

RF EXPOSURE REPORT



Applicant: Quanta Computer Inc.
No. 188, Wenhua 2nd Road, Guishan District, Taoyuan City
33377, Taiwan

Manufacturer: Quanta Computer Inc.
No. 188, Wenhua 2nd Road, Guishan District, Taoyuan City
33377, Taiwan

Product Name: Clover Mini

Brand Name: Clover

Model No.: C305

Model Difference: N/A

Report Number: ES/2022/20018

FCC ID HFS-C305

IC: 1787B-C305

Issue Date: April 14, 2022

Date of EUT Received: February 22, 2022

Approved By _____

John Yeh

We hereby certify that:

The above equipment was evaluate by SGS Taiwan Ltd. The evaluation in this report is in compliance with FCC Rule Part §2.1091 and RSS-102.

The results of this report relate only to the sample identified in this report.

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| Revision History | | | | | |
|------------------|----------|-------------|----------------|------------|--------|
| Report Number | Revision | Description | Issue Date | Revised By | Remark |
| ES/2022/20018 | 00 | Original | April 14, 2022 | Ruby Ou | |
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Note:

- 1、The remark "*" indicates modification of the report upon requests from certification body.

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1 DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)

1.1 Product Description

| | |
|-------------------|------------------|
| Product Name: | Clover Mini |
| Brand Name: | Clover |
| Model No.: | C305 |
| Model Difference: | N/A |
| Hardware Version: | N/A |
| Firmware Version: | N/A |
| Power Supply: | 12V from Adapter |

1.2 Evaluation site

| Laboratory | Site Address | FCC Designation number | ISED Company Number | CAB Identifier |
|---|--|------------------------|---------------------|----------------|
| SGS Taiwan Ltd. Central RF Lab. (TAF code 3702) | <input type="checkbox"/> No. 134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, 24803, Taiwan. | TW0027 | 4620A | TW3702 |
| | <input checked="" type="checkbox"/> No. 2, Keji 1st Rd., Guishan Township, Taoyuan County, 333 Taiwan. | TW0028 | 4620E | |
| | <input type="checkbox"/> 1F, No. 8, Alley 15, Lane 120, Sec. 1, Nei Hu Road, Nei Hu District, Taipei City, 222 Taiwan. | TW0029 | 23862 | |

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1.3 Antenna Information:

1.3.1 BT / WLAN 2.4GHz

| Antenna Type | Supplier | Main / Aux | Antenna Part No. | Freq. (MHz) | Peak Antenna Gain (dBi) | MIMO Antenna Gain (dBi) |
|--------------|----------|------------|------------------|-------------|-------------------------|-------------------------|
| PIFA | CAN | Main | DQ60AYP6Y35 | 2.4GHz | 2.12 | 4.92 |
| | | Aux | DQ60AYP6Y36 | | 1.78 | 4.92 |

1.3.2 WLAN 5GHz

| Antenna Type | Supplier | Antenna Part No. | Main / Aux | Note |
|--------------|----------|------------------|------------|-------|
| PIFA | CAN | DQ60AYP6Y35 | Main | Ant 1 |
| | | DQ60AYP6Y36 | Aux | Ant 2 |

| Operating Frequency (MHz) | | | Ant 1 Peak Gain (dBi) | Ant 2 Peak Gain (dBi) | MIMO Gain |
|---------------------------|---|--------|-----------------------|-----------------------|-----------|
| 5150.0 | ~ | 5250.0 | 2.77 | 2.45 | 5.62 |
| 5250.0 | ~ | 5350.0 | 2.45 | 1.92 | 5.2 |
| 5470.0 | ~ | 5725.0 | 2.81 | 2.86 | 5.85 |
| 5725.0 | ~ | 5850.0 | 3.47 | 2.99 | 6.24 |

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1.3.3 WWAN

| Antenna Type | Antenna Part No. |
|--------------|------------------|
| COUPLING | DQ60AYF0000 |

| Operating Frequency (MHz) | Ant 0 Peak Gain (dBi) |
|---------------------------|-----------------------|
| LTE-Band 2 | 1850 ~ 1910 1.61 |
| LTE-Band 4 | 1710 ~ 1755 2.19 |
| LTE-Band 5 | 824 ~ 849 0.37 |
| LTE-Band 12 | 699 ~ 716 2.07 |
| LTE-Band 13 | 777 ~ 787 1.71 |
| LTE-Band 17 | 704 ~ 716 2.07 |
| LTE-Band 66 | 1710 ~ 1780 2.19 |

Note: Antenna information is provided by the applicant.

