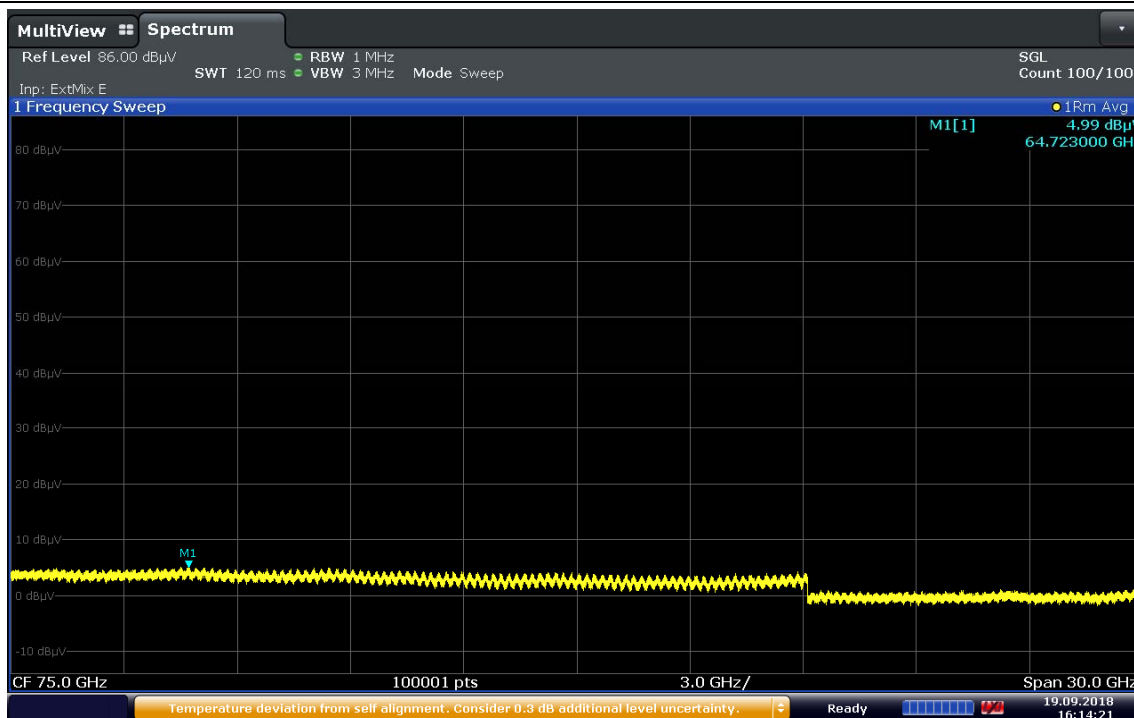
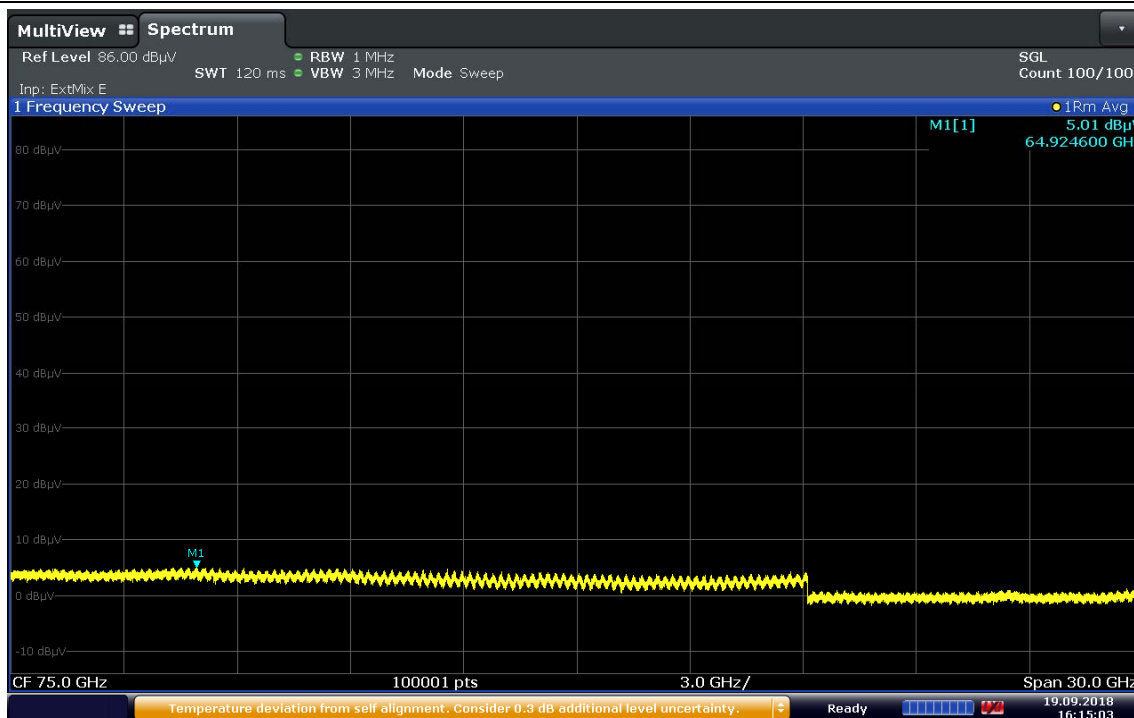


