

## 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    |        |
|               |          |             |                |            |        |
|               |          |             |                |            |        |
|               |          |             |                |            |        |
|               |          |             |                |            |        |
|               |          |             |                |            |        |
|               |          |             |                |            |        |

**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.<br>Central RF Lab.<br>(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 + $\pi$ /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<br>ac VHT20 | 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<br>ac VHT40 | 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 VHT80           | 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<br>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<br>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:

|                           |             |                         |                    |                  |  | FCC                     |                                     | ISED                              |
|---------------------------|-------------|-------------------------|--------------------|------------------|--|-------------------------|-------------------------------------|-----------------------------------|
| Operating Frequency (MHz) |             | Max. Output Power (dBm) | Antenna Gain (dBi) | EIRP / ERP (dBm) |  | Operation Distance (cm) | Power Density (mW/cm <sup>2</sup> ) | Power Density (W/m <sup>2</sup> ) |
| 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<br>(MHz)                            | Electric Field<br>Strength (V/m) | Magnetic Field<br>Strength (A/m) | Power Density<br>(mW/cm <sup>2</sup> ) | Averaging Time<br>(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 <sup>2</sup> )                 | 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<br>(Uncontrolled Environment) |                          |                                   |                                   |                            |
|-----------------------------------------------------------------------------------------------|--------------------------|-----------------------------------|-----------------------------------|----------------------------|
| Frequency Range (MHz)                                                                         | Electric Field (V/m rms) | Magnetic Field Strength (A/m rms) | Power Density (W/m <sup>2</sup> ) | Reference Period (minutes) |
| 0.003-10                                                                                      | 83                       | 90                                | -                                 | Instantaneous*             |
| 0.1-10                                                                                        | -                        | $0.73/f$                          | -                                 | 6**                        |
| 1.1-10                                                                                        | $87/f^{0.5}$             | -                                 | -                                 | 6**                        |
| 10-20                                                                                         | 27.46                    | 0.0728                            | 2                                 | 6                          |
| 20-48                                                                                         | $58.07/f^{0.25}$         | $0.1540/f^{0.25}$                 | $8.944/f^{0.5}$                   | 6                          |
| 48-300                                                                                        | 22.06                    | 0.05852                           | 1.291                             | 6                          |
| 300-6000                                                                                      | $3.142 f^{0.3417}$       | $0.008335 f^{0.3417}$             | $0.02619 f^{0.6834}$              | 6                          |
| 6000-15000                                                                                    | 61.4                     | 0.163                             | 10                                | 6                          |
| 15000-150000                                                                                  | 61.4                     | 0.163                             | 10                                | $616000/f^{1.2}$           |
| 150000-300000                                                                                 | $0.158 f^{0.5}$          | $4.21 \times 10^{-4} f^{0.5}$     | $6.67 \times 10^{-5} f$           | $616000/f^{1.2}$           |

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 <sup>2</sup> ) | Limit (mW/cm <sup>2</sup> ) | 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 <sup>2</sup> ) | Limit (W/m <sup>2</sup> ) | 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.

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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 | $\Sigma$ (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 | $\Sigma$ (Power Density / Limit) of BT+ WLAN + WWAN |
|-------------------|---------------------|---------------------|-----------------------------------------------------|
| 0.003             | 0.115               | 0.264               | 0.382                                               |

#### Note:

1.  $\Sigma$ (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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