1. Maximum Permissible Exposure (MPE)

Standard Applicable

According to §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

This is a Mobile device, the MPE is required.

According to §1.1310 and §2.1091 RF exposure is calculated.

Limits for Maximum Permissive Exposure (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Averaging Time (minute)
Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*($180/f^2$)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	F/1500	30
1500-15000	/	/	1.0	30

F = frequency in MHz

* = Plane-wave equipment power density

Maximum Permissible Exposure (MPE) Evaluation

The worst case of Peak power: refer to FCC test report for detail measurement date.

Power measurement:

BDR Mode

Frequency (MHz)	Peak Reading Power (dBm)	Cable Loss	Output Power (dBm)	Output Power (W)	Limit (W)
Low	8.96	0.00	8.96	0.00787	0.125
Mid	9.51	0.00	9.51	0.00893	0.125
High	9.58	0.00	9.58	0.00908	0.125

Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$S=PG/4\pi R^2$

Where: S = Power density

P = Power input to antenna

G = Power gain of the antenna in the direction of interest relative to an isotropic radiator

R = Distance to the center of radiation of the antenna

Maximum output power at antenna input terminal:	9.58	(dBm)
Maximum output power at antenna input terminal:	9.078205302	(mW)
Tune-Up power Tolerance:	2	dB
Duty cycle:	100	(%)
Maximum Pav :	14.38798578	(mW)
Antenna gain (typical):	2.85	(dBi)
Maximum antenna gain:	1.927524913	(numeric)
Prediction distance:	20	(cm)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm^2)
Power density at predication frequency at 20 (cm)	0.0055201	(mW/cm^2)

Measurement Result:

The predicted power density level at 20 cm is 0.0055 mW/cm^2.. This is below the uncontrolled exposure limit of 1 mW/cm^2.

The worst case of Peak power a mode: refer to FCC test report for detail measurement date.

Power measurement:

LE Mode

Frequency (MHz)	Peak Reading Power (dBm)	Cable Loss	Output Power (dBm)	Output Power (W)	Limit (W)
2402.00	7.77	0.00	7.77	0.00598	1
2442.00	8.54	0.00	8.54	0.00714	1
2480.00	8.47	0.00	8.47	0.00703	1

Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$S=PG/4\pi R^2$

Where: S = Power density

P = Power input to antenna

G = Power gain of the antenna in the direction of interest relative to an isotropic radiator

R = Distance to the center of radiation of the antenna

Maximum output power at antenna input terminal:	8.54	(dBm)
Maximum output power at antenna input terminal:	7.144963261	(mW)
Tune-Up power Tolerance:	2	dB
Duty cycle:	100	(%)
Maximum Pav :	11.32400363	(mW)
Antenna gain (typical):	2.85	(dBi)
Maximum antenna gain:	1.927524913	(numeric)
Prediction distance:	20	(cm)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm^2)
Power density at predication frequency at 20 (cm)	0.0043446	(mW/cm^2)

Measurement Result

The predicted power density level at 20 cm is 0.0043 mW/cm^2. This is below the uncontrolled exposure limit of 1 mW/cm^2.

Wireless module FCC ID: PU5AL5230S

5150MHz – 5250MHz Mode:

The worst case of Average power a mode: refer to FCC test report for detail measurement date.

Power measurement:

Maximum Conducted (Average) Output Power (5150-5250MHz band)							
Condition			RF Output Power (dBm)				
Modulation Mode	N_{TX}	Freq. (MHz)	Chain Port 1	Power Limit	DG (dBi)	EIRP Power	EIRP Limit
QPSK	1	5180	9.52	16.11	3.00	12.52	21.79
QPSK	1	5210	10.77	16.11	3.00	13.77	21.79
QPSK	1	5240	10.42	16.10	3.00	13.42	21.79
Result			Complied				

Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$S=PG/4\pi R^2$

Where: S = Power density

P = Power input to antenna

G = Power gain of the antenna in the direction of interest relative to an isotropic radiator

R = Distance to the center of radiation of the antenna

Maximum output power at antenna input terminal:	13.77	(dBm)
Maximum output power at antenna input terminal:	23.82319469	(mW)
Tune-Up power Tolerance:	2	dB
Duty cycle:	100	(%)
Maximum Pav :	37.75721909	(mW)
Antenna gain (typical):	3	(dBi)
Maximum antenna gain:	1.995262315	(numeric)
Prediction distance:	20	(cm)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm^2)
Power density at predication frequency at 20 (cm)	0.0149951	(mW/cm^2)

Measurement Result

The predicted power density level at 20 cm is 0.015 mW/cm^2. This is below the uncontrolled exposure limit of 1 mW/cm^2.

Wireless module FCC ID: PU5AL5230S

5725MHz – 5850MHz Mode:

The worst case of Average power a mode: refer to FCC test report for detail measurement date.

Power measurement:

Maximum Conducted Output Power Result							
Condition			RF Output Power (dBm)				
Modulation Mode	N_{Tx}	Freq. (MHz)	Chain Port 1	Power Limit	DG (dBi)	EIRP Power	EIRP Limit
QPSK	1	5736	10.38	30.00	3.20	13.58	36.00
QPSK	1	5762	9.61	30.00	3.20	12.81	36.00
QPSK	1	5814	10.55	30.00	3.20	13.75	36.00
Result			Complied				

Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$S=PG/4\pi R^2$

Where: S = Power density

P = Power input to antenna

G = Power gain of the antenna in the direction of interest relative to an isotropic radiator

R = Distance to the center of radiation of the antenna

Maximum output power at antenna input terminal:	13.75	(dBm)
Maximum output power at antenna input terminal:	23.71373706	(mW)
Tune-Up power Tolerance:	2	dB
Duty cycle:	100	(%)
Maximum Pav :	37.58374043	(mW)
Antenna gain (typical):	3.2	(dBi)
Maximum antenna gain:	2.089296131	(numeric)
Prediction distance:	20	(cm)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm^2)
Power density at predication frequency at 20 (cm)	0.0156297	(mW/cm^2)

Measurement Result

The predicted power density level at 20 cm is 0.0156mW/cm^2. This is below the uncontrolled exposure limit of 1 mW/cm^2.

Simultaneous transmission mode

2.4GHz mode + (5150MHz – 5250MHz) Mode:

Prediction frequency:	2.4	(GHz)
Power density at predication frequency at 20 (cm)	0.0055201	(mW/cm^2)

Prediction frequency:	5	(GHz)
Power density at predication frequency at 20 (cm)	0.0149951	(mW/cm^2)
2.4GHz + 5GHz Power density at predication frequency at 20 (cm) distance	0.0205152	(mW/cm^2)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm^2)

The predicted power density level at 20 cm is 0.0205152mW/cm^2. This is below the uncontrolled exposure limit of 1 mW/cm^2.

Simultaneous transmission mode

2.4GHz mode + (5725MHz – 5850MHz) Mode:

Prediction frequency:	2.4	(GHz)
Power density at predication frequency at 20 (cm)	0.0055201	(mW/cm^2)

Prediction frequency:	5	(GHz)
Power density at predication frequency at 20 (cm)	0.0156297	(mW/cm^2)
2.4GHz + 5GHz Power density at predication frequency at 20 (cm) distance	0.0211498	(mW/cm^2)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm^2)

The predicted power density level at 20 cm is 0.0211498 mW/cm^2. This is below the uncontrolled exposure limit of 1 mW/cm^2.

Note: Wireless module FCC ID: PU5AL5230S can be operated simultaneously with 2.4 GHz radio.

~ End of Report ~