

# TEST REPORT

**Application No.:** GZCR2303000223AT  
**Applicant:** Comba Telecom Network Systems Limited  
**Address of Applicant:** Flat/Rm 10, 3/F, Bio-Informatics Ctr, 2 Science Park West Avenue, HK Science Park, Pak Shek Kok, N.T. Hong Kong  
**Manufacturer:** Comba Network Systems Company Limited  
**Address of Manufacturer:** No. 10 Shenzhou Road, Guangzhou Science City, Guangzhou 510663, Guangdong, P.R.China  
**Factory:** Comba Telecom Technology (Guangzhou) Ltd.  
**Address of Factory:** No. 6 Jinbi Road, Economics and Technology Development District, Guangzhou, Guangdong, China  
**Equipment Under Test (EUT):**  
**EUT Name:** Comflex NG  
**Model No.:** ARU-6B-Internal  
**Trade Mark:** Comba  
**Standard(s) :** 47 CFR Part 2  
47 CFR Part 20  
47 CFR Part 24  
**Date of Receipt:** 2023-03-02  
**Date of Test:** 2023-03-02 to 2023-04-12  
**Date of Issue:** 2023-04-17

|                     |              |
|---------------------|--------------|
| <b>Test Result:</b> | <b>Pass*</b> |
|---------------------|--------------|

\* In the configuration tested, the EUT complied with the standards specified above.

*Ricky Liu*

Ricky Liu  
Manager



SGS-CSTC Standards Technical Services Co., Ltd.  
Guangzhou Branch Testing Center EEC Laboratory

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| Revision Record |                  |            |          |
|-----------------|------------------|------------|----------|
| Version         | Chapter          | Date       | Remark   |
| 01              | GZCR230300022306 | 2023-04-17 | Original |
|                 |                  |            |          |
|                 |                  |            |          |
|                 |                  |            |          |

|                          |  |                               |  |
|--------------------------|--|-------------------------------|--|
| Authorized for issue by: |  |                               |  |
|                          |  | Kevin Zhang                   |  |
|                          |  | Kevin Zhang /Project Engineer |  |
|                          |  | Jerry Chan                    |  |
|                          |  | Jerry Chan /Reviewer          |  |



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## 2 Test Summary

| Item                                                          | Standard             | Method                                                                               | Requirement                     | Result |
|---------------------------------------------------------------|----------------------|--------------------------------------------------------------------------------------|---------------------------------|--------|
| Out-of-band rejection                                         | KDB935210 D05 v01r04 | KDB935210 D05 v01r04 clause 3.3                                                      | KDB935210 D05 v01r04 clause 3.3 | Pass   |
| Input-versus-output signal comparison                         | 47 CFR Part 2        | KDB935210 D05 v01r04 clause 3.4                                                      | Part 2.1049                     | Pass   |
| Mean output power and amplifier/booster gain                  | 47 CFR Part 24       | KDB935210 D05 v01r04 clause 3.5                                                      | Part 24.232                     | Pass   |
| Out-of-band/out-of-block(including intermodulation) emissions |                      | KDB935210 D05 v01r04 clause 3.6                                                      | Part 24.238                     | Pass   |
| Conducted spurious emissions                                  |                      | KDB935210 D05 v01r04 clause 3.6                                                      | Part 24.238                     | Pass   |
| Frequency stability                                           |                      | 47 CFR Part 2.1055<br>KDB935210 D05 v01r04 clause 3.7<br>ANSI C63.26-2015 Clause 5.6 | Part 24.235                     | Pass   |
| Radiated spurious emissions                                   |                      | KDB935210 D05 v01r04 clause 3.8<br>ANSI C63.26-2015 Clause 5.5                       | Part 24.238                     | Pass   |

The EUT is a remote unit of DAS which can be capable of multi-band operation (details refer to clause 4.1 of this report). It receives base-station downlink via fiber-optic or coaxial cable from host unit, transmits via antenna to handset, and returns handset uplink via fiber-optic or coaxial cable to host unit.

**Only test for Broadband PCS band downlink in this report.**

### Note:

E.U.T./ EUT means Equipment Under Test

Pass means the test result passed the test standard requirement, please find the detailed decision rule in the report relative section.



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## 4 General Information

### 4.1 Details of EUT

|                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Power Supply:                | DC 48V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Test Voltage:                | DC 48V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Operating Temperature:       | -40 to +55 °C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Operating Humidity:          | ≤95%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Frequency Range:             | <div>Lower 700MHz: Uplink: 698-716MHz<br/>Downlink: 728-746MHz</div> <div>Upper 700MHz: Uplink: 777-787MHz<br/>Downlink: 746-756MHz</div> <div>Cellular: Uplink: 824-849MHz<br/>Downlink: 869-894MHz</div> <div>EAWS: Uplink: 1710-1755MHz<br/>Downlink: 2110-2180MHz</div> <div>Broadband PCS: Uplink: 1850-1915MHz<br/>Downlink: 1930-1995MHz</div> <div>BRS/EBS: Uplink: 2496-2690MHz<br/>Downlink: 2496-2690MHz</div> <div>3.7GHz service: Uplink: 3700-3980MHz<br/>Downlink: 3700-3980MHz</div> |
| Support Technology:          | LTE<br>5G NR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Modulation Type:             | PSK/QPSK/QAM/16QAM/64QAM/256QAM                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Interface:                   | Input Port N-Female<br>Debug Port Type-c                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Normal Output Power:         | <div>Lower 700MHz: 19dBm</div> <div>Upper 700MHz: 19dBm</div> <div>Cellular: 19dBm</div> <div>EAWS: 19dBm</div> <div>Broadband PCS: 19dBm</div> <div>BRS/EBS: 22dBm</div> <div>3.7GHz service: 22dBm</div>                                                                                                                                                                                                                                                                                           |
| (per antenna port, downlink) |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Normal System Gain:          | uplink & downlink: 80dB                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| EUT Configuration:           | 1T1R                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Antenna Type:                | Internal Antenna                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |



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Antenna Gain: Lower 700MHz: 4dBi  
(declared by the manufacturer) Upper 700MHz: 4dBi  
Cellular: 4dBi  
EAWS: 4dBi  
Broadband PCS: 4dBi  
BRS/EBS: 5dBi  
3.7GHz Service: 3dBi  
Software Version: ARUFGAV0100.01

## 4.2 Description of Support Units

| Description | Manufacturer                         | Model No.               | Serial No. |
|-------------|--------------------------------------|-------------------------|------------|
| Notebook    | LENOVO                               | Lenovo Xiaoxinchao 5000 | PF0TNMG8   |
| Comflex NG  | Comba Network System Company Limited | Comflex NG MU           | /          |
| Comflex NG  |                                      | ARU-HUB-AC              | /          |

## 4.3 Test Environment

| Environment Parameter | Selected Values During Test |             |
|-----------------------|-----------------------------|-------------|
| Relative Humidity     | Ambient                     |             |
| Value                 | Temperature (°C)            | Voltage (V) |
| TNVN                  | Asmbient                    | DC 48       |
| TLVL                  | -30                         | DC 40.8     |
| TLVH                  | -30                         | DC 55.2     |
| THVL                  | +50                         | DC 40.8     |
| THVH                  | +50                         | DC 55.2     |

VN: Normal Voltage, TN: Normal Temperature

VL: Lower Extreme Voltage, VH: Higher Extreme Voltage

TL: Lower Extreme Temperature, TH: Higher Extreme Temperature

## 4.4 Measurement Uncertainty

| No. | Item                           | Measurement Uncertainty                                                                        |
|-----|--------------------------------|------------------------------------------------------------------------------------------------|
| 1   | RF Output Power                | ±0.75dB                                                                                        |
| 2   | Transmitter unwanted emissions | ±0.75dB                                                                                        |
| 3   | Radiated Spurious Emission     | ±5.06dB (30MHz-1GHz; 3m); ±4.46dB (30MHz-1GHz; 10m); ±5.08dB (1GHz-6GHz); ±5.14dB (6GHz-18GHz) |
| 4   | Occupied Channel Bandwidth     | ± 3%                                                                                           |



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### 4.5 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou Branch EMC Laboratory,  
198 Kezhu Road, Sciencetech Park, Guangzhou Economic & Technology Development District,  
Guangzhou, China 510663

Tel: +86 20 82155555 Fax: +86 20 82075059

No tests were sub-contracted.

### 4.6 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

#### ● ACMA

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory can also perform testing for the Australian/New Zealand Regulatory Compliance Mark (RCM).

#### ● SGS UK(Certificate No.: 32), SGS-TUV SAARLAND and SGS-FIMKO

Have approved SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory as a supplier of EMC TESTING SERVICES and SAFETY TESTING SERVICES.

#### ● FCC Recognized Accredited Test Firm(Registration No.: 486818)

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been accredited and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Designation Number: CN5016, Test Firm Registration Number: 486818.

#### ● ISED (Registration No.: 4620B, CAB identifier: CN0052)

SGS-CSTC Standards Technical Services Co., Ltd., has been registered by Innovation Science and Economic Development Canada for Wireless Device Testing laboratories to test to Canadian radio equipment requirements. Registration No. 4620B, CAB identifier: CN0052.

#### ● VCCI (Registration No.: R-12460, C-12584, G-20107 and T-11179)

The 10m Semi-anechoic chamber, 966 Anechoic Chamber and Shielded Room of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-12460, C-12584, G-20107 and T-11179 respectively.

#### ● CBTL (Lab Code: TL129)

SGS-CSTC Standards Technical Services Co., Ltd., E&E Laboratory has been assessed and fully comply with the requirements of ISO/IEC 17025:2017, the Basic Rules, IECEE 01 and Rules of procedure IECEE 02, and the relevant IECEE CB-Scheme Operational documents.

### 4.7 Deviation from Standards

None

### 4.8 Abnormalities from Standard Conditions

None



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## 5 Equipment List

### Conducted test equipment

| Equipment                                       | Manufacturer            | Model No | Inventory No | Cal Date   | Cal Due Date |
|-------------------------------------------------|-------------------------|----------|--------------|------------|--------------|
| Temperature Chamber                             | GZ GongWen Co.Ltd.      | GDJW-100 | EMC0039      | 2022-07-04 | 2023-07-03   |
| MI CABLE                                        | SGS-EMC                 | 0.8M     | EMC2137      | 2021-11-02 | 2023-11-01   |
| MI CABLE                                        | SGS-EMC                 | 0.8M     | EMC2136      | 2021-11-02 | 2023-11-01   |
| EXA Signal Analyzer<br>(10Hz-44GHz)             | Keysight                | N9010A   | EMC2138      | 2022-09-08 | 2023-09-07   |
| MXA Signal Analyzer<br>(10Hz-50GHz)             | KEYSIGHT                | N9020B   | SEM004-24    | 2022-04-24 | 2023-04-23   |
| Test Software                                   | TST                     | V2.0     | GZE100-78    | N/A        | N/A          |
| ESG vector signal<br>generator<br>(250kHz-6GHz) | Agilent<br>Technologies | E4438C   | SEM006-03    | 2023-02-20 | 2024-02-19   |