1.4 Rated Power

1.4.1 Bluetooth / WLAN 2.4GHz

| Mode | Freq. Range (MHz) | Channels | Module | Modulation Technology | Max Output Power (dBm) | Antenna Gain (dBi) | Antenna Directional Gain (dBi) | EIRP (dBm) | Worst Case |
|------------------|-------------------|----------|---------|------------------------------|------------------------|--------------------|--------------------------------|------------|------------|
| BR+EDR | 2402-2480 | 79 | WCN3990 | GFSK + π /4DQPSK + 8DPSK | 6.50 | 1.78 | N/A | 8.28 | |
| BLE | 2402-2480 | 40 | | GFSK | 2.23 | 1.78 | | 4.01 | |
| 802.11b/g/n_HT20 | 2412-2462 | 11 | | DSSS & OFDM | 20.00 | 2.12 | 4.92 | 24.92 | V |

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1.4.2 WLAN 5GHz (FCC):

| 802.11 | Freq. Range (MHz) | Modulation Technology | Module | Max. Output Power (dBm) | Antenna Gain (dBi) | EIRP (dBm) | Worst Case |
|---------------------|-------------------|-----------------------|---------|-------------------------|--------------------|------------|------------|
| a | 5150~5250 | OFDM | WCN3990 | 16.50 | 5.62 | 22.12 | |
| | 5250~5350 | | | 16.50 | 5.20 | 21.70 | |
| | 5470~5725 | | | 16.50 | 5.85 | 22.35 | |
| | 5725~5850 | | | 16.50 | 6.24 | 22.74 | |
| n HT20 ac VHT 20 | 5150~5250 | | | 20.50 | 5.62 | 26.12 | |
| | 5250~5350 | | | 20.50 | 5.20 | 25.70 | |
| | 5470~5725 | | | 20.50 | 5.85 | 26.35 | |
| | 5725~5850 | | | 20.50 | 6.24 | 26.74 | V |
| n HT40 ac VHT 40 | 5150~5250 | | | 19.50 | 5.62 | 25.12 | |
| | 5250~5350 | | | 19.50 | 5.20 | 24.70 | |
| | 5470~5725 | | | 19.50 | 5.85 | 25.35 | |
| | 5725~5850 | | | 19.50 | 6.24 | 25.74 | |
| ac VHT 80 | 5150~5250 | | | 18.50 | 5.62 | 24.12 | |
| | 5250~5350 | | | 18.50 | 5.20 | 23.70 | |
| | 5470~5725 | | | 18.50 | 5.85 | 24.35 | |
| | 5725~5850 | | | 18.50 | 6.24 | 24.74 | |

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1.4.3 WLAN 5GHz (IC):

| 802.11 | Freq. Range (MHz) | Modulation Technology | Module | Max. Output Power (dBm) | Antenna Gain (dBi) | EIRP (dBm) | Worst Case |
|--------------------|-------------------|-----------------------|---------|-------------------------|--------------------|------------|------------|
| a | 5180~5240 | OFDM | WCN3990 | 16.50 | 5.62 | 22.12 | |
| | 5260~5320 | | | 16.50 | 5.20 | 21.70 | |
| | 5500~5580 | | | 16.50 | 5.85 | 22.35 | |
| | 5660~5700 | | | 16.50 | 5.85 | 22.35 | |
| | 5745~5825 | | | 16.50 | 6.24 | 22.74 | |
| n HT20 ac VHT20 | 5180~5240 | | | 20.50 | 5.62 | 26.12 | |
| | 5260~5320 | | | 20.50 | 5.20 | 25.70 | |
| | 5500~5580 | | | 20.50 | 5.85 | 26.35 | |
| | 5660~5700 | | | 20.50 | 5.85 | 26.35 | |
| | 5745~5825 | | | 20.50 | 6.24 | 26.74 | V |
| n HT40 ac VHT40 | 5190~5230 | | | 19.50 | 5.62 | 25.12 | |
| | 5270~5310 | | | 19.50 | 5.20 | 24.70 | |
| | 5510~5550 | | | 19.50 | 5.85 | 25.35 | |
| | 5670~5670 | | | 19.50 | 5.85 | 25.35 | |
| | 5755~5795 | | | 19.50 | 6.24 | 25.74 | |
| ac VHT80 | 5210~5210 | | | 18.50 | 5.62 | 24.12 | |
| | 5290~5290 | | | 18.50 | 5.20 | 23.70 | |
| | 5530~5530 | | | 18.50 | 5.85 | 24.35 | |
| | 5775~5775 | | | 18.50 | 6.24 | 24.74 | |

