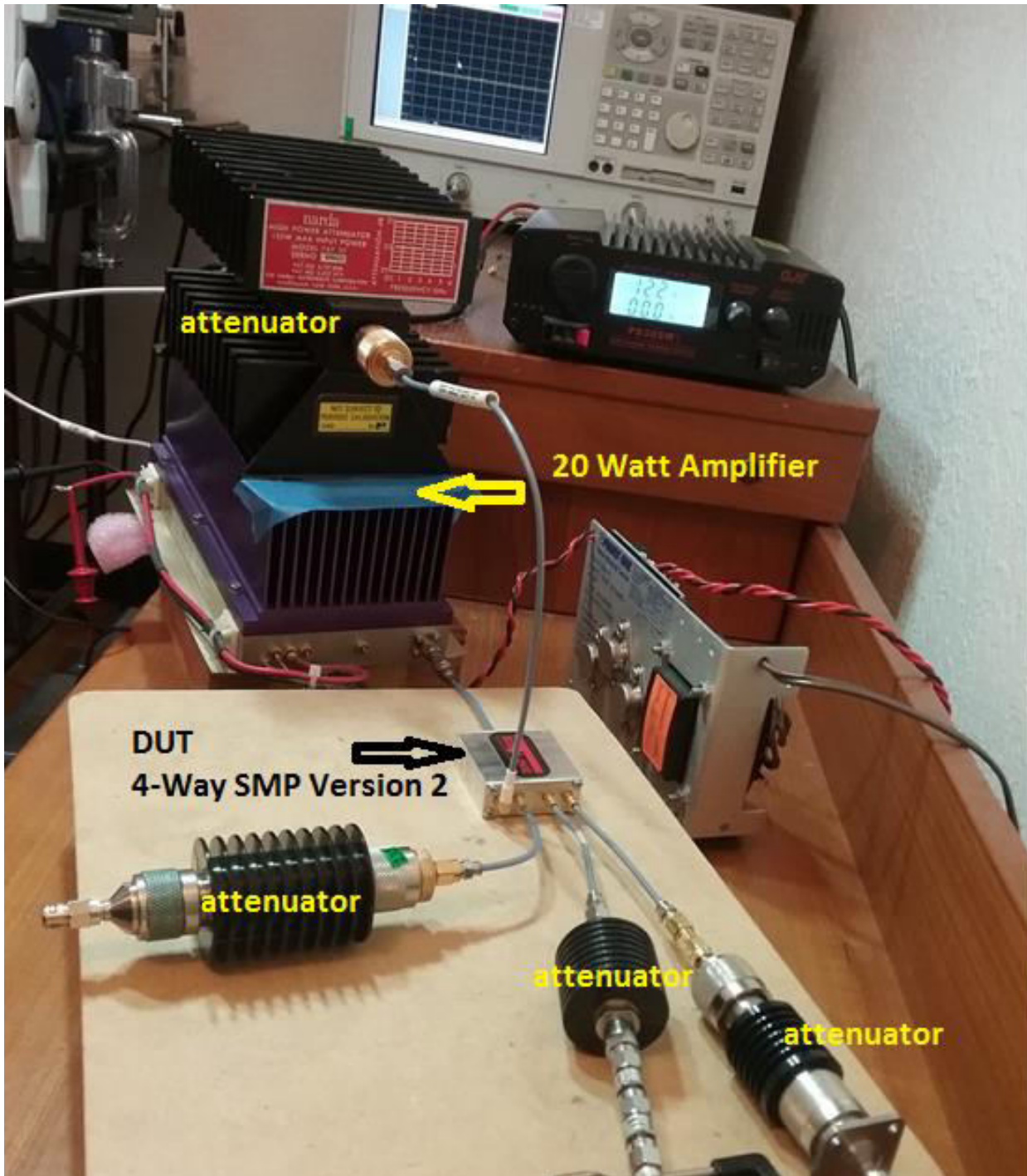


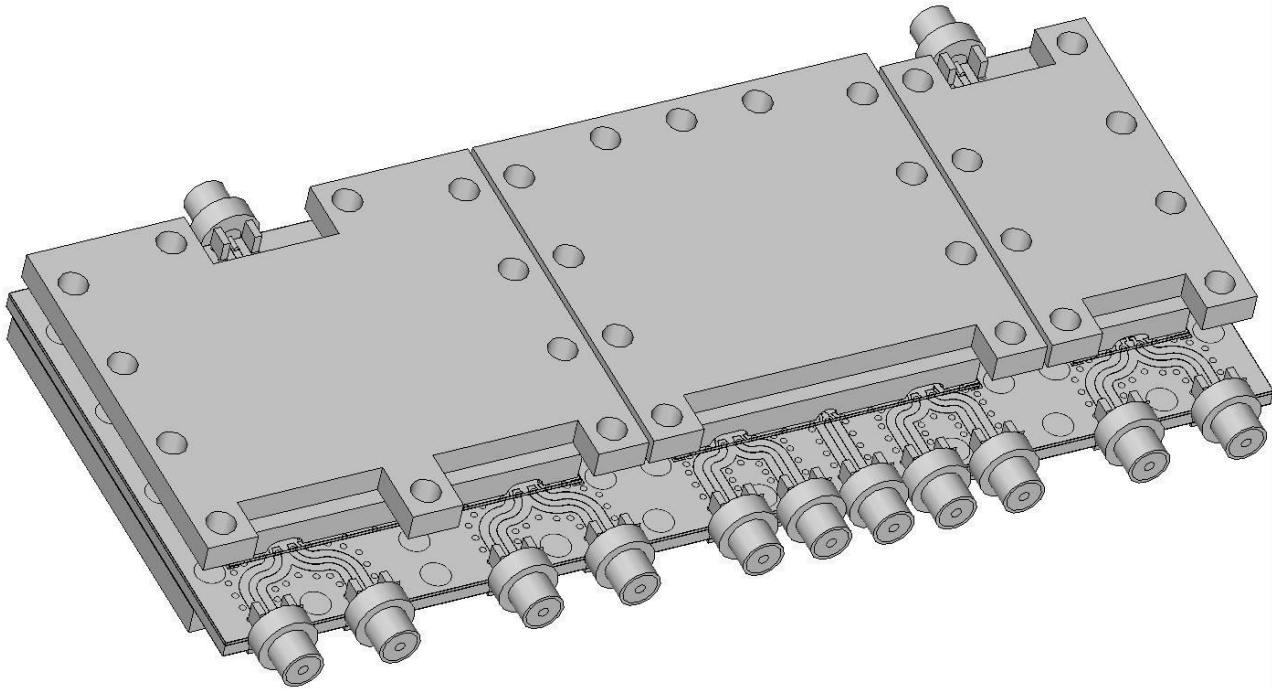


### High Power Splitter Testing Conditions

1) 20 Watt testing of [BBTLine's Surface Mount RF Splitters](#) occurs at a CW frequency of 3.55 GHz using a narrow-band amplifier with maximum 20 watt output power as shown below:



- 2) All devices tested to-date at elevated power levels show no damage and/or S-parameter deviations/shifts from their original room-temperature/low-power S-parameters.
- 3) High power testing occurs with high power attenuators as loads. These high power attenuators have good return loss characteristics. So, virtually no reflected load power is returned to the splitter.
- 4) High power testing of the Surface Mount (SMT) devices occurred using the [splitter evaluation board](#) with associated “stiffener plates” as shown below:



The “stiffener plates” do offer a significant level of heat-sinking since they are 93 mil thick Aluminum plates (one plate is placed in direct contact with the lid of the SMT splitter and the other plates is placed on the backside of the evaluation board...secured top to bottom with 2-56 screws/nuts). These plates are recommended for high power applications of BBTLIne’s Surface Mount Products.

See the following documents for more detail:

“TB\_with\_SMP\_splitters\_plates.sat” - A .sat 3-D Mechanical File With Structure Details

“Evaluation\_Board\_Cautions\_5\_14\_2017.pdf” - Document Outlining Evaluation Board Cautions And Usage

“BBTLIne\_Splitter\_Evaluation\_Board\_Preliminary\_5\_14\_2017.pdf” - Details/Images Of Evaluation Board/Stiffeners.

- 5) Because the splitters are internally constructed using 0201 (20 mil by 10 mil) isolation resistors, there is a significant difference between maximum Splitter power and maximum Combiner power. Maximum Combiner power is limited by the power rating of an 0201 resistor (50 mW’s or +17 dBm at room temperature) and would occur under the worst-case condition of Combining two same-frequency and perfectly anti-phase signals (0 degrees/180 degrees). This is not a practical operating condition because this would yield no power at the common port - but, it serves to indicate the worst-case power conditions for the device operated as a combiner.