60 GHz ~ 90 GHz / 1cc / High / 45°



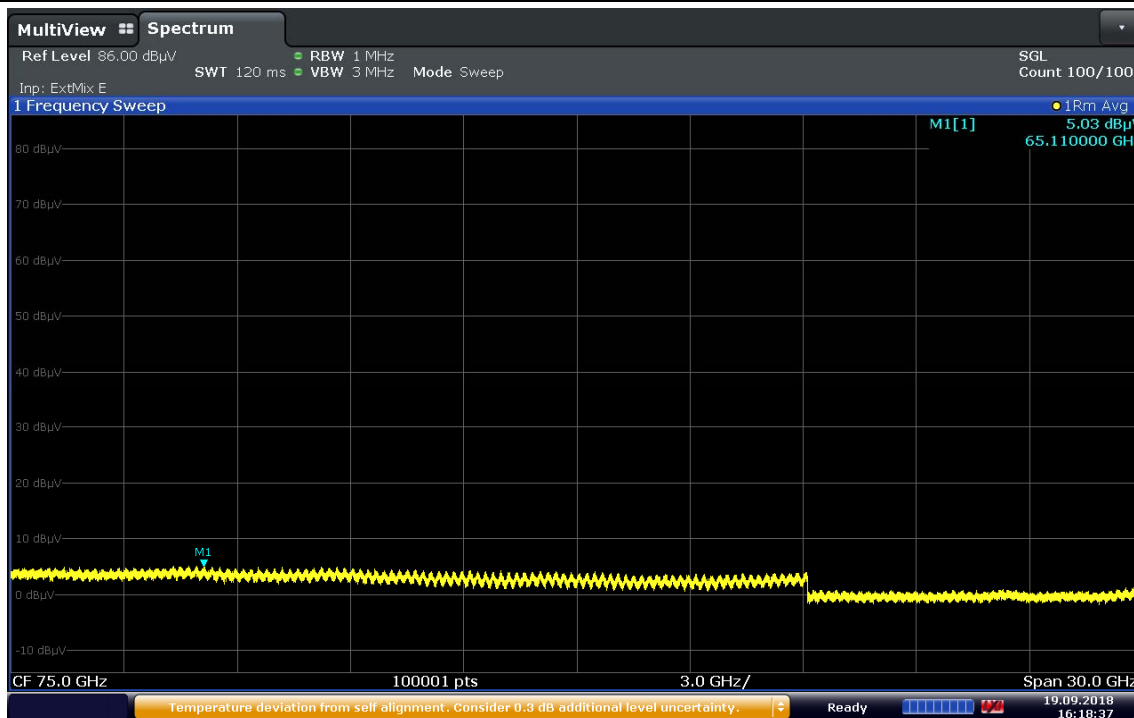
16:14:22 19.09.2018

60 GHz ~ 90 GHz / 1cc / High / 135°



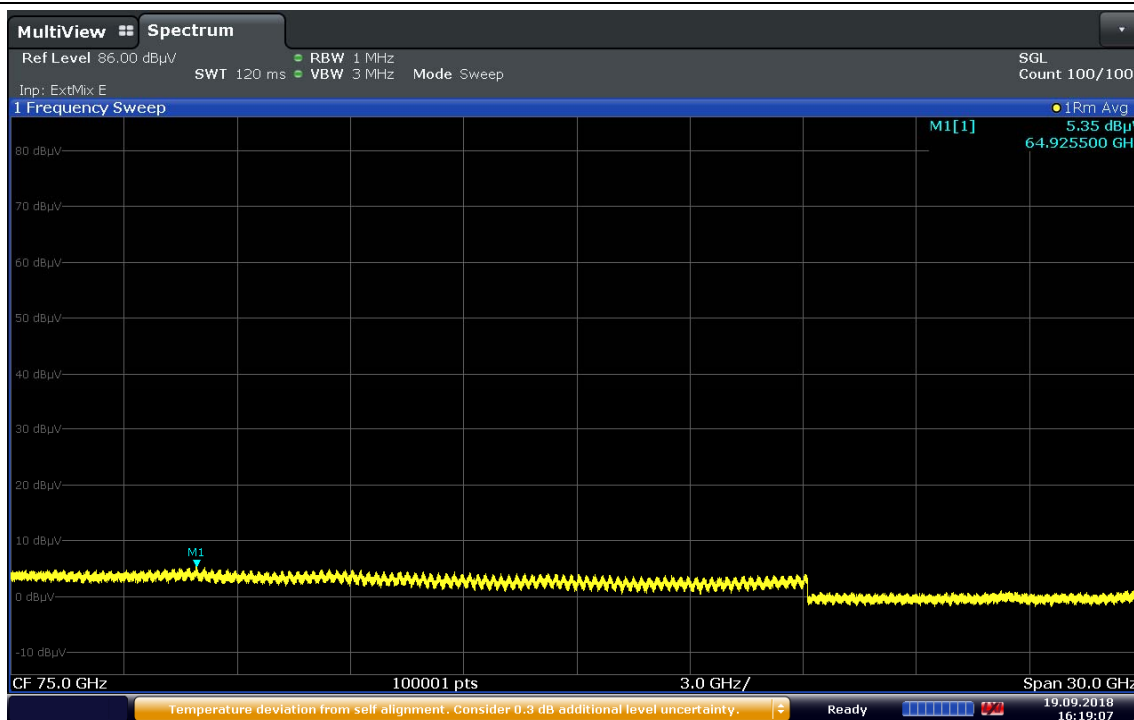
16:15:04 19.09.2018

60 GHz ~ 90 GHz / 8cc / Low / 45°



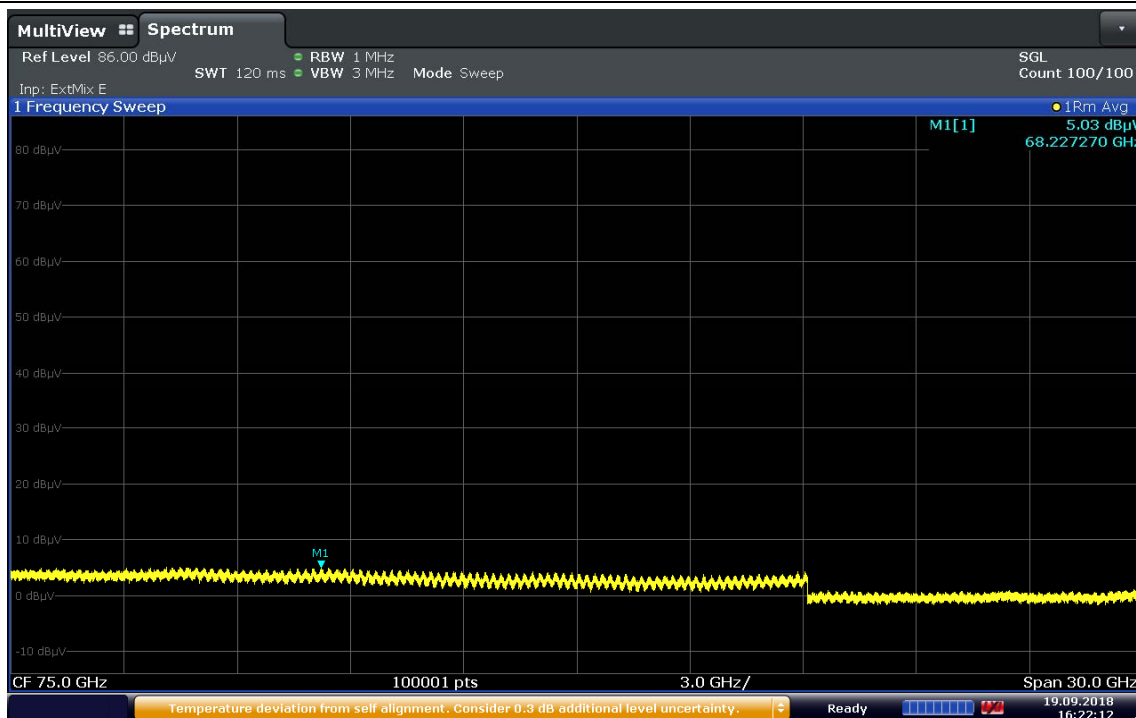