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1.4.4 WWAN:

| Operating Frequency (MHz) | | Max. Output Power (dBm) | Antenna Gain (dBi) | EIRP / ERP (dBm) | FCC | | ISED |
|---------------------------|-------------|-------------------------|--------------------|------------------|-------------------------|-------------------------------------|-----------------------------------|
| | | | | | Operation Distance (cm) | Power Density (mW/cm ²) | Power Density (W/m ²) |
| LTE-Band 2 | 1850 ~ 1910 | 22.08 | 1.61 | 23.69 | 20 | 0.05 | 0.47 |
| LTE-Band 4 | 1710 ~ 1755 | 22.59 | 2.19 | 24.78 | 20 | 0.06 | 0.60 |
| LTE-Band 5 | 824 ~ 849 | 22.79 | 0.37 | 23.16 | 20 | 0.04 | 0.41 |
| LTE-Band 12 | 699 ~ 716 | 22.77 | 2.07 | 24.84 | 20 | 0.06 | 0.61 |
| LTE-Band 13 | 777 ~ 787 | 22.63 | 1.71 | 24.34 | 20 | 0.05 | 0.54 |
| LTE-Band 17 | 704 ~ 716 | 22.82 | 2.07 | 24.89 | 20 | 0.06 | 0.61 |
| LTE-Band 66 | 1710 ~ 1780 | 21.96 | 2.19 | 24.15 | 20 | 0.05 | 0.52 |

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2 MAXIMUM PERMISSIBLE EXPOSURE (MPE)

2.1 FCC 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 Permissible 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 |
| 1500-100000 | / | / | 1.0 | 30 |

f = frequency in MHz

* = Plane-wave equipment power density

Prediction of MPE limit at a given distance

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

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

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2.2 ISED Standard Applicable

This submittal(s) (test report) is intended to comply with RSS-102 issue 5 Radio frequency Radiation Exposure requirement.

This is a Mobile device, the MPE is required.

Limits for Maximum Permissible Exposure (MPE)

| RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment) | | | | |
|---|----------------------------------|---|------------------------------------|---------------------------------|
| Frequency Range (MHz) | Electric Field (V/m rms) | Magnetic Field Strength (A/m rms) | Power Density (W/m ²) | Reference Period (minutes) |
| 0.003-10 | 83 | 90 | - | Instantaneous* |
| 0.1-10 | - | 0.73/ <i>f</i> | - | 6** |
| 1.1-10 | 87/ <i>f</i> ^{0.5} | - | - | 6** |
| 10-20 | 27.46 | 0.0728 | 2 | 6 |
| 20-48 | 58.07/ <i>f</i> ^{0.25} | 0.1540/ <i>f</i> ^{0.25} | 8.944/ <i>f</i> ^{0.5} | 6 |
| 48-300 | 22.06 | 0.05852 | 1.291 | 6 |
| 300-6000 | 3.142 <i>f</i> ^{0.3417} | 0.008335 <i>f</i> ^{0.3417} | 0.02619 <i>f</i> ^{0.6834} | 6 |
| 6000-15000 | 61.4 | 0.163 | 10 | 6 |
| 15000-150000 | 61.4 | 0.163 | 10 | 616000/ <i>f</i> ^{1.2} |
| 150000-300000 | 0.158 <i>f</i> ^{0.5} | 4.21 x 10 ⁻⁴ <i>f</i> ^{0.5} | 6.67 x 10 ⁻⁵ <i>f</i> | 616000/ <i>f</i> ^{1.2} |

F = frequency in MHz

* = Based on nerve stimulation (NS).

** = Based on specific absorption rate (SAR)

Maximum Permissible Exposure (MPE) Evaluation

Prediction of MPE limit at a given distance

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

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

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2.3 Power Density Calculation (Worst Case)

