

An origami-based multilayer structure suitable for passive chipless radio frequency identification applications is presented in this paper. Contrary to the existing multilayer designs where metallic via is used for the interconnections, the proposed technique uses the folding of the structure designed in a flexible substrate. Thus, the multilayer structure is obtained from a thin printed circuit board that is folded to give the desired 3-D structure. The proposed structure consists of cascaded commensurate transmission line sections (also known as C-sections) coupled at alternative ends. The group delay (GD) characteristic of the C-sections is utilized for encoding. Broad side coupling of the structure is exploited here, which enables large GD with higher frequency selectivity. It is proved that to produce the same amount of delay, linearly cascaded C-sections demands five times more number of C-sections than that of a multilayered structure, which also signifies the factor of miniaturization of the proposed design. A coding capacity of 6 and 12 b is estimated from the simulation, respectively, for single group and multigroup of multilayered C-sections in the allowed industrial, scientific, and medical (ISM) bands. This shows for the first time that frequency domain chipless technology can be compatible with the use of ISM bands. It also allows a coding capacity of 43 b in the ultra-wideband band which is comparable with the EAN 13 barcode.