16:18:37 19.09.2018

60 GHz ~ 90 GHz / 8cc / Low / 135°



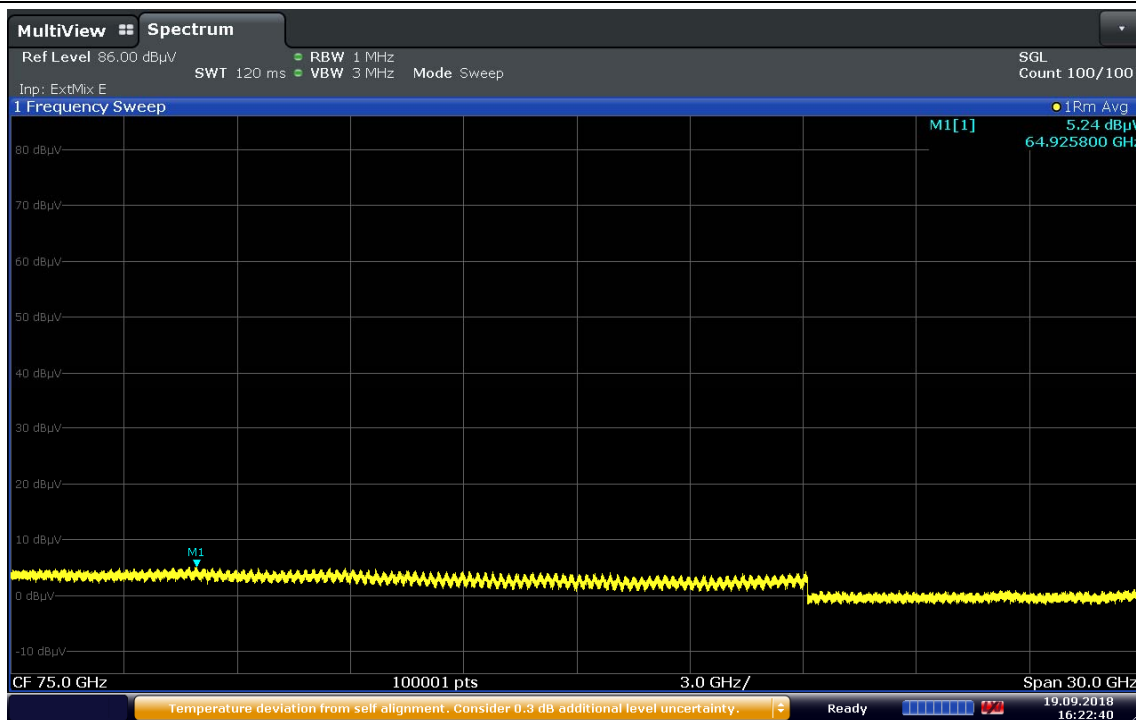
16:19:08 19.09.2018

60 GHz ~ 90 GHz / 8cc / Middle / 45°



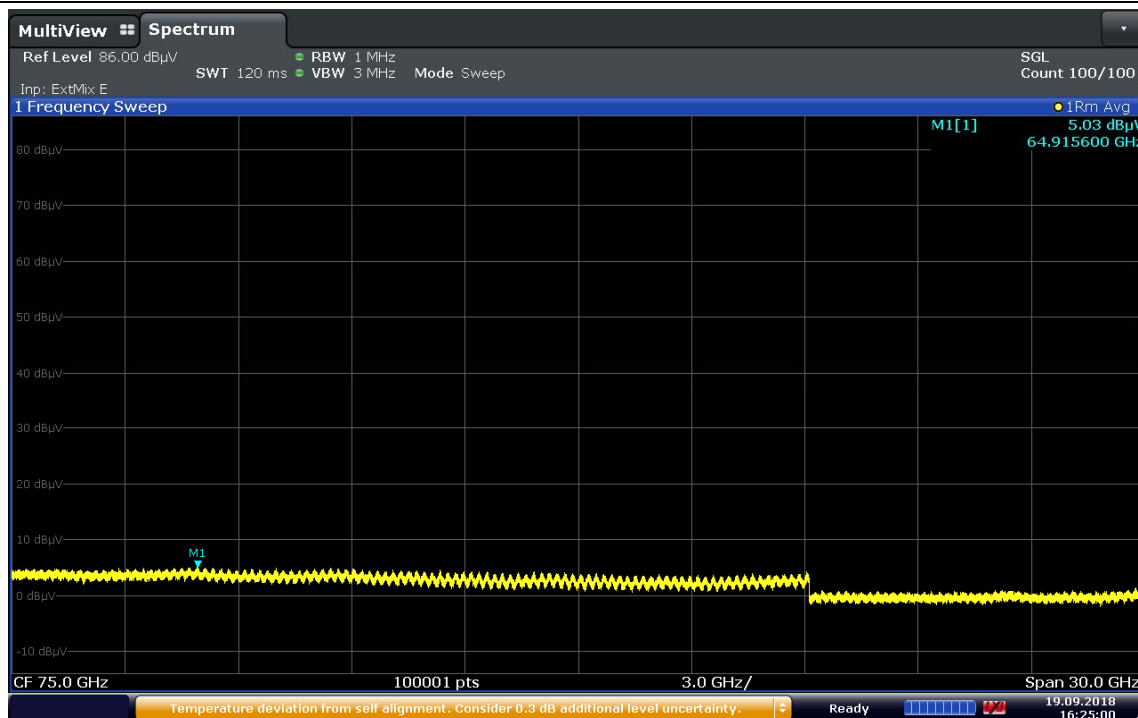
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60 GHz ~ 90 GHz / 8cc / Middle / 135°



