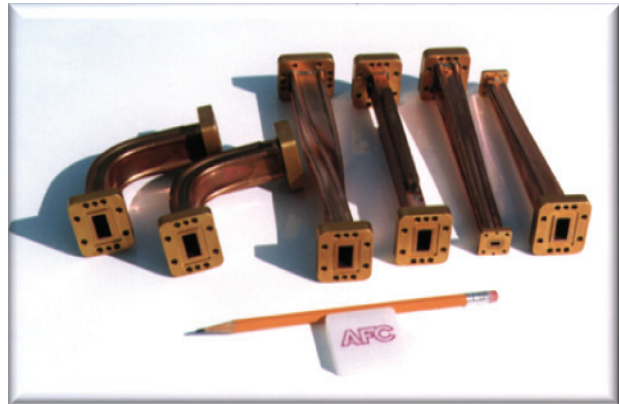




# Tallguide®

## Ultra Low-Loss Waveguide

**T**allguide® is an ultra low loss waveguide replacement for standard WR type waveguide. Side by side comparisons, in dB per foot, establish the order of a **ten-fold** improvement in transmission loss. Transition into and out of Tallguide is established by electroformed transition units. Tallguide has all the necessary components to design any waveguide run from the transmitter to the antenna. Between the Tallguide transition units are bends, twists, several straight sections and a mode suppressor. Tallguide is a multi-mode waveguide. Even with precision components, a small amount of higher order modes are still excited. The mode-suppressor in a Tallguide run preserves the signal linearity by absorbing all higher order modes. The signal linearity is further improved due to the fact that the wavelength of the Tallguide is larger than that of the standard waveguide. For power users, the power handling capability of the Tallguide is typically four to five times higher than the power amount safely carried by standard waveguide. Therefore, Tallguide serves as a good alternative in places where water-cooled or air-fin cooled waveguide runs are used. Where satellite uplinks are limited by maximum EIRP, Tallguide replacement runs typically offer an improvement of the order of 4 to 5 dB. Such power savings may be used to scale down antenna size by 40 percent. Reduction antenna size would lead to substantial savings in site civil works and installation costs. Tallguide is installed similar to ordinary rectangular waveguide. No special alignment or tools are required.



*AFC's Tallguide products showing bends, twists and transitions*

The promise of oversized waveguides for low loss transmission has been under investigation for years. A few different circular waveguides have been developed for specialized applications. In the circular  $TE_{11}$  mode, the most common example is the feed for the horn reflector antenna used at most of the terrestrial microwave or satellite earth stations. Mode trapping is not a primary concern for this application. In the circular  $TE_{01}$  mode, the primary application is for extremely high power handling capability used in fusion energy research. In this mode, the curvature of the E field makes efficient mode suppression difficult. Tallguide uses precision rectangular waveguides for operation in the  $TE_{01}$  mode. In this mode the E-field lines are straight and parallel to the broad wall of the waveguide. High order modes are easily suppressed with the use of low loss, high temperature mode suppressor units.

## Features

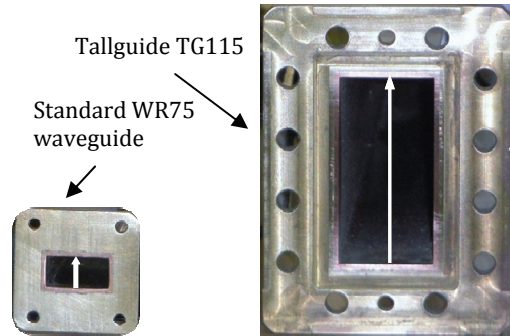
- ◆ *Low attenuation; typically 1/10 of standard size waveguides*
- ◆ *Standard components cover the frequency range 5 to 220 GHz*
- ◆ *High power handling capability*
- ◆ *Includes bends and twists for any complex installation*
- ◆ *Low loss means reduced system, antenna, civil works and installation costs*
- ◆ *No special alignment or tools required*
- ◆ *Quick delivery with standard components*

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The diagram illustrates the actual size of a standard waveguide (WR75) and a Tallguide (TG115) for operation in the 10 to 15 GHz range. The transition units, used to convert the standard waveguide to the Tallguide dimensions, feature a sophisticated design to provide mode free operation. The hyperbolic secant H-plane bends and non-linear twists also feature mode free operation. This insures zero delay distortion, critical to satellite communications, digital microwave, super radar and ECM applications.



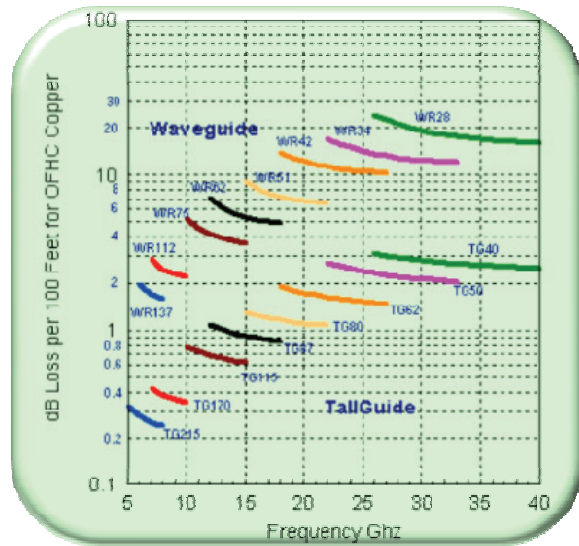
Size comparison of standard WR75 and Tallguide TG115 also showing the E-field orientation