### Radiated test equipment (30MHz to 1GHz)

| Equipment                                 | Manufacturer                          | Model No             | Inventory No | Cal Date   | Cal Due Date |
|-------------------------------------------|---------------------------------------|----------------------|--------------|------------|--------------|
| EMI Test Receiver<br>(1Hz-8GHz)           | Rohde & Schwarz                       | ESW8                 | EMC2229      | 2023-02-20 | 2024-02-19   |
| 966 Anechoic Chamber                      | Shenzhen C.R.T<br>Technology Co., LTD | 9mX6mX6m             | EMC2230      | 2022-04-12 | 2025-04-11   |
| Network Analyzer<br>(100k-8.5GHz)         | KEYSIGHT                              | ENA Series<br>E5071C | EMC2191      | 2022-05-25 | 2023-05-24   |
| Amplifier<br>(9k-1000MHz)                 | SONOMA                                | 310                  | EMC2237      | 2022-04-18 | 2023-04-17   |
| TRILOG Broadband<br>Antenna<br>(25M-2GHz) | SCHWARZBECK                           | VULB 9168            | EMC2238      | 2022-04-20 | 2025-04-19   |
| Horn Antenna<br>1-18GHz                   | SCHWARZBECK<br>MESS-ELEKTRONIK        | BBHA 9120D           | EMC2251      | 2022-08-02 | 2025-08-01   |
| Coaxial Cable                             | Times Microwave                       | TMC-<br>AMI19394A    | EMC239       | 2022-05-18 | 2024-05-17   |



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| Radiated test equipment (above 1GHz)        |                                |               |              |            |              |
|---------------------------------------------|--------------------------------|---------------|--------------|------------|--------------|
| Equipment                                   | Manufacturer                   | Model No      | Inventory No | Cal Date   | Cal Due Date |
| 1GHz-26.5 GHz Pre-Amplifier                 | Agilent                        | 8449B         | EMC0521      | 2022-12-16 | 2023-12-15   |
| Microwave Broadband Preamplifier (18-40GHz) | SCHWARZBECK                    | BBV 9721      | EMC2172      | 2022-08-24 | 2023-08-23   |
| EMI Test Receiver (10Hz-26.5GHz)            | Rohde & Schwarz                | ESIB26        | EMC0522      | 2022-12-16 | 2023-12-15   |
| EXA Signal Analyzer (10Hz-44GHz)            | Keysight                       | N9010A        | EMC2138      | 2022-09-08 | 2023-09-07   |
| Chamber cable (Above 1GHz)                  | Scoflex                        | KMKM-8.0m     | EMC0545      | 2022-08-24 | 2024-08-23   |
| Chamber Cable (Below 1GHz)                  | Scoflex                        | KMKM-8.0m     | EMC0546      | 2022-08-24 | 2024-08-23   |
| Trilog Broadband Antenna (25MHz-1GHz)       | SCHWARZBECK                    | VULB 9160     | EMC2025      | 2022-09-07 | 2023-09-06   |
| Horn Antenna (1GHz-18GHz)                   | SCHWARZBECK<br>MESS-ELEKTRONIK | BBHA 9120D    | EMC2026      | 2022-09-21 | 2025-09-20   |
| Horn Antenna 1-18GHz                        | SCHWARZBECK<br>MESS-ELEKTRONIK | BBHA 9120D    | EMC2251      | 2022-02-02 | 2025-08-01   |
| Horn Antenna (14-40GHz)                     | SCHWARZBECK                    | BBHA 9170     | EMC2041      | 2020-06-28 | 2023-06-27   |
| Broad-Band Horn Antenna (15-40GHz)          | Schwarzbeck                    | BBHA 9170     | SEM003-15    | 2021-7-11  | 2024-7-10    |
| 966 Anechoic Chamber                        | C.R.T                          | 9m x 6m x 6m  | EMC2142      | 2020-12-20 | 2023-12-19   |
| Test Software E3                            | Audix                          | Ver.6.120110a | GZE100-61    | N/A        | N/A          |



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## 6 Radio Spectrum Matter Test Results

### 6.1 Out-of-band rejection

Test Requirement: KDB 935210 D05 clause 3.3

Test Method: KDB 935210 D05 clause 3.3

Limit: Within the passband

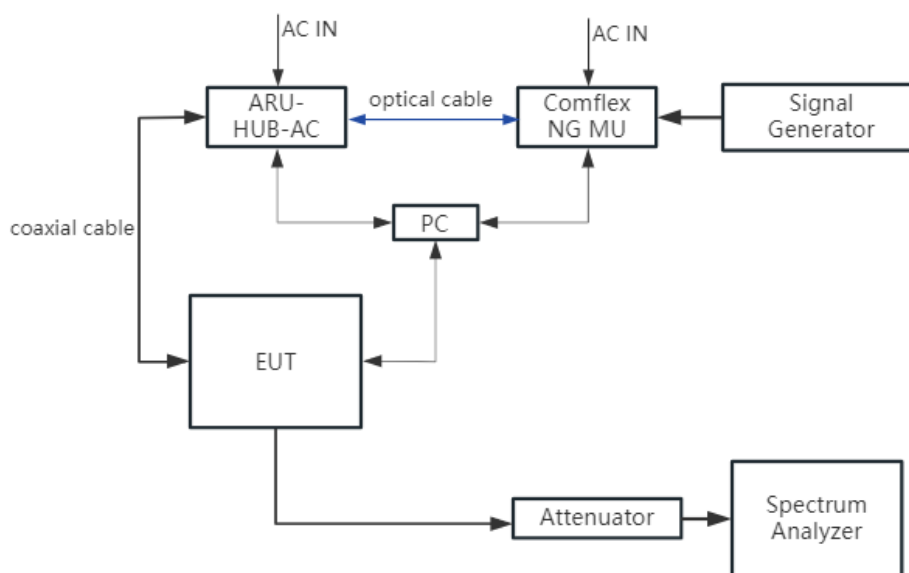
#### 6.1.1 E.U.T. Operation

Operating Environment:

Temperature: 22.3 °C Humidity: 65 % RH Atmospheric Pressure: 1008 mbar

EUT Operation: Drive the EUT to the maximum output power at maximum gain.

