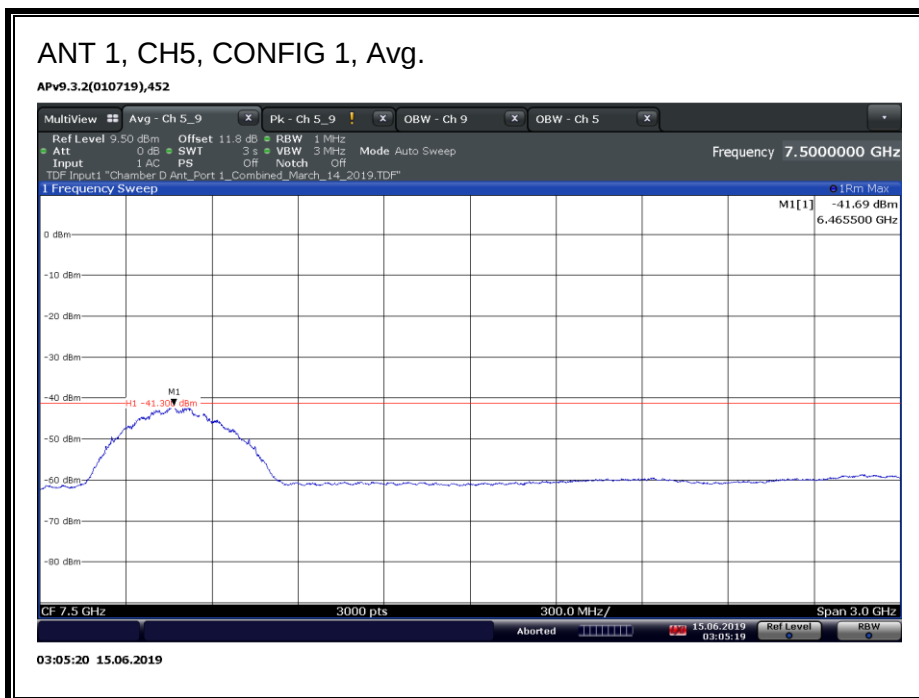
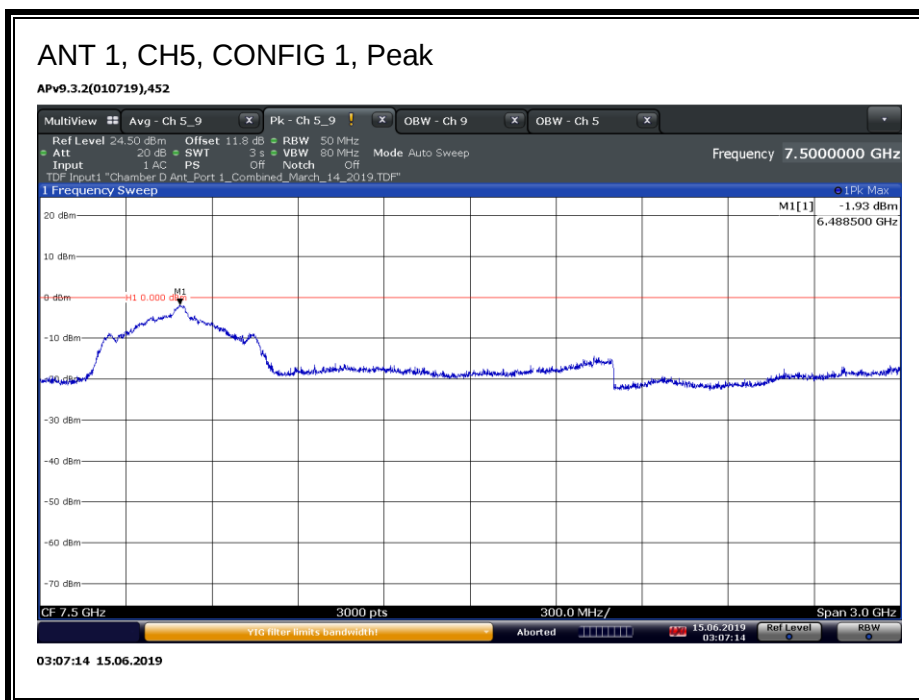
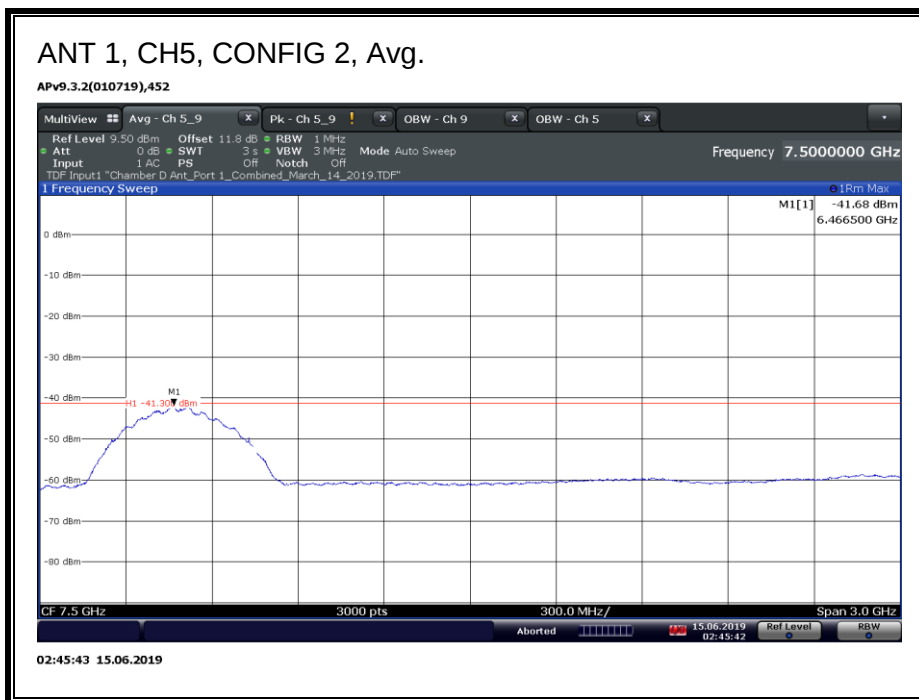
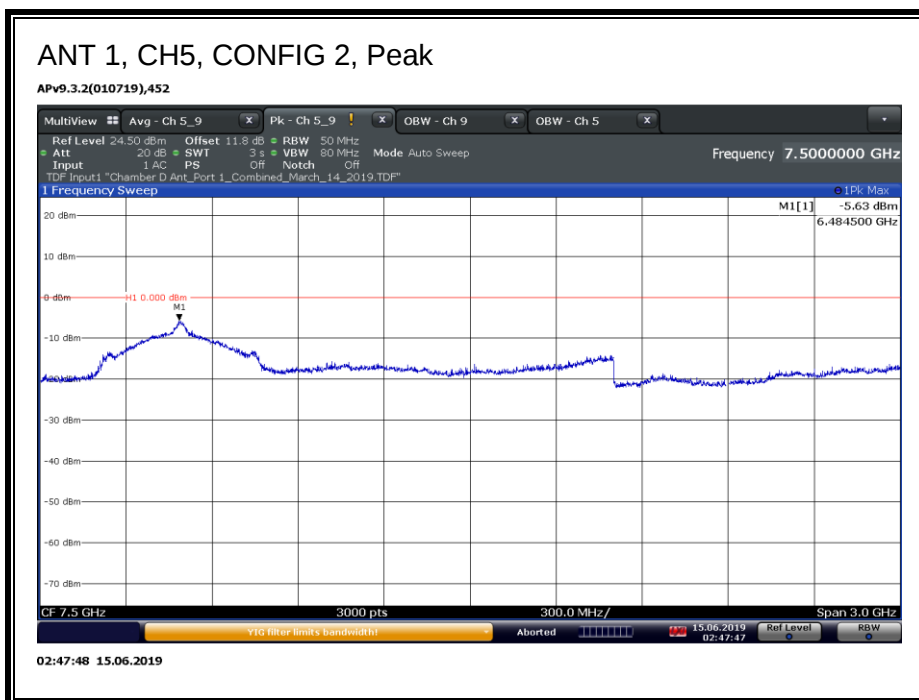
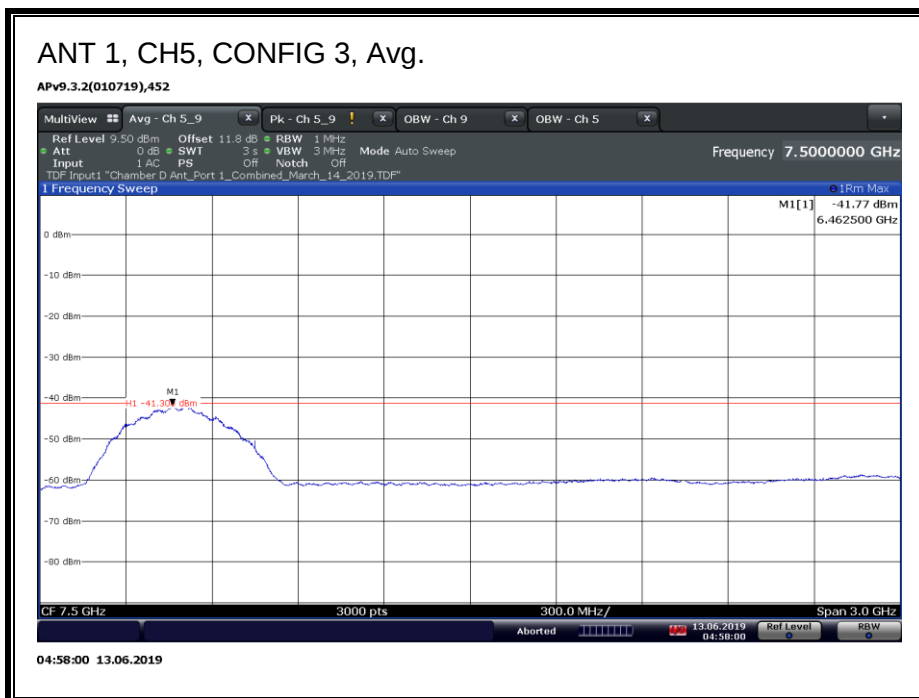
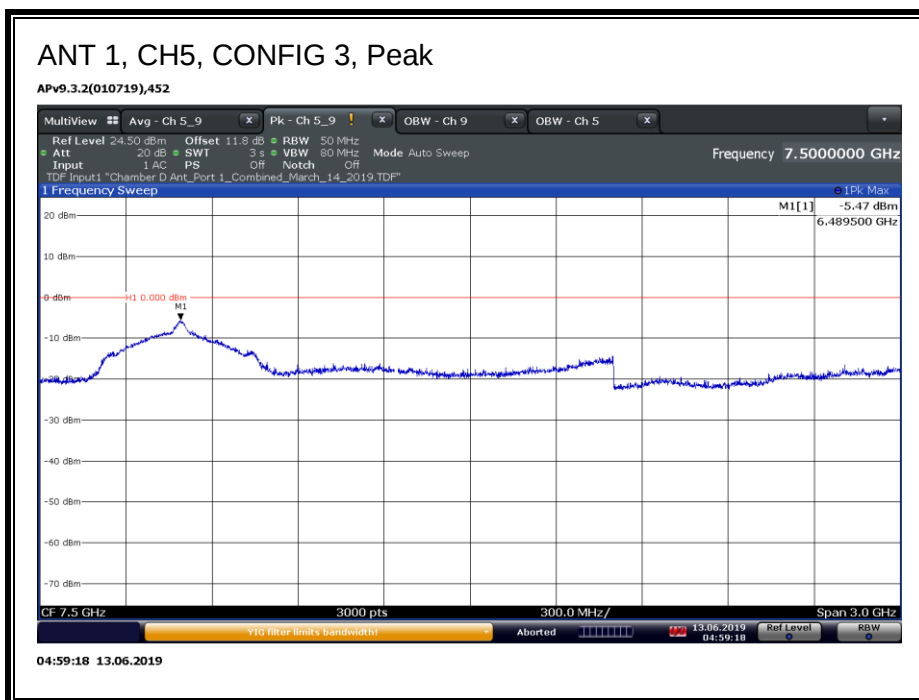
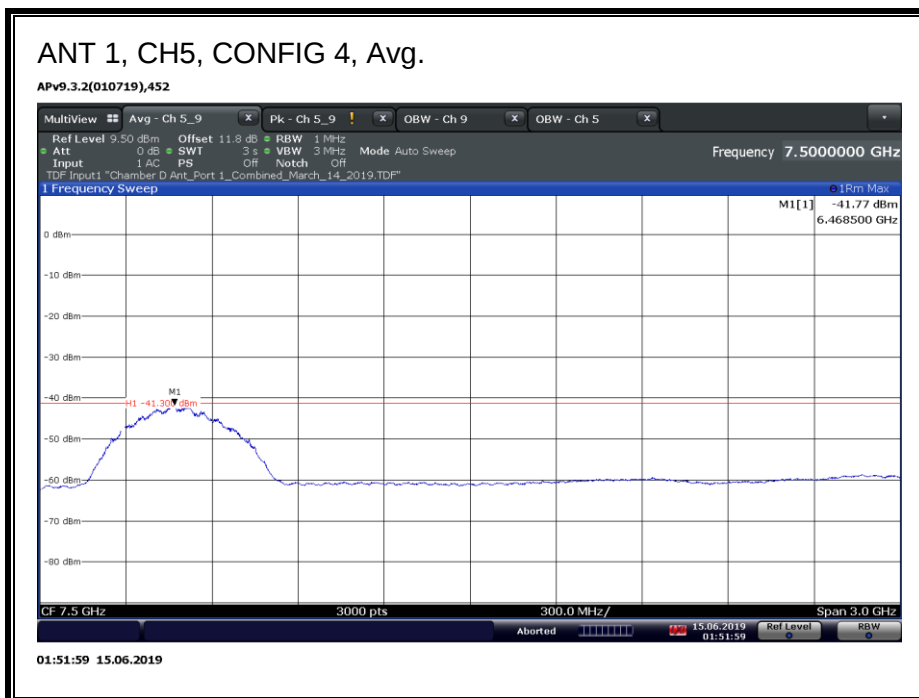
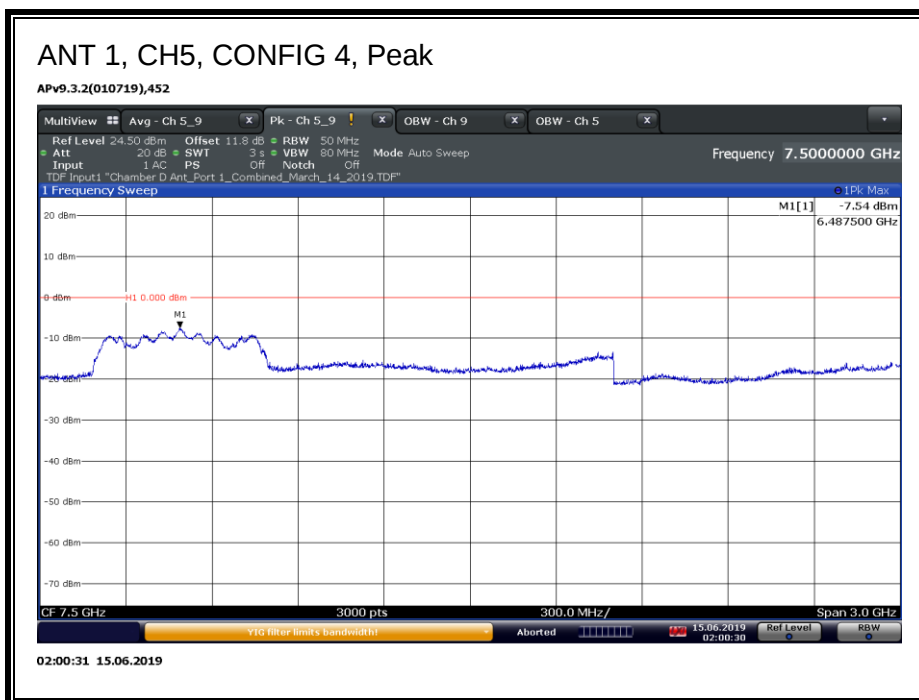
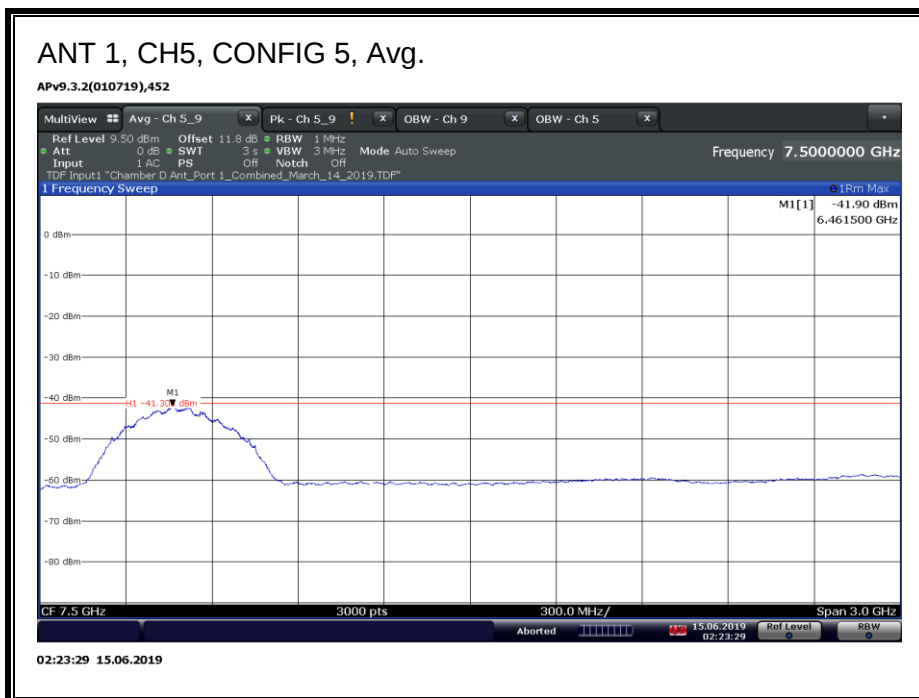
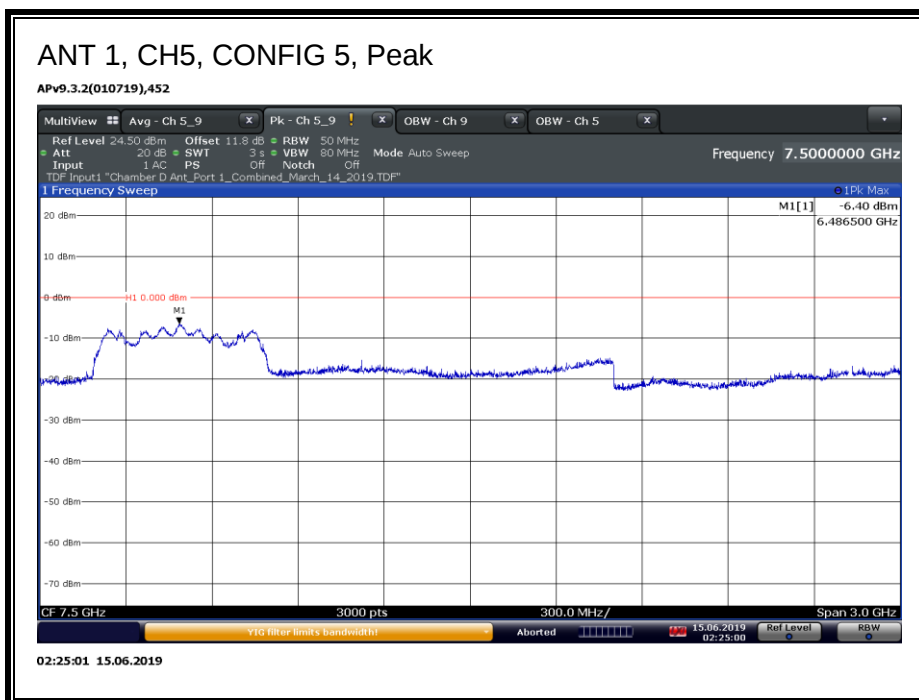


