Abstract—Here, we propose a novel leaky-wave antenna operating in the V-band. The antenna provides high broadside efficiency and low return loss in the frequency range of operation from 50 to 70 GHz. The antenna consists of an array of substrate integrated waveguide fed dipoles and can be fabricated through cost-effective PCB processes. High peak directivities of over 20 dBi are obtained for a compact (4 x 80 mm²) array consisting of only 20 unit cells. The directivity is flat (+/- 1 dB deviation) and can be further increased by enlarging the array. Furthermore the antenna provides over 40 deg of beam steering in the frequency range of operation.

I. INTRODUCTION

The advent of 60 GHz mobile access necessitates directive beam steering antennas and a cost effective technology. Leaky-wave antennas (LWAs) can complement the flexible C-RoF systems envisaged to provide cost-effective solutions for mobile fronthauling and WiGig [1]. In order to employ LWAs, e.g., for 60 GHz WiGig applications, a high radiation efficiency, large steering angle, low return loss and a linear dispersion behavior are required. In this paper, we report on a novel LWA based on a substrate integrated waveguide (SIW), which is low loss and has an almost linear dispersion slope besides near the cut-off frequency [2]. The LWA employs printed dipoles as radiating elements, which increases the radiation efficiency around broadside and allows for a low return loss (RL) without need for special launch structures, needed for other LWA designs [3].

II. RESULTS

The proposed antenna (depicted in Fig. 1) is designed to exhibit broadside radiation around 61.4 GHz in the middle of the 57-66 GHz band by employing Eigenmode simulations. Through asymmetrical positioning of the printed dipoles the open-stopband of the LWA is reduced [4]. Thereby the RL stays below -13 dB, even around broadside, resulting in high radiation efficiency between 60 % and 89 % as presented in Fig. 2. The radiation efficiency is limited primarily by a high S12 between -5 dB and -12 dB, which can be compensated by employing larger LWA arrays or meandered antennas.

The LWA provides improved high directivity as well as beam steering capabilities in the H-plane as shown in Fig. 3. The radiation patterns demonstrate peak directivities over 20 dBi, FTBR of 20 dB and beam steering capabilities from -28 deg to +15 deg versus broadside within the used frequency range.

REFERENCES