#### 6.1.2 Test Setup



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Guangzhou Branch Technical Service EEC Laboratory 中国·广州·经济技术开发区科学城科珠路198号 邮编: 510663 t (86-20) 82155555 f (86-20) 82075058 sgs.china@sgs.com

### 6.1.3 Test Procedure

Adjust the internal gain control of the EUT to the maximum gain for which equipment certification is sought.

- a) Connect a signal generator to the input of the EUT.
- b) Configure a swept CW signal with the following parameters:
  - 1) Frequency range =  $\pm 250\%$  of the manufacturer's specified pass band.
  - 2) The CW amplitude shall be 3 dB below the AGC threshold and shall not activate the AGC threshold throughout the test.
  - 3) Dwell time = approximately 10 ms.
  - 4) Frequency step = 50 kHz.
- c) Connect a spectrum analyzer to the output of the EUT using appropriate attenuation.
- d) Set the RBW of the spectrum analyzer to between 1% and 5% of the manufacturer's pass band with the VBW set to  $3 \times \text{RBW}$ .
- e) Set the detector to Peak and the trace to Max-Hold.
- f) After the trace is completely filled place a marker at the peak amplitude which is designated as  $f_0$ , with two additional markers (use the marker delta method) at the 20 dB bandwidth (i.e., at the points where the level has fallen by 20 dB).
- g) Capture the frequency response plot for inclusion in the test report.

### 6.1.4 Measurement Record

Please refer to Appendix - Test Data and Result for report GZCR230300022306.



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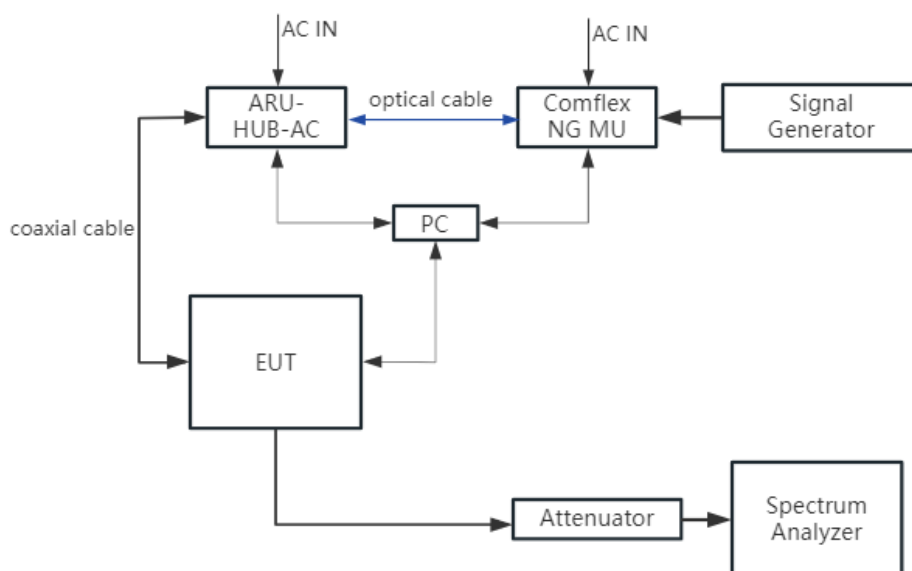
## 6.2 Input versus output comparison

Test Requirement: 47 CFR Part 2.1049  
 Test Method: KDB 935210 D05 clause 3.4  
 Limit: The spectral plots of the output signal and the input signal are similar (in passband and rolloff characteristic features and relative spectral locations).

### 6.2.1 E.U.T. Operation

Operating Environment:  
 Temperature: 22.3 °C Humidity: 65 % RH Atmospheric Pressure: 1008 mbar  
 EUT Operation: Drive the EUT to the maximum output power at maximum gain.

### 6.2.2 Test Setup



## 6.2.3 Test Procedure

A 26 dB bandwidth measurement shall be performed on the input signal and the output signal; alternatively, the 99% OBW can be measured and used. See KDB Publication 971168 [R8] for more information on measuring OBW.

- a) Connect a signal generator to the input of the EUT.
- b) Configure the signal generator to transmit the AWGN signal.
- c) Configure the signal amplitude to be just below the AGC threshold level (see 3.2), but not more than 0.5 dB below.
- d) Connect a spectrum analyzer to the output of the EUT using appropriate attenuation.
- e) Set the spectrum analyzer center frequency to the center frequency of the operational band under test. The span range of the spectrum analyzer shall be between  $2 \times$  to  $5 \times$  the emission bandwidth (EBW) or alternatively, the OBW.
- f) The nominal RBW shall be in the range of 1 % to 5 % of the anticipated OBW, and the VBW shall be  $\geq 3 \times$  RBW.
- g) Set the reference level of the instrument as required to preclude the signal from exceeding the maximum spectrum analyzer input mixer level for linear operation. In general, the peak of the spectral envelope must be more than  $[10 \log (OBW / RBW)]$  below the reference level. Steps f) and g) may require iteration to enable adjustments within the specified tolerances.
- h) The noise floor of the spectrum analyzer at the selected RBW shall be at least 36 dB below the reference level.
- i) Set spectrum analyzer detection function to positive peak.
- j) Set the trace mode to max hold.
- k) Determine the reference value: Allow the trace to stabilize. Set the spectrum analyzer marker to the highest amplitude level of the displayed trace (this is the reference value) and record the associated frequency.
- l) Place two markers, one at the lowest and the other at the highest frequency of the envelope of the spectral display, such that each marker is at or slightly below the -26 dB down amplitude. The 26 dB EBW (alternatively OBW) is the positive frequency difference between the two markers. If the spectral envelope crosses the -26 dB down amplitude at multiple points, the lowest or highest frequency shall be selected as the frequencies that are the furthest removed from the center frequency at which the spectral envelope crosses the -26 dB down amplitude point.
- m) Repeat steps e) to l) with the input signal connected directly to the spectrum analyzer (i.e., input signal measurement).
- n) Compare the spectral plot of the input signal (determined from step m) to the output signal (determined from step l) to affirm that they are similar (in passband and rolloff characteristic features and relative spectral locations), and include plot(s) and descriptions in test report.
- o) Repeat the procedure [steps e) to n)] with the input signal amplitude set to 3 dB above the AGC threshold.
- p) Repeat steps e) to o) with the signal generator set to the narrowband signal.
- q) Repeat steps e) to p) for all frequency bands authorized for use by the EUT.