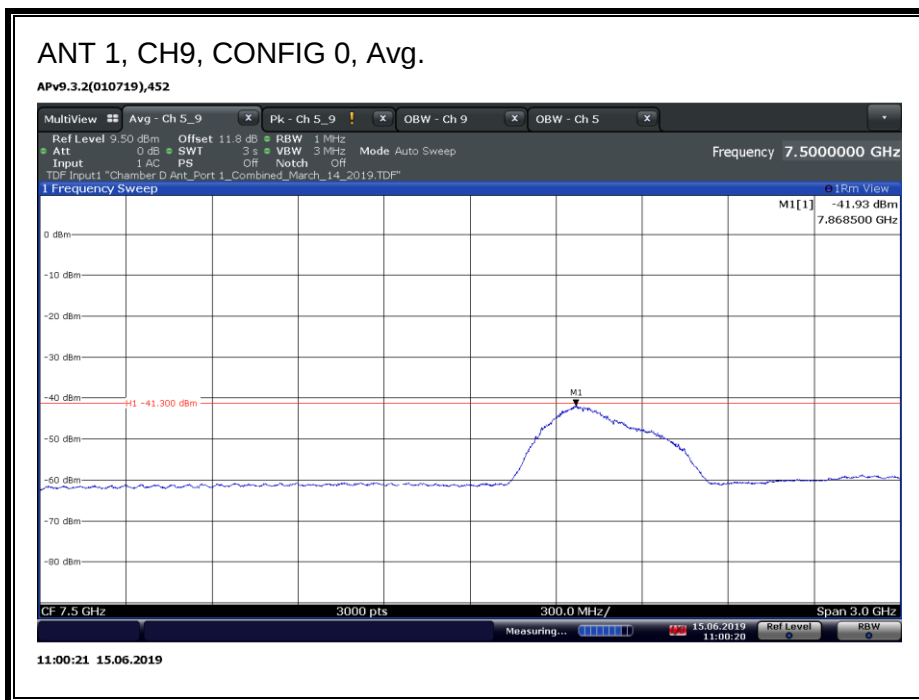
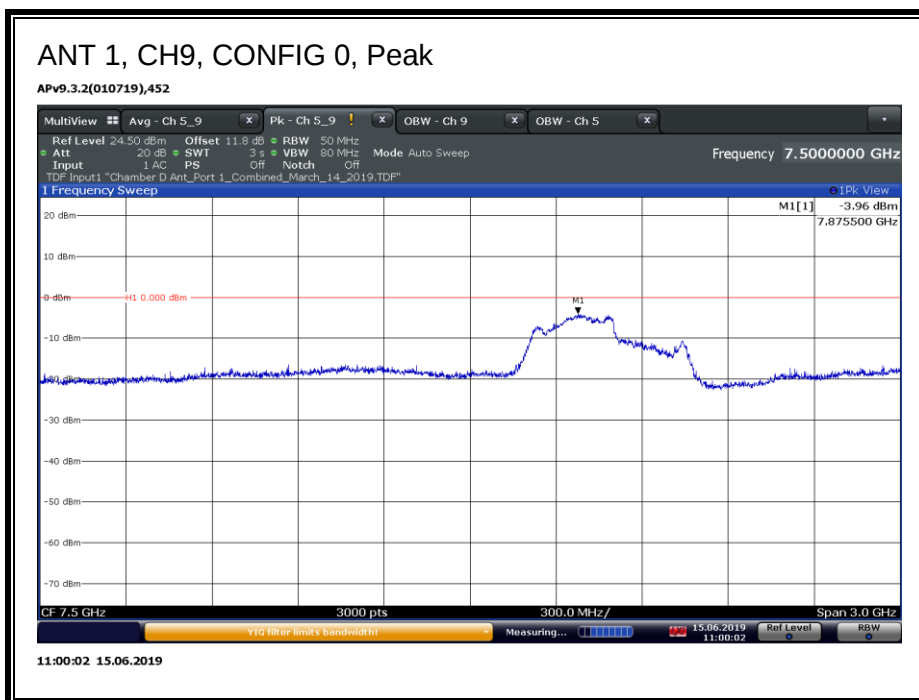


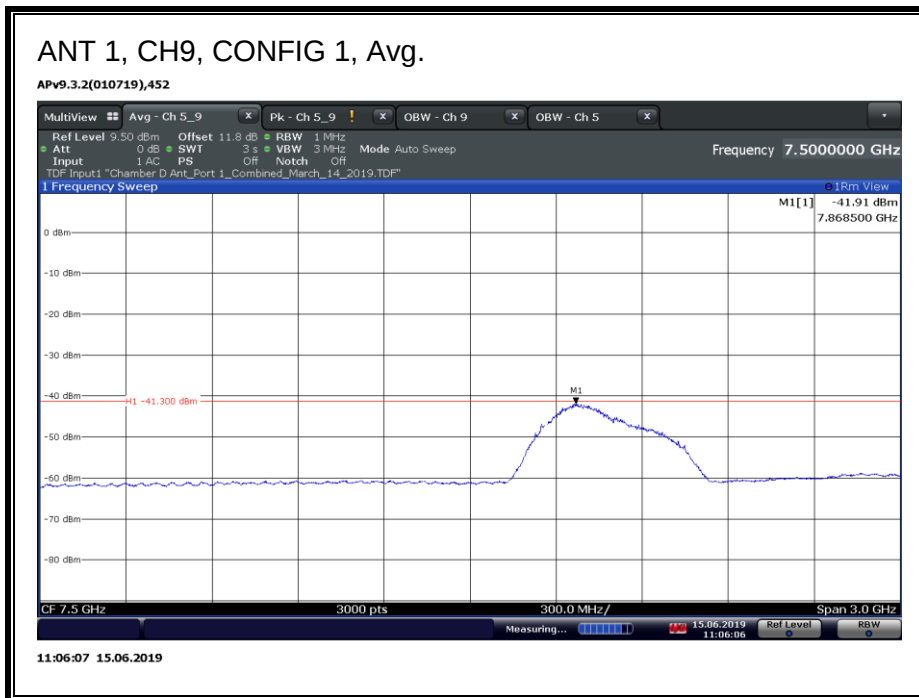
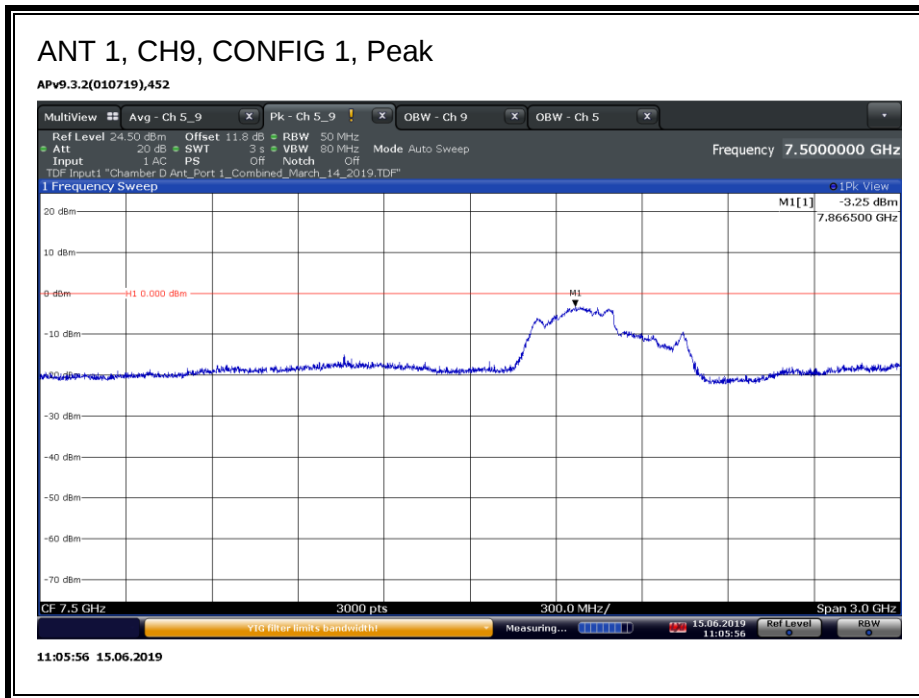


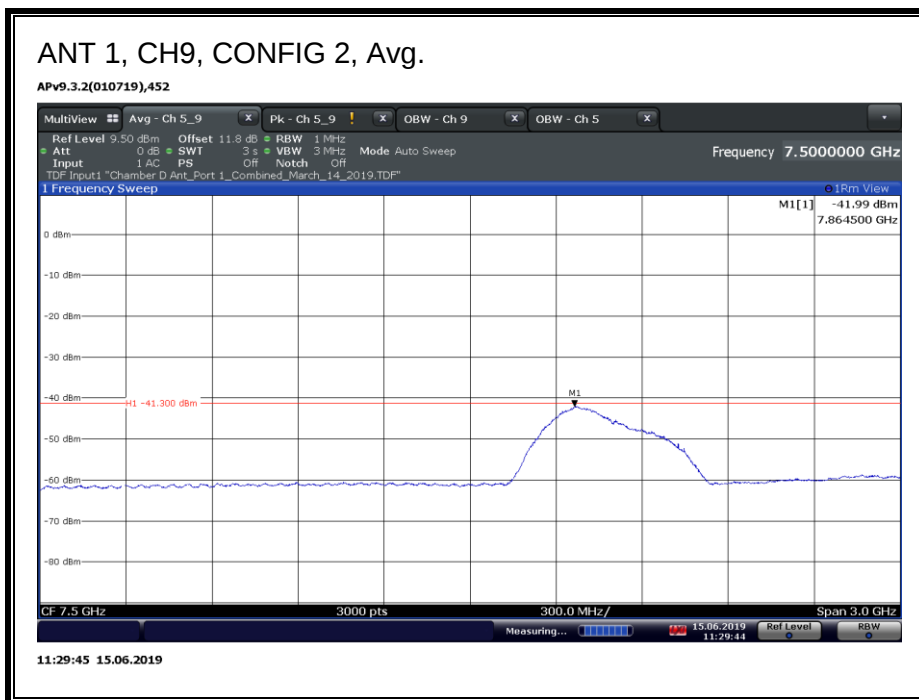
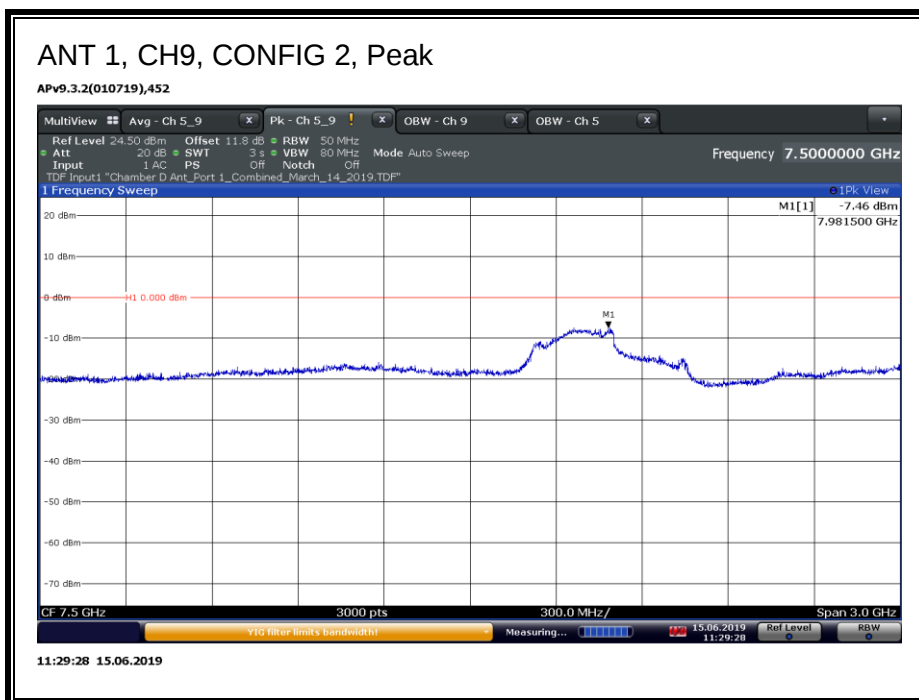


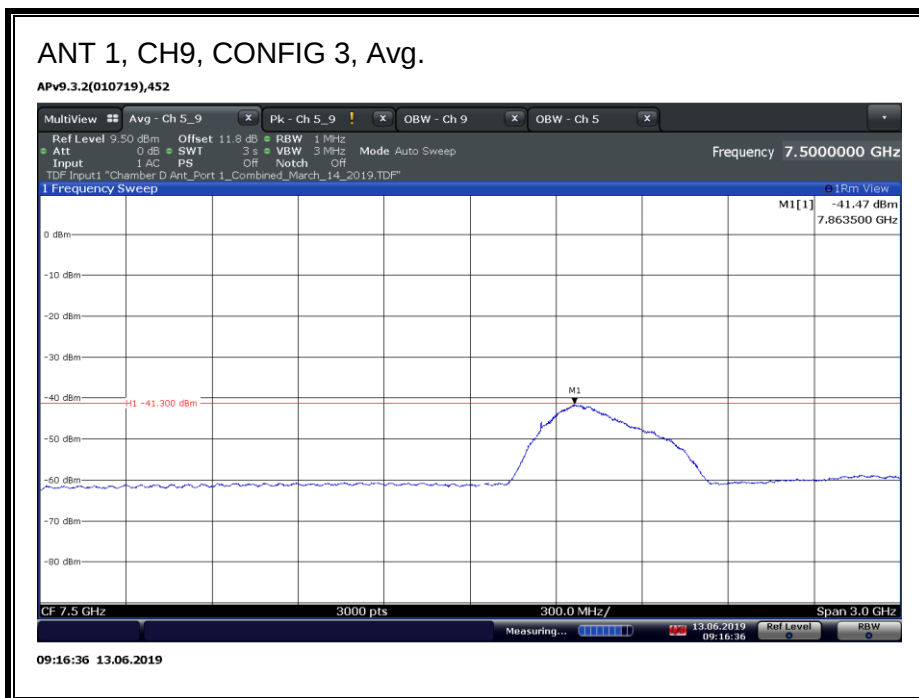
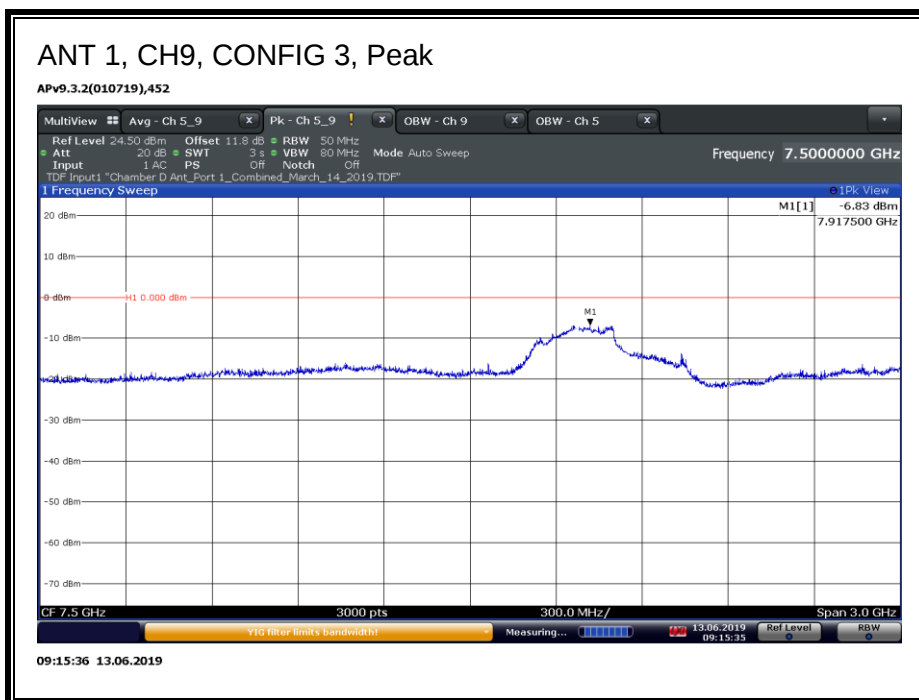






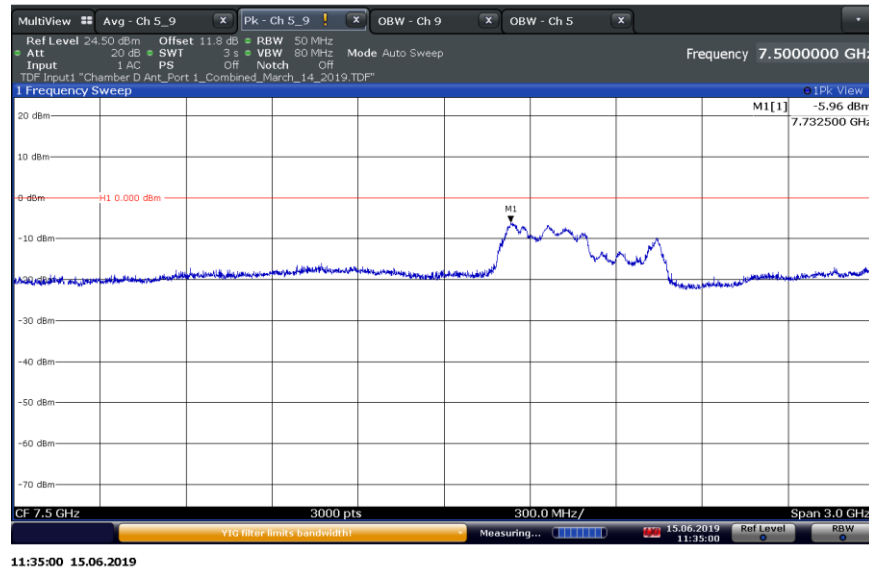






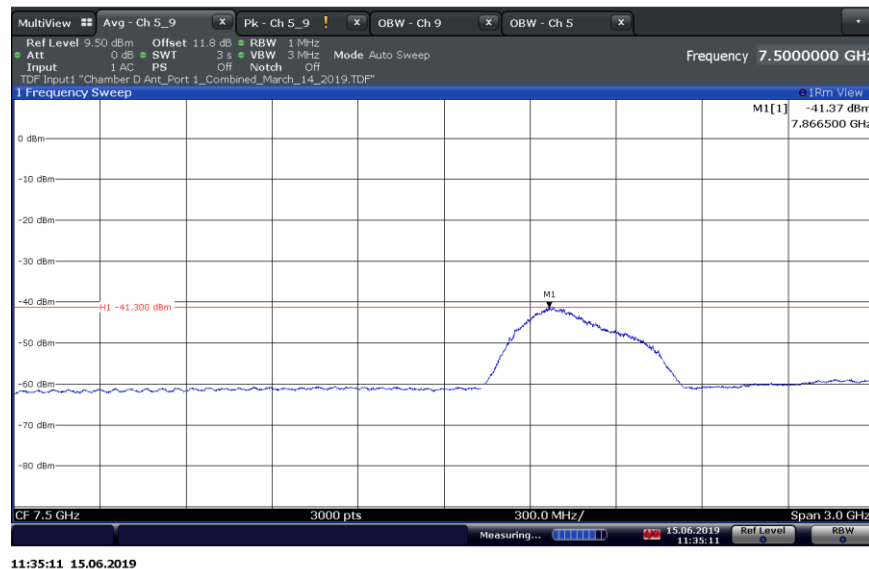
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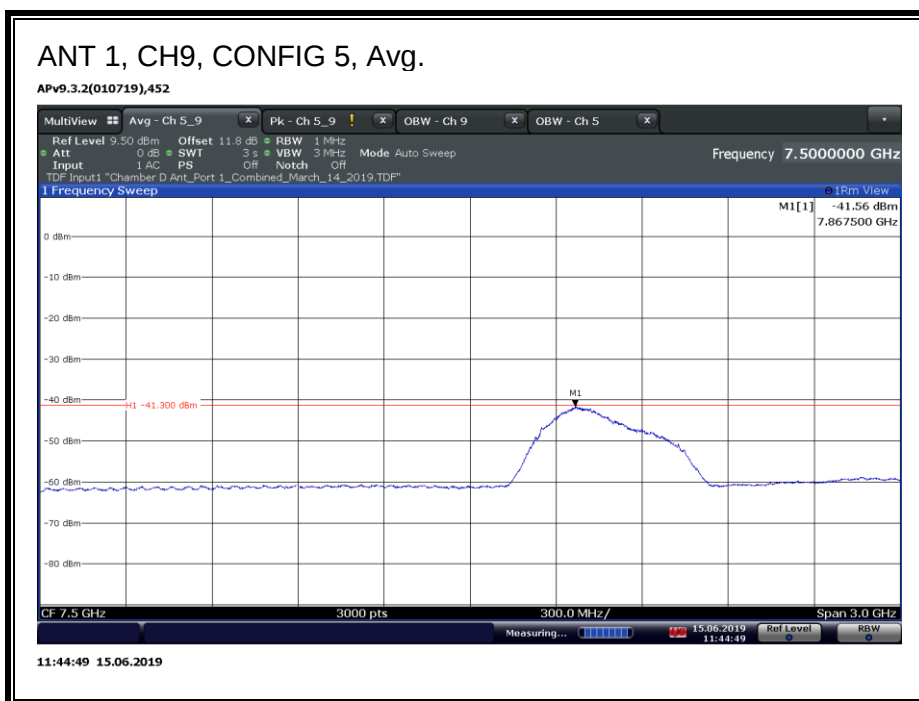
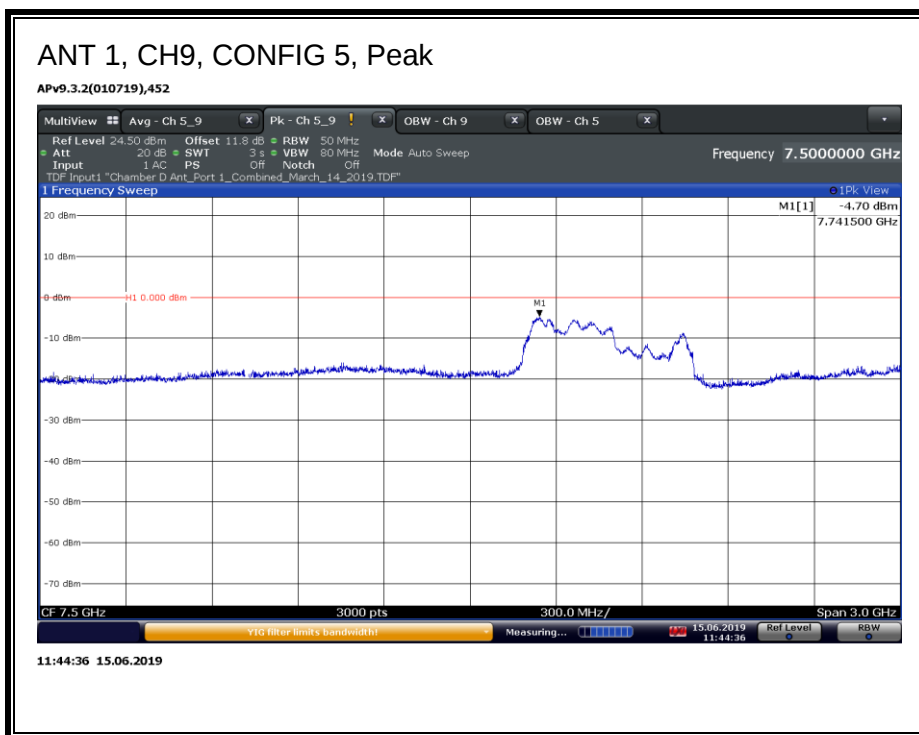
APv9.3.2(010719),452

