The purpose of the study was to developed special birdcage resonators for small objects including human wrist, hand and small animals at 3T MRI/MRS. Ahead of substantial development, different types of parameters based on theoretical analysis through lumped element transmission line theory were arranged. Following making the birdcage resonators, the primary analysis was performed with network analyzer (HP 4195A) and finally experimental analysis was carried out with 3T MRI (Medinus, Korea). The manufactured birdcage resonator is typically composed of 12-element structures to which low-pass filter is fundamentally applied. The diameter and length of each element of birdcage resonator are as follows. (1) diameter 13□, length of element 22□, (2) diameter 15□, length of element 22□, (3) diameter 17□, length of element 25□. The copper tape with the width of 1 cm was used for the coils. MRI acquisition parameters are TR=500ms, TE=17ms, Ave=2 for T1-WT images, and TR=4000ms, TE=96ms, Ave=2 for T2-WT images. The ratio of sample's diameter and birdcage resonator's was approximately 55%, 63% and 70%. Consequently this study determined that it is obtained the best quality of image and S/R when the ratio of object's diameter is approximately 50□80 . A general theoretical analysis of birdcage coil has many differences from experimental results. The reason why it was influenced by many factors which were not considering when a general theoretical analysis of birdcage coil was performed. The induced resistance may be considered as part of the resistive loss if quantitative value can be found, using a radiation resistance approach.