

**TABLE 1** Parametric analysis of the tag with uniform and non-uniform meandered lines

S.N.	No. of turns of element g'	No. of turns of element h'	Uniform meander lines			Non-uniform meander lines		
			t	Gain dBi	Read Range (m)	t	Gain dBi	Read Range (m)
1	1	0	0.2252	-1.5	4.13	0.2420	-0.5	4.81
2	2	0	0.2801	-0.5	5.18	0.3039	0.0	5.71
3	3	0	0.2908	-0.4	5.33	0.3297	0.1	6.02
4	1	1	0.3290	-0.4	5.67	0.3844	0.2	6.57
5	1	2	0.4192	0	6.71	0.6522	0.8	9.18
6	2	1	0.3861	-0.2	6.29	0.5350	0.8	8.31
7	2	2	0.5383	0.4	7.96	0.8042	0.8	10.19
8	3	0	0.4365	0.3	7.09	0.5655	0.6	8.35
9	3	2	0.5826	0.7	8.57	0.8213	0.9	10.4

**TABLE 2** Trimming and bending performance of the tag antenna arms.

S.N.	Left arm (mm)	Earlier tag		Proposed tag		S.N.	Right arm (mm)	Earlier tag		Proposed tag	
		Return Loss (dB)	Read Range (m)	Return Loss (dB)	Read Range (m)			Return Loss (dB)	Read Range (m)	Return Loss (dB)	Read Range (m)
1	00	41	10.8	28	10.40	1	00	41	10.8	28	10.40
2	01	38	10.6	27	9.90	2	01	41	10.7	27	9.50
3	02	32	10.0	26	9.10	3	02	34	10.4	26	9.40
4	03	29	9.60	26	9.00	4	03	29	10.2	26	8.70
5	04	25	9.46	26	8.50	5	04	22	8.70	25	7.90
6	05	25	9.33	26	8.00	6	05	23	7.20	25	7.00
7	06	24	9.22	25	7.30	7	06	23	6.80	24	6.70
8	07	24	7.67	25	7.00	8	07	23	6.54	25	6.60
9	08	23	7.12	25	6.70	9	08	22	6.60	24	6.40
10	09	23	6.92	24	6.50	10	09	23	6.60	24	6.50
			Bending angle(degree)	15°	30°	45°	75°	95°	130°	190°	
			Read Range(m)	10.4	10.33	10.3	10.3	10.24	9.74	8.13	

**TABLE 3** Measured read range and trimming data of the proposed tag.

Tags	Size(mm ×mm)	Theoretical read range (m)		Measured read range (m)		S.N.	Trimming	Earlier design	Proposed design	Trimming	Earlier design	Proposed design
		ETSI band	FCC band	ETSI band	FCC band		Left arm (mm)	Read Range (m)	Read Range (m)	Right arm (mm)	Read Range (m)	Read Range (m)
Earlier design	16×67	10.8	10.2	10.2	9.8	1	00	10.2	10.1	00	10.2	10.1

Proposed design	16×67	10.4	10.0	10.1	9.7	2	03	9.0	8.0	03	9.0	8.0
						3	06	8.0	7.0	06	6.5	6.5
						4	09	6.5	6.0	09	5.5	5.7