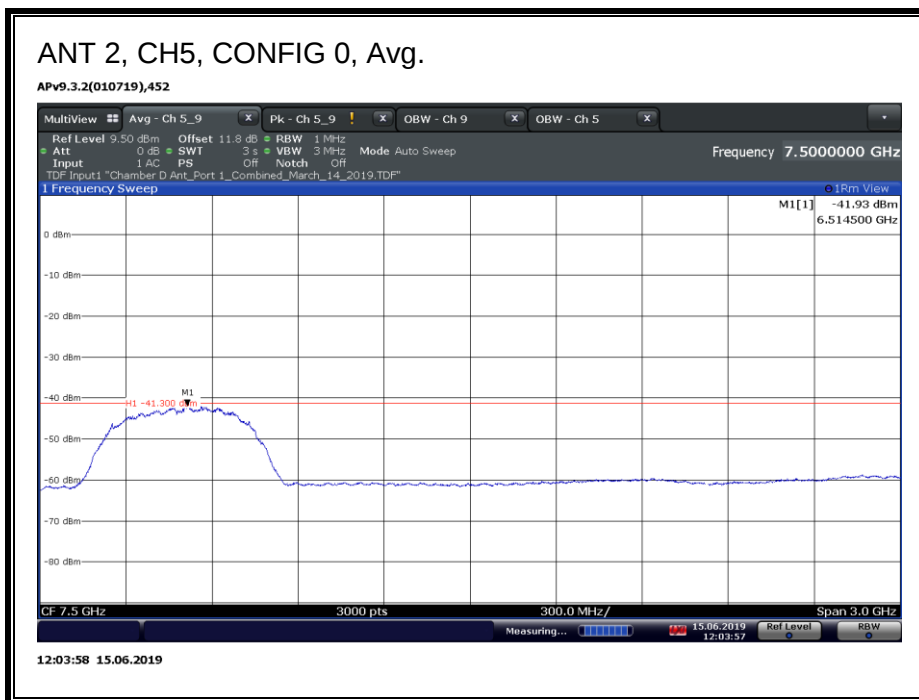
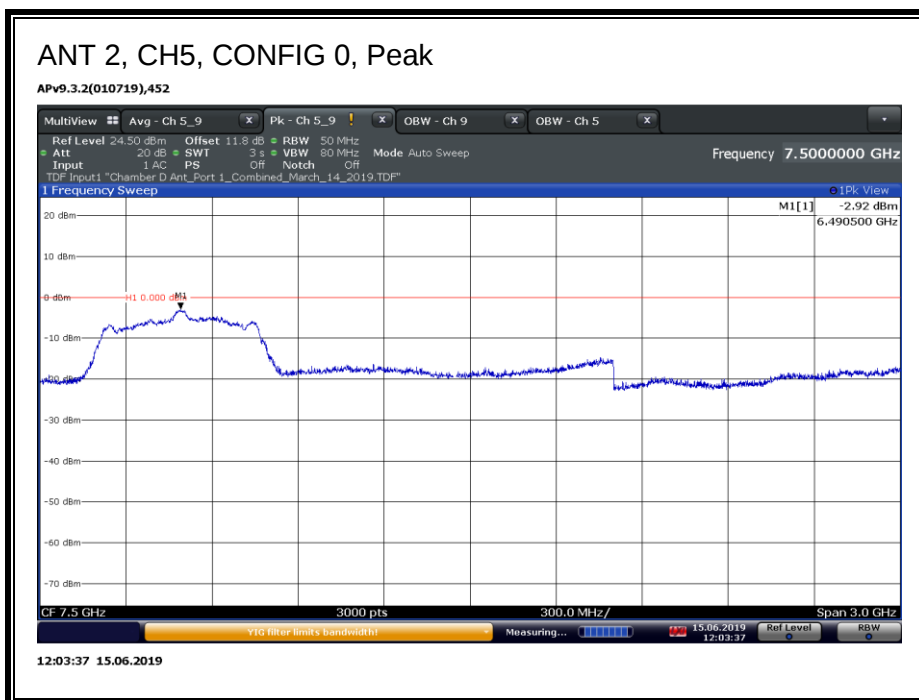


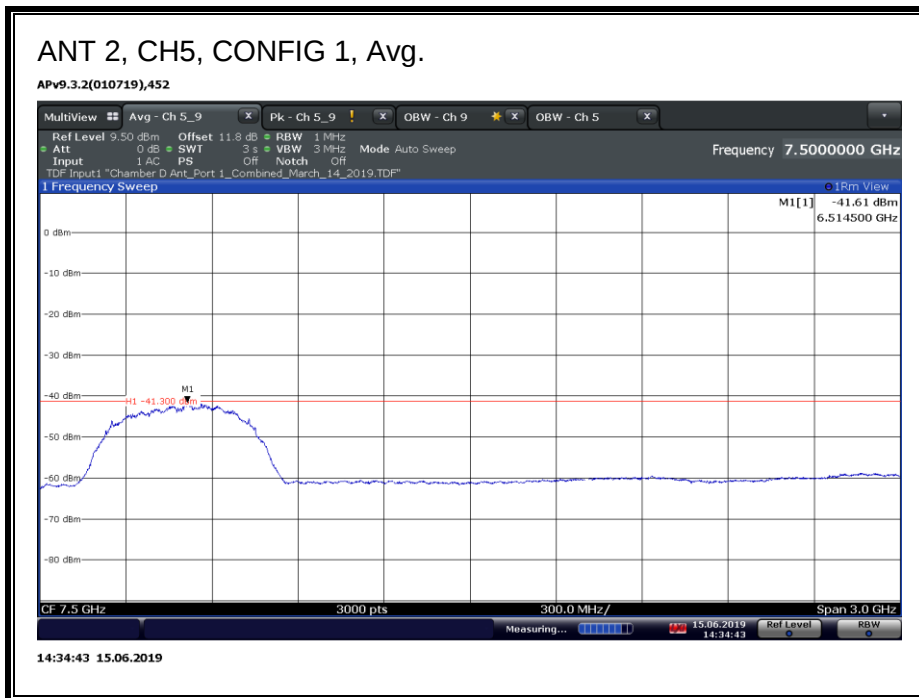
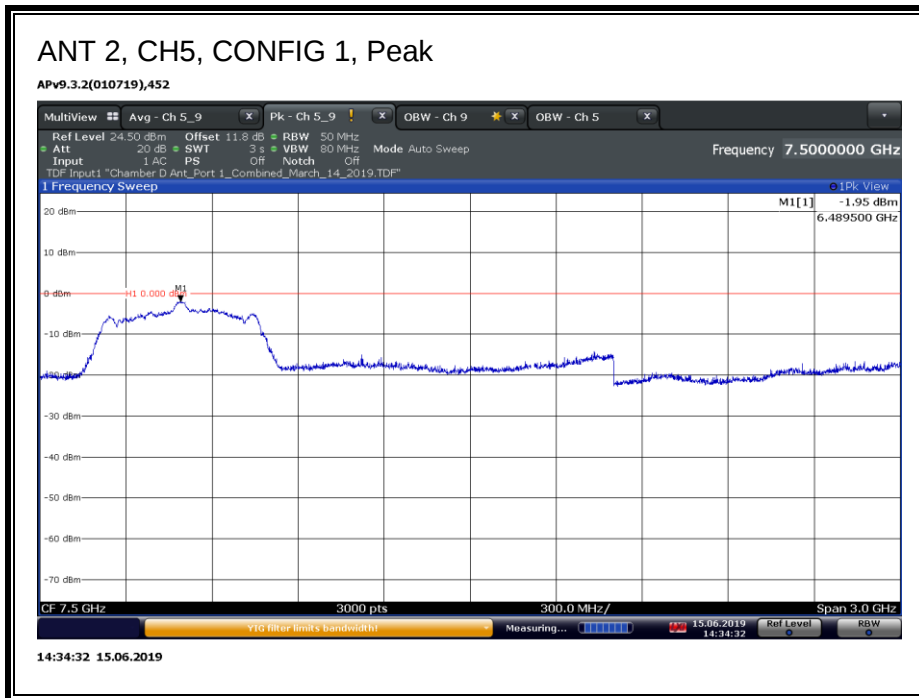
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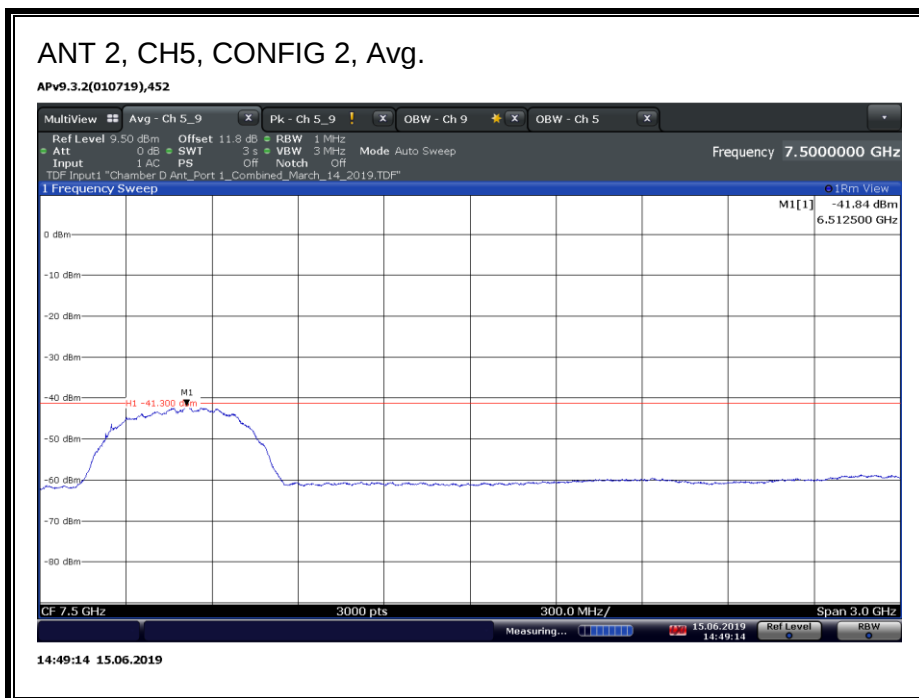
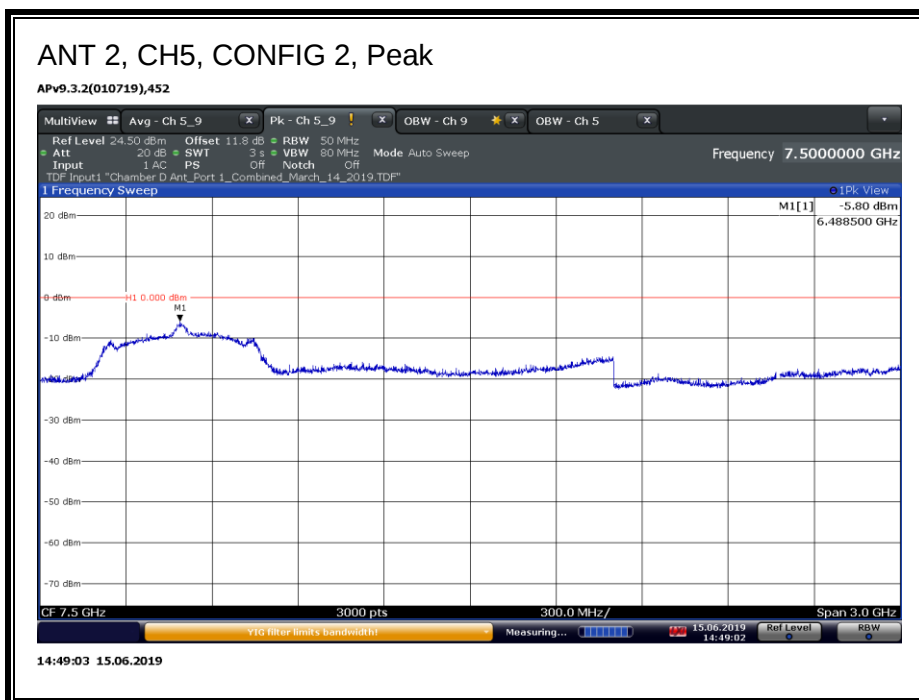
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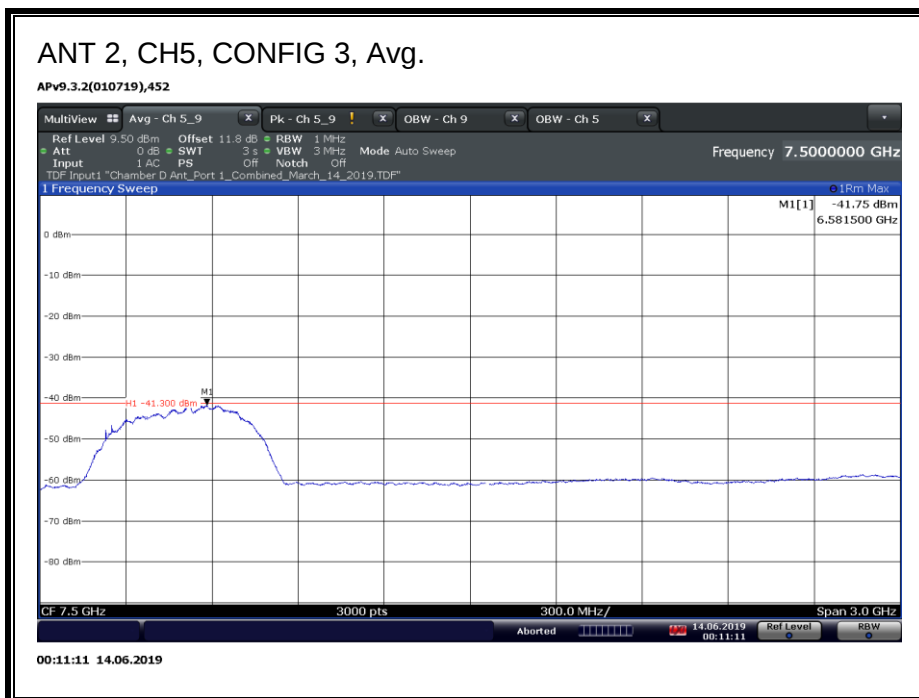
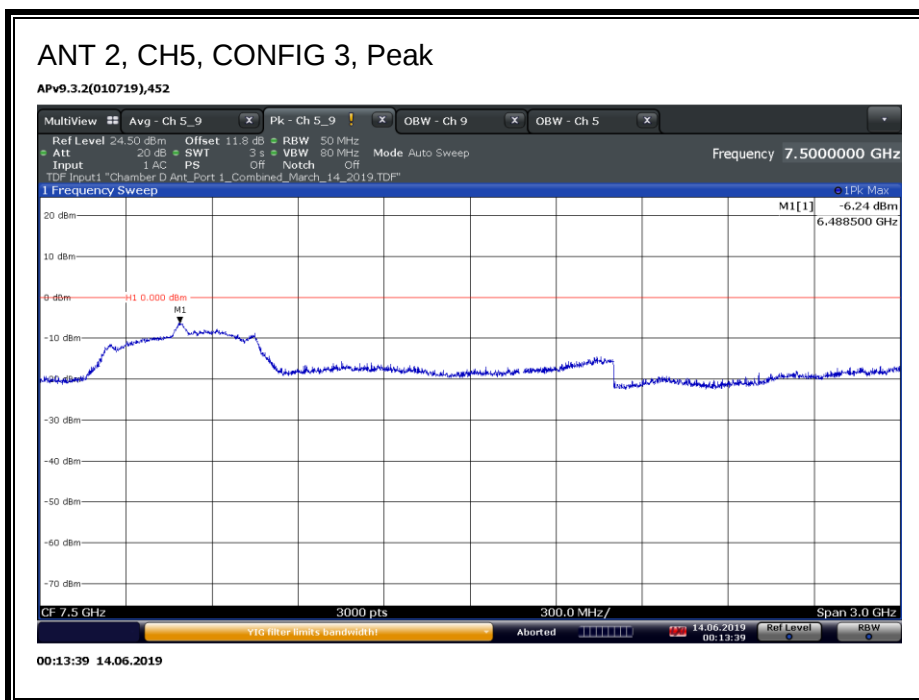


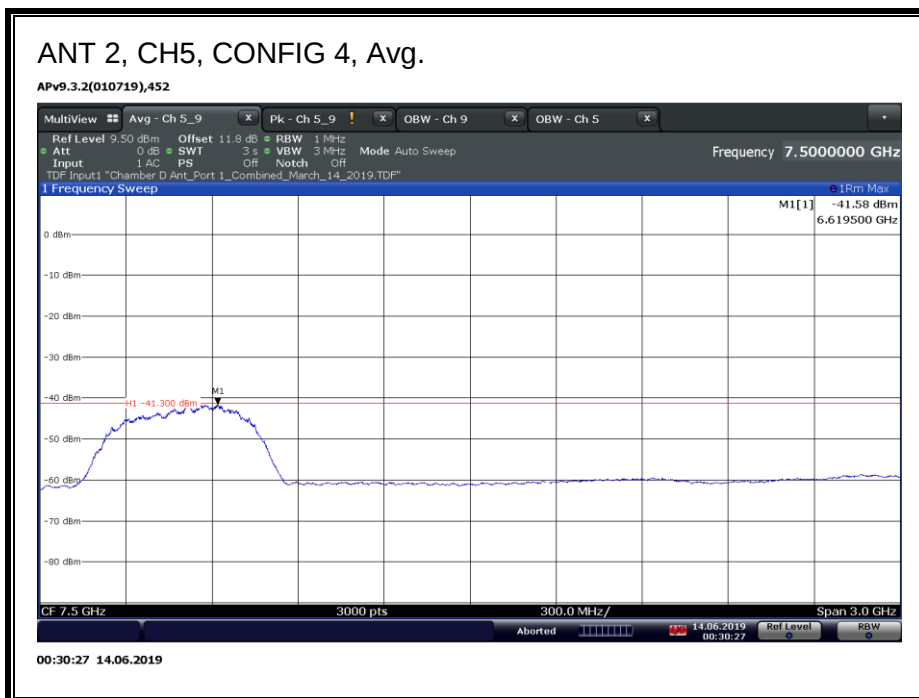
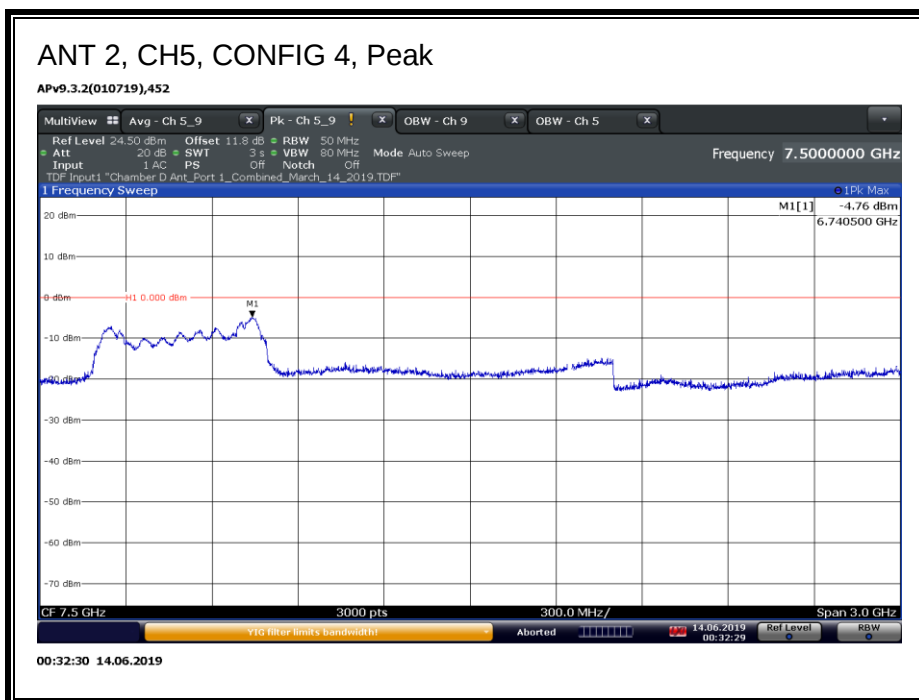


