

## Maximum Permissible Exposure Report

### 1. Product Information

FCC ID : FCC ID: H79-019NC9  
 EUT : NovoConnect Wireless Collaboration System  
 Test Model : NC-X900  
 Power Supply : For adapter Input: AC 100-240V, 50/60Hz, 0.4A  
 For adapter Output: DC 5V, 3A  
 Hardware Version : /  
 Software Version : /

#### Bluetooth

Frequency Range : 2402MHz ~ 2480MHz  
 Chanel Number : 79 channels for Bluetooth V4.1 (DSS)  
 Chanel Spacing : 1MHz for Bluetooth V4.1 (DSS)  
 Modulation Type : GFSK,  $\pi/4$ -DQPSK, 8-DPSK for Bluetooth V4.1(DSS)  
 Bluetooth Version : V4.1

#### WIFI(2.4G Band)

Frequency Range : 2412MHz-2462MHz  
 Channel Spacing : 5MHz  
 Channel Number : 11 channels for 20MHz bandwidth(2412MHz~2462MHz)  
 7 channels for 40MHz bandwidth(2422MHz~2452MHz)  
 Modulation Type : IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK);  
 IEEE 802.11g/n: OFDM(64QAM, 16QAM, QPSK, BPSK)

#### WIFI (5.2G Band )

Frequency Range : 5180MHz-5240MHz  
 Channel Number : 4 channels for 20MHz bandwidth(5180MHz-5240MHz)  
 2 channels for 40MHz bandwidth(5190MHz~5230MHz)  
 1 channels for 80MHz bandwidth(5210MHz)  
 Modulation Type : IEEE 802.11a/n/ac: OFDM(64QAM, 16QAM, QPSK, BPSK)

#### WIFI(5.8G Band)

Frequency Range : 5745MHz-5825MHz  
 Channel Number : 5 channels for 20MHz bandwidth(5745MHz-5825MHz)  
 2 channels for 40MHz bandwidth(5755MHz~5795MHz)  
 1 channels for 80MHz bandwidth(5775MHz)  
 Modulation Type : IEEE 802.11a/n/ac: OFDM(64QAM, 16QAM, QPSK, BPSK)

#### Antenna Description

External Antenna(ANT 0), used for Bluetooth & WIFI TX/RX,  
 3.0dBi(Max.) for 2.4G Band, 3.0dBi(Max.) for 5G Band;  
 External Antenna(ANT 1), used for WIFI TX/RX,  
 3.0dBi(Max.) for 2.4G Band, 3.0dBi(Max.) for 5G Band  
 Exposure category : General population/uncontrolled environment  
 EUT Type : Production Unit  
 Device Type : Mobile Device

## 2. Evaluation Method

Systems operating under the provisions of FCC 47 CFR section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as mobile device whereby a distance of 0.2m normally can be maintained between the user and the device, and below RF Permissible Exposure limit shall comply with.

In accordance with KDB447498 D01 General RF Exposure Guidance v06 for Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneous transmitting antennas incorporated in a host device, based on the calculated/estimated, numerically modelled or measured field strengths or power density, is  $\leq 1.0$ . The MPE ratio of each antenna is determined at the minimum test separation distance required by the operating configurations and exposure conditions of the host device, according to the ratio of field strengths or power density to MPE limit, at the test frequency. Either the maximum peak or spatially averaged results from measurements or numerical simulations may be used to determine the MPE ratios. Spatial averaging does not apply when MPE is estimated using simple calculations based on far-field plane-wave equivalent conditions. The antenna installation and operating requirements for the host device must meet the minimum test separation distances required by all antennas, in both standalone and simultaneous transmission operations, to satisfy compliance.

## 3. Limit

### 3.1 Refer evaluation method

[ANSI C95.1-1999](#): IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.

[FCC KDB publication 447498 D01 General RF Exposure Guidance v06](#): Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies.

[FCC CFR 47 part1 1.1310](#): Radiofrequency radiation exposure limits.

[FCC CFR 47 part2 2.1091](#): Radiofrequency radiation exposure evaluation: mobile devices.

### 3.2 Limit

Limits for Maximum Permissible Exposure (MPE)/Controlled Exposure

| Frequency Range(MHz)                        | Electric Field Strength(V/m) | Magnetic Field Strength(A/m) | Power Density (mW/cm <sup>2</sup> ) | Averaging Time (minute) |
|---|------------------------------|------------------------------|-------------------------------------|-------------------------|
| Limits for Occupational/Controlled Exposure |                              |                              |                                     |                         |
| 0.3 – 3.0                                   | 614                          | 1.63                         | (100)*                              | 6                       |
| 3.0 – 30                                    | 1842/f                       | 4.89/f                       | (900/f <sup>2</sup> )*              | 6                       |
| 30 – 300                                    | 61.4                         | 0.163                        | 1.0                                 | 6                       |
| 300 – 1500                                  | /                            | /                            | f/300                               | 6                       |
| 1500 – 100,000                              | /                            | /                            | 5                                   | 6                       |

