BC111: Bidirectional Coupler for WR340 Waveguide

General Description

BC111 (Fig. 1) is a dual directional (bidirectional) coupler intended for simultaneous sampling the powers of both incident and reflected wave in high-power 2450 MHz industrial applications using WR340 (R26) rectangular waveguide.

The coupling mechanism involves two probes (antennas) inserted into the waveguide, outputs of which are appropriately combined and distributed to the two output connectors.

The coupler integrates two attenuators to isolate the internal coupling structure from the coupled port loads, and to improve the coupled port match.

Standard coupling factor is -60 dB, allowing maximal waveguide working power 10 kW.

The BC111 coupler module is fastened to a parent waveguide by means of six M3 or similar-diameter screws after machining of appropriate holes in the waveguide wall (see the waveguide machining template shown in Fig. 5).

Alternatively, a calibrated assembly consisting of a BC111 fixed to a precisely machined parent waveguide with standard length 174 mm can be provided (Fig. 2).

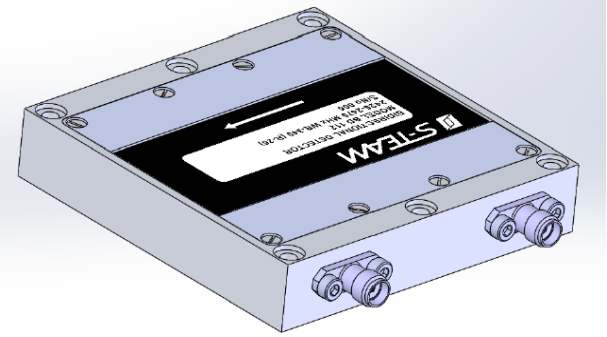

Fig. 1. Bidirectional coupler BC111.

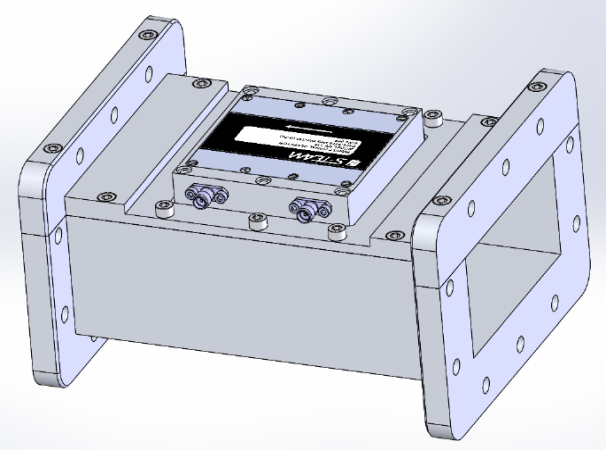

Fig. 2. BC111 installed on a standard-length waveguide.

Specifications

Waveguide of destination	WR340 (R26)
Waveguide wall thickness	2 mm ± 0.025 mm
Frequency range	2425 – 2475 MHz
Coupling factor/Max working power	-60 dB / 10 kW
Coupling factor uncertainty limits (3-σ deviation)	±1 dB
Directivity	25 dB min
Coupled ports impedance	50 Ω
Coupled ports connectors	SMAf
Dimensions (L x W x H)	73 mm × 82.5 mm × 19.5 mm
Mass	160 g
Waveguide surface flatness required at BC interface	0.04 mm
Surface finish	E-CLPS 4600
Operating temperature range	-10 °C to +65 °C
Storage temperature range	-20 °C to +80 °C

Typical Directivity

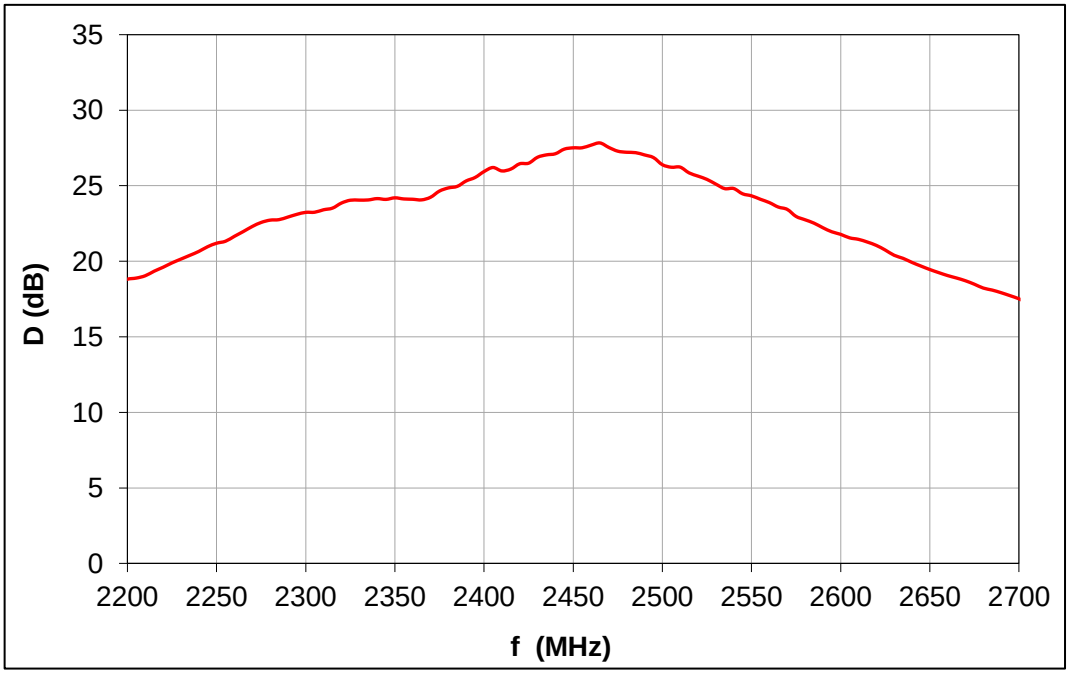

Fig. 3. Typical BC111 directivity (both directions).