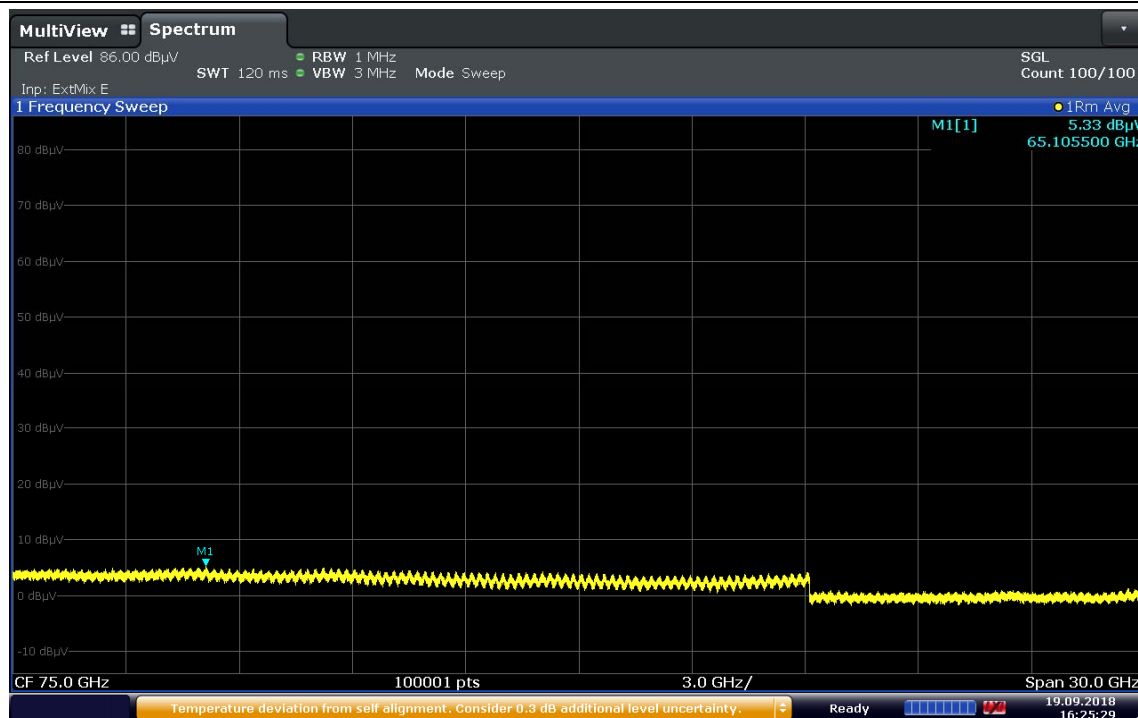
16:22:40 19.09.2018

60 GHz ~ 90 GHz / 8cc / High / 45°

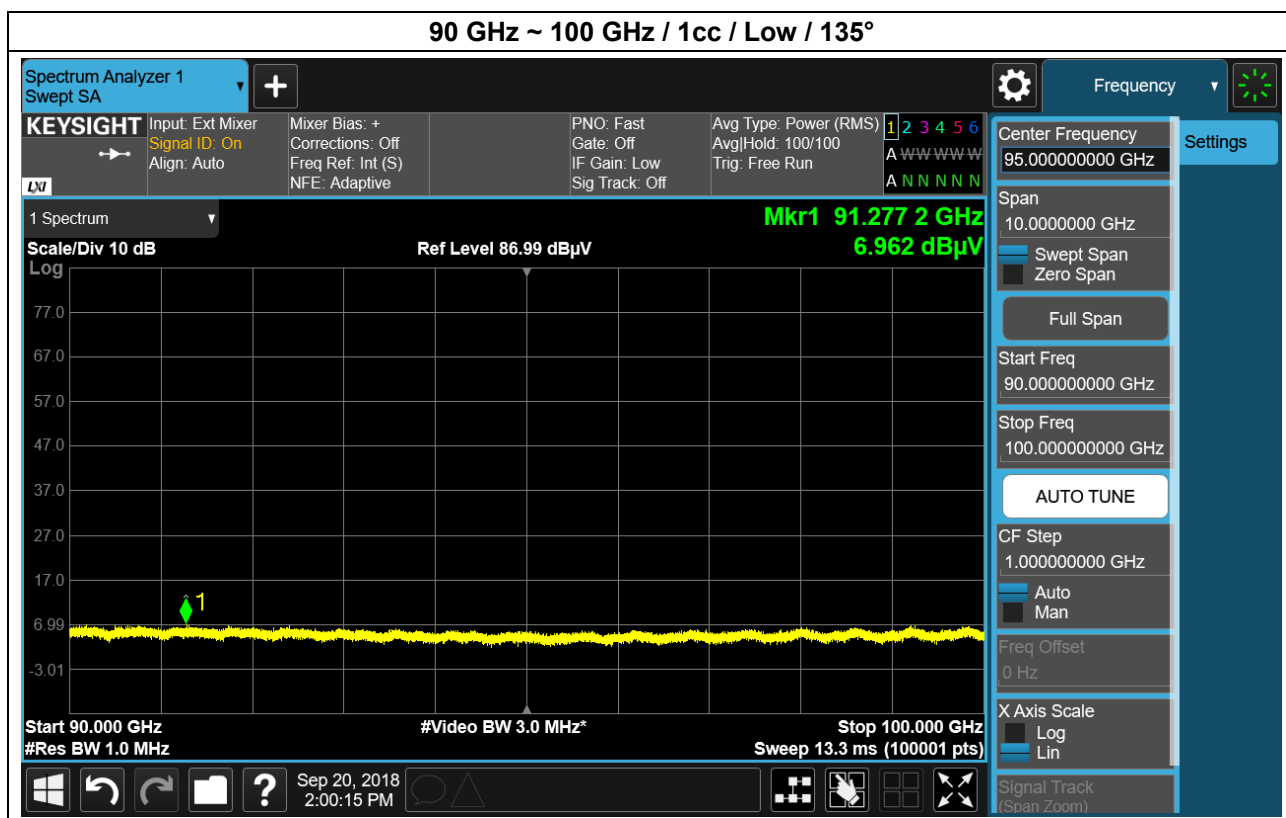
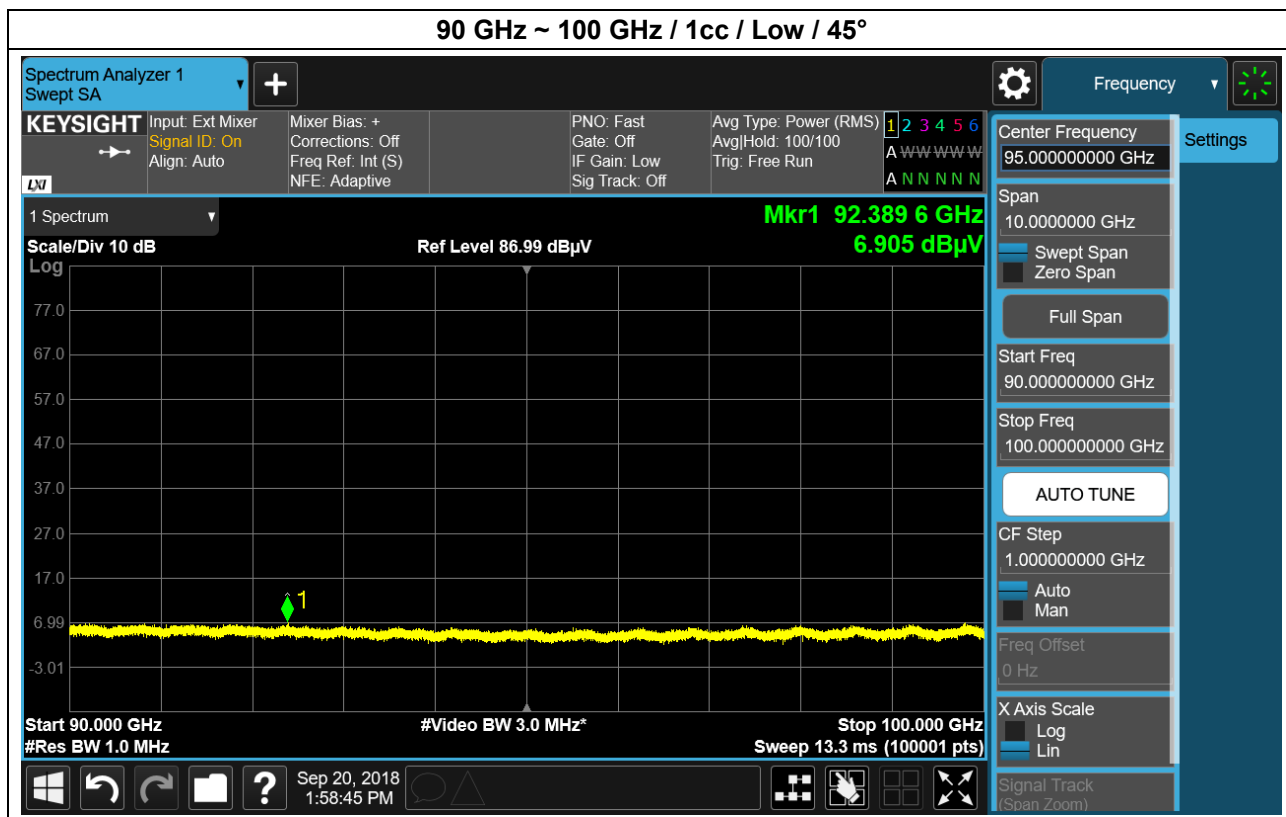