Limits for Maximum Permissible Exposure (MPE)/Uncontrolled Exposure

| Frequency Range(MHz)                        | Electric Field Strength(V/m) | Magnetic Field Strength(A/m) | Power Density (mW/cm <sup>2</sup> ) | Averaging Time (minute) |
|---|------------------------------|------------------------------|-------------------------------------|-------------------------|
| Limits for Occupational/Controlled Exposure |                              |                              |                                     |                         |
| 0.3 – 3.0                                   | 614                          | 1.63                         | (100)*                              | 30                      |
| 3.0 – 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 – 100,000                              | /                            | /                            | 1.0                                 | 30                      |

F=frequency in MHz

\*=Plane-wave equivalent power density

#### 4. MPE Calculation Method

Predication 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

#### 5. Antenna Information

NC-X900 can only use antennas certificated as follows provided by manufacturer;

| Internal Identification | Antenna Identification | Antenna type and antenna number | Operate frequency band                  | Maximum antenna gain |
|-------------------------|------------------------|---------------------------------|---|----------------------|
| Ant_0                   | Bluetooth & WIFI       | External Antenna                | 2.4GHz – 2.4835 GHz<br>5.15GHz -5.85GHz | 3.0dBi(Max.)         |
| Ant_1                   | Wifi                   | External Antenna                | 2.4GHz – 2.4835 GHz<br>5.15GHz -5.85GHz | 3.0dBi(Max.)         |

#### 6. Conducted Power

[BT Max Conducted Power]

| Mode          | Channel | Frequency (MHz) | Peak Conducted Output Power (dBm) |
|---------------|---------|-----------------|-----------------------------------|
| GFSK          | 0       | 2402            | 2.728                             |
|               | 39      | 2441            | 3.295                             |
|               | 78      | 2480            | 3.255                             |
| $\pi/4$ DQPSK | 0       | 2402            | 2.578                             |
|               | 39      | 2441            | 3.164                             |
|               | 78      | 2480            | 3.131                             |
| 8DPSK         | 0       | 2402            | 2.557                             |
|               | 19      | 2440            | 3.054                             |
|               | 39      | 2480            | 3.014                             |

## [2.4GWIFI Max Conducted Power]

| Mode              | Channel | Frequency (MHz) | Max Conducted Power(dBm) |       |
|-------------------|---------|-----------------|--------------------------|-------|
|                   |         |                 | ANT 0                    | ANT 1 |
| IEEE 802.11b      | 1       | 2412            | 8.81                     | 7.15  |
|                   | 6       | 2437            | 7.34                     | 7.03  |
|                   | 11      | 2462            | 7.20                     | 7.22  |
| IEEE 802.11g      | 1       | 2412            | 7.51                     | 7.42  |
|                   | 6       | 2437            | 6.99                     | 7.2   |
|                   | 11      | 2462            | 7.00                     | 7.3   |
| IEEE 802.11n HT20 | 1       | 2412            | 7.36                     | 7.13  |
|                   | 6       | 2437            | 6.76                     | 6.67  |
|                   | 11      | 2462            | 7.12                     | 6.71  |
| IEEE 802.11n HT40 | 3       | 2422            | 6.83                     | 7.35  |
|                   | 6       | 2437            | 7.41                     | 6.73  |
|                   | 9       | 2452            | 6.51                     | 6.71  |

## [5.2GWIFI Max Conducted Power]

| Mode        | Channel | Frequency (MHz) | Max Conducted Power(dBm) |       |
|-------------|---------|-----------------|--------------------------|-------|
|             |         |                 | ANT 0                    | ANT 1 |
| 11A         | 36      | 5180            | 5.79                     | 6.88  |
|             | 40      | 5200            | 7.06                     | 7.61  |
|             | 48      | 5240            | 7.28                     | 7.5   |
| 11N20 SISO  | 36      | 5180            | 6.76                     | 6.86  |
|             | 40      | 5200            | 6.98                     | 7.13  |
|             | 48      | 5240            | 6.64                     | 7.46  |
| 11N40 SISO  | 38      | 5190            | 6.84                     | 6.76  |
|             | 46      | 5230            | 7.21                     | 6.83  |
| 11AC20 SISO | 36      | 5180            | 6.94                     | 7.65  |
|             | 40      | 5200            | 7.6                      | 7.34  |
|             | 48      | 5240            | 7.19                     | 7.37  |
| 11AC40 SISO | 38      | 5190            | 7.45                     | 7.17  |
|             | 46      | 5230            | 6.7                      | 7.23  |
| 11AC80 SISO | 42      | 5210            | 6.9                      | 7.13  |