## Selection of Tallguide Components

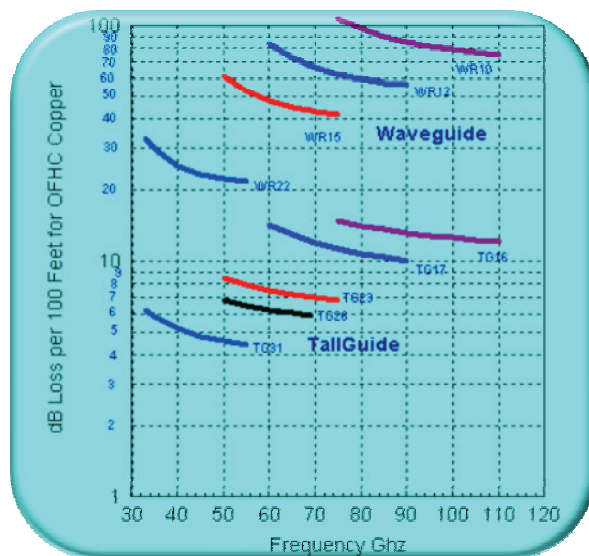
AFC can provide the exact Tallguide system to match your requirements. There is a Tallguide band equivalent to each standard WR waveguide band. The thirteen different rectangular waveguide bands described in this sheet cover the common frequency range of 5.8 to 110 GHz. Available options include special designs for unique applications, choice of different flanges, and Tallguide for operation from 5 GHz up to 220 GHz. The [Model Selection Table](#) lists the thirteen common different types of Tallguide and the part numbers for each component associated with a particular waveguide.

The graphs illustrate **the power savings** for Tallguide and the corresponding transmission loss for standard waveguides. Since most radar installations involve a common Tallguide for both a transmit and a receive path, the savings are doubled when considering the overall system. Tallguide power savings in dB, are a factor of 6 to 10 times better in comparison with standard waveguide. For power users, Tallguide power handling capability is typically 4 to 5 times higher than that of the standard waveguide. Tallguide does not require any special alignment or tools for installation.

**Transition** units provide the conversion from standard waveguides to the Tallguide dimensions. A transition unit is required at each end of the Tallguide run. Transition units are available with an input cover (-1), or an input grooved (-2) flange for pressure gasket.



Insertion Loss comparison between standard waveguide and Tallguide (5 to 40 GHz)



Insertion Loss comparison between standard waveguide and Tallguide (30 to 120 GHz)

The **straight** Tallguide sections are available in any length up to 12 feet. The dash number is used to identify the desired length in inches. For example, a straight Tallguide 10 feet, 6-1/2 inches long would be identified as -126.5.

The **mode suppressors** listed in the table are for the most common application in that particular frequency range. One is required within each Tallguide run.

For something out of the ordinary, mode suppressors for special applications may have to be modified to provide optimum performance.

**Bends** in the H plane for Tallguide look like E plane bends in standard waveguides. However, in order to insure mode free operation, the Tallguide bends are limited to H plane bends. To simplify installation, AFC offers 90 degree Tallguide twists. These may be used with Tallguide H plane bends, located after the transition units, to accomplish an E plane bend result.

### Tallguide Model Selection Table

Frequency Range GHz	Standard Waveguide WRxxx	Tallguide TGxxx	Tallguide Attenuation dB per 100ft.	Component Part Number				
				Transition Units	Straight Sections	Mode Suppressor	H-Plane Bend	90-deg Twist
5.8 to 8.2	WR137	<a href="#">TG215</a>	0.28 to 0.24	181-1364-x	181-1368-y	181-1365	181-1367	181-1366
7.0 to 10.0	WR112	<a href="#">TG170</a>	0.41 to 0.35	181-1167-x	181-1166-y	181-1168	181-1169	181-1170
8.2 to 12.4	WR90	<a href="#">TG134</a>	0.58 to 0.43	181-1359-x	181-1363-y	181-1360	181-1362	181-1361
10 to 15	WR75	<a href="#">TG115</a>	0.78 to 0.63	181-1078-x	181-0911-y	181-1079	181-1080	181-1081
12 to 20	WR62	<a href="#">TG87</a>	1.25 to 0.93	181-0770-x	181-0769-y	181-0775	181-0782	181-0877
15 to 22	WR51	<a href="#">TG80</a>	1.30 to 1.08	181-0995-x	181-0997-y	181-0996	181-0998	181-0999
17 to 27	WR42	<a href="#">TG62</a>	1.91 to 1.47	181-1082-x	181-1076-y	181-1083	181-1084	181-1085
22 to 33	WR34	<a href="#">TG50</a>	2.71 to 2.05	181-1086-x	181-1087-y	181-1088	181-1090	181-1092
26 to 40	WR28	<a href="#">TG40</a>	3.98 to 2.88	181-1087-x	181-0913-y	181-1089	181-1091	181-1093
33 to 55	WR22	<a href="#">TG31</a>	6.20 to 4.50	181-1374-x	181-1378-y	181-1375	181-1377	181-1376
50 to 75	WR15	<a href="#">TG23</a>	8.50 to 6.80	181-1380-x	181-1384-y	181-1381	181-1383	181-1382
60 to 90	WR12	<a href="#">TG17</a>	15.0 to 10.0	181-1404-x	181-1407-y	181-1408	181-1406	181-1405
75 to 110	WR10	<a href="#">TG16</a>	17.0 to 13.0	181-1385-x	181-1389-y	181-1386	181-1388	181-1387

x: indicate 1 for input cover flange; 2 for grooved flange. y: section length in inches.

Contact the AFC sales department at [sales@afcsat.com](mailto:sales@afcsat.com) for other Tallguide bands.

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