Dimensional Drawing

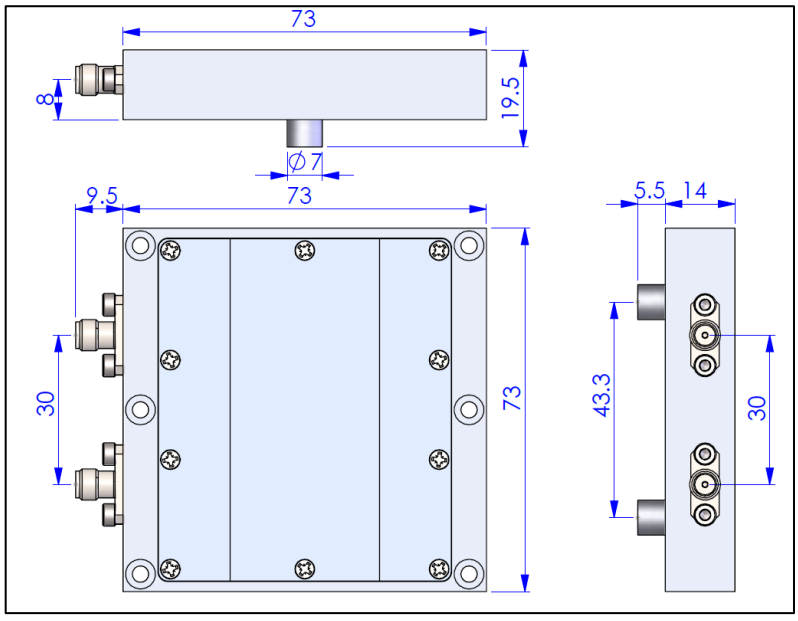

Fig. 4. Basic BC111 dimensions (version with SMAf connectors). All dimensions are in millimeters.

Waveguide Machining Template

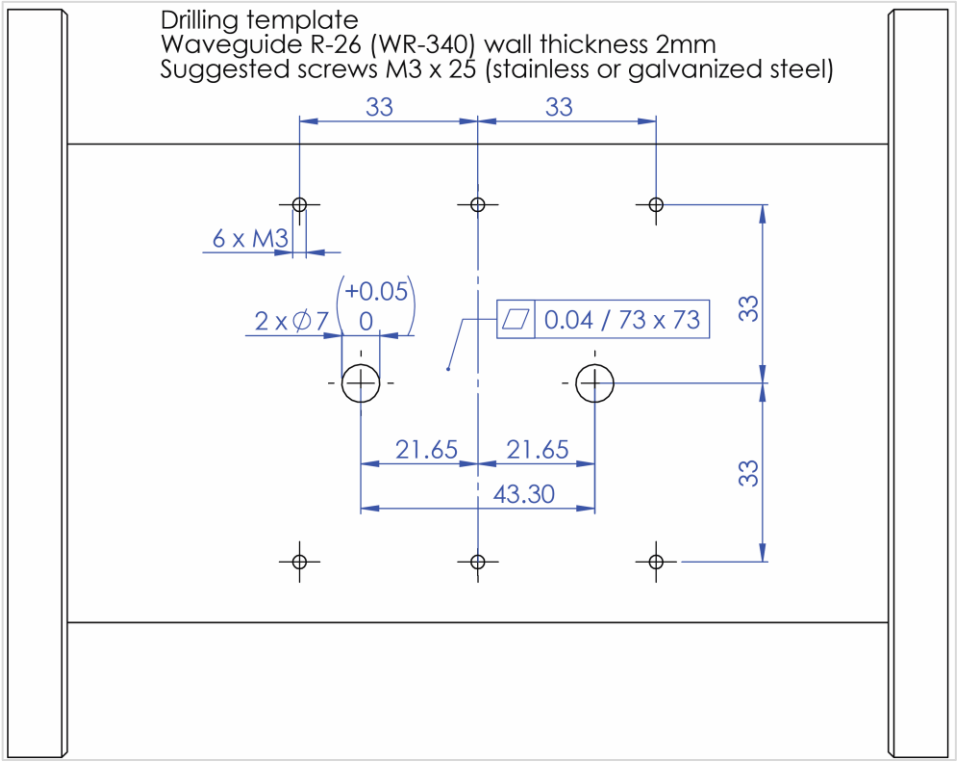

Fig. 5. Waveguide machining template. All dimensions are in millimeters. The pattern is centered about the waveguide axis. The waveguide wall thickness must be 2 mm.

Important Note

Complying with the specified waveguide wall thickness and flatness of its surface interfacing with the BC111 is essential for the specified coupling factor. The slope of the coupling factor as a function of the wall thickness is about -6 dB/mm (increasing the wall thickness decreases the coupled power).

If the wall thickness differs from the specified figure but is known, a user-defined correction based on the above slope can be applied. Nevertheless, the wall thickness should not deviate from the specification by more than ±0.3 mm, otherwise the BC111 directivity will deteriorate.

To avoid problems with manufacturing precision waveguide components, a calibrated assembly consisting of a BC111 module fixed to a parent waveguide can be ordered. Standard waveguide length is 174 mm.