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RF EXPOSURE EVALUATION

Applicant	**: NEID CO.,LTD.**
Applicant Address	**: 1363, Hyohaeng-ro, Hwaseong-si, Gyeonggi-do, Republic of Korea**
Kind of Product	**: RFID Reader for PR-TL (NA-Holder)**
Equipment model name	**: RFID Reader for PR-TL (NA-Holder)**
FCC ID	**: 2BB8X-HOLDER**
IC	**: 31018-HOLDER**

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Standard Requirement

- FCC Rules
Following FCC KDB 447498D01 "General SAR test exclusion guidance"
The corresponding SAR Exclusion Threshold condition, listed below :

a) For 100 MHz to 6 GHz and test separation distances ≤ 50 mm, the 1-g and 10-g SAR test
   exclusion thresholds are determined by the following:
   [(max. power of channel, including tune-up tolerance, mW) / (min. test separation distance,
   mm)] x [$\sqrt{f(GHz)}$] ≤ 3.0 for 1-g SAR, and ≤ 7.5 for 10-g extremity SAR,30 where
     * f(GHz) is the RF channel transmit frequency in GHz
     * Power and distance are rounded to the nearest mW and mm before calculation
     * The result is rounded to one decimal place for comparison
     * The values 3.0 and 7.5 are referred to as numeric thresholds in step b) below
   The test exclusions are applicable only when the minimum test separation distance is ≤ 50
   mm, and for transmission frequencies between 100 MHz and 6 GHz. When the minimum
   test separation distance is < 5 mm, a distance of 5 mm according to 4.1 f) is applied to
   determine SAR test exclusion.

b) For 100 MHz to 6 GHz and test separation distances > 50 mm, the 1-g and 10-g SAR test
   exclusion thresholds are determined by the following (also illustrated in Appendix B):
   1) {[Power allowed at numeric threshold for 50 mm in step a)] + [(test separation distance
      − 50 mm)x(f(MHz)/150)]} mW, for 100 MHz to 1500 MHz
   2) {[Power allowed at numeric threshold for 50 mm in step a)] + [(test separation distanc
      − 50 mm)x10]} mW, for > 1500 MHz and ≤ 6 GHz

c) For frequencies below 100 MHz, the following may be considered for SAR test exclusion
   (also illustrated in Appendix C):
   1) For test separation distances > 50 mm and < 200 mm, the power threshold at the
       corresponding test separation distance at 100 MHz in step b) is multiplied by [1 +
       log(100/f(MHz))]
   2) For test separation distances ≤ 50 mm, the power threshold determined by the equation
      in c) 1) for 50 mm and 100 MHz is multiplied by 1/2
   3) SAR measurement procedures are not established below 100 MHz.

Appendix C

SAR Test Exclusion Thresholds for < 100 MHz and < 200 mm

Approximate SAR test exclusion power thresholds at selected frequencies and test separation distances
are illustrated in the following table. The equation and threshold in 4.3.1 must be applied to determine
SAR test exclusion.

MHz	< 50	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	mm
100	237	474	481	487	494	501	507	514	521	527	534	541	547	554	561	567	
50	308	617	625	634	643	651	660	669	677	686	695	703	712	721	729	738	
10	474	948	961	975	988	1001	1015	1028	1041	1055	1068	1081	1095	1108	1121	1135	
1	711	1422	1442	1462	1482	1502	1522	1542	1562	1582	1602	1622	1642	1662	1682	1702	mW
0.1	948	1896	1923	1949	1976	2003	2029	2056	2083	2109	2136	2163	2189	2216	2243	2269	
0.05	1019	2039	2067	2096	2125	2153	2182	2211	2239	2268	2297	2325	2354	2383	2411	2440	
0.01	1185	2370	2403	2437	2470	2503	2537	2570	2603	2637	2670	2703	2737	2770	2803	2837	

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- ISED Rules
Following RSS-102 Issue 5, Section 2.5.1
The corresponding SAR Exclusion Threshold condition, listed below :

SAR evaluation is required if the separation distance between the user and/or bystander and the antenna and/or radiating element of the device is less than or equal to 20 cm, except when the device operates at or below the applicable output power level (adjusted for tune-up tolerance) for the specified separation distance defined in Table 1.

Table 1: SAR evaluation - Exemption limits for routine evaluation based on frequency and separation distance

Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of ≤5 mm	At separation distance of 10 mm	At separation distance of 15 mm	At separation distance of 20 mm	At separation distance of 25 mm
≤300	71 mW	101 mW	132 mW	162 mW	193 mW
450	52 mW	70 mW	88 mW	106 mW	123 mW
835	17 mW	30 mW	42 mW	55 mW	67 mW
1900	7 mW	10 mW	18 mW	34 mW	60 mW
2450	4 mW	7 mW	15 mW	30 mW	52 mW
3500	2 mW	6 mW	16 mW	32 mW	55 mW
5800	1 mW	6 mW	15 mW	27 mW	41 mW

Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of 30 mm	At separation distance of 35 mm	At separation distance of 40 mm	At separation distance of 45 mm	At separation distance of ≥50 mm
≤300	223 mW	254 mW	284 mW	315 mW	345 mW
450	141 mW	159 mW	177 mW	195 mW	213 mW
835	80 mW	92 mW	105 mW	117 mW	130 mW
1900	99 mW	153 mW	225 mW	316 mW	431 mW
2450	83 mW	123 mW	173 mW	235 mW	309 mW
3500	86 mW	124 mW	170 mW	225 mW	290 mW
5800	56 mW	71 mW	85 mW	97 mW	106 mW

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MPE Calculations

$$P = \frac{P_t G_t}{4\pi r^2} = \frac{V^2}{Z_0} = \frac{E_{rms}^2}{120\pi}$$

Where

P = Electrical energy in watts
V = Voltage in V
Z_0 : Impedance in free space

$$E = \frac{\sqrt{30 P_t G_t}}{r} = \frac{\sqrt{30 EIRP(W)}}{r}$$

Where

P_t = transmitter output power in watts
G_t = numeric gain of the transmitting antenna (unitless)
E = electric field strength in V/m
r = measurement distance in meters (m)

$20\log(E) = 10\log(30) + 10\log(EIRP) - 20\log(r)$
$E(dBV) = EIRP(dBW) - 20\log(r) + 14.77$
$EIRP(dBm) = E(dBuV) + 20\log(r) - 104.77$

Evaluation Results : SAR test is exempt as shown in the table below.

Mode	Frequency (MHz)	Measured power (dBuV/m@3m)	Maximum power (dBm)	Maximum power (mW)	SAR Test Exclusion Threshold (mW)	
					FCC	ISED
RFID	13.56	45.0	-50.23	0.00001	*443	**71

* [474 x (1+log100/f(MHz))]/2 = 443mW

** Safety distance : 5 mm