## 6.2.4 Measurement Record

Please refer to Appendix - Test Data and Result for report GZCR230300022306.



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### 6.3 Mean output power and amplifier/booster gain

Test Requirement: 47 CFR Part 24.232

Test Method: KDB 935210 D05 clause 3.5

Limit: Base stations with an emission bandwidth of 1 MHz or less are limited to 1640 watts equivalent isotropically radiated power (EIRP) with an antenna height up to 300 meters HAAT  
Base stations with an emission bandwidth greater than 1 MHz are limited to 1640 watts/MHz equivalent isotropically radiated power (EIRP) with an antenna height up to 300 meters HAAT  
In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB

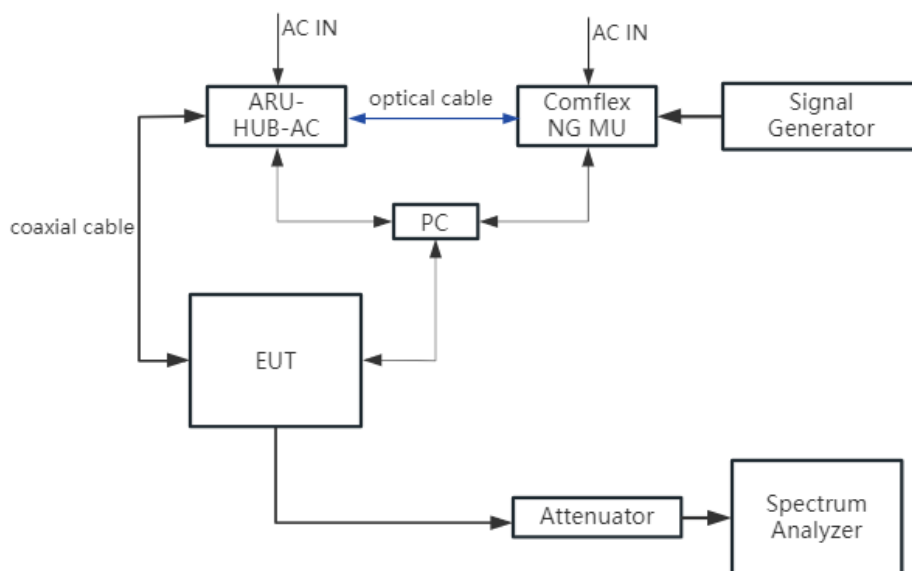
#### 6.3.1 E.U.T. Operation

Operating Environment:

Temperature: 22.3 °C Humidity: 65 % RH Atmospheric Pressure: 1008 mbar

EUT Operation: Drive the EUT to the maximum output power at maximum gain.

#### 6.3.2 Test Setup



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### 6.3.3 Test Procedure

- a) Connect a signal generator to the input of the EUT.
  - b) Configure to generate the AWGN (broadband) test signal.
  - c) The frequency of the signal generator shall be set to the frequency  $f_0$  as determined from 3.3.
  - d) Connect a spectrum analyzer or power meter to the output of the EUT using appropriate attenuation as necessary.
  - e) Set the signal generator output power to a level that produces an EUT output level that is just below the AGC threshold (see 3.2), but not more than 0.5 dB below.
  - f) Measure and record the output power of the EUT; use 3.5.3 or 3.5.4 for power measurement.
  - g) Remove the EUT from the measurement setup. Using the same signal generator settings, repeat the power measurement at the signal generator port, which was used as the input signal to the EUT, and record as the input power. EUT gain may be calculated as described in 3.5.5.
  - h) Repeat steps f) and g) with input signal amplitude set to 3 dB above the AGC threshold level.
  - i) Repeat steps e) to h) with the narrowband test signal.
  - j) Repeat steps e) to i) for all frequency bands authorized for use by the EUT.
  - h) After the mean input and output power levels have been measured as described in the preceding subclauses, the mean gain of the EUT can be determined from:  

$$\text{Gain (dB)} = \text{output power (dBm)} - \text{input power (dBm)}.$$
- Report the mean gain for each authorized operating frequency band and each test signal stimulus.

### 6.3.4 Measurement Record

Please refer to Appendix - Test Data and Result for report GZCR230300022306.



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### 6.4 Out-of-band/out-of-block(including intermodulation) emissions