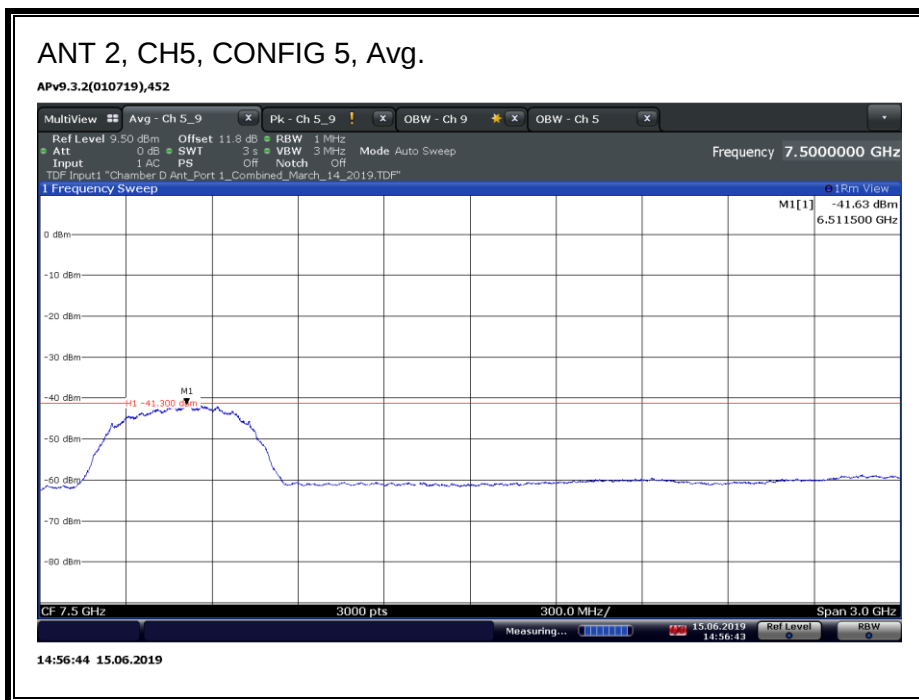
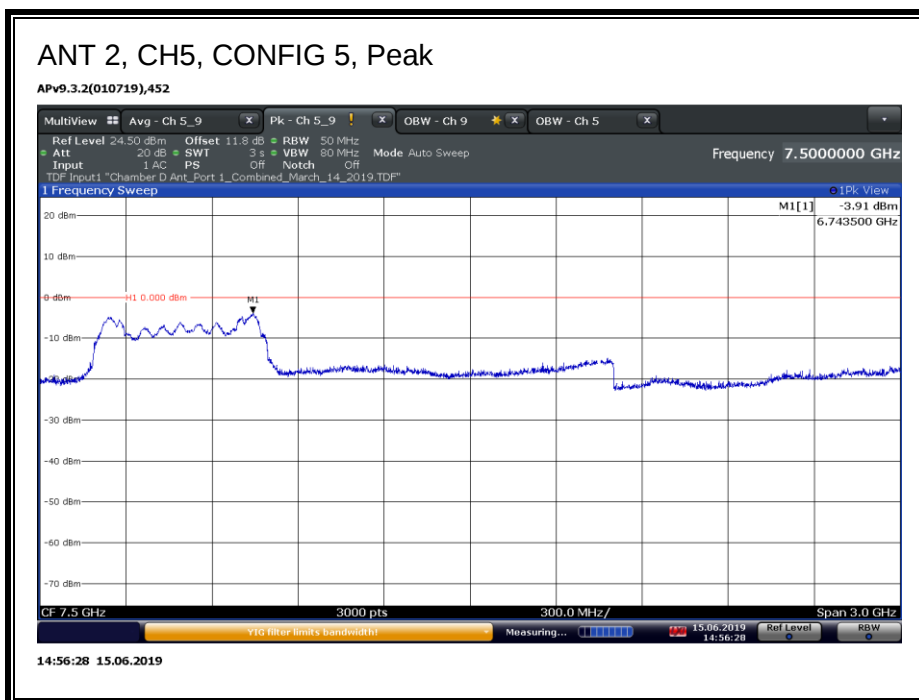


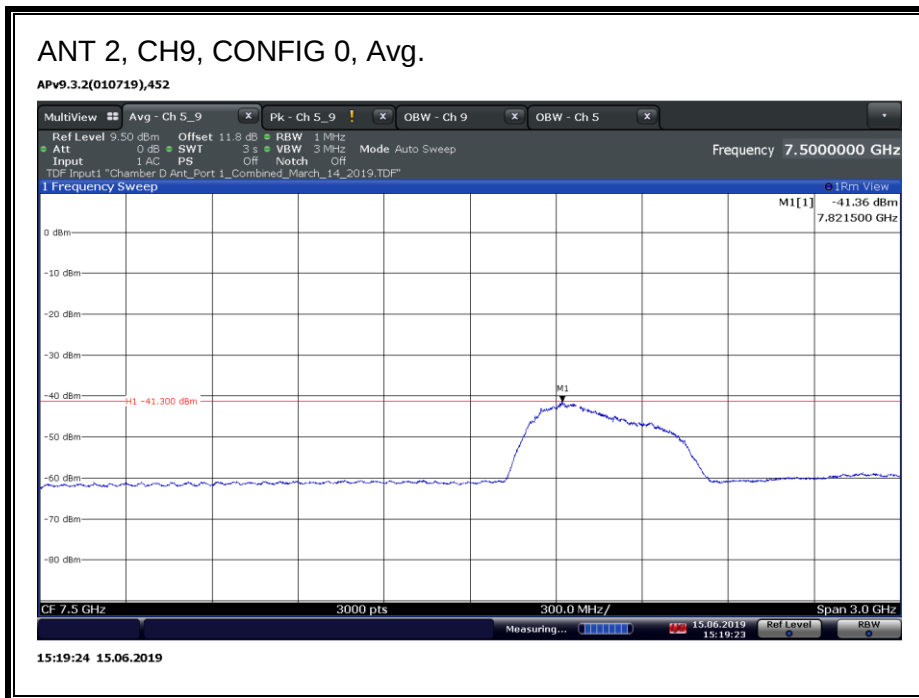
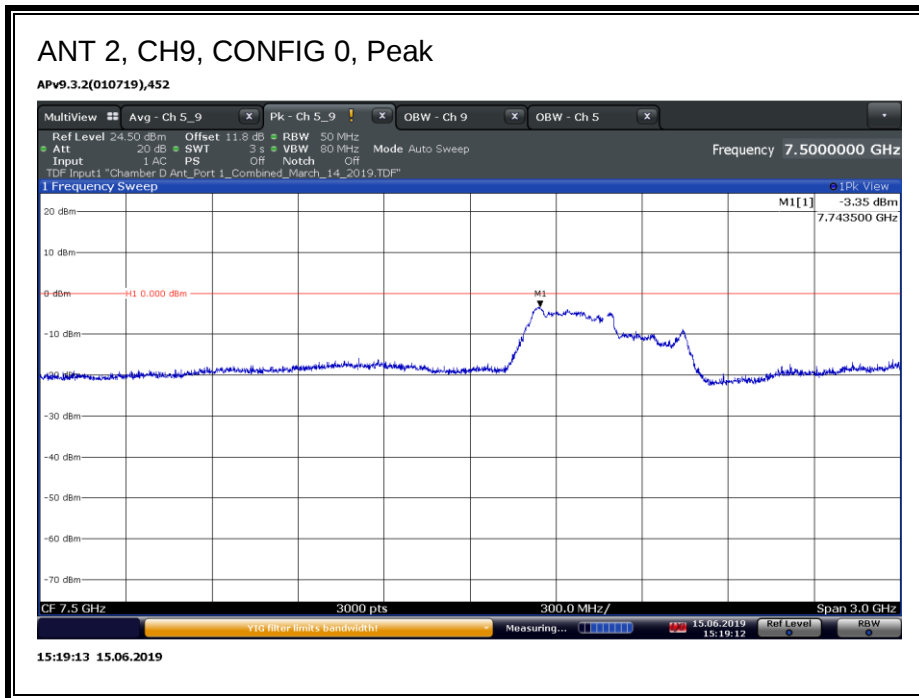


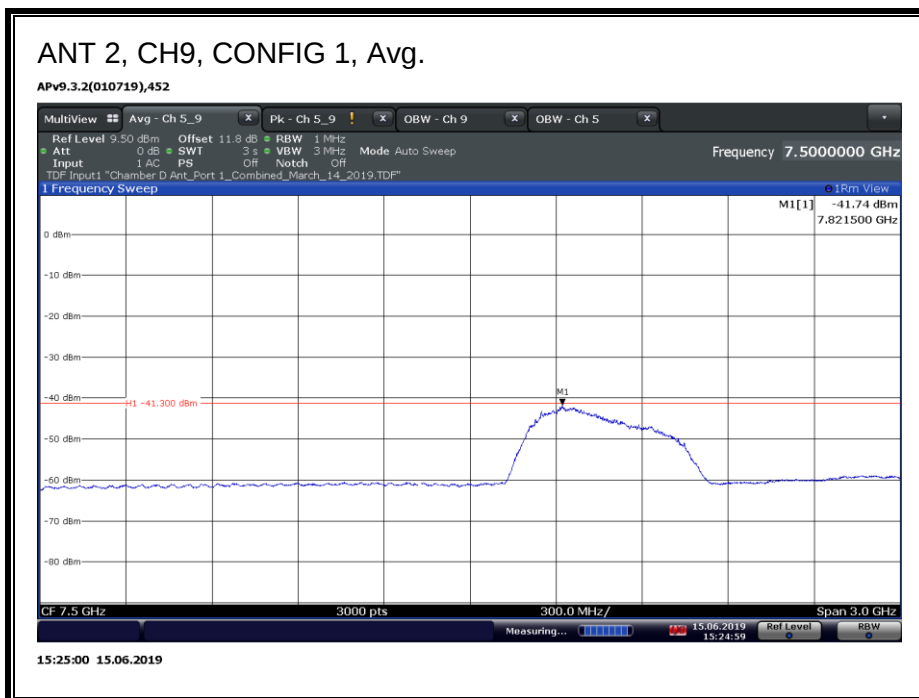
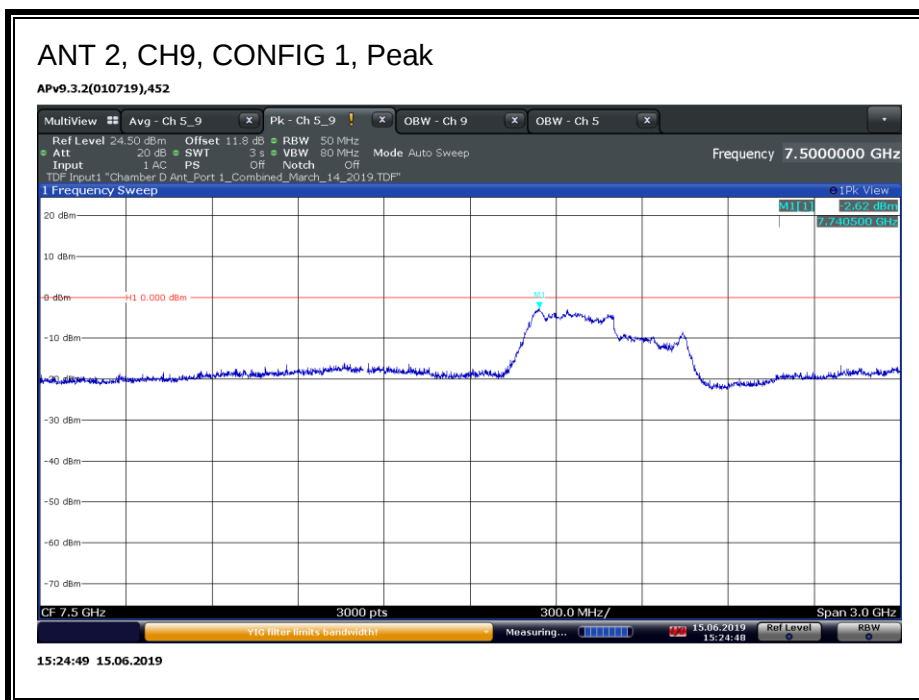


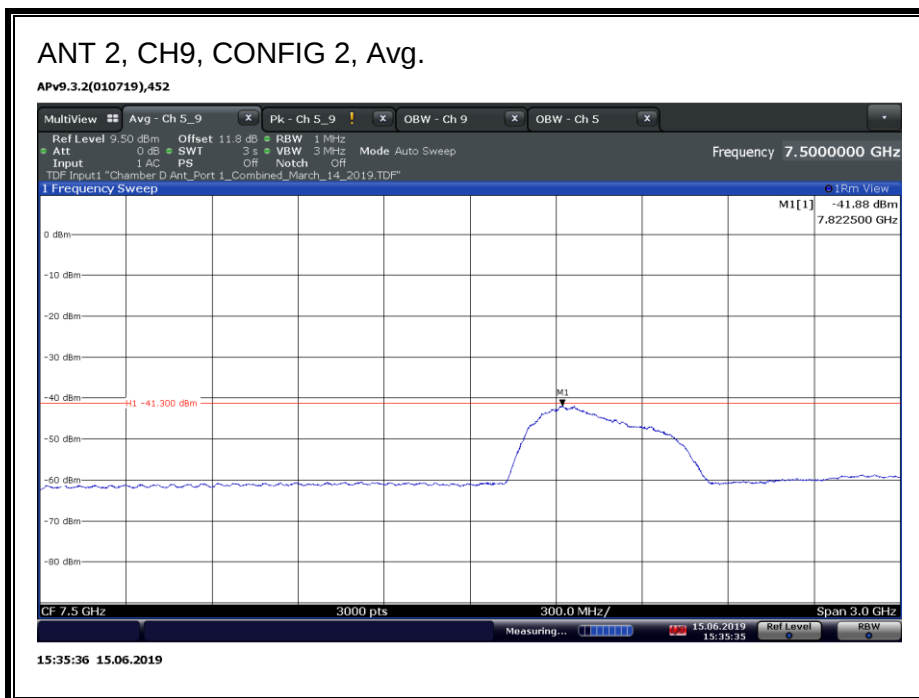
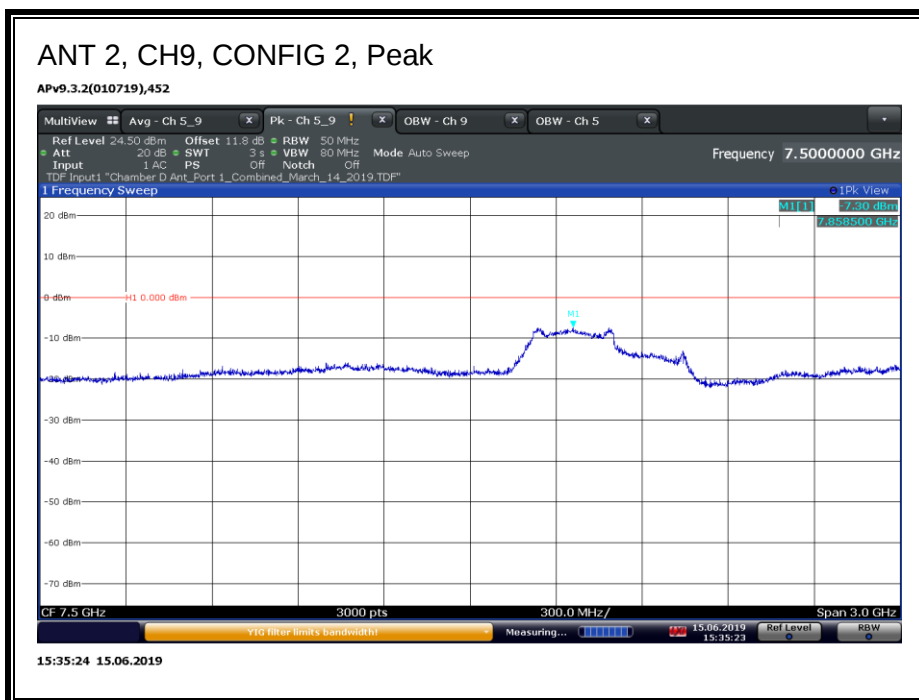


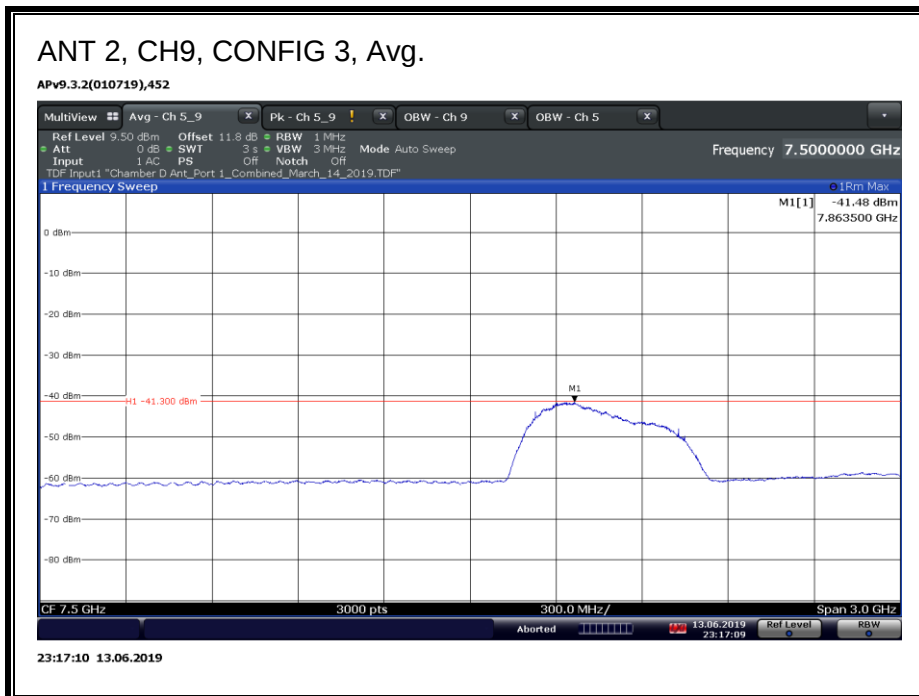
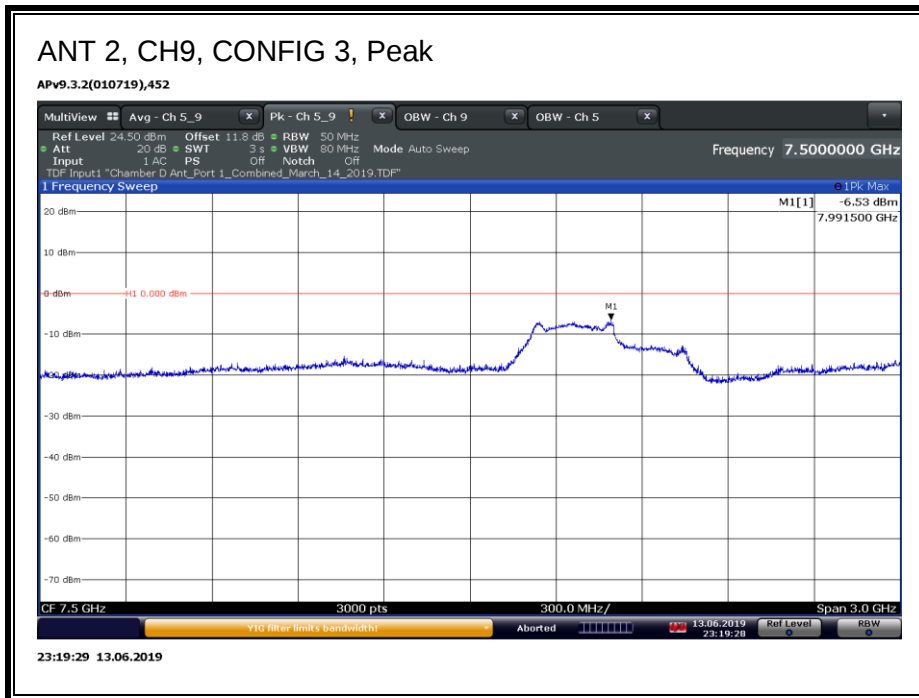


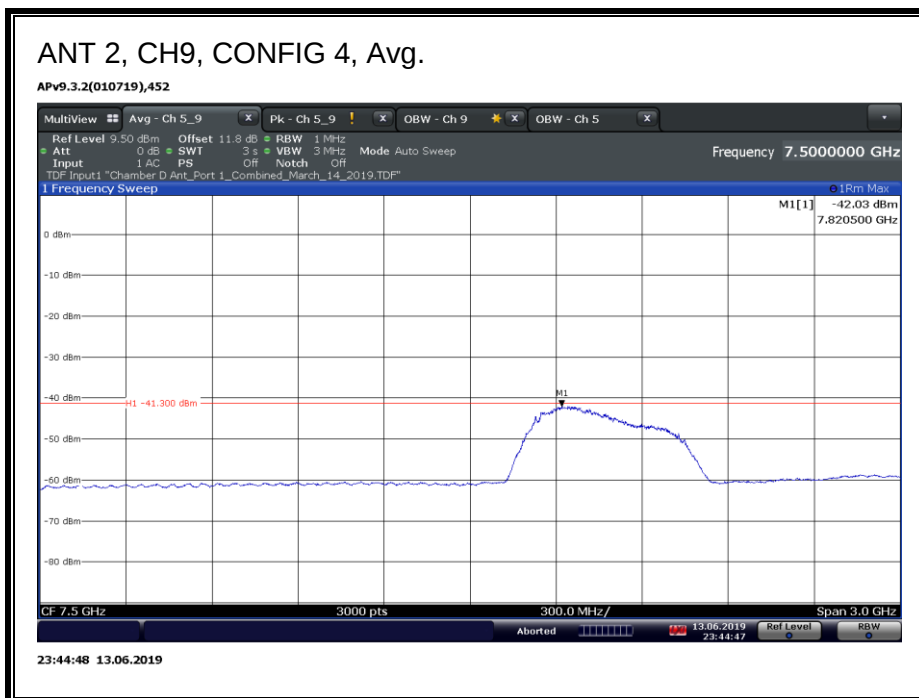
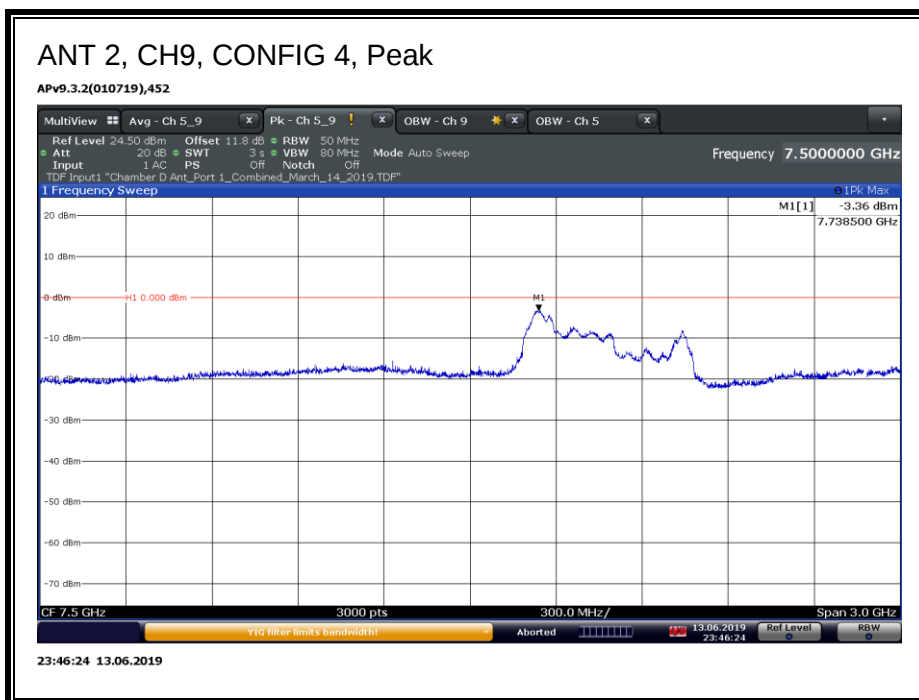


