



# Compliance Testing, LLC

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## Test Report

Prepared for: FRTek

Model: FRM-DU28D / FRM-MRU28D

Description: 5G 28 GHz Optical DAS

FCC ID: 2AFEG-FRM-28

To

FCC Part 1.1310

Date of Issue: July 9, 2020

On the behalf of the applicant:

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Attention of:

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Project Test Engineer

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### Test Report Revision History

| Revision | Date           | Revised By  | Reason for Revision                                                         |
|----------|----------------|-------------|-----------------------------------------------------------------------------|
| 1.0      | July 9, 2020   | Greg Corbin | Original Document                                                           |
| 2.0      | August 4, 2020 | Greg Corbin | Revised calculations based on tune up power                                 |
| 3.0      | August 6, 2020 | Greg Corbin | Added output power table to page 5<br>Corrected typo in SISO UL calculation |
|          |                |             |                                                                             |

**FCC Site Reg. #349717**

**IC Site Reg. #2044A-2**

**Non-accredited tests contained in this report:**

**N/A**

**EUT Description:**

**Model: FRM-DU28D / FRM-MRU28D**

**Description: 5G 28 GHz Optical DAS**

**Additional Information:**

The EUT is a 5G 28 GHz Optical DAS (Distributed Amplifier System).

The frequency range for both the uplink and downlink is 27.5 – 28.35 GHz.

The EUT has separate SISO and MIMO input / outputs.

Modulation used is according to the 5G NR (New Radio Standard) 3GPP 38 (Downlink: CP-OFDM, Uplink: CP-OFDM or DFT-S-OFDM – up to 256QAM).

Channel Capacity is:

100MHz X 8FA (Continuous & Non-Continuous) or 200MHz X 4FA (Continuous & Non-Continuous) or 400MHz X 2FA (Continuous & Non-Continuous)

DU Antenna Gain = 10 dBi

mRU Antenna Gain = 8 dBi

**EUT Operation during Tests**

EUT was set up for normal operating conditions.

The EUT was controlled by a GUI titled “FRTek 5G DAS GUI – version 0.22”

5G test signals with either 100 MHz or 400 MHz bandwidths were used as required.

The DU and mHU antennas were removed to provide access to the antenna ports.

Test signals were injected into the antenna ports.

The 5G 28 GHz Optical DAS contains the following individual units.

| Product Name   | Model Name  | Serial Number  | Version |
|----------------|-------------|----------------|---------|
| 28 GHz 5G mRU  | FR-R5G17AFU | FRC14-198-0007 | 10.30   |
| 28 GHz 5G DU   | FR-R5G17AFU | FRC10-198-0004 | 10.30   |
| 28 GHz 5G DRU  | FR-R5G17AFU | FRC13-198-0004 | 10.30   |
| 28 GHz 5G MDU  | FR-R5G17AFU | FRC11-198-0004 | 10.30   |
| 28 GHz 5G MHU  | FR-R5G17AFU | FRC12-198-0004 | 10.21   |
| 28 GHz 5G MPSU | FR-R5G17AFU | FRC15-198-0007 | N/A     |

The EUT Antenna ports are listed below.

| DU                  | mRU                  |
|---------------------|----------------------|
| SISO Downlink Input | SISO Downlink Output |
| SISO Uplink Output  | SISO Uplink Input    |
| MIMO Downlink Input | MIMO Downlink Output |
| MIMO Uplink Output  | MIMO Uplink Input    |



## MPE Evaluation

This is a mobile device used in Uncontrolled Exposure environment.

### Limits Uncontrolled Exposure 47 CFR 1.1310 Table 1, (B)

|                  |                                                     |
|------------------|-----------------------------------------------------|
| 0.3-1.234 MHz:   | Limit [mW/cm <sup>2</sup> ] = 100                   |
| 1.34-30 MHz:     | Limit [mW/cm <sup>2</sup> ] = (180/f <sup>2</sup> ) |
| 30-300 MHz:      | Limit [mW/cm <sup>2</sup> ] = 0.2                   |
| 300-1500 MHz:    | Limit [mW/cm <sup>2</sup> ] = f/1500                |
| 1500-100,000 MHz | Limit [mW/cm <sup>2</sup> ] = 1.0                   |

## Test Data

### Output Power

|                 | Manufacturer<br>rated power | Tune up<br>procedure | Output Power for RF Exposure calculation |              |
|-----------------|-----------------------------|----------------------|------------------------------------------|--------------|
|                 | (dBm)                       | (dB)                 | (dBm)                                    | (mw)         |
| <b>Downlink</b> | <b>20</b>                   | <b>± 2dB</b>         | <b>22</b>                                | <b>158.5</b> |
| <b>Uplink</b>   | <b>17</b>                   | <b>± 2dB</b>         | <b>19</b>                                | <b>79.4</b>  |

### SISO Downlink

|                          |        |
|--------------------------|--------|
| Test Frequency, MHz      | 27925  |
| Power, Conducted, mW (P) | 158.5  |
| Antenna Gain Isotropic   | 8 dBi  |
| Antenna Gain Numeric (G) | 6.31   |
| Antenna Type             | Linear |
| Distance (R)             | 20 cm  |

|                                      |
|--------------------------------------|
| $S = \frac{P * G}{4\pi r^2}$         |
| Power Density (S) mw/cm <sup>2</sup> |
|                                      |

|                                                     |
|-----------------------------------------------------|
| Power Density (S) = 0.199 mw/cm <sup>2</sup>        |
| Limit = (from above table) = 1.0 mw/cm <sup>2</sup> |

### SISO Uplink

|                          |        |
|--------------------------|--------|
| Test Frequency, MHz      | 27925  |
| Power, Conducted, mW (P) | 79.4   |
| Antenna Gain Isotropic   | 10 dBi |
| Antenna Gain Numeric (G) | 10     |
| Antenna Type             | Linear |
| Distance (R)             | 20 cm  |

|                                      |
|--------------------------------------|
| $S = \frac{P * G}{4\pi r^2}$         |
| Power Density (S) mw/cm <sup>2</sup> |
|                                      |

|                                                     |
|-----------------------------------------------------|
| Power Density (S) = 0.158 mw/cm <sup>2</sup>        |
| Limit = (from above table) = 1.0 mw/cm <sup>2</sup> |

**The EUT complies with the MPE limit at 20 cm.**

END OF TEST REPORT