Test Requirement: 47 CFR Part 24.238

Test Method: KDB 935210 D05 clause 3.6

Limit: The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

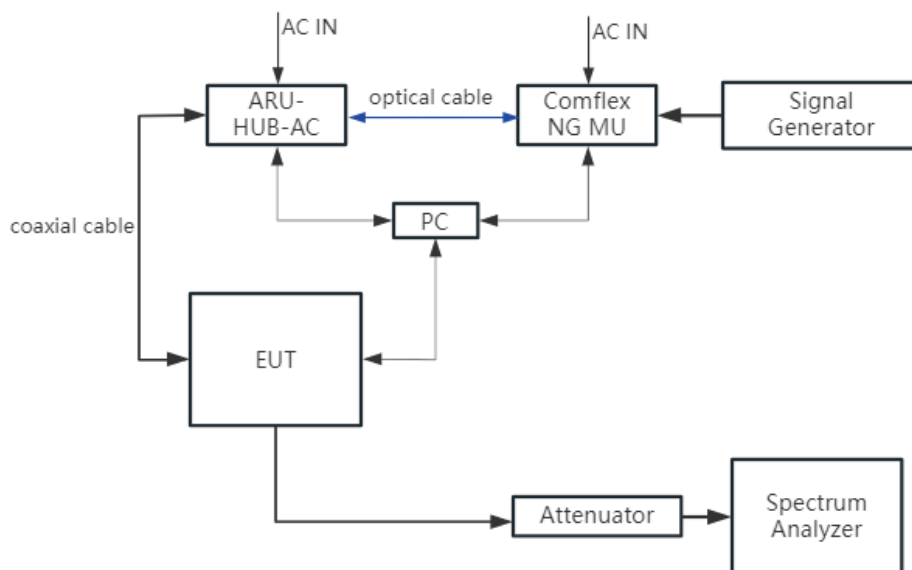
#### 6.4.1 E.U.T. Operation

Operating Environment:

Temperature: 22.3 °C Humidity: 65 % RH Atmospheric Pressure: 1008 mbar

EUT Operation: Drive the EUT to the maximum output power at maximum gain.

#### 6.4.2 Test Setup



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### 6.4.3 Test Procedure

a) Connect a signal generator to the input of the EUT.

If the signal generator is not capable of generating two modulated carriers simultaneously, then two discrete signal generators can be connected with an appropriate combining network to support this two-signal test.

b) Set the signal generator to produce two AWGN signals as previously described (e.g., 4.1 MHz OBW). Set the signal generator amplitudes so that the power from each into the EUT is equivalent.

c) Set the center frequencies such that the AWGN signals occupy adjacent channels, as defined by industry standards such as 3GPP or 3GPP2, at the upper edge of the frequency band or block under test.

d) Set the composite power levels such that the input signal is just below the AGC threshold (see 3.2), but not more than 0.5 dB below. The composite power can be measured using the procedures provided in KDB Publication 971168 [R8], but it will be necessary to expand the power integration bandwidth so as to include both of the transmit channels. Alternatively, the composite power can be measured using an average power meter as described in KDB Publication 971168 [R8].

e) Connect a spectrum analyzer to the output of the EUT using appropriate attenuation as necessary.

f) Set the RBW = reference bandwidth in the applicable rule section for the supported frequency band (typically 1 % of the EBW or 100 kHz or 1 MHz)

g) Set the VBW =  $3 \times \text{RBW}$ .

h) Set the detector to power averaging (rms) detector.

i) Set the Sweep time = auto-couple.

j) Set the spectrum analyzer start frequency to the upper block edge frequency, and the stop frequency to the upper block edge frequency plus 300 kHz or 3 MHz, for frequencies below and above 1 GHz, respectively.

k) Trace average at least 100 traces in power averaging (rms) mode.

l) Use the marker function to find the maximum power level.

m) Capture the spectrum analyzer trace of the power level for inclusion in the test report.

n) Repeat steps k) to m) with the composite input power level set to 3 dB above the AGC threshold.

o) Reset the frequencies of the input signals to the lower edge of the frequency block or band under test.

p) Reset the spectrum analyzer start frequency to the lower block edge frequency minus 300 kHz or 3 MHz, for frequencies below and above 1 GHz, respectively, and the stop frequency to the lower band or block edge frequency.

q) Repeat steps k) to n).

r) Repeat steps a) to q) with the signal generator configured for a single test signal tuned as close as possible to the block edges.

s) Repeat steps a) to r) with the narrowband test signal.

t) Repeat steps a) to s) for all authorized frequency bands or blocks used by the EUT.

### 6.4.4 Measurement Record

Please refer to Appendix - Test Data and Result for report GZCR230300022306.



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### 6.5 Conducted Spurious emissions

Test Requirement: 47 CFR Part 24.238

Test Method: KDB 935210 D05 clause 3.6

Limit: The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

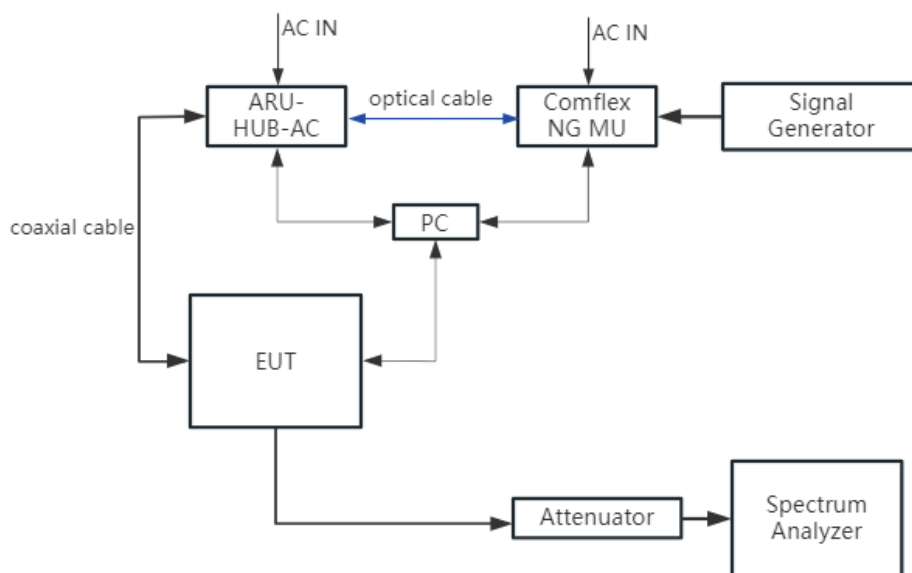
#### 6.5.1 E.U.T. Operation

Operating Environment:

Temperature: 22.3 °C Humidity: 65 % RH Atmospheric Pressure: 1008 mbar

EUT Operation: Drive the EUT to the maximum output power at maximum gain.

