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(19) **United States**(12) **Patent Application Publication****Yoon et al.**(10) **Pub. No.: US 2022/0368291 A1**(43) **Pub. Date: Nov. 17, 2022**(54) **SPATIAL POWER-COMBINING DEVICES  
WITH REDUCED SIZE****H01L 23/00** (2006.01)**H01P 3/06** (2006.01)(71) Applicant: **Qorvo US, Inc.**, Greensboro, NC (US)(72) Inventors: **Soack Dae Yoon**, Torrance, CA (US);  
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Park, CA (US)(52) **U.S. Cl.**  
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**2924/1423** (2013.01)(21) Appl. No.: **17/811,911**(22) Filed: **Jul. 12, 2022****Related U.S. Application Data**(63) Continuation of application No. 16/820,880, filed on  
Mar. 17, 2020, now Pat. No. 11,387,791.**Publication Classification**(51) **Int. Cl.**  
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**H03F 3/21** (2006.01)  
**H01P 3/08** (2006.01)(57) **ABSTRACT**

Spatial power-combining devices with reduced dimensions are disclosed. Spatial power-combining devices are provided that employ a hybrid structure including both a planar splitter/combiner and an antipodal antenna array. Planar splitters may be arranged to divide an input signal while antipodal antenna arrays may be arranged to combine amplified signals. In other applications, the order may be reversed such that antipodal antenna arrays are arranged to divide an input signal while a planar combiner is arranged to combine amplified signals. Advantages of such spatial power-combining devices include reduced size and weight while maintaining suitable performance for operation in desired frequency bands.

