide $J$ with height $H_J$ and length $L_J$. The height of the junction waveguide $J$ is linearly increased over a length of $L_T$ from $H_J$ to $H_T$ by a tapered transition $T$. A stepped transition $S$ connects the tapered transition $T$ to the output waveguide ($G_2$, $G_3$). The optimum dimensions of the power divider have been obtained from parametric analysis followed by computer-aided optimization using Microwave Studio\textsuperscript{TM}.

Fig. 4.1 Structure of the power divider ($J$: Junction waveguide, $T$: Tapered transition, $S$: Stepped transition).
4.2. Design and Simulation of the E-plane Power Divider

Fig 4.2 shows the dimensional parameters of the power divider. Interior corners in the tapered transition T and in the stepped transition S are rounded with a radius of $0.16b$ for split-block fabrication using an end mill.

![Diagram of the E-plane Power Divider](image)

**Fig. 4.2** Dimensional parameters of the power divider.

Figs 4.3 to 4.7 show results of the parametric analysis for the power divider in the WR-10 waveguide (75–110 GHz, $a = 2.54$ mm, $b/a = 0.50$). Figs 4.3 and 4.4 show the reflection coefficient at the input waveguide ($S_{11}$) versus the height $H_J$ and length $L_J$ of the junction waveguide $J$. The level of the input impedance matching and the bandwidth are sensitive to the variations of $H_J$ and $L_J$. Fig 4.5 shows the effect of the length $L_T$ of the tapered transition $T$. The operating frequency range is shifted with variations in $L_T$. Figs 4.6 and 4.7 show the reflection coefficient change versus the height $H_S$ and length $L_S$ of the stepped transition $S$. As in the case of the junction waveguide, the input reflection
coefficient is sensitive to the changes in $H_S$ and $L_S$.

Fig. 4.3 Input reflection coefficient versus the junction waveguide height.

Fig. 4.4 Input reflection coefficient versus the junction waveguide length.
Fig. 4.5  Input reflection coefficient versus the tapered transition length.

![Graph showing input reflection coefficient versus tapered transition length](image)

Fig. 4.6  Input reflection coefficient versus the stepped transition height.

![Graph showing input reflection coefficient versus stepped transition height](image)
Fig. 4.7 Input reflection coefficient versus the stepped transition length.
Near-optimum dimensions can be obtained from parametric studies. Final optimum dimensions of the power divider have been obtained by using the automatic optimization functionality of Microwave Studio™ and are presented in Table 4.1 for the waveguide narrow-wall to broad-wall dimension \( b/a = 0.4, 0.5, \) and 0.6. Dimensions in Table 4.1 are normalized by the narrow-wall width \( b \). Standard WR-series rectangular waveguides have the aspect ratio \( (b/a) \) ranging from 0.405 to 0.512. Dimensions of a power divider for a specific value of \( b/a \) can be obtained from Table 4.1 by interpolation. Figure 4.8 shows the input reflection coefficient \( (S_{11}) \) at the input waveguide \( G_1 \). The reflection coefficient is less than \(-20 \text{ dB}\) at 75–110 GHz in all of three cases \((b/a = 0.4, 0.5, \text{ and } 0.6)\).

![Figure 4.8](image)

**Fig. 4.8** Input reflection coefficient \( (S_{11}) \) of the optimum power divider for different ratios of waveguide wall dimensions \((b/a)\).
### Table 4.1 Optimum dimensions of the power divider.

<table>
<thead>
<tr>
<th>$b/a$</th>
<th>$H_1/b$</th>
<th>$L_1/b$</th>
<th>$L_T/b$</th>
<th>$H_S/b$</th>
<th>$L_S/b$</th>
<th>$R/b$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.40</td>
<td>0.43</td>
<td>0.86</td>
<td>0.53</td>
<td>0.842</td>
<td>0.61</td>
<td>0.16</td>
</tr>
<tr>
<td>0.50</td>
<td>0.48</td>
<td>0.78</td>
<td>0.51</td>
<td>0.840</td>
<td>0.70</td>
<td>0.16</td>
</tr>
<tr>
<td>0.60</td>
<td>0.51</td>
<td>0.49</td>
<td>0.59</td>
<td>0.826</td>
<td>0.68</td>
<td>0.16</td>
</tr>
</tbody>
</table>
4.3 Design and Simulation of the $E$-plane Power Divider with Variable Power Ratio

The output power ratio can be increased if the offset increase. With additional impedance matching structures such as irises, posts and steps in waveguide width and/or height, one can achieve higher output power ratios while keeping the input reflection below $-20$ dB.

![Diagram of the proposed power divider with offset $a=0.094$.](image)

**Fig. 4.9** Structure of the proposed power divider with offset $a=0.094$
Fig. 4.10  Input reflection coefficient versus the offset.