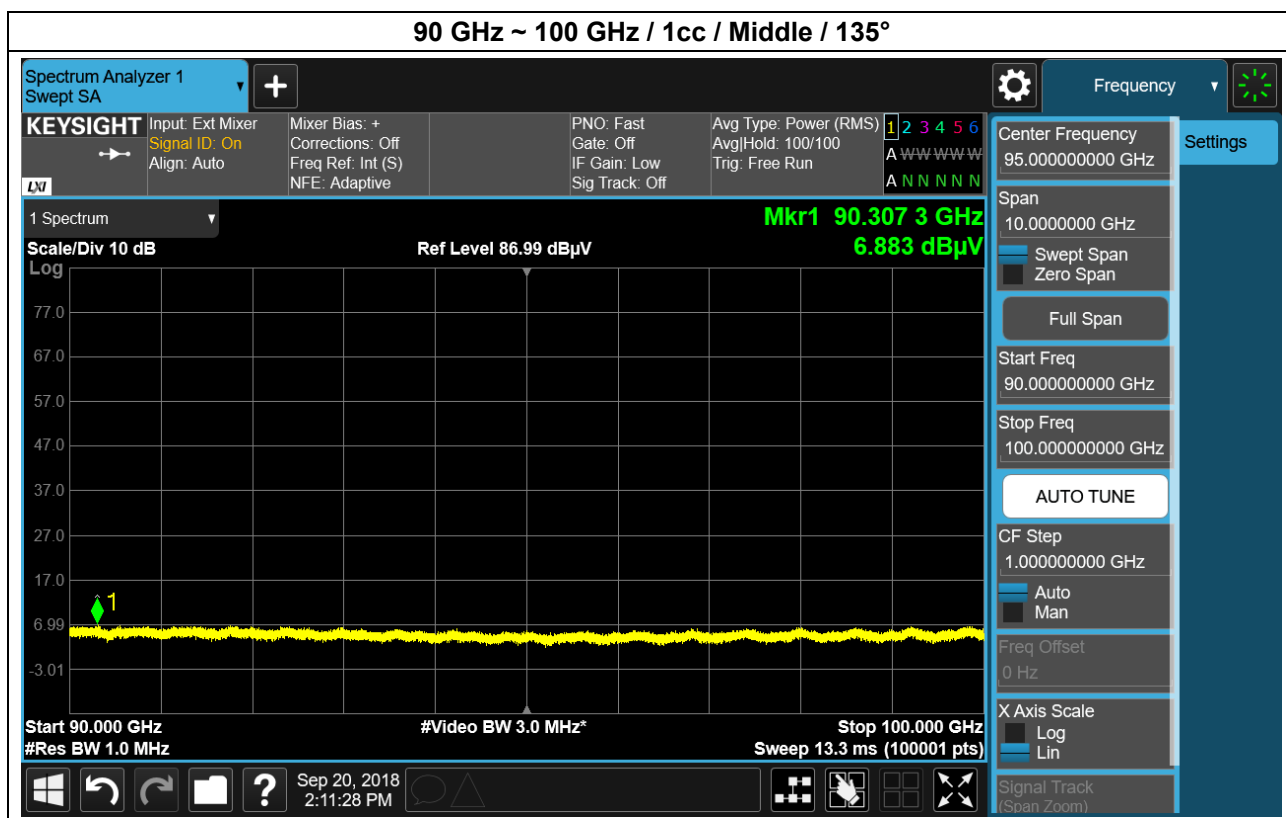
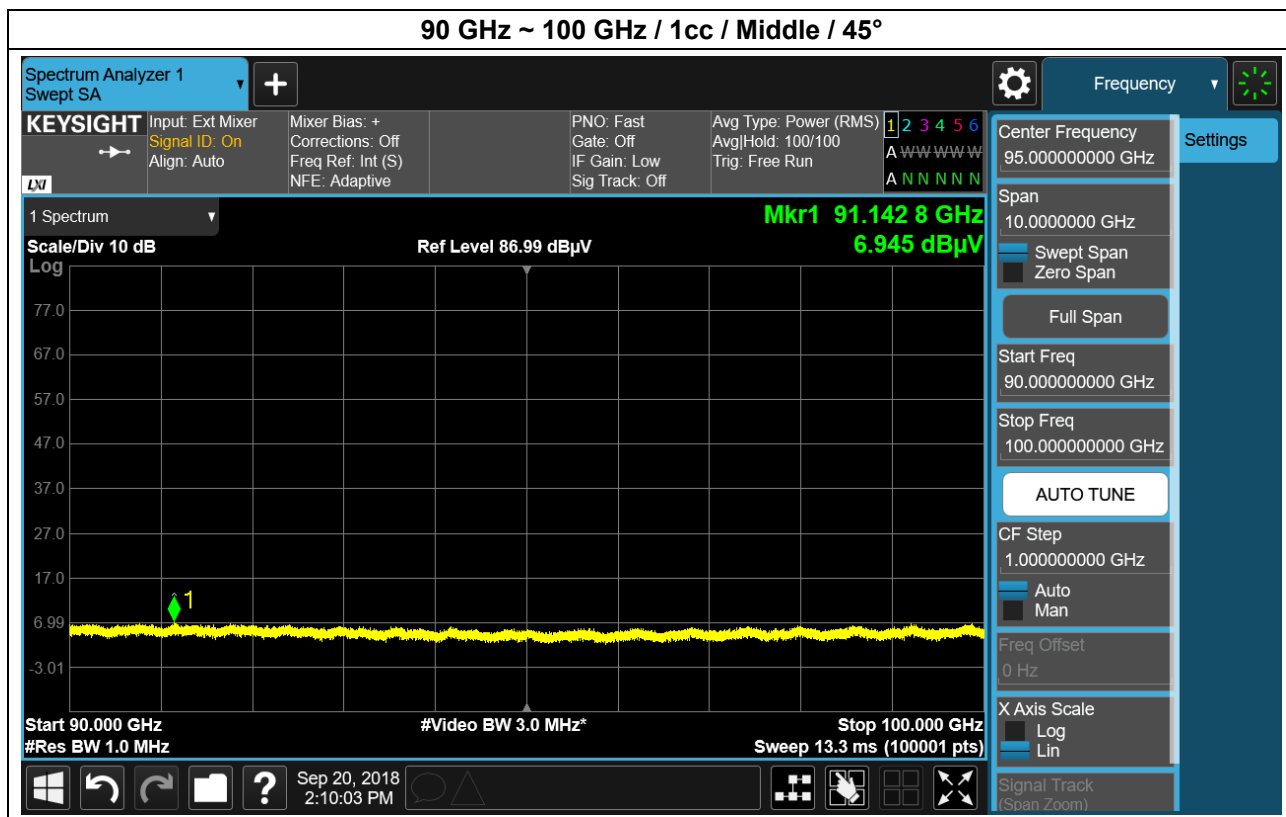
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