APPENDIX I
RADIO FREQUENCY EXPOSURE

LIMIT

According to §15.247(i), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines. See § 1.1307(b)(1) of this chapter.

EUT Specification

<table>
<tr><td>EUT</td><td colspan="3">Smart I/O+ Controller</td></tr>
<tr><td>Model</td><td colspan="3">KT-61205W</td></tr>
<tr><td>Data Applies To</td><td colspan="3">KT-61220W; KT-63511W; KT-63514W</td></tr>
<tr><td>Model Discrepancy</td><td colspan="3">
<table>
<tr><th>Model</th><th>Discrepancy</th></tr>
<tr><td>KT-61205W</td><td>◎Ethernet 10/100 Mbps
◎2.4GHz, IEEE802.11b/g/n 1T1R
◎USB HOST 2.0
◎RS232/RS485 configurable port * 2 ports
◎12 DIO</td></tr>
<tr><td>KT-61220W</td><td>◎Ethernet 10/100 Mbps
◎2.4GHz, IEEE802.11b/g/n 1T1R
◎USB HOST 2.0
◎RS232/RS485 configurable port * 2 ports
◎6 AI</td></tr>
<tr><td>KT-63511W</td><td>◎Cloud Enabler
◎Ethernet 10/100 Mbps
◎2.4GHz, IEEE802.11b/g/n 1T1R
◎USB HOST 2.0
◎RS232/RS485 configurable port * 1 ports
◎128 Registers(SW)</td></tr>
<tr><td>KT-63514W</td><td>◎Cloud Enabler
◎Ethernet 10/100 Mbps
◎2.4GHz, IEEE802.11b/g/n 1T1R
◎USB HOST 2.0
◎RS232/RS485 configurable port * 2 ports
◎256 Registers(SW)</td></tr>
</table>
</td></tr>
<tr><td>Brand</td><td colspan="3">KEYSTONE MICROTECH</td></tr>
<tr><td>RF Module</td><td>Realtek</td><td>Model:</td><td>RTL8196E</td></tr>
<tr><td>Frequency band (Operating)</td><td colspan="3">☒ 802.11b/g/n HT20: 2.412GHz ~ 2.462GHz
802.11n HT40: 2.422GHz ~ 2.452GHz
☐ 802.11a, 802.11n HT20 : 5180MHz ~ 5240MHz; 5745 ~ 5825MHz
802.11n HT40 : 5190MHz ~ 5230MHz; 5755 ~ 5795MHz
802.11ac VHT80 : 5210MHz; 5755MHz
☐ Others</td></tr>
<tr><td>Device category</td><td colspan="3">☐ Portable (<20cm separation)
☒ Mobile (>20cm separation)
☐ Others</td></tr>
</table>

Exposure classification	☐ Occupational/Controlled exposure (S = 5mW/cm^2) ☒ General Population/Uncontrolled exposure (S=1mW/cm^2)
Antenna Specification	Antenna Gain 2.4GHz 2.0 dBi (Numeric gain: 1.58)
Maximum Average output power	IEEE 802.11b Mode : 23.07 dBm (202.768 mW) IEEE 802.11g Mode : 22.55 dBm (179.887 mW) IEEE 802.11n HT20 Mode : 22.57 dBm (180.717 mW) IEEE 802.11n HT40 Mode : 21.78 dBm (150.661 mW)
Evaluation applied	☒ MPE Evaluation* ☐ SAR Evaluation ☐ N/A

Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	September 3, 2015	Initial Issue	ALL	Eva Lin

TEST RESULTS

No non-compliance noted.

Calculation

Given $E = \frac{\sqrt{30 \times P \times G}}{d}$ & $S = \frac{E^2}{377}$

Where E = Field strength in Volts / meter
P = Power in Watts
G = Numeric antenna gain
d = Distance in meters
S = Power density in milliwatts / square centimeter

Combining equations and re-arranging the terms to express the distance as a function of the remaining variables yields:

$$S = \frac{30 \times P \times G}{377 d^2}$$

Changing to units of mW and cm, using:

P (mW) = P (W) / 1000 and

d (cm) = d(m) / 100

Yields

$$S = \frac{30 \times (P/1000) \times G}{377 \times (d/100)^2} = 0.0796 \times \frac{P \times G}{d^2}$$ ***Equation 1***

Where d = Distance in cm
P = Power in mW
G = Numeric antenna gain
S = Power density in mW / cm^2

Maximum Permissible Exposure

Substituting the MPE safe distance using d = 20 cm into Equation 1:

$$S = 0.000199 \times P \times G$$

Where P = Power in mW
G = Numeric antenna gain
S = Power density in mW / cm^2

IEEE 802.11b Mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm^2	Limit (mW/cm2)	Result
Low	2412	202.768	1.58	20	0.0638	1	Pass

IEEE 802.11g Mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm^2	Limit (mW/cm2)	Result
High	2462	179.887	1.58	20	0.0566	1	Pass

IEEE 802.11n HT 20 Mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm^2	Limit (mW/cm2)	Result
Mid	2437	180.717	1.58	20	0.0568	1	Pass

IEEE 802.11n HT 40 Mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm^2	Limit (mW/cm2)	Result
High	2452	150.661	1.58	20	0.0474	1	Pass