#### 6.5.2 Test Setup



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### 6.5.3 Test Procedure

- a) Connect a signal generator to the input of the EUT.
- b) Set the signal generator to produce the broadband test signal as previously described (i.e., 4.1 MHz OBW AWGN).
- c) Set the center frequency of the test signal to the lowest available channel within the frequency band or block.
- d) Set the EUT input power to a level that is just below the AGC threshold (see 3.2), but not more than 0.5 dB below.
- e) Connect a spectrum analyzer to the output of the EUT using appropriate attenuation as necessary.
- f) Set the RBW = reference bandwidth in the applicable rule section for the supported frequency band of operation (e.g., reference bandwidth is typically 100 kHz or 1 MHz).
- g) Set the VBW  $\geq 3 \times$  RBW.
- h) Set the Sweep time = auto-couple.
- i) Set the spectrum analyzer start frequency to the lowest RF signal generated in the equipment, without going below 9 kHz, and the stop frequency to the lower band/block edge frequency minus 100 kHz or 1 MHz, as specified in the applicable rule part.

The number of measurement points in each sweep must be  $\geq (2 \times \text{span}/\text{RBW})$ , which may require that the measurement range defined by the start and stop frequencies be subdivided, depending on the available number of measurement points provided by the spectrum analyzer.<sup>4</sup>

- j) Select the power averaging (rms) detector function.
- k) Trace average at least 10 traces in power averaging (rms) mode.
- l) Use the peak marker function to identify the highest amplitude level over each measured frequency range. Record the frequency and amplitude and capture a plot for inclusion in the test report.
- m) Reset the spectrum analyzer start frequency to the upper band/block edge frequency plus 100 kHz or 1 MHz, as specified in the applicable rule part, and the spectrum analyzer stop frequency to  $10 \times$  the highest frequency of the fundamental emission (see Section 2.1057). The number of measurement points in each sweep must be  $\geq (2 \times \text{span}/\text{RBW})$ , which may require that the measurement range defined by the start and stop frequencies be subdivided, depending on the available number of measurement points provided by the spectrum analyzer.
- n) Trace average at least 10 traces in power averaging (rms) mode.
- o) Use the peak marker function to identify the highest amplitude level over each of the measured frequency ranges. Record the frequency and amplitude and capture a plot for inclusion in the test report; also provide tabular data, if required.
- p) Repeat steps i) to o) with the input test signals firstly tuned to a middle band/block frequency/channel, and then tuned to a high band/block frequency/channel.
- q) Repeat steps c) to p) with the narrowband test signal.
- r) Repeat steps b) to q) for all authorized frequency bands/blocks used by the EUT.

### 6.5.4 Measurement Record

Please refer to Appendix - Test Data and Result for report GZCR230300022306.



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### 6.6 Frequency Stability

Test Requirement: 47 CFR Part 24.235

Test Method: 47 CFR Part 2.1055  
KDB 935210 D05 clause 3.7  
ANSI C63.26-2015 clause 5.6

Limit: The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

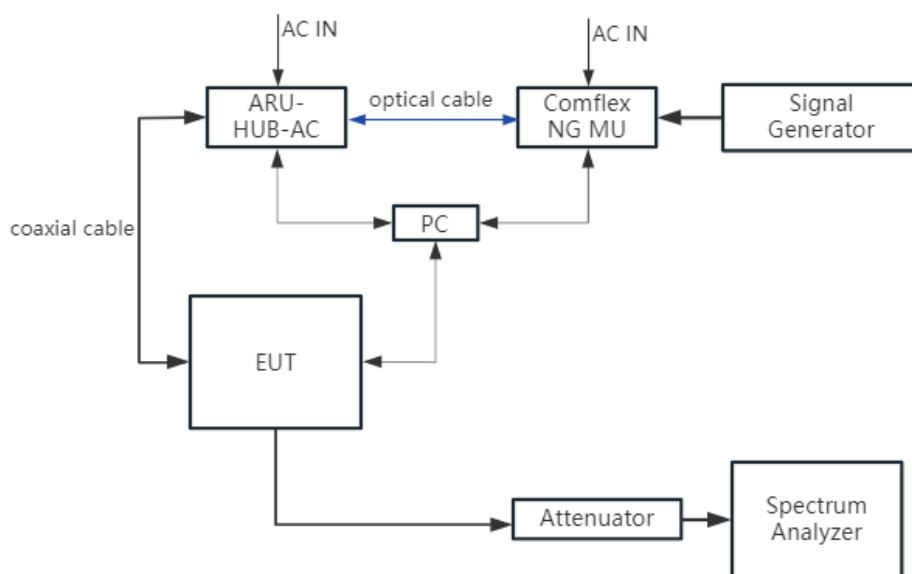
#### 6.6.1 E.U.T. Operation

Operating Environment:

Temperature: 22.3 °C Humidity: 65 % RH Atmospheric Pressure: 1008 mbar

EUT Operation: Drive the EUT to the maximum output power at maximum gain.

#### 6.6.2 Test Setup



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### 6.6.3 Test Procedure

Frequency stability measurement applies for an EUT that processes the input signal in a manner that could have an influence on its output signal frequency/frequencies. Measure frequency stability using the procedure in 5.6 with the following addition: Connect the reference clock input of the signal generator to the reference output of the frequency counter to affirm that any frequency offset is from the signal booster and not the difference in the reference oscillators of the measurement equipment.

Test procedure in 5.6:

Frequency stability is a measure of the frequency drift due to temperature and supply voltage variations, with reference to the frequency measured at +20 °C and rated supply voltage.