FCC Standalone MPE

| Operation Mode | Evaluation Frequency (MHz) | Operation Distance (cm) | Max. output Power (dBm) | Antenna Gain (dBi) | Max. output Power EIRP (mW) | Power Density (PD) (mW/cm ²) | Limit (mW/cm ²) | Pass / Fail | Power Density / Limit |
|----------------|----------------------------|-------------------------|-------------------------|--------------------|-----------------------------|--|-----------------------------|-------------|-----------------------|
| BT | 2480.00 | 20 | 6.5 | 1.83 | 6.81 | 0.0014 | 1.000 | Pass | 0.001 |
| WLAN 2.4G | 2412.00 | 20 | 20 | 4.92 | 310.46 | 0.062 | 1.000 | Pass | 0.062 |
| WLAN 5G | 5240.00 | 20 | 20.5 | 6.24 | 472.06 | 0.094 | 1.000 | Pass | 0.094 |
| LTE-Band 2 | 1852.50 | 20 | 22.08 | 1.61 | 233.88 | 0.047 | 1.000 | Pass | 0.047 |
| LTE-Band 4 | 1717.50 | 20 | 22.59 | 2.19 | 300.61 | 0.060 | 1.000 | Pass | 0.060 |
| LTE-Band 5 | 844.00 | 20 | 22.79 | 0.37 | 207.01 | 0.041 | 0.563 | Pass | 0.073 |
| LTE-Band 12 | 707.50 | 20 | 22.77 | 2.07 | 304.79 | 0.061 | 0.472 | Pass | 0.129 |
| LTE-Band 13 | 779.50 | 20 | 22.63 | 1.71 | 271.64 | 0.054 | 0.520 | Pass | 0.104 |
| LTE-Band 17 | 710.00 | 20 | 22.82 | 2.07 | 308.32 | 0.061 | 0.473 | Pass | 0.129 |
| LTE-Band 66 | 1775.00 | 20 | 21.96 | 2.19 | 260.02 | 0.052 | 1.000 | Pass | 0.052 |

ISED Standalone MPE

| Operation Mode | Evaluation Frequency (MHz) | Operation Distance (cm) | Max. output Power (dBm) | Antenna Gain (dBi) | Output Power EIRP (mW) | Power Density (PD) (W/m ²) | Limit (W/m ²) | Pass / Fail | Power Density / Limit |
|----------------|----------------------------|-------------------------|-------------------------|--------------------|------------------------|--|---------------------------|-------------|-----------------------|
| BT | 2480.00 | 20 | 6.5 | 1.83 | 6.81 | 0.014 | 5.469 | Pass | 0.003 |
| WLAN 2.4G | 2412.00 | 20 | 20 | 4.92 | 310.46 | 0.618 | 5.366 | Pass | 0.115 |
| WLAN 5G | 5240.00 | 20 | 20.5 | 6.24 | 472.06 | 0.940 | 9.119 | Pass | 0.103 |
| LTE-Band 2 | 1852.50 | 20 | 22.08 | 1.61 | 233.88 | 0.466 | 4.480 | Pass | 0.104 |
| LTE-Band 4 | 1717.50 | 20 | 22.59 | 2.19 | 300.61 | 0.598 | 4.255 | Pass | 0.141 |
| LTE-Band 5 | 844.00 | 20 | 22.79 | 0.37 | 207.01 | 0.412 | 2.618 | Pass | 0.157 |
| LTE-Band 12 | 707.50 | 20 | 22.77 | 2.07 | 304.79 | 0.607 | 2.321 | Pass | 0.262 |
| LTE-Band 13 | 779.50 | 20 | 22.63 | 1.71 | 271.64 | 0.541 | 2.480 | Pass | 0.218 |
| LTE-Band 17 | 710.00 | 20 | 22.82 | 2.07 | 308.32 | 0.614 | 2.326 | Pass | 0.264 |
| LTE-Band 66 | 1775.00 | 20 | 21.96 | 2.19 | 260.02 | 0.518 | 4.351 | Pass | 0.119 |

Note: For conservativeness, the lowest uplink frequency of each band is used to determine the MPE limit of that band.

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.
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2.4 Collocated Power Density Calculation

FCC Collocated MPE

| Max BT PD / Limit | Max WLAN PD / Limit | Max WWAN PD / Limit | Σ (Power Density / Limit) of BT+ WLAN + WWAN |
|-------------------|---------------------|---------------------|---|
| 0.001 | 0.094 | 0.129 | 0.224 |

ISED Collocated MPE

| Max BT PD / Limit | Max WLAN PD / Limit | Max WWAN PD / Limit | Σ (Power Density / Limit) of BT+ WLAN + WWAN |
|-------------------|---------------------|---------------------|---|
| 0.003 | 0.115 | 0.264 | 0.382 |

Note:

1. Σ (Power Density / Limit): This is a summation of [(Power Density for each transmitter/antenna included in the simultaneous transmission) / (corresponding MPE limit)].
2. Considering the collocated transmitters, the aggregated (Power Density /limit) is smaller than 1, and MPE of collocated transmitters is compliant

~ End of Report ~

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