

TABLE I. SUMMARY OF THE BEAMFORMER PERFORMANCE

Technology	0.18 $\mu$ m SiGe BiCMOS (Jazz SiGe120, 1P6M)
Frequency band	Q-Band (40-45 GHz)
Supply voltage	5 V (analog), 3.3 V (digital)
Current consumption	720 mA
Chip area	2.6x3.2 mm <sup>2</sup>
Single Path Characteristics	
Input return loss	$\leq -10$ dB @ 36.6-50 GHz
Output return loss	$\leq -10$ dB @ 37.6-50 GHz
Channel power gain (ave)	12.5 dB @ 42.5 GHz (3-dB BW: 40-45 GHz)
Phase resolution	4-bit
Gain variation (for 4-bit phase states)	$< 1.3$ dB (RMS) @ 35-50 GHz
Phase error (for 4-bit phase states)	$< 8.8^\circ$ (RMS) @ 35-50 GHz
Output $P_{1dB}$	$-5 \pm 1.5$ dBm @ 42.5 GHz
Maximum output power ( $P_{sat}$ )	$-2.5 \pm 1.5$ dBm @ 42.5 GHz
Isolation (output-to-input)	$\leq -55$ dB @ 35-50 GHz
Array Characteristics	
Phase mismatch (RMS)	$\leq 7^\circ$ @ 40-50 GHz (between all channels)
Amplitude mismatch (RMS)	$\leq 1.8$ dB @ 40-50 GHz (between all channels)
Isolation (channel-to-channel)	$\leq -30$ dB @ 35-50 GHz
Array factor directivity	12 dB (16 elements)