## [5.8GWIFI Max Conducted Power]

| Mode        | Channel | Frequency (MHz) | Max Conducted Power(dBm) | Max Conducted Power(dBm) |
|-------------|---------|-----------------|--------------------------|--------------------------|
|             |         |                 | ANT 0                    | ANT 1                    |
| 11A         | 149     | 5745            | 7.38                     | 7.74                     |
|             | 157     | 5785            | 7.54                     | 7.48                     |
|             | 165     | 5825            | 7.46                     | 7.85                     |
| 11N20 SISO  | 149     | 5745            | 7.21                     | 7.3                      |
|             | 157     | 5785            | 7.35                     | 7.46                     |
|             | 165     | 5825            | 7.42                     | 7.75                     |
| 11N40 SISO  | 151     | 5755            | 7.16                     | 6.6                      |
|             | 159     | 5795            | 7.46                     | 6.92                     |
| 11AC20 SISO | 149     | 5745            | 6.94                     | 7.65                     |
|             | 157     | 5785            | 7.6                      | 7.34                     |
|             | 165     | 5825            | 7.19                     | 7.37                     |
| 11AC40 SISO | 151     | 5755            | 7.45                     | 7.17                     |
|             | 159     | 5795            | 6.7                      | 7.23                     |
| 11AC80 SISO | 155     | 5775            | 6.66                     | 7.23                     |

## 7. Manufacturing tolerance

## BT

| GFSK                 |           |            |            |
|----------------------|-----------|------------|------------|
| Channel              | Channel 0 | Channel 39 | Channel 78 |
| Target (dBm)         | 3.0       | 3.0        | 3.0        |
| Tolerance $\pm$ (dB) | 1.0       | 1.0        | 1.0        |
| $\pi/4$ DQPSK        |           |            |            |
| Channel              | Channel 0 | Channel 39 | Channel 78 |
| Target (dBm)         | 3.0       | 3.0        | 3.0        |
| Tolerance $\pm$ (dB) | 1.0       | 1.0        | 1.0        |
| 8DPSK                |           |            |            |
| Channel              | Channel 0 | Channel 19 | Channel 39 |
| Target (dBm)         | 3.0       | 3.0        | 3.0        |
| Tolerance $\pm$ (dB) | 1.0       | 1.0        | 1.0        |

## 2.4GWIFI

| IEEE 802.11b         |           |           |            |
|----------------------|-----------|-----------|------------|
| Channel              | Channel 1 | Channel 6 | Channel 11 |
| Target (dBm)         | 8         | 7         | 7          |
| Tolerance $\pm$ (dB) | 1.0       | 1.0       | 1.0        |
| IEEE 802.11g         |           |           |            |
| Channel              | Channel 1 | Channel 6 | Channel 11 |
| Target (dBm)         | 7         | 7         | 7          |
| Tolerance $\pm$ (dB) | 1.0       | 1.0       | 1.0        |
| IEEE 802.11n20       |           |           |            |
| Channel              | Channel 1 | Channel 6 | Channel 11 |
| Target (dBm)         | 7         | 7         | 7          |
| Tolerance $\pm$ (dB) | 1.0       | 1.0       | 1.0        |
| IEEE 802.11n40       |           |           |            |
| Channel              | Channel 1 | Channel 6 | Channel 11 |
| Target (dBm)         | 7         | 7         | 7          |
| Tolerance $\pm$ (dB) | 1.0       | 1.0       | 1.0        |

## 5.2GWIFI

| IEEE 802.11a         |            |            |            |
|----------------------|------------|------------|------------|
| Channel              | Channel 36 | Channel 40 | Channel 48 |
| Target (dBm)         | 6          | 7          | 7          |
| Tolerance $\pm$ (dB) | 1.0        | 1.0        | 1.0        |
| IEEE 802.11n HT20    |            |            |            |
| Channel              | Channel 36 | Channel 40 | Channel 48 |
| Target (dBm)         | 7          | 7          | 7          |
| Tolerance $\pm$ (dB) | 1.0        | 1.0        | 1.0        |
| IEEE 802.11ac VHT20  |            |            |            |
| Channel              | Channel 36 | Channel 40 | Channel 48 |
| Target (dBm)         | 7          | 7          | 7          |
| Tolerance $\pm$ (dB) | 1.0        | 1.0        | 1.0        |
| IEEE 802.11n40       |            |            |            |
| Channel              | Channel 38 | Channel 46 | /          |
| Target (dBm)         | 7          | 7          | /          |
| Tolerance $\pm$ (dB) | 1.0        | 1.0        | /          |
| IEEE 802.11ac VHT40  |            |            |            |
| Channel              | Channel 38 | Channel 46 | /          |
| Target (dBm)         | 7          | 7          | /          |
| Tolerance $\pm$ (dB) | 1.0        | 1.0        | /          |
| IEEE 802.11ac VHT80  |            |            |            |
| Channel              | Channel 42 | /          | /          |
| Target (dBm)         | 7          | /          | /          |
| Tolerance $\pm$ (dB) | 1.0        | /          | /          |