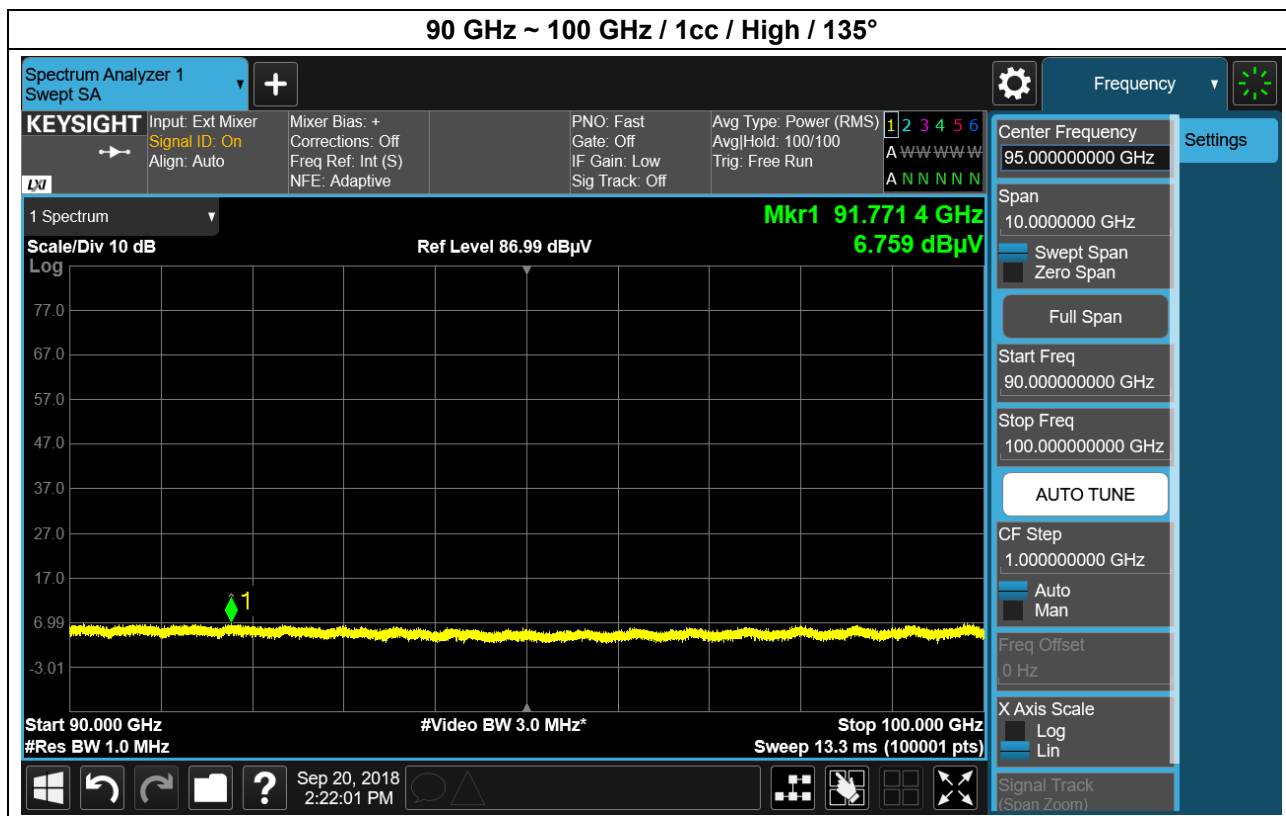
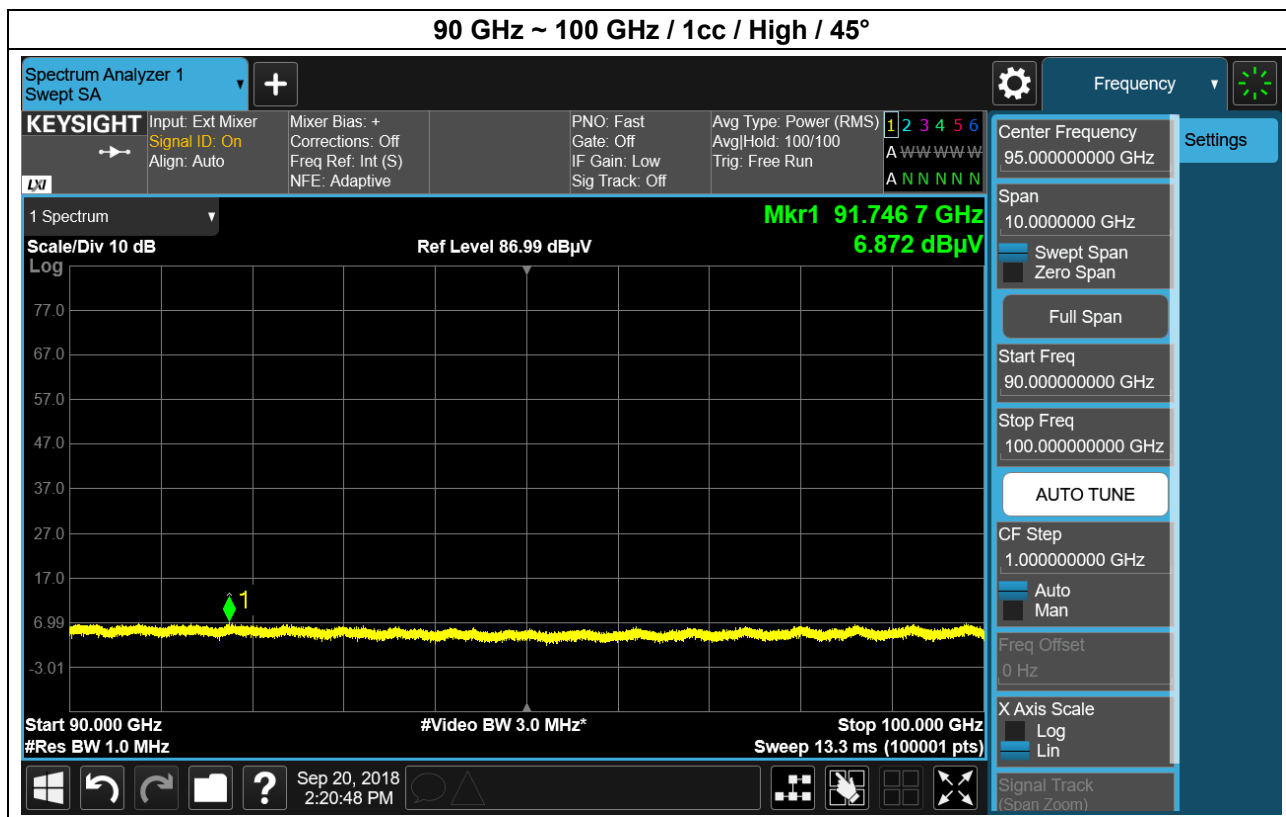
60 GHz ~ 90 GHz / 8cc / High / 135°