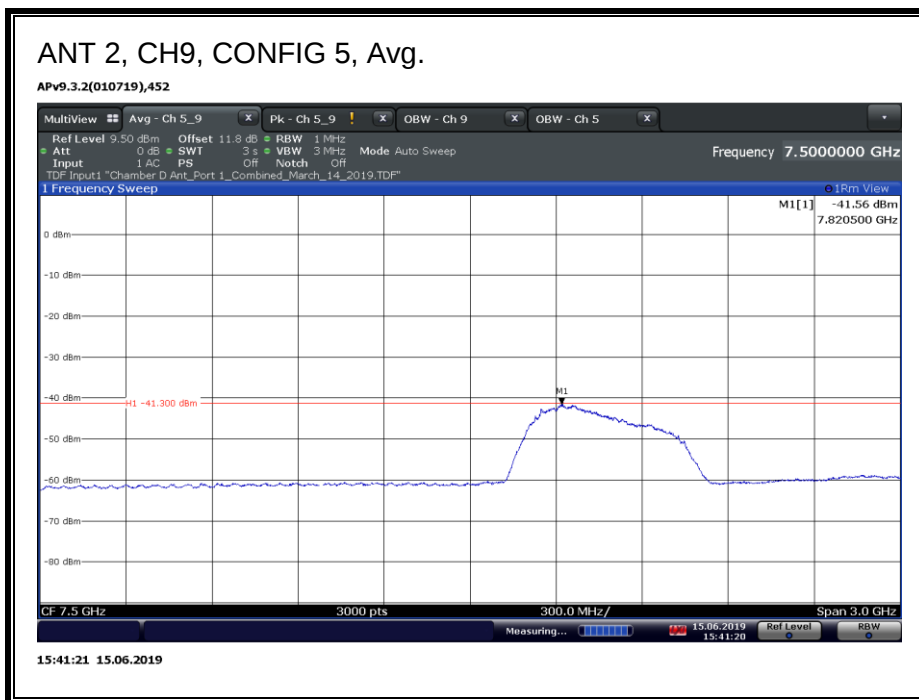
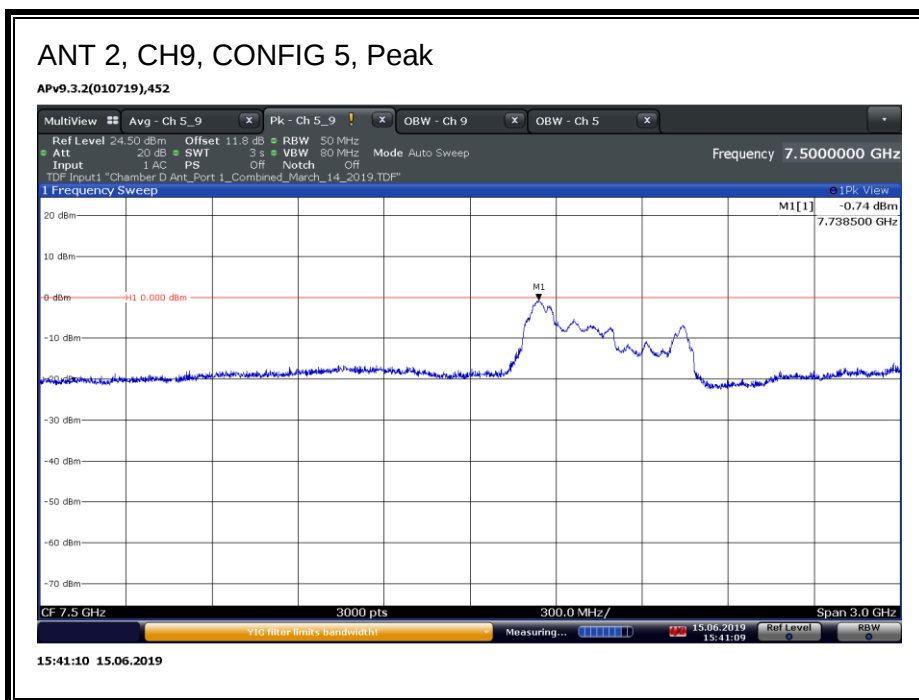


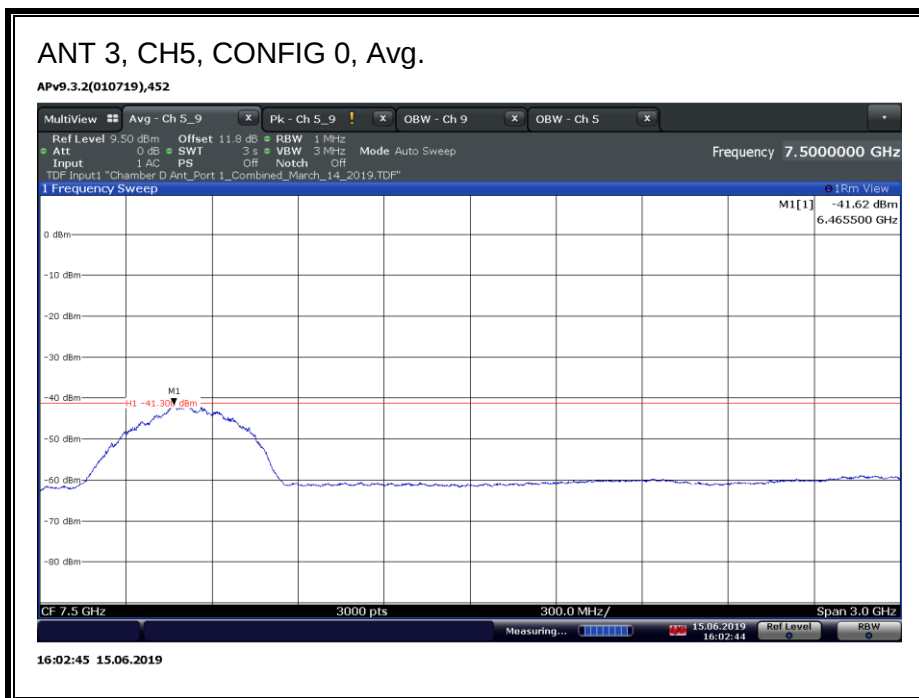
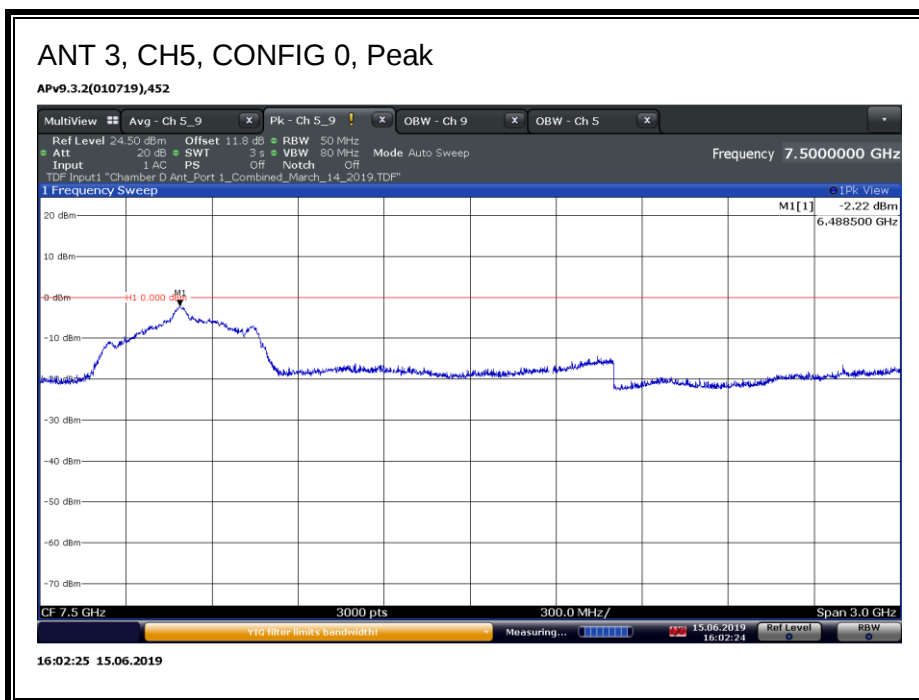


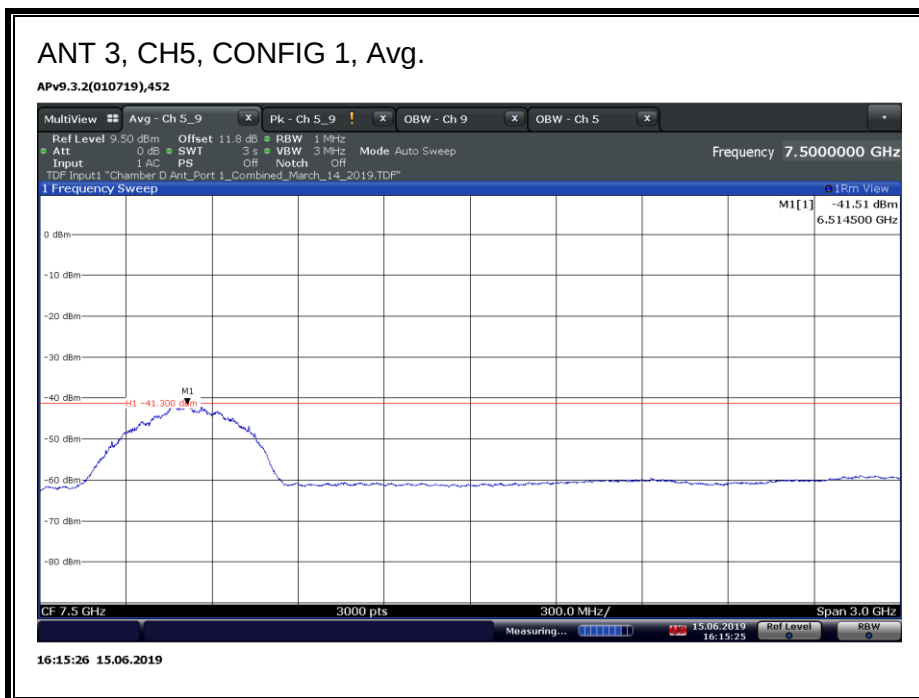
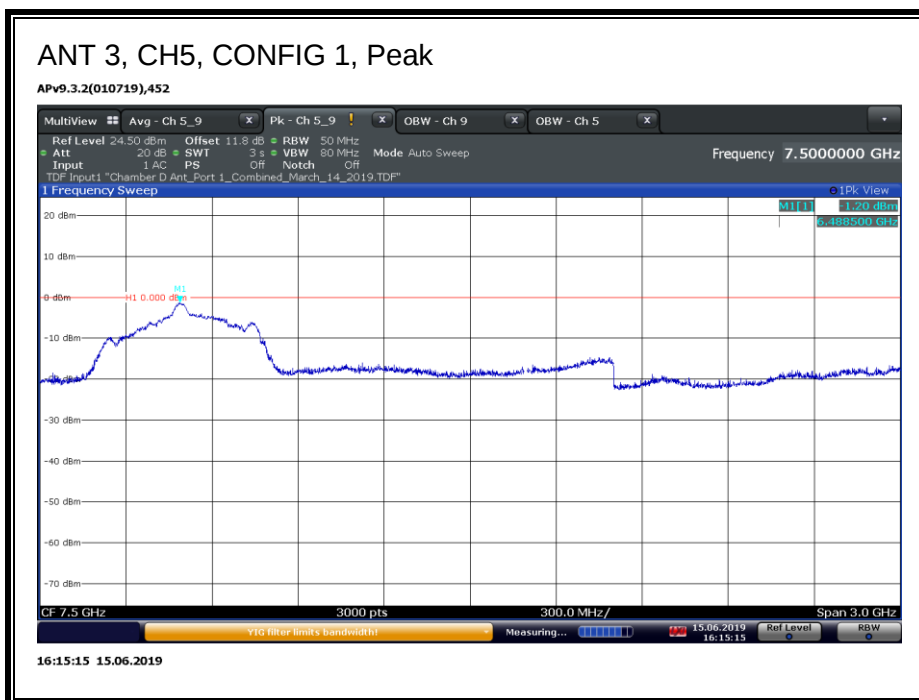


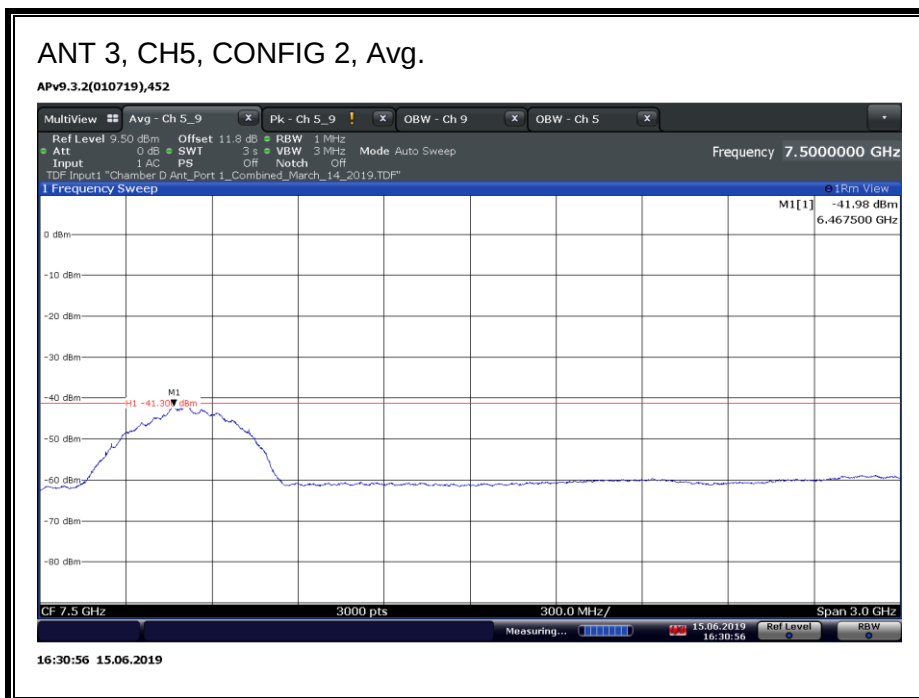
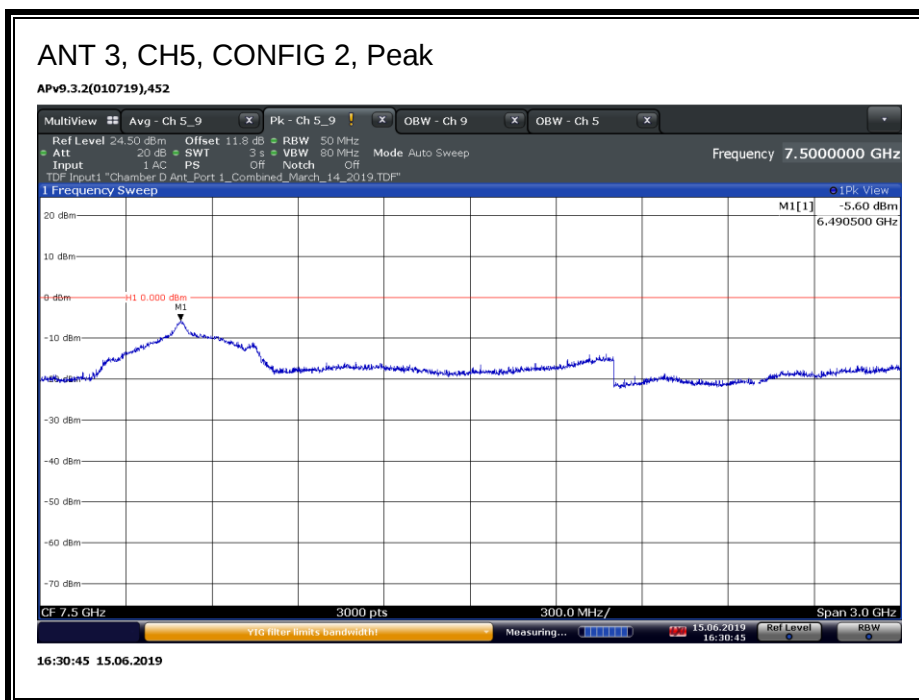


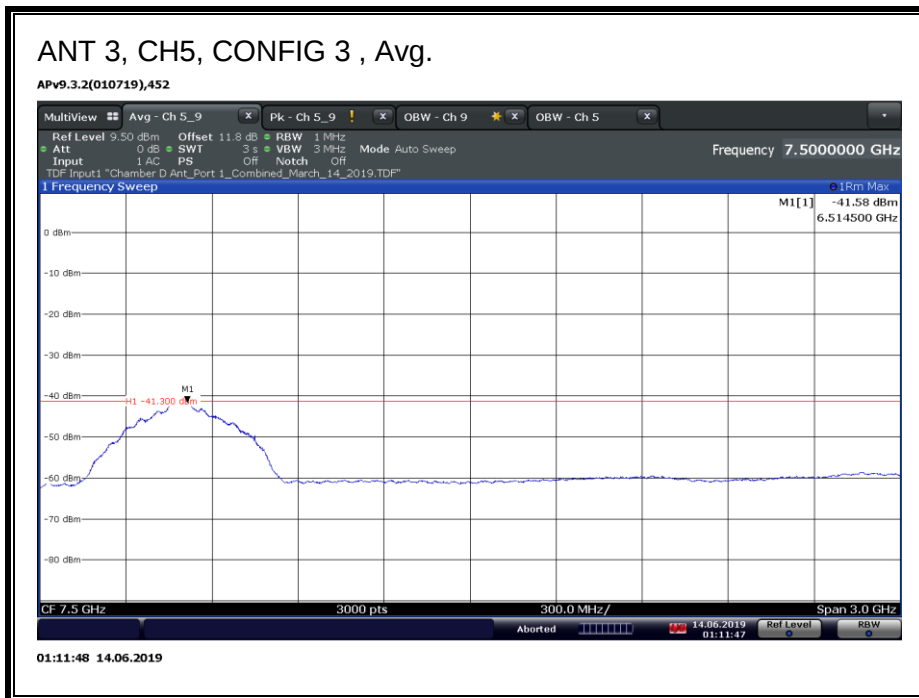
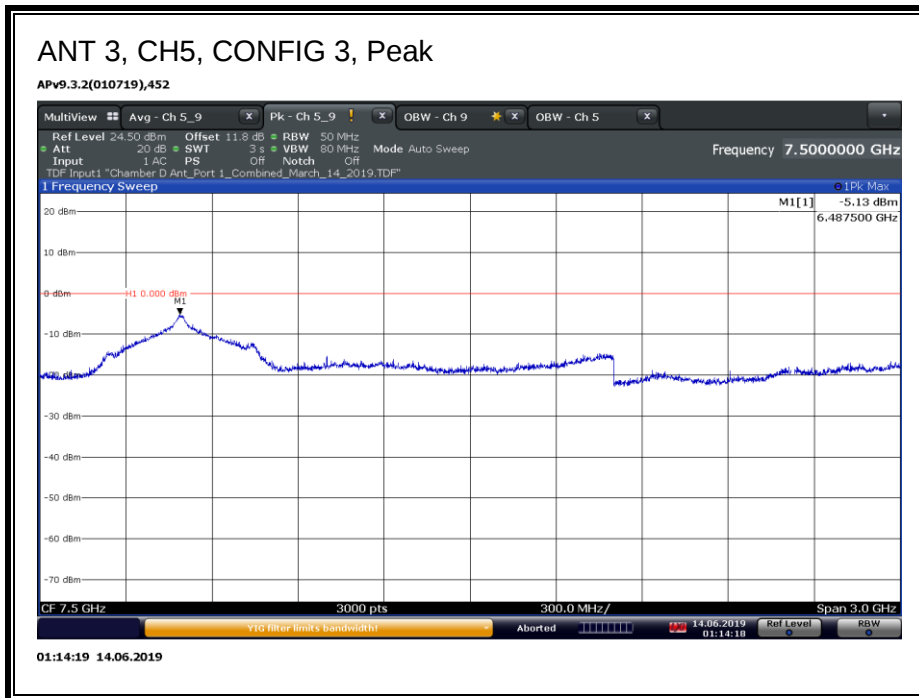