- 6) Because there is a large difference between maximum splitting power and maximum combining power, care must be taken to understand the splitter load return loss levels (in order to avoid damaging the splitter with reflected power from the loads). For example, with the 4-Way “Version 1” splitter, the device is roughly 80% efficient at 3.55 GHz. If 20 watts is injected at the common port, there will be 16 watts output spread across the four ports (four watts per port). The splitter itself will consume roughly four watts (hence the need for the heat-sinking from the “plates”). If the return loss of the splitter leg loads is poor (e.g., on the order of -10 dB), this would mean that 400 mW’s of power would be reflected from the splitter loads back into the splitter (true for each of the four legs of the splitter). This condition would clearly exceed the 50 mW’s of the internal 0201 resistors and damage could result. If the return

loss of the splitter leg loads is much better (e.g., -20 dB), then only 40 mW's of RF power will be reflected back into the splitter (for each of the four legs). There would be no damage in this case. These are the issues that must be carefully thought through when using BBTLLine's RF Splitters.

7) The high power test procedure involves the following steps: a) gather baseline Splitter S-parameters at room temperature, b) adjust Splitter common port RF input power to 1 watt, let unit sit for one hour and then gather S-parameters, c) adjust RF input power to 2 watts, let unit sit for one hour and then gather S-parameters, d) adjust RF input power to 4 watts, let unit sit for one hour and then gather S-parameters, e) adjust RF input power to 10 watts, let unit sit for one hour and then gather S-parameters, f) adjust RF input power to 20 watts, let unit sit for one hour and then gather S-parameters. Compare all S-parameters to original room-temperature S-parameters. **No noticeable shift of any S-parameters has been noticed to-date.**

8) It is the responsibility of the consumer to test under any test conditions deviating from the above (e.g., different temperatures, frequencies, heat-sinking conditions, etc.) to ensure that BBTLLine's devices will meet their specific needs.

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