Fig. 4.11  Performance of the proposed divider for power ratios
4.4. Design and Simulation of the \( E \)-plane Power Divider with Input Matching Section

![Diagram of the power divider](image)

**Fig. 4.12** Structure of the power divider (\( M \): Impedance matching section).

![Reflection Coefficient Graph](image)

**Fig. 4.13** Input reflection coefficient versus the two \( E \)-plane power divider

We can see the reflection coefficient with impedance matching section \( M \) can be achieved below \(-20\)dB operating at 65-110 GHz in Fig.4.13.
Figs 4.14 and 4.15 shows the level of the input impedance matching and the bandwidth are sensitive to the variations of $W_0$ and $H_0$.

![Fig. 4.14](image1.png)

**Fig. 4.14** Input reflection coefficient versus the impedance matching section $M$ width.

![Fig. 4.15](image2.png)

**Fig. 4.15** Input reflection coefficient versus the impedance matching section $M$ depth.
V. Full waveguide-band $E$-Plane Power Divider with High Output Power Ratio

5.1. $E$-plane Power Divider with Variable Power Ratio

Fig. 5.1 shows the structure of the proposed power divider. The power divider consists of a $T$-junction with rounded corners and a smoothly tapered septum. The output waveguides are denoted by Port 2 and Port 3, whose output power is $P_2$ and $P_3$, respectively. Output power ratios $P_2/P_3$ of up to 10 are achieved by offsetting the septum as shown in Fig 5.1. The maximum offset is dictated by the smallest possible gap between the septum tip that can accurately be fabricated.

![Diagram of power divider structure](image)

**Fig. 5.1** Proposed power divider structure for output power
5.2. Design and Simulation of the $E$-plane Power Divider

The output power ratio can be increased if the input reflection is allowed to increase up to $-15$ dB. With additional impedance matching structures such as irises, posts and steps in waveguide width and/or height, one can achieve higher output power ratios while keeping the input reflection below $-20$ dB. With proper impedance matching, power ratios can arbitrarily be increased by increasing the output waveguide taper while keeping reflection coefficient less than a specified value.

Fig. 5.2 shows design parameters of the proposed power divider. Rounded corners of the junction have radius $R_1$ while the septum has a circular taper of radius $R_2$. The sharp tip of the septum is removed such that the septum has length $L_2$. The septum offset $L_0$ controls the output power ratio. Parameters $R_1$, $R_2$ and $L_2$ are kept constant for all values of output power ratios.

![Diagram of the proposed power divider](image)

**Fig. 5.2** Dimensions of the proposed power divider

Fig. 36 shows the input reflection coefficient under $-20$ dB of 75-120 GHz. Figs
5.3 to 5.7 show the results of the parametric analysis for the power divider in the WR-10 waveguide(75-120GHz, $a=2.54\text{mm}$, $b/a=0.50$), with $R_1$ of about $0.7R_2$ and $L_0=0$. Figs 5.4 and 5.7 show the rounded corners of circular taper radius $R_2$ and the septum length $L_2$ are adjusted for reflection coefficient at the input waveguide (S11). Figs 5.5 and 5.6 show the effect of the junction radius $R_1$ and the septum offset $L_0$ is adjusted the operating frequency range. Figs 5.8 shows in the case of the junction waveguide, the output power ratio is sensitive to the changes in $L_0$, and the output power ratio is maximum at 75 GHz. Table 3 shows the dimensions of the designed power divider normalized by the broad wall width $a$.

Fig. 5.3 Input reflection coefficient of the $E$-plane power divider.
Fig. 5.4 Input reflection coefficient versus the septum length $L_2$.

Fig. 5.5 Input reflection coefficient versus the septum offset $L_0$. 
Fig. 5.6  Input reflection coefficient versus the rounded corners of the junction radius $R_1$

Fig. 5.7  Input reflection coefficient versus the rounded corners of circular taper radius $R_2$
Fig. 5.8 Output power ratio versus the septum offset $L_0$.

Table 5.1 Dimensions of the proposed power divider

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>$L_0 / b$</td>
<td>0 – 0.45</td>
</tr>
<tr>
<td>$R_1 / b$</td>
<td>1.64</td>
</tr>
<tr>
<td>$L_2 / b$</td>
<td>1.16</td>
</tr>
<tr>
<td>$R_2 / b$</td>
<td>2.27</td>
</tr>
</tbody>
</table>
VI. Conclusions

In this paper, we presented the new $E$- and $H$-plane power dividers and all cases operating over the full rectangular waveguide band with maximum high output power ratios while having reflection coefficient of less than $-20$ dB over the operating bandwidth of 75-110 GHz obtained using Microwave Studio™ by CST. All designs of the proposed power dividers was given for the WR-10 waveguide.

Optimum dimensions of the proposed power divider have been obtained by parametric analysis followed by computer optimization for the waveguide-wall aspect ratio $b/a$ of 0.4, 0.5 and 0.6. Dimensions have been given in terms of the broad-wall width $a$ so that a full-band power divider can be designed in any standard rectangular waveguide. The proposed power divider has an advantage of structural simplicity and ease of fabrication. The proposed power dividers concept can be applied to the design of waveguide components where the power needs to be divided over wideband with high ratios.
REFERENCES


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