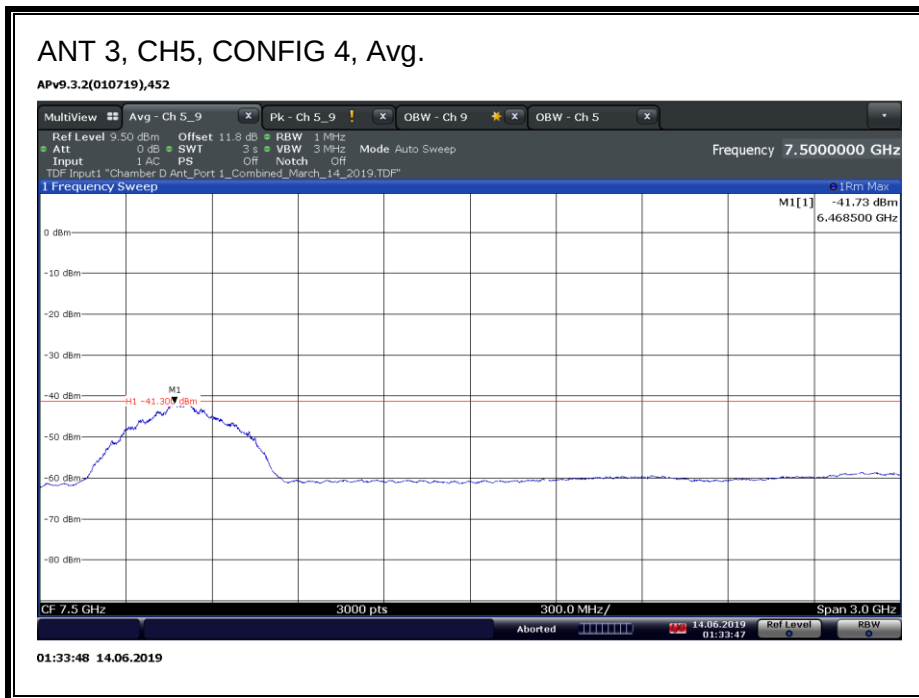
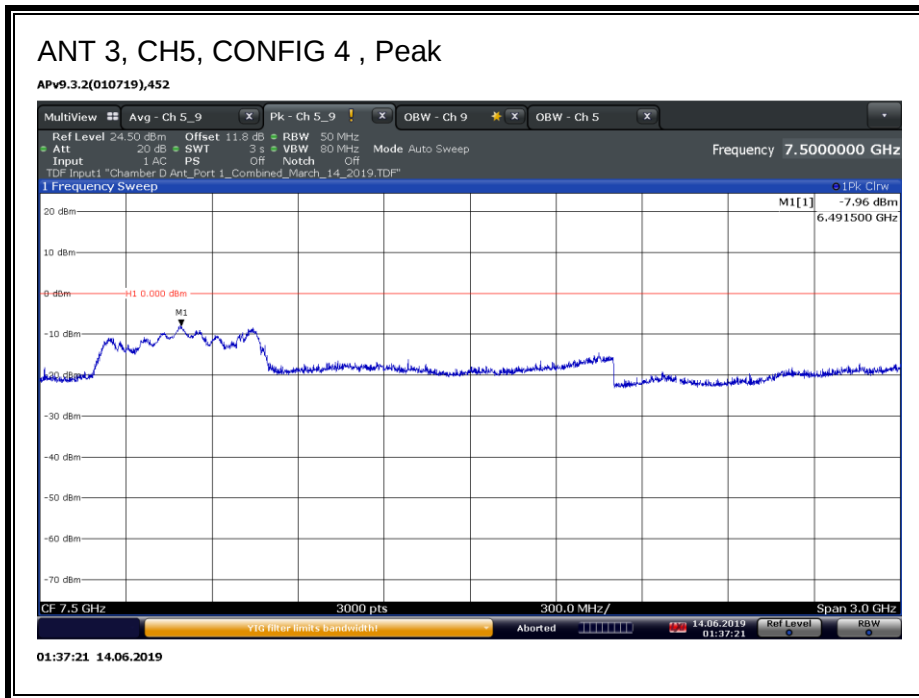


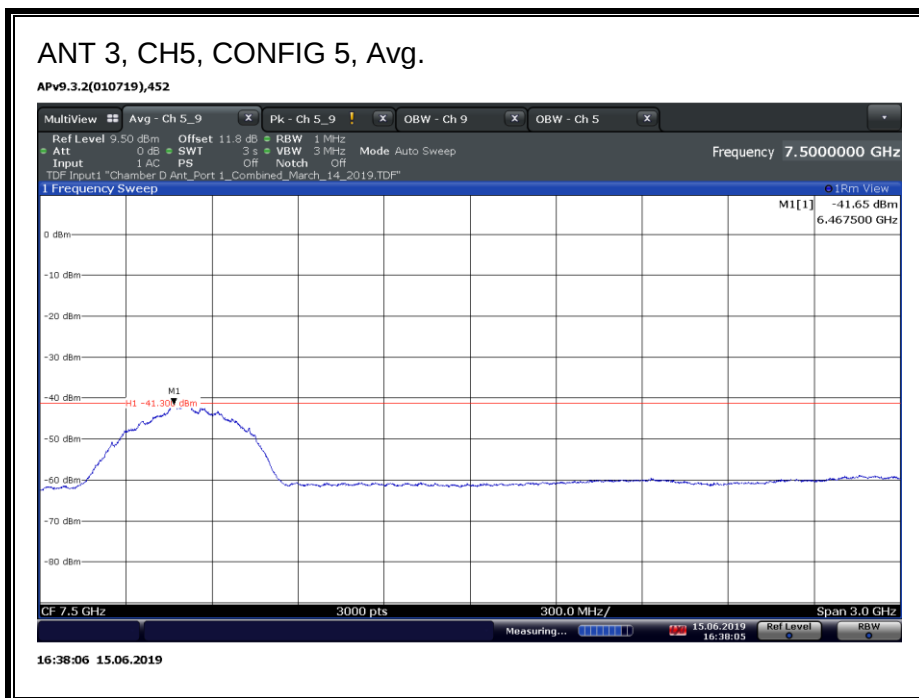
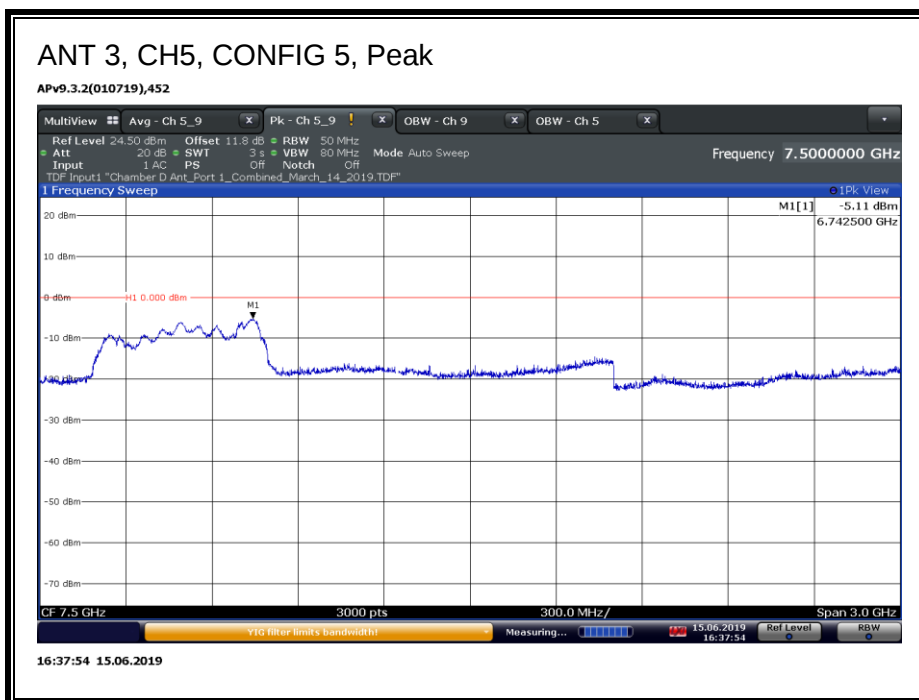


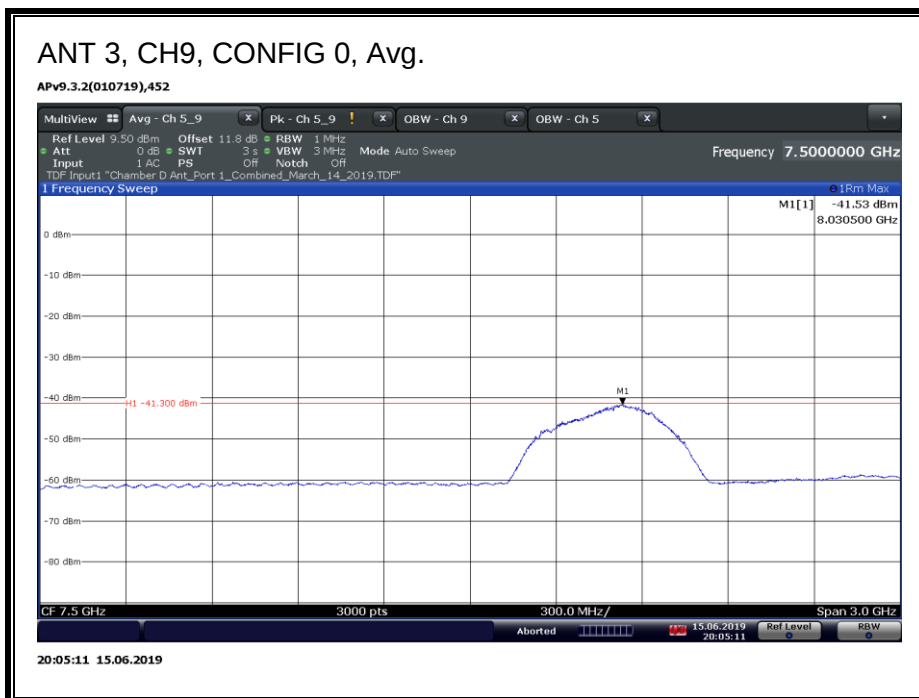
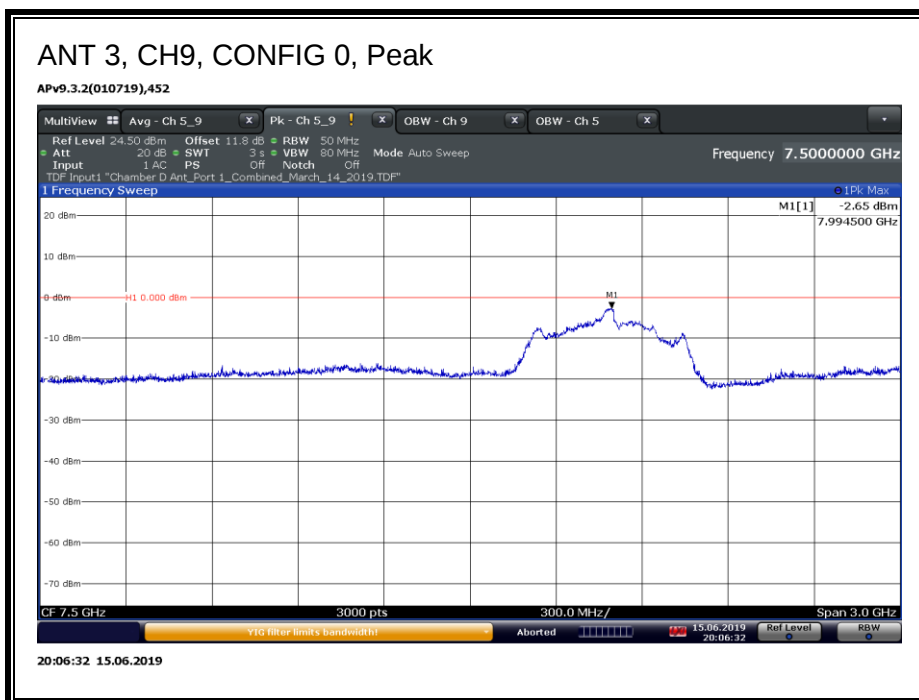


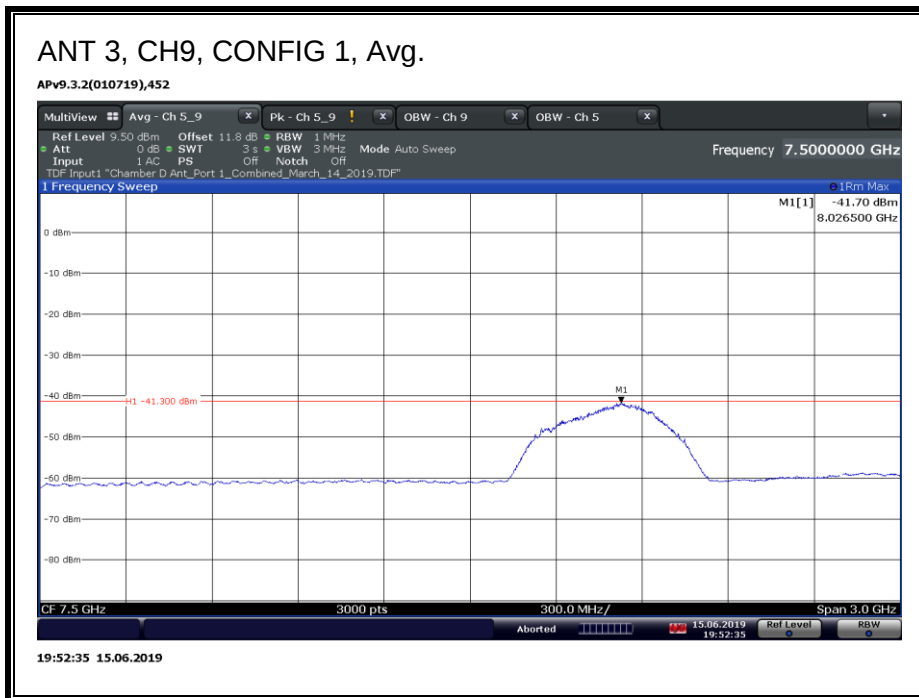
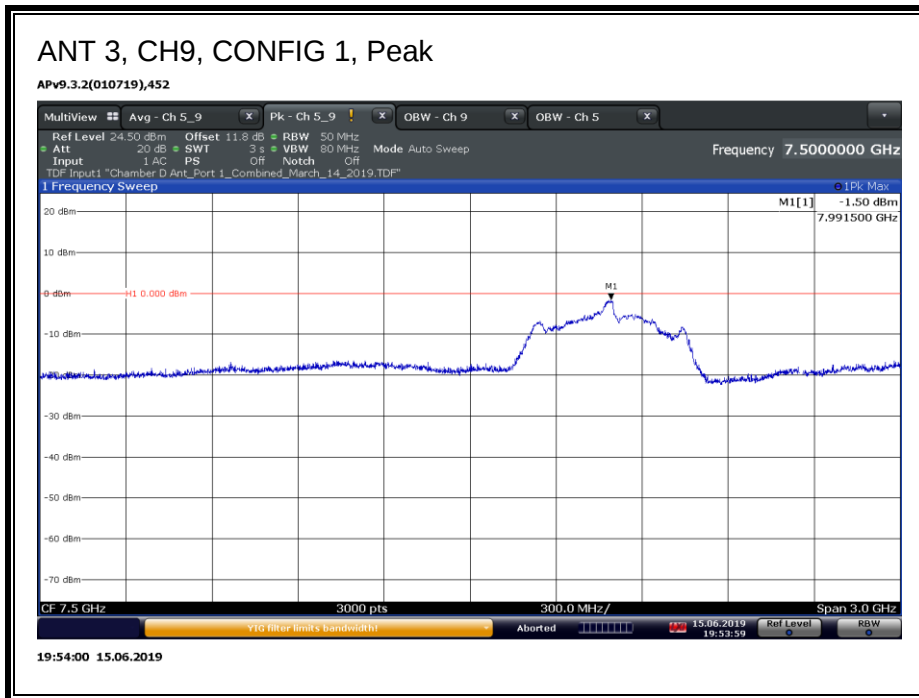


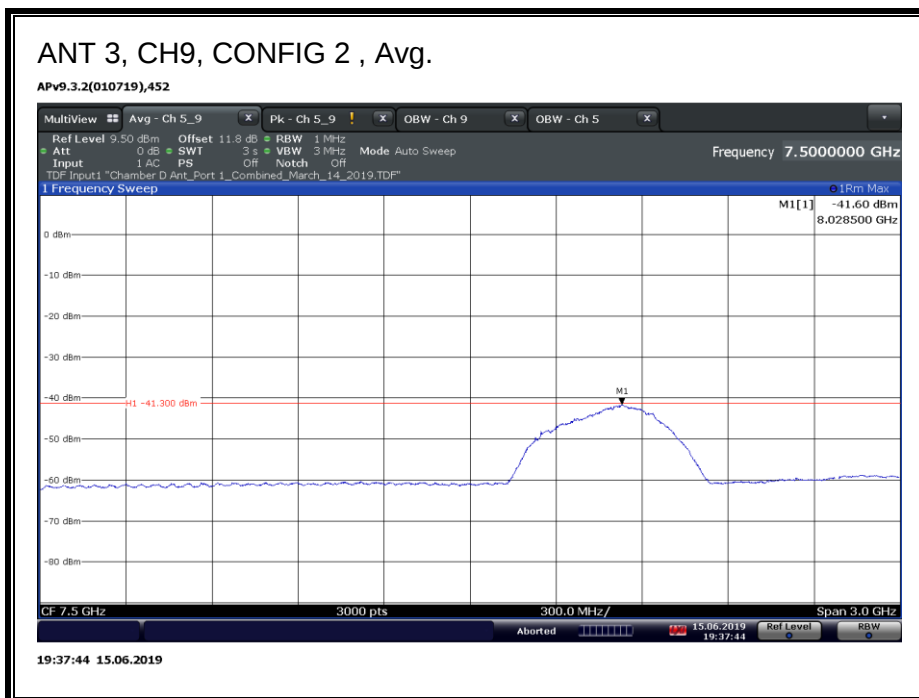
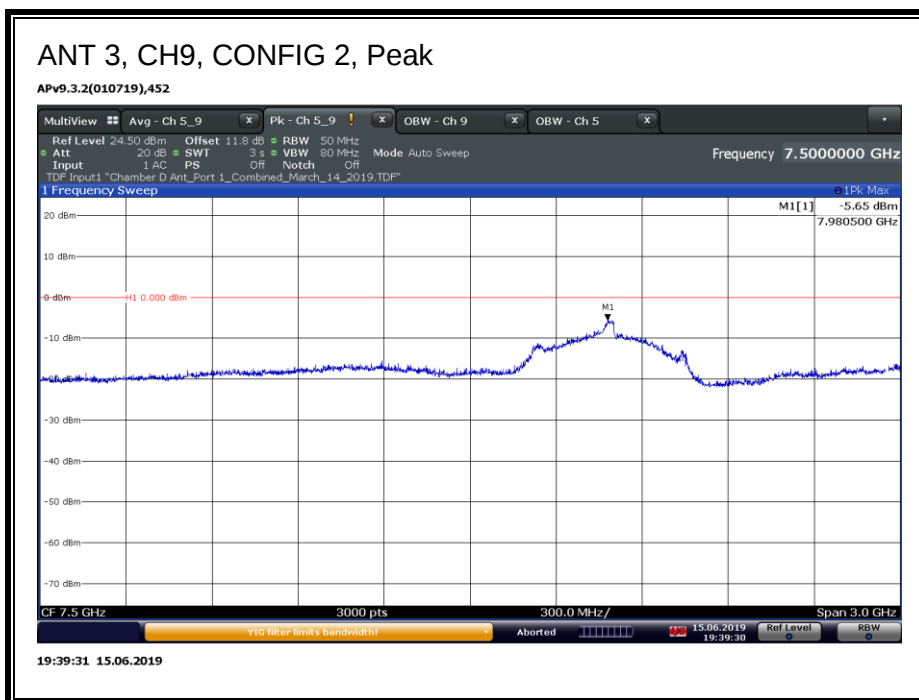


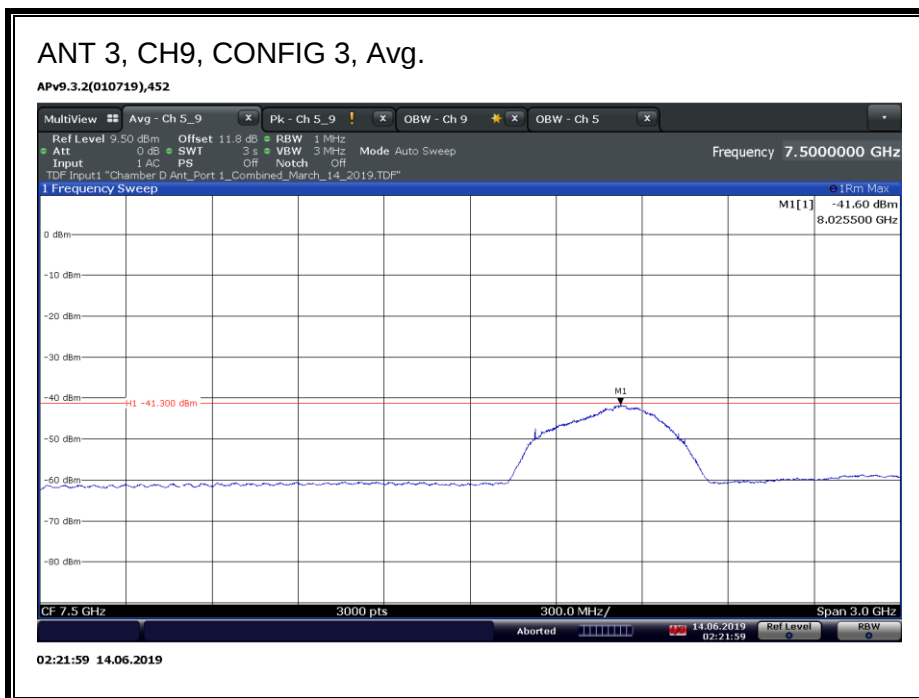
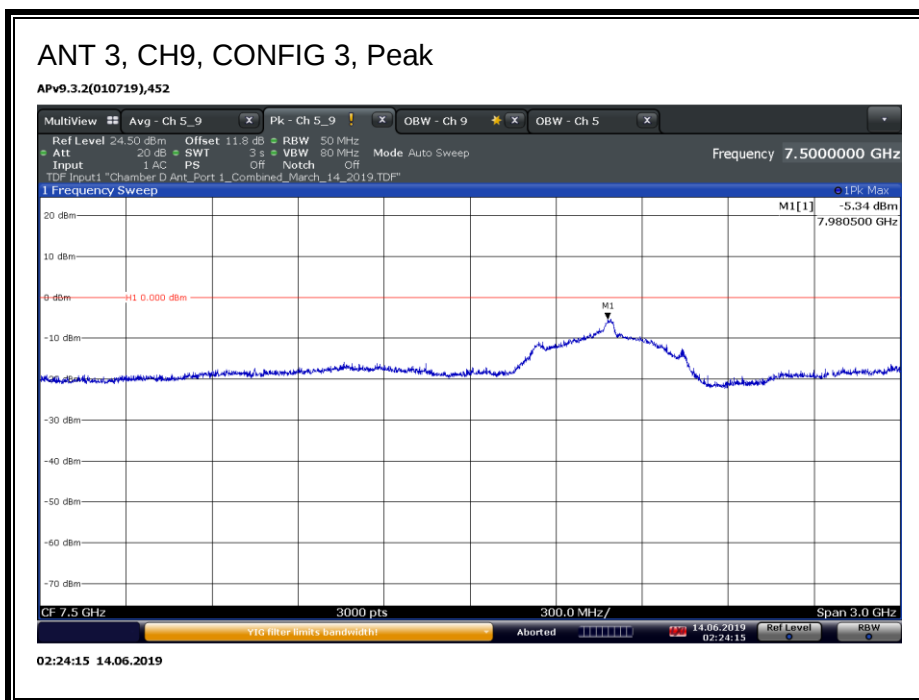