## 5.8GWIFI

| IEEE 802.11a         |             |             |             |
|----------------------|-------------|-------------|-------------|
| Channel              | Channel 149 | Channel 157 | Channel 165 |
| Target (dBm)         | 7           | 7           | 7           |
| Tolerance $\pm$ (dB) | 1.0         | 1.0         | 1.0         |
| IEEE 802.11n HT20    |             |             |             |
| Channel              | Channel 149 | Channel 157 | Channel 165 |
| Target (dBm)         | 7           | 7           | 7           |
| Tolerance $\pm$ (dB) | 1.0         | 1.0         | 1.0         |
| IEEE 802.11ac VHT20  |             |             |             |
| Channel              | Channel 149 | Channel 157 | Channel 165 |
| Target (dBm)         | 7           | 7           | 7           |
| Tolerance $\pm$ (dB) | 1.0         | 1.0         | 1.0         |
| IEEE 802.11n40       |             |             |             |
| Channel              | Channel 151 | Channel 159 | /           |
| Target (dBm)         | 7           | 7           | /           |
| Tolerance $\pm$ (dB) | 1.0         | 1.0         | /           |
| IEEE 802.11ac VHT40  |             |             |             |
| Channel              | Channel 151 | Channel 159 | /           |
| Target (dBm)         | 7           | 7           | /           |
| Tolerance $\pm$ (dB) | 1.0         | 1.0         | /           |
| IEEE 802.11ac VHT80  |             |             |             |
| Channel              | Channel 155 | /           | /           |
| Target (dBm)         | 7           | /           | /           |
| Tolerance $\pm$ (dB) | 1.0         | /           | /           |

## 8. Measurement Results

### 8.1 Standalone MPE

As declared by the Applicant, the EUT is a wireless device used in a fix application, at least 20 cm from any body part of the user or nearby persons; from the maximum EUT RF output power, the minimum separation distance,  $r = 20\text{cm}$ , as well as the gain of the used antenna refer to antenna information, the RF power density can be obtained.

| Mode      | RF output power |     | Antenna Gain (dBi) | Antenna Gain (linear) | MPE (mW/cm <sup>2</sup> ) | MPE Limits (mW/cm <sup>2</sup> ) |
|-----------|-----------------|-----|--------------------|-----------------------|---------------------------|----------------------------------|
|           | dBm             | mW  |                    |                       |                           |                                  |
| BT        | 4               | 2.5 | 3.0                | 1.995                 | 0.001                     | 1                                |
| 2.4G WIFI | 9               | 7.9 | 3.0                | 1.995                 | 0.0032                    | 1                                |
| 5.2G WIFI | 8               | 6.3 | 3.0                | 1.995                 | 0.0025                    | 1                                |
| 5.8G WIFI | 8               | 6.3 | 3.0                | 1.995                 | 0.0025                    | 1                                |

Remark:

1. Output power including turn-up tolerance;
2. MPE evaluate distance is 20cm from user manual provide by manufacturer.
3. MPE values =  $PG/4\pi R^2$ ;

### 8.2 Simultaneous Transmission MPE

The sample supports 2 antennas.

Bluetooth and WIFI can simultaneous transmit, the WIFI mode of 802.11n/ac can simultaneous transmit. According to KDB447498 D01 General RF Exposure Guidance v06 for Transmitters used in mobile exposure conditions for simultaneous transmission operations;

$\Sigma$  of MPE ratios  $\leq 1.0$

| Mode                  | MPE1 (mW/cm <sup>2</sup> ) | MPE2 (mW/cm <sup>2</sup> ) | $\Sigma$ MPE ratios | Limit | Results |
|-----------------------|----------------------------|----------------------------|---------------------|-------|---------|
| BT & 2.4G WIFI        | 0.001                      | 0.0032                     | 0.0042              | 1     | PASS    |
| BT & 5.2G WIFI        | 0.001                      | 0.0025                     | 0.0035              | 1     | PASS    |
| BT & 5.8G WIFI        | 0.001                      | 0.0025                     | 0.0035              | 1     | PASS    |
| 2.4G WIFI & 2.4G WIFI | 0.0032                     | 0.0032                     | 0.0064              | 1     | PASS    |
| 5.2G WIFI & 5.2G WIFI | 0.0025                     | 0.0025                     | 0.005               | 1     | PASS    |
| 5.8G WIFI & 5.8G WIFI | 0.0025                     | 0.0025                     | 0.005               | 1     | PASS    |

## 9. Conclusion

The measurement results comply with the FCC Limit per 47 CFR 2.1091 for the uncontrolled RF Exposure of mobile device.

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