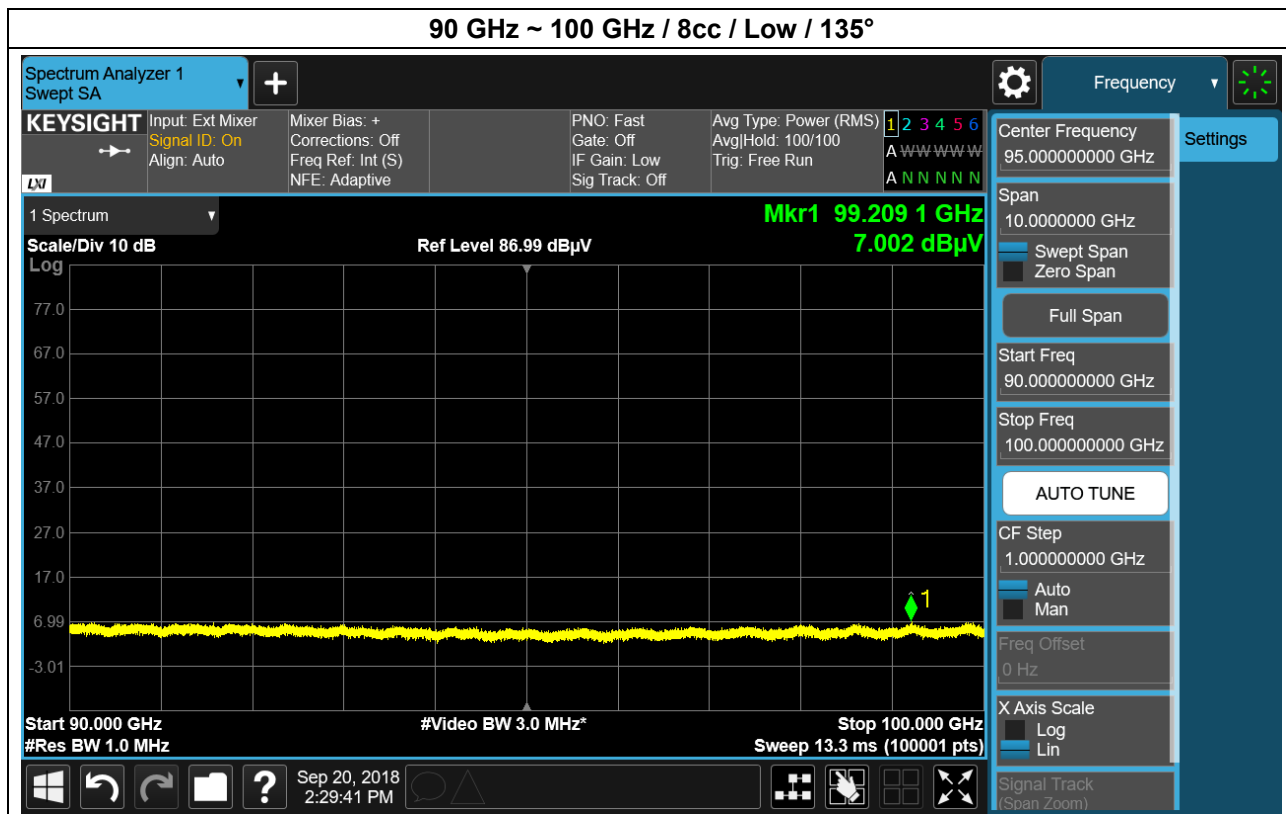
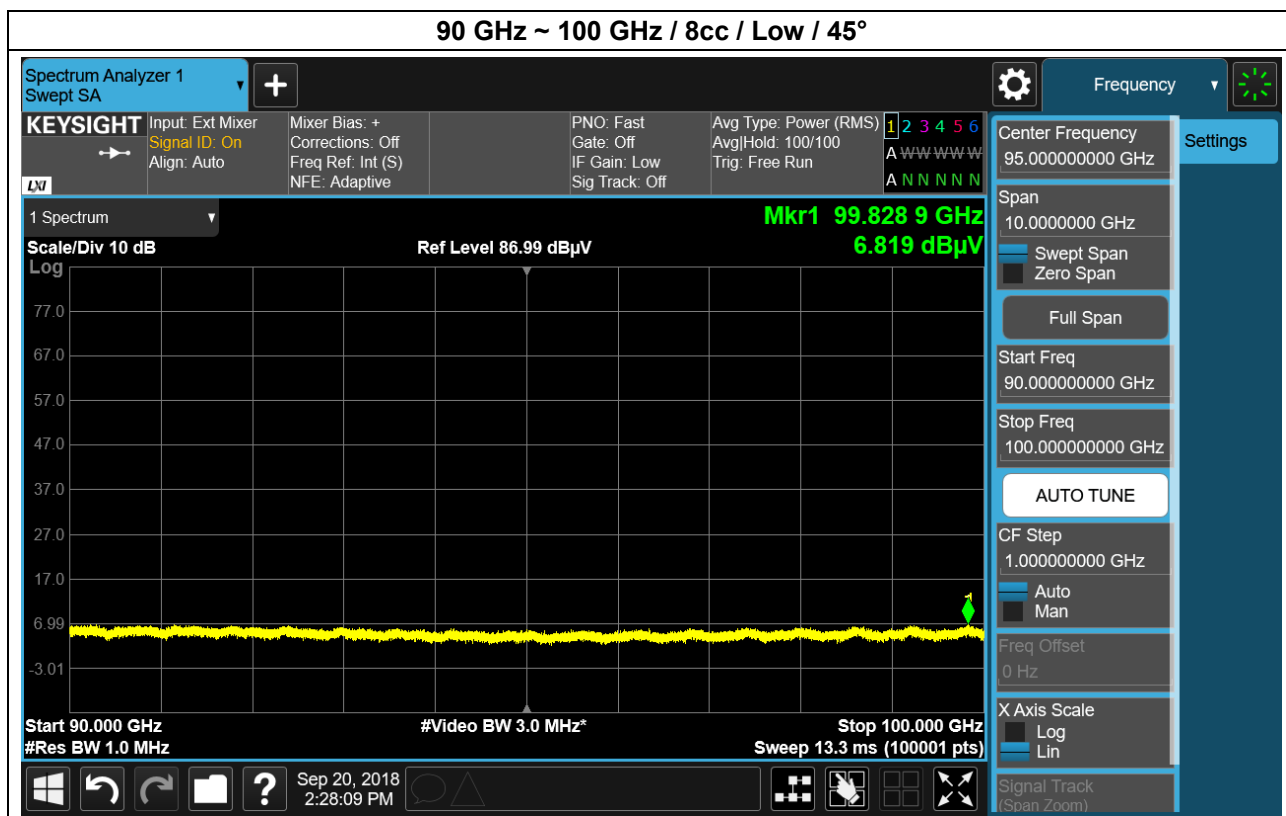