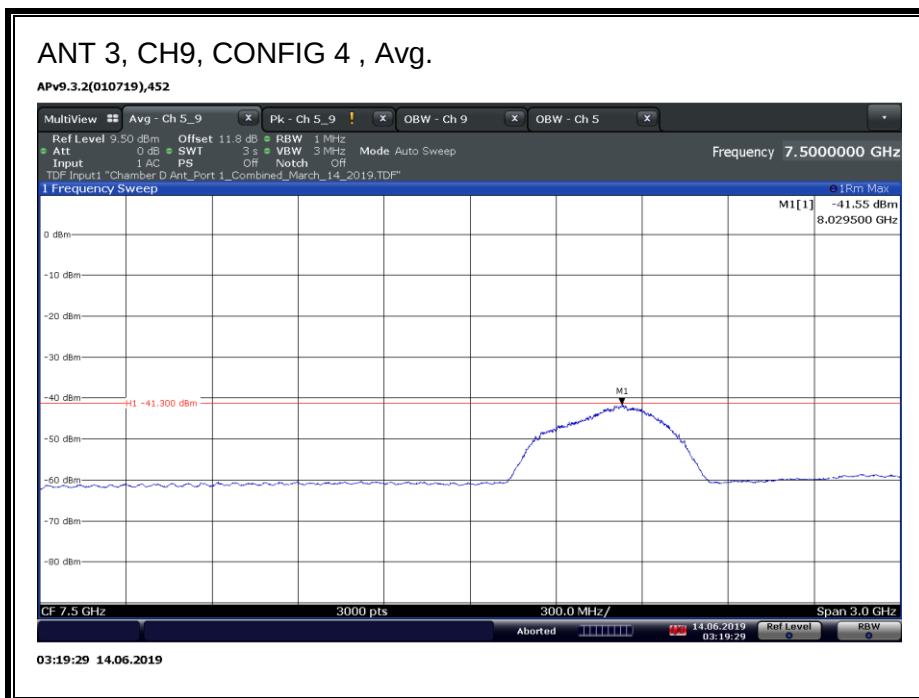
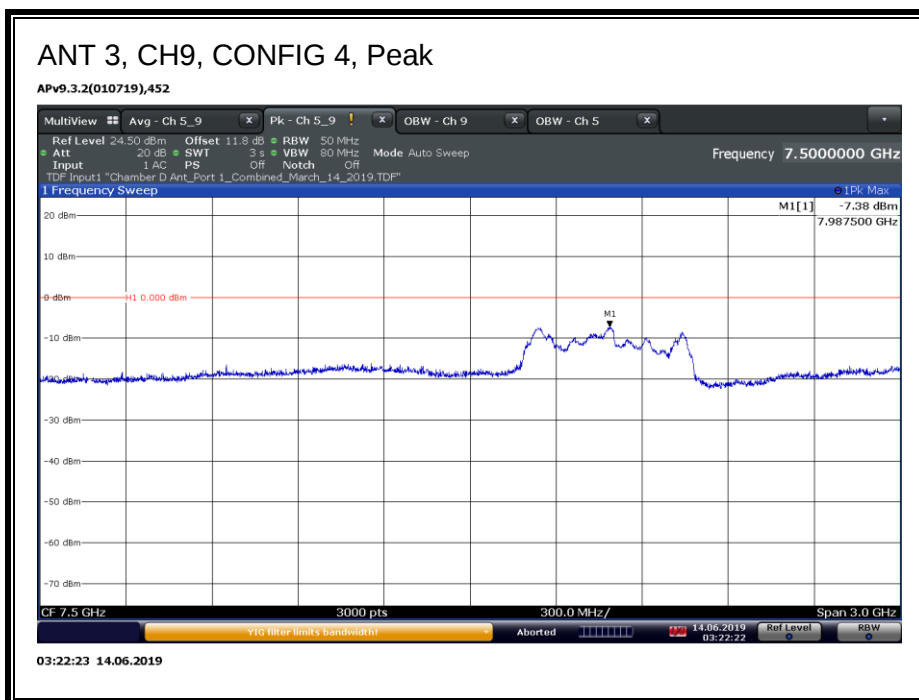


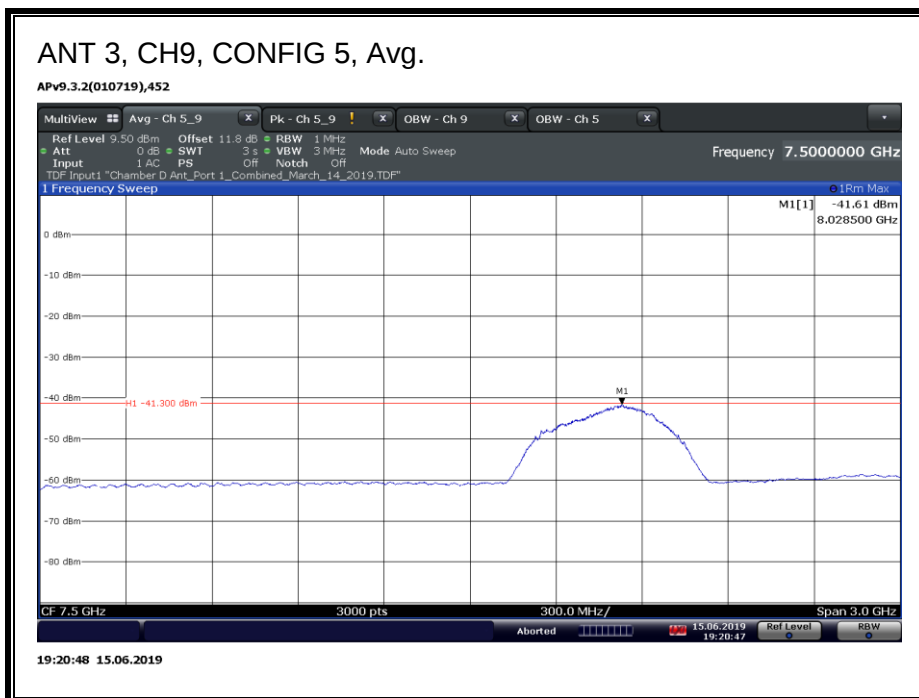
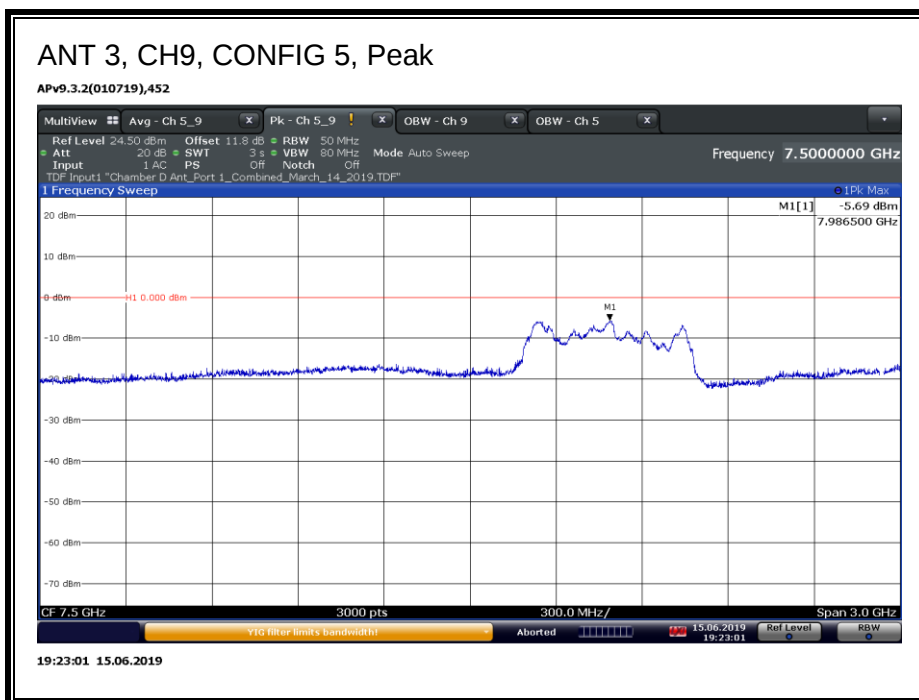












### 8.3. CESSATION TIME

#### LIMIT

§15.519(a)(1) A UWB device operating under the provisions of this section shall transmit only when it is sending information to an associated receiver. The UWB intentional radiator shall cease transmission within 10 seconds unless it receives an acknowledgement from the associated receiver that its transmission is being received. An acknowledgment of reception must continue to be received by the UWB intentional radiator at least every 10 seconds or the UWB device must cease transmitting.

#### TEST PROCEDURES

Transmissions are monitored for two cases:

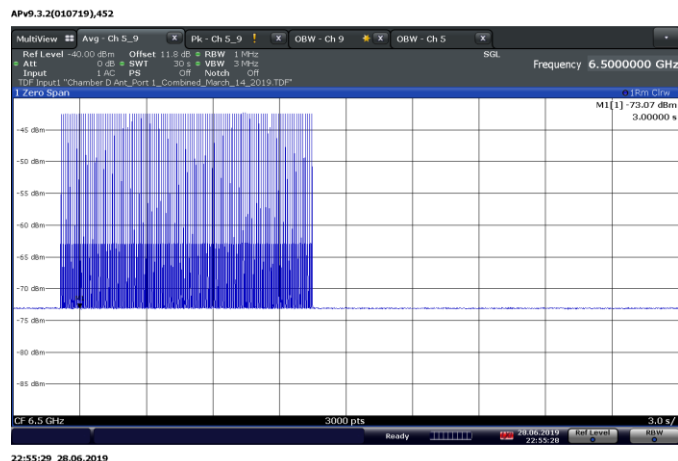
1. The smart phone ends the UWB link.
2. The EUT ends the UWB link.

#### RESULTS

Signal Levels on all Plots

- EUT is High Amplitude
- Smart Phone is Low Amplitude

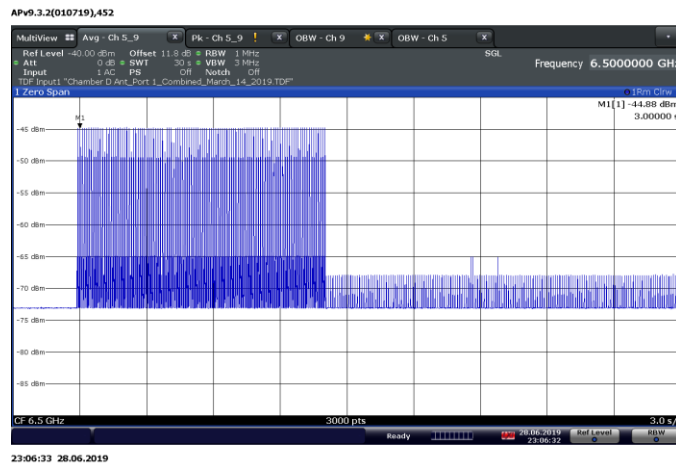
##### Case 1: Smart Phone ends the UWB link



#### RESULT

- All devices, including the EUT, cease transmissions

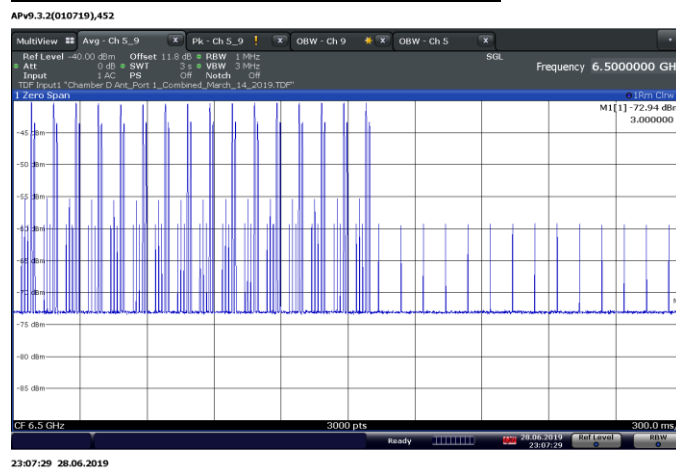
### Case 2: EUT ends the UWB link



### RESULT

- EUT ends the link, Smart Phone stops Acknowledgements but continues Polling
  - EUT ceases transmissions, does not respond to Polling Signals

### Zoom-in Plot during On-Off Transition



### RESULT

- Shows Link Traffic, Acknowledgements and Polling Signals while Link is established
- Shows Polling Signals after Link has ended

## 8.4. AVERAGE EMISSIONS

### LIMIT

§15.519 (3)(c) The radiated emissions at or below 960 MHz from a device operating under the provisions of this section shall not exceed the emission levels in §15.209. The radiated emissions above 960 MHz from a device operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz:

#### 15.209 (a)

| Frequency (MHz) | Field strength (microvolts/meter) | Measurement distance (meters) |
|-----------------|-----------------------------------|-------------------------------|
| 0.009-0.490     | 2400/F(kHz)                       | 300                           |
| 0.490-1.705     | 24000/F(kHz)                      | 30                            |
| 1.705-30.0      | 30                                | 30                            |
| 30-88           | 100**                             | 3                             |
| 88-216          | 150**                             | 3                             |
| 216-960         | 200**                             | 3                             |
| Above 960       | 500                               | 3                             |

#### 15.519 (3)(c)

| Frequency in MHz | EIRP in dBm |
|------------------|-------------|
| 960-1610         | -75.3       |
| 1610-1990        | -63.3       |
| 1990-3100        | -61.3       |
| 3100-10600       | -41.3       |
| Above 10600      | -61.3       |

§15.519 (3)(d) In addition to the radiated emission limits specified in the table in paragraph (c) of this section, UWB transmitters operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of no less than 1 kHz:

| Frequency in MHz | EIRP in dBm |
|------------------|-------------|
| 1164-1240        | -85.3       |
| 1559-1610        | -85.3       |

## **TEST PROCEDURE**

ANSI C63.10 Clause 10.2 and 10.3.

### **PROCEDURE FOR 9 kHz TO 960 MHz**

Measurements are made with the antenna feeding a spectrum analyzer via a preamplifier and cables, at a maximum distance of 3m from the EUT.

### **PROCEDURE FOR 960 MHz TO 6 GHz**

Measurements are made with the antenna feeding a spectrum analyzer via a preamplifier and cables, at a maximum distance of 0.5m from the EUT.

A low pass filter with a cut off frequency of 6 GHz is used to suppress the fundamental and perform measurement for 0.96 - 6 GHz.

### **RESULTS FOR 6 GHz TO 9 GHz**

The 6 - 9 GHz frequency band is covered in Section 8.2.

### **PROCEDURE FOR 9 GHz TO 18 GHz**

Measurements are made with the antenna feeding a spectrum analyzer via a preamplifier and cables, at a maximum distance of 0.5m from the EUT.

A high pass filter with pass band frequency beyond 9 GHz is used to suppress the fundamental and perform measurement for 9 - 18 GHz.

### **PROCEDURE FOR 1.164 TO 1.240 GHz**

Measurements are made with the antenna feeding a spectrum analyzer via a preamplifier and cables, at a maximum distance of 0.5m from the EUT.

RBW = 120kHz & VBW = 360 kHz were used at pre-scan.

### **PROCEDURE FOR 1.559 – 1.610 GHz**

Measurements are made with the antenna feeding a spectrum analyzer via a preamplifier and cables, at a maximum distance of 0.5m from the EUT.

RBW = 120kHz & VBW = 360 kHz were used at pre-scan.

### **PROCEDURE FOR 18 GHz TO 40 GHz**

Measurements are made with the antenna feeding a spectrum analyzer via a preamplifier and cables, at a maximum distance of 0.5m from the EUT.

A final test is made at any frequencies at which emissions are found. During this final scan, the antenna is kept no further from the EUT than the maximum distance calculated for each band that yields a minimum system noise floor.

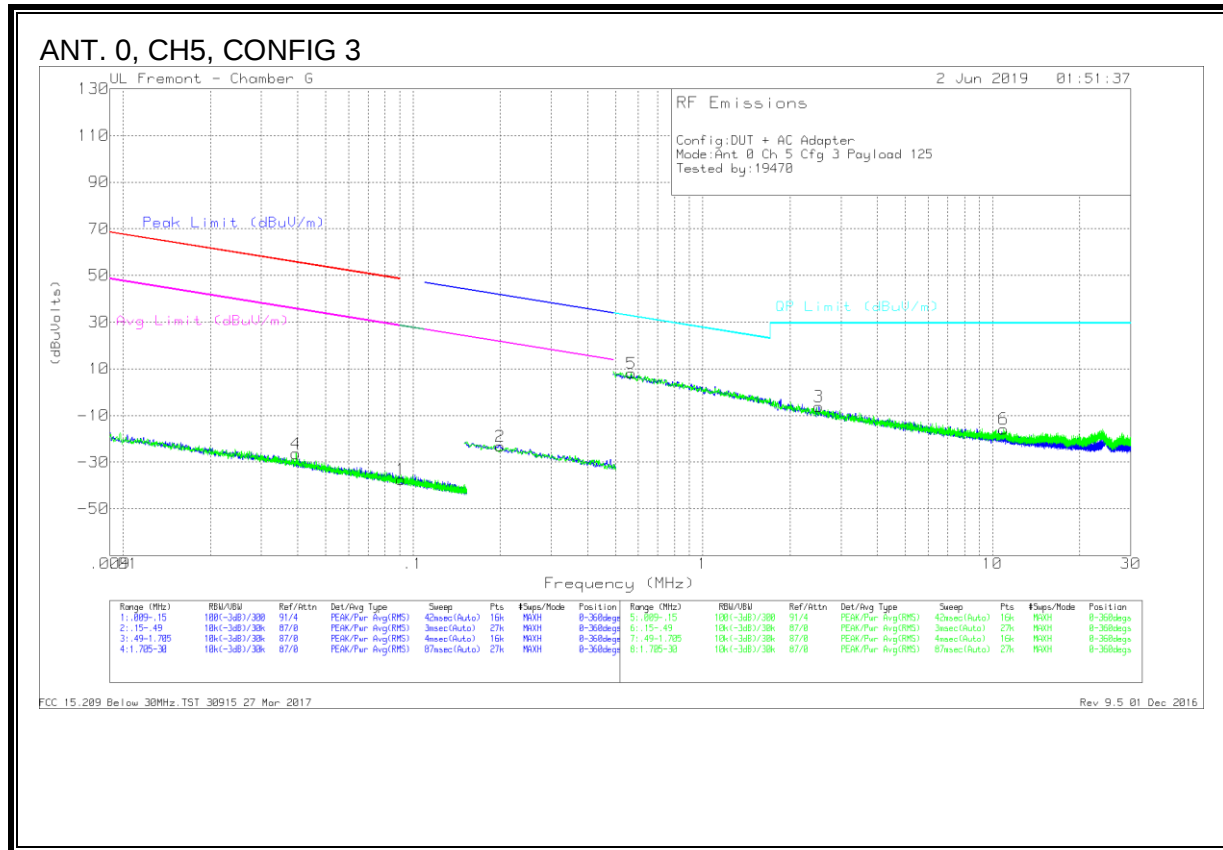
Distance Correction Factor from 3m to 0.5m =  $20 \cdot \log(0.5\text{m}/3\text{m}) = -15.56 \text{ dB}$

## **RESULTS**

### **AVERAGE Emissions Summary**

| Ant | CH | Config | Payload | Power Setting | Frequency Range |              |                 |                 |               |             |             |
|-----|----|--------|---------|---------------|-----------------|--------------|-----------------|-----------------|---------------|-------------|-------------|
|     |    |        |         |               | 9 kHz - 30 MHz  | 30 - 960 MHz | 1164 - 1240 MHz | 1559 - 1610 MHz | 0.96 - 18 GHz | 18 - 26 GHz | 26 - 40 GHz |
| 0   | 5  | 3      | 125     | Max           | PASS            | PASS         | PASS            | PASS            | PASS          | PASS        | PASS        |
| 0   | 9  | 3      | 125     | Max           | PASS            | PASS         | PASS            | PASS            | PASS          | PASS        | PASS        |
| 1   | 5  | 3      | 125     | Max           | PASS            | PASS         | PASS            | PASS            | PASS          | PASS        | PASS        |
| 1   | 9  | 3      | 125     | Max           | PASS            | PASS         | PASS            | PASS            | PASS          | PASS        | PASS        |
| 2   | 5  | 3      | 125     | Max           | PASS            | PASS         | PASS            | PASS            | PASS          | PASS        | PASS        |
| 2   | 9  | 3      | 125     | Max           | PASS            | PASS         | PASS            | PASS            | PASS          | PASS        | PASS        |
| 3   | 5  | 3      | 125     | Max           | PASS            | PASS         | PASS            | PASS            | PASS          | PASS        | PASS        |
| 3   | 9  | 3      | 125     | Max           | PASS            | PASS         | PASS            | PASS            | PASS          | PASS        | PASS        |