The operating carrier frequency shall be set up in accordance with the manufacturer's published operation and instruction manual prior to the commencement of these tests. No adjustment of any frequency determining circuit element shall be made subsequent to this initial set-up. Frequency stability is tested:

- At 10 °C intervals of temperatures between -30 °C and +50 °C at the manufacturer's rated supply voltage, and
- At +20 °C temperature and  $\pm 15\%$  supply voltage variations. If a product is specified to operate over a range of input voltage then the -15% variation is applied to the lowermost voltage and the +15% is applied to the uppermost voltage.

During the test all necessary settings, adjustments and control of the EUT have to be performed without disturbing the test environment, i.e., without opening the environmental chamber. The frequency stabilities can be maintained to a lesser temperature range provided that the transmitter is automatically inhibited from operating outside the lesser temperature range. For handheld equipment that is only capable of operating from internal batteries and the supply voltage cannot be varied, the frequency stability tests shall be performed at the nominal battery voltage and the battery end point voltage specified by the manufacturer. An external supply voltage can be used and set at the internal battery nominal voltage, and again at the battery operating end point voltage which shall be specified by the equipment manufacturer.

If an unmodulated carrier is not available, the mean frequency of a modulated carrier can be obtained by using a frequency counter with gating time set to an appropriately large multiple of bit periods (gating time depending on the required accuracy). Full details on the choice of values shall be included in the test report.

### 6.6.4 Measurement Record

Please refer to Appendix - Test Data and Result for report GZCR230300022306.



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### 6.7 Radiated Spurious emission

Test Requirement: 47 CFR Part 24.238

Test Method: KDB 935210 D05 clause 3.8  
ANSI C63.26-2015 clause 5.5

Limit: The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

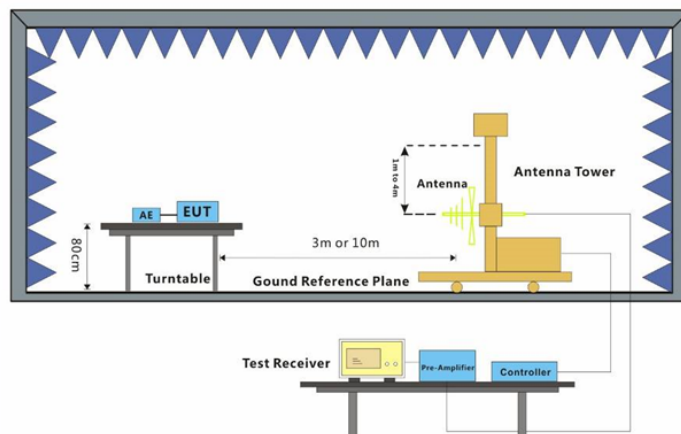
#### 6.7.1 E.U.T. Operation

Operating Environment:

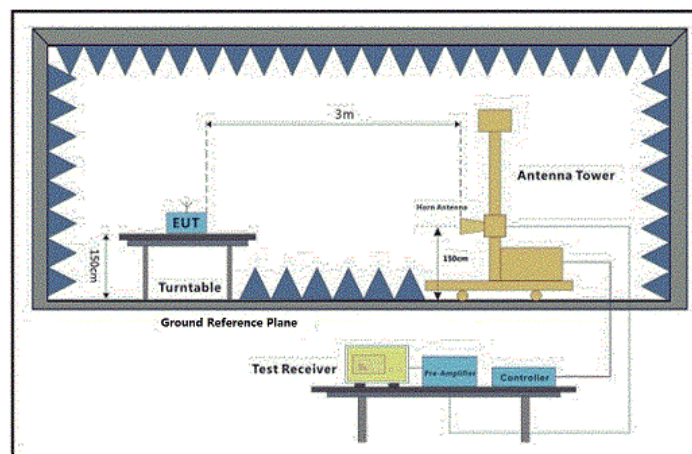
Temperature: 25.1 °C Humidity: 59 % RH Atmospheric Pressure: 1020 mbar

EUT Operation: Drive the EUT to the maximum output power at maximum gain.

#### 6.7.2 Test Setup



30MHz-1GHz



Above 1GHz



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### 6.7.3 Test procedure

1. Scan from 30MHz to 40GHz, find the maximum radiation frequency to measure.
2. The technique used to find the Spurious Emissions of the transmitter was the antenna substitution method. Substitution method was performed to determine the actual ERP/EIRP emission levels of the EUT.

Below 1GHz test procedure as below:

- 1) The EUT was powered on and placed on a table in the chamber. The antenna of the transmitter was extended to its maximum length. modulation mode and the measuring receiver shall be tuned to the frequency of the transmitter under test.
- 2) Rotating through 360° the turntable. After the fundamental emission was maximized, a field strength measurement was made.
- 3) Steps 1) and 2) were performed with the EUT and the receive antenna in both vertical and horizontal polarization.
- 4) The transmitter was then removed and replaced with another antenna. The center of the antenna was approximately at the same location as the center of the transmitter.
- 5) A signal at the disturbance was fed to the substitution antenna by means of a non-radiating cable. With both the substitution and the receive antennas horizontally polarized, the receive antenna was raised and lowered to obtain a maximum reading at the test receiver. The level of the signal generator was adjusted until the measured field strength level in step 2) is obtained for this set of conditions.
- 6) The output power into the substitution antenna was then measured.
- 7) Steps 5) and 6 )were repeated with both antennas vertically polarized.
- 8) Calculate power in dBm by the following formula:

Level (dBm) = Read Level (dBm) + Correction Factor (dB)

Above 1GHz test procedure as below:

- 1) Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber.
- 2) Calculate power in dBm by the following formula:  
Level (dBm) = Read Level (dBm) + Correction Factor (dB)

### 6.7.4 Measurement Record

Please refer to Appendix - Test Data and Result for report GZCR230300022306.



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## 7 Test Setup Photographs

Refer to Appendix - Test Setup Photos for GZCR2303000223AT.

## 8 EUT Constructional Details (EUT Photos)

Refer to External and Internal Photos for GZCR2303000223AT.

- End of the Report -



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