### 8.4.1. AVERAGE EMISSIONS, 9 kHz – 30 MHz



#### Trace Markers

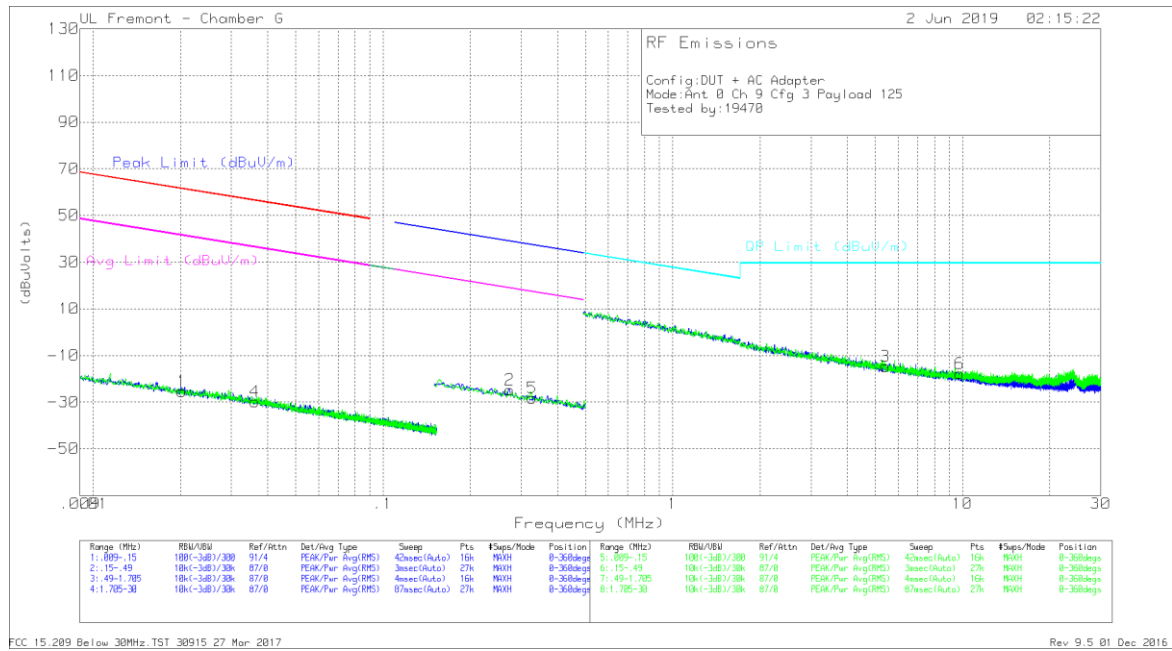
| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | Loop Antenna (dBm) | Cables (dB) | Dist Corr 30m | Corrected Reading (dBuV/m) | Peak Limit (dBuV/m) | Margin (dB) | Avg Limit (dBuV/m) | Margin (dB) | QP Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | Margin (dB) | Avg Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) |
|--------|-----------------|----------------------|-----|--------------------|-------------|---------------|----------------------------|---------------------|-------------|--------------------|-------------|-------------------|-------------|---------------------|-------------|--------------------|-------------|----------------|
| 4      | .03947          | 40.24                | Pk  | 13.4               | 0           | -80           | -26.36                     | 55.66               | -82.02      | 35.66              | -62.02      | -                 | -           | -                   | -           | -                  | -           | 0-360          |
| 1      | .09098          | 30.71                | Pk  | 11.9               | 0           | -80           | -37.39                     | -                   | -           | -                  | -           | 28.41             | -65.8       | -                   | -           | -                  | -           | 0-360          |
| 2      | .19984          | 45.48                | Pk  | 11.2               | .1          | -80           | -23.22                     | -                   | -           | -                  | -           | -                 | -           | 41.6                | -64.82      | 21.6               | -44.82      | 0-360          |

#### Pk - Peak detector

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | Loop Antenna (dBm) | Cables (dB) | Dist Corr 30m | Corrected Reading (dBuV/m) | QP Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) |
|--------|-----------------|----------------------|-----|--------------------|-------------|---------------|----------------------------|-------------------|-------------|----------------|
| 5      | .56729          | 37.16                | Pk  | 10.8               | .1          | -40           | 8.06                       | 32.53             | -24.47      | 0-360          |
| 3      | 2.51772         | 22.85                | Pk  | 10.8               | .2          | -40           | -6.15                      | 29.5              | -35.65      | 0-360          |
| 6      | 10.90696        | 13.3                 | Pk  | 10.5               | .4          | -40           | -15.8                      | 29.5              | -45.3       | 0-360          |

#### Pk - Peak detector

### ANT. 0, CH9, Config 3



### Trace Markers

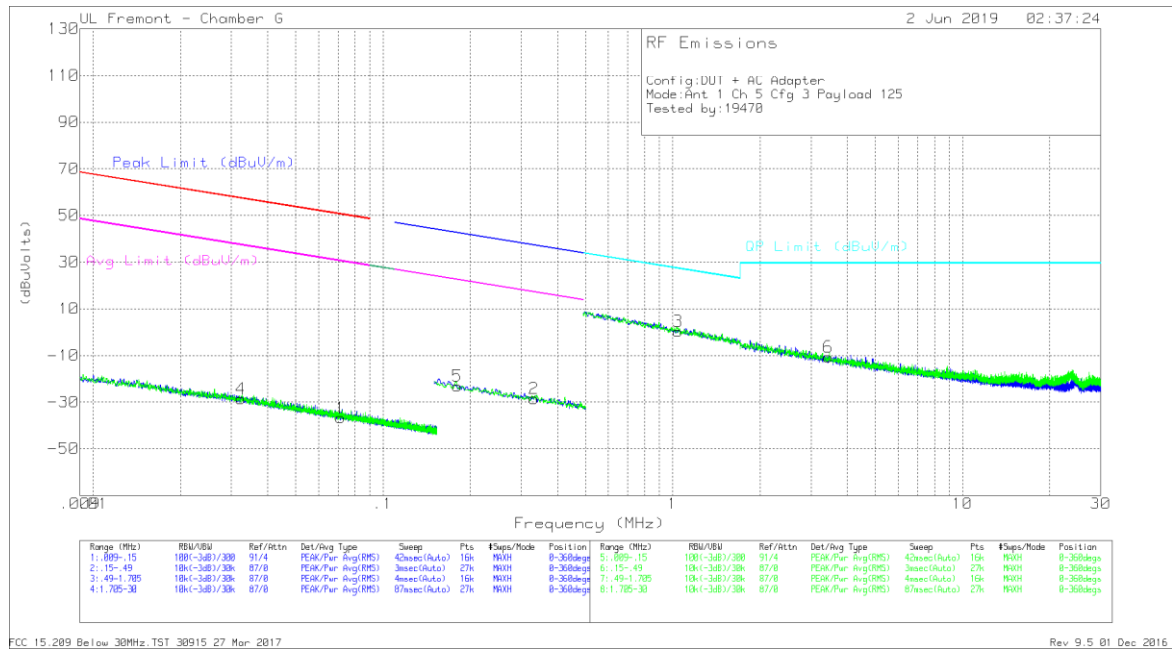
| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | Loop Antenna (dBm) | Cables (dB) | Dist Corr 300m | Corrected Reading (dBuV/m) | Peak Limit (dBuV/m) | Margin (dB) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | Margin (dB) | Avg Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) |
|--------|-----------------|----------------------|-----|--------------------|-------------|----------------|----------------------------|---------------------|-------------|--------------------|-------------|---------------------|-------------|--------------------|-------------|----------------|
| 1      | .02023          | 39.76                | Pk  | 14.9               | 0           | -80            | -25.34                     | 61.46               | -86.8       | 41.46              | -66.8       | -                   | -           | -                  | -           | 0-360          |
| 4      | .03613          | 36.55                | Pk  | 13.7               | 0           | -80            | -29.75                     | 56.43               | -86.18      | 36.43              | -66.18      | -                   | -           | -                  | -           | 0-360          |
| 2      | .2736           | 44.18                | Pk  | 11                 | 1           | -80            | -24.72                     | -                   | -           | -                  | -           | 38.87               | -63.59      | 18.87              | -43.59      | 0-360          |
| 5      | .32731          | 40.81                | Pk  | 10.9               | 1           | -80            | -28.19                     | -                   | -           | -                  | -           | 37.31               | -65.5       | 17.31              | -45.5       | 0-360          |

### Pk - Peak detector

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | Loop Antenna (dBm) | Cables (dB) | Dist Corr 30m | Corrected Reading (dBuV/m) | QP Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) |
|--------|-----------------|----------------------|-----|--------------------|-------------|---------------|----------------------------|-------------------|-------------|----------------|
| 3      | 5.42226         | 14.26                | Pk  | 10.8               | .3          | -40           | -14.64                     | 29.5              | -44.14      | 0-360          |
| 6      | 9.76726         | 11.27                | Pk  | 10.6               | .4          | -40           | -17.73                     | 29.5              | -47.23      | 0-360          |

### Pk - Peak detector

### ANT. 1, CH5, Config 3



### Trace Markers

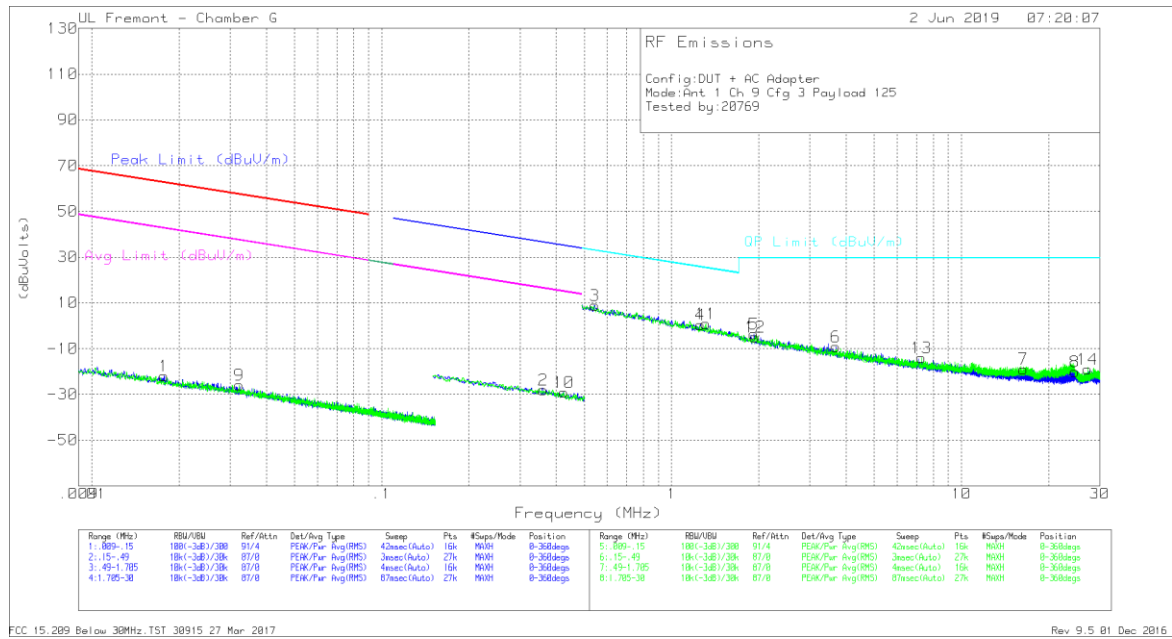
| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | Loop Antenna (dBm) | Cables (dB) | Dist Corr 300m | Corrected Reading (dBuV/m) | Peak Limit (dBuV/m) | Margin (dB) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | Margin (dB) | Avg Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) |
|--------|-----------------|----------------------|-----|--------------------|-------------|----------------|----------------------------|---------------------|-------------|--------------------|-------------|---------------------|-------------|--------------------|-------------|----------------|
| 4      | .03237          | 37.38                | Pk  | 14                 | 0           | -80            | -28.62                     | 57.38               | -86         | 37.38              | -66         | -                   | -           | -                  | -           | 0-360          |
| 1      | .07142          | 31.05                | Pk  | 12.2               | 0           | -80            | -36.75                     | 50.51               | -87.26      | 30.51              | -67.26      | -                   | -           | -                  | -           | 0-360          |
| 5      | .18055          | 45.47                | Pk  | 11.3               | 1           | -80            | -23.13                     | -                   | -           | -                  | -           | 42.49               | -65.62      | 22.49              | -45.62      | 0-360          |
| 2      | .33208          | 40.52                | Pk  | 10.9               | 1           | -80            | -28.48                     | -                   | -           | -                  | -           | 37.19               | -65.67      | 17.19              | -45.67      | 0-360          |

### Pk - Peak detector

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | Loop Antenna (dBm) | Cables (dB) | Dist Corr 30m | Corrected Reading (dBuV/m) | Margin (dB) | QP Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) |
|--------|-----------------|----------------------|-----|--------------------|-------------|---------------|----------------------------|-------------|-------------------|-------------|----------------|
| 3      | 1.04305         | 29.52                | Pk  | 10.7               | .1          | -40           | .32                        | -           | 27.26             | -26.94      | 0-360          |
| 6      | 3.44258         | 18.34                | Pk  | 10.8               | .2          | -40           | -10.66                     | -           | 29.5              | -40.16      | 0-360          |

### Pk - Peak detector

### ANT. 1, CH9, Config 3



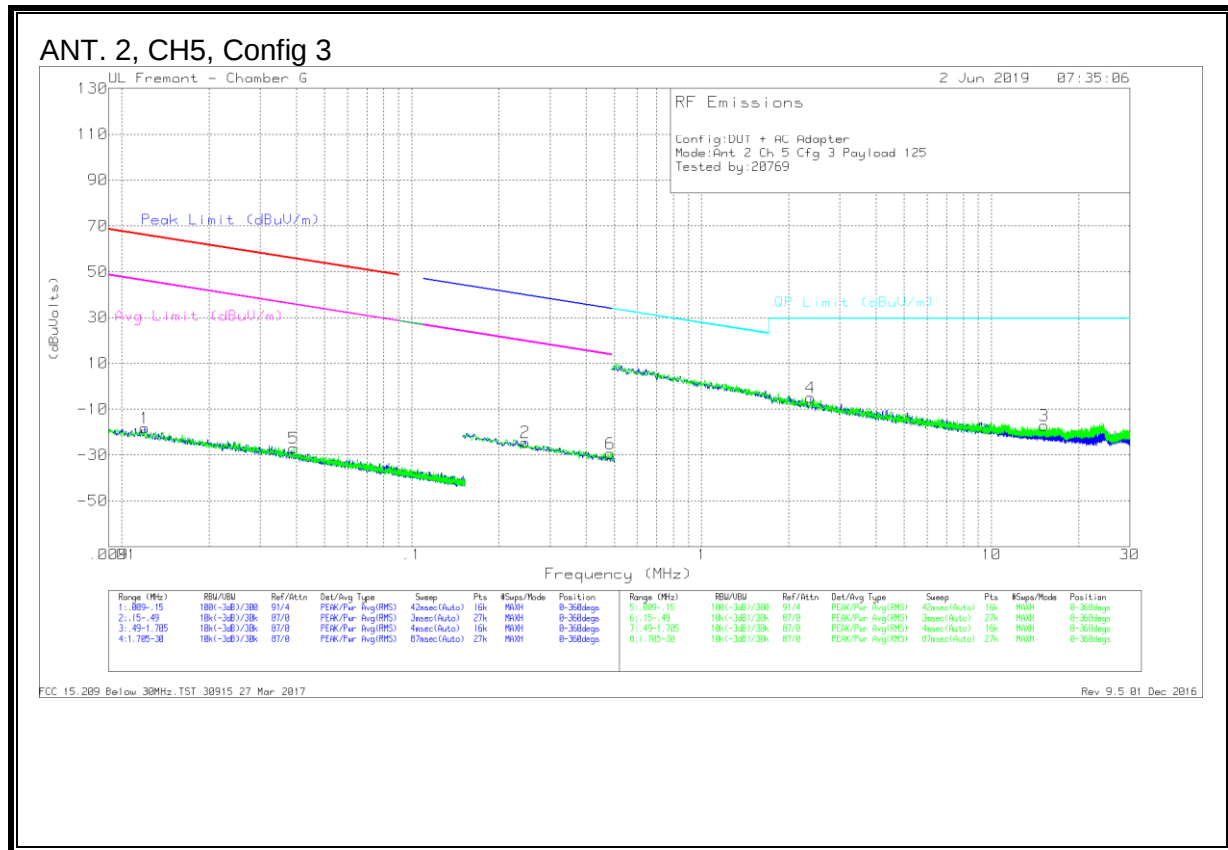
### Trace Markers

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | Loop Antenna (dBm) | Cables (dB) | Dist Corr 300m | Corrected Reading (dBuV/m) | Peak Limit (dBuV/m) | Margin (dB) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | Margin (dB) | Avg Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) |
|--------|-----------------|----------------------|-----|--------------------|-------------|----------------|----------------------------|---------------------|-------------|--------------------|-------------|---------------------|-------------|--------------------|-------------|----------------|
| 1      | 01778           | 42.22                | Pk  | 15.8               | 0           | -80            | -27.58                     | 62.59               | -84.57      | 42.59              | -64.57      | -                   | -           | -                  | -           | 0-360          |
| 9      | 03225           | 40.14                | Pk  | 14                 | 0           | -80            | -25.86                     | 57.42               | -83.28      | 37.42              | -63.28      | -                   | -           | -                  | -           | 0-360          |
| 2      | 36044           | 41.04                | Pk  | 10.9               | .1          | -80            | -27.96                     | -                   | -           | -                  | -           | 36.47               | -64.43      | 16.47              | -44.43      | 0-360          |
| 10     | 4249            | 39.88                | Pk  | 10.9               | .1          | -80            | -29.12                     | -                   | -           | -                  | -           | 35.04               | -64.16      | 15.04              | -44.16      | 0-360          |

### Pk - Peak detector

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | Loop Antenna (dBm) | Cables (dB) | Dist Corr 30m | Corrected Reading (dBuV/m) | QP Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) |
|--------|-----------------|----------------------|-----|--------------------|-------------|---------------|----------------------------|-------------------|-------------|----------------|
| 3      | .54278          | 38.01                | Pk  | 10.8               | .1          | -40           | 8.91                       | 32.91             | -24         | 0-360          |
| 4      | 1.25623         | 29.69                | Pk  | 10.7               | .1          | -40           | .49                        | 25.65             | -25.16      | 0-360          |
| 11     | 1.31259         | 30.14                | Pk  | 10.7               | .1          | -40           | .94                        | 25.27             | -24.33      | 0-360          |
| 5      | 1.92403         | 25.5                 | Pk  | 10.7               | .2          | -40           | -3.6                       | 29.5              | -33.1       | 0-360          |
| 12     | 1.94394         | 24.22                | Pk  | 10.7               | .2          | -40           | -4.88                      | 29.5              | -34.38      | 0-360          |
| 6      | 3.6852          | 19.69                | Pk  | 10.8               | .2          | -40           | -9.31                      | 29.5              | -38.81      | 0-360          |
| 13     | 7.27774         | 15.04                | Pk  | 10.7               | .3          | -40           | -13.96                     | 29.5              | -43.46      | 0-360          |
| 7      | 16.37281        | 10.81                | Pk  | 9.9                | .4          | -40           | -18.89                     | 29.5              | -48.39      | 0-360          |
| 8      | 24.5645         | 10.82                | Pk  | 8.6                | .5          | -40           | -20.08                     | 29.5              | -49.58      | 0-360          |
| 14     | 27.17664        | 12.17                | Pk  | 8.1                | .6          | -40           | -19.13                     | 29.5              | -48.63      | 0-360          |

### Pk - Peak detector



## Trace Markers

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | Loop Antenna (dBm) | Cables (dB) | Dist Corr 300m | Corrected Reading (dBuV/m) | Peak Limit (dBuV/m) | Margin (dB) | Avg Limit (dBuV/m) | Margin (dB) | Peak Limit (dBuV/m) | Margin (dB) | Avg Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) |
|--------|-----------------|----------------------|-----|--------------------|-------------|----------------|----------------------------|---------------------|-------------|--------------------|-------------|---------------------|-------------|--------------------|-------------|----------------|
| 1      | 01201           | 43.76                | Pk  | 10                 | 0           | .00            | -33.24                     | 66                  | -84.24      | 46                 | -84.24      | -                   | -           | -                  | -           | 0-360          |
| 5      | 03922           | 39.62                | Pk  | 13.4               | 0           | .00            | -27.08                     | 55.71               | -82.79      | 35.71              | -82.79      | -                   | -           | -                  | -           | 0-360          |
| 2      | 04986           | 44.43                | Pk  | 11                 | 0           | .00            | -24.47                     | -                   | -           | -                  | -           | -                   | -           | -                  | -           | 0-360          |
| 6      | 08507           | 39.72                | Pk  | 10.0               | -1          | .00            | -25.39                     | -                   | -           | -                  | -           | -                   | -           | -                  | -           | 0-360          |

## Pk - Peak detector

| Marker | Frequency (MHz) | Meter Reading (dBuV) | Det | Loop Antenna (dBm) | Cables (dB) | Dist Corr 30m | Corrected Reading (dBuV/m) | QP Limit (dBuV/m) | Margin (dB) | Azimuth (Degs) |
|--------|-----------------|----------------------|-----|--------------------|-------------|---------------|----------------------------|-------------------|-------------|----------------|
| 4      | 2.37572         | 24.21                | Pk  | 10.7               | .2          | -40           | -4.89                      | 29.5              | -34.39      | 0-360          |
| 3      | 15.22001        | 12.22                | Pk  | 10.1               | .4          | -40           | -17.28                     | 29.5              | -46.78      | 0-360          |

## Pk - Peak detector