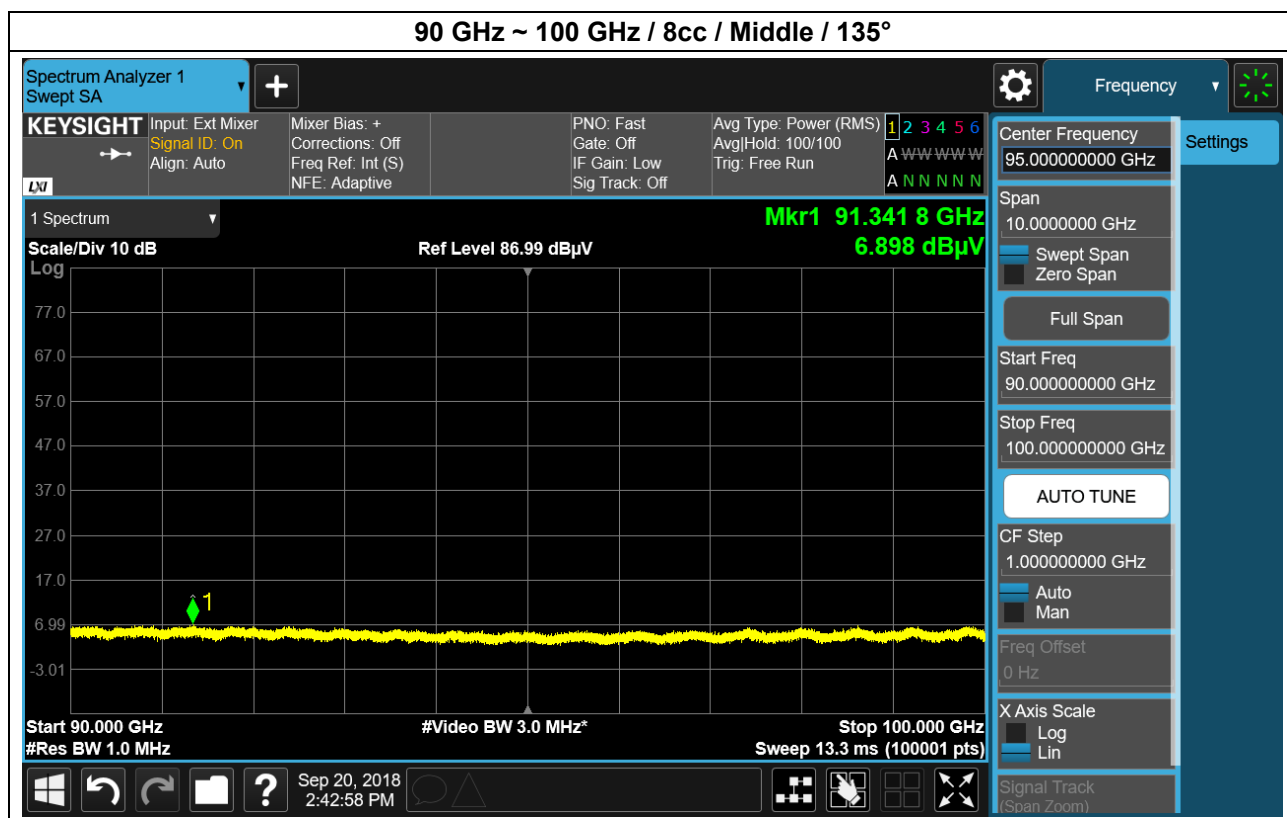
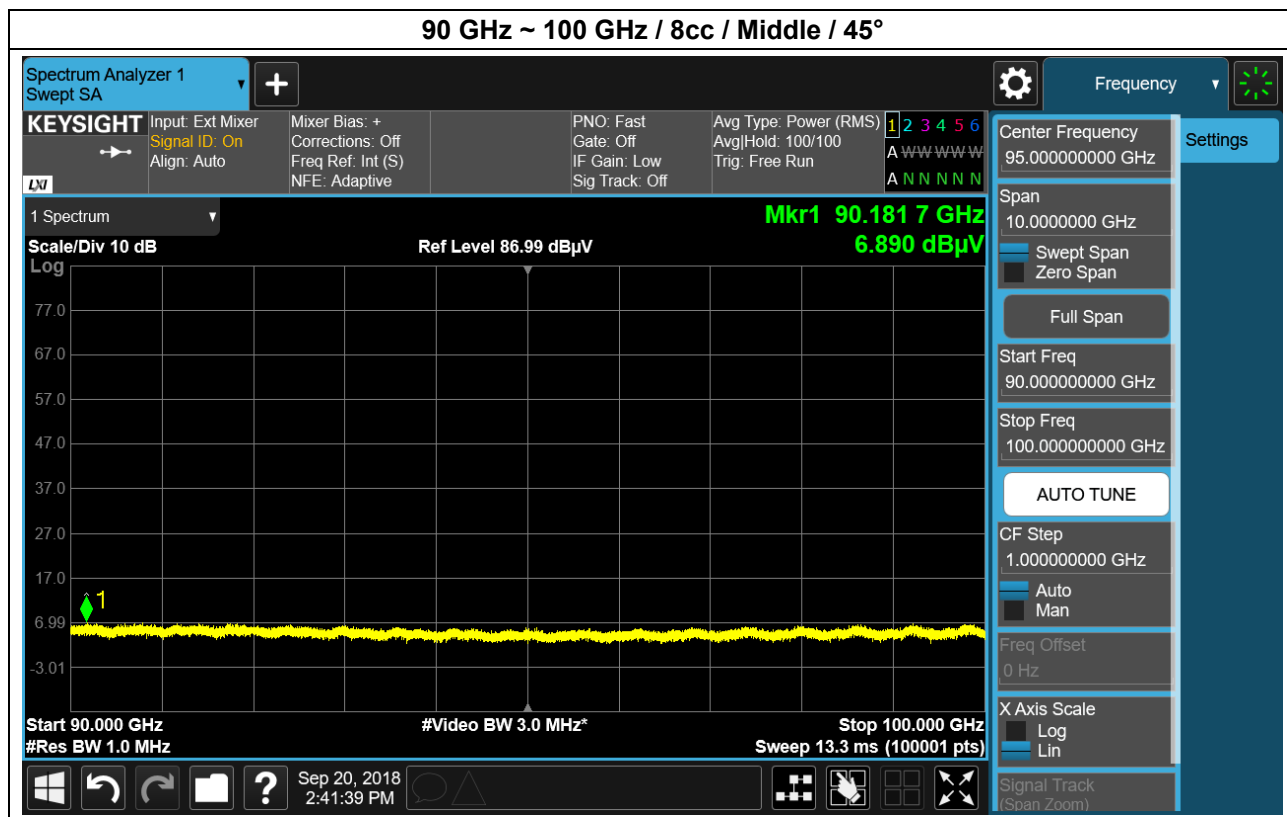
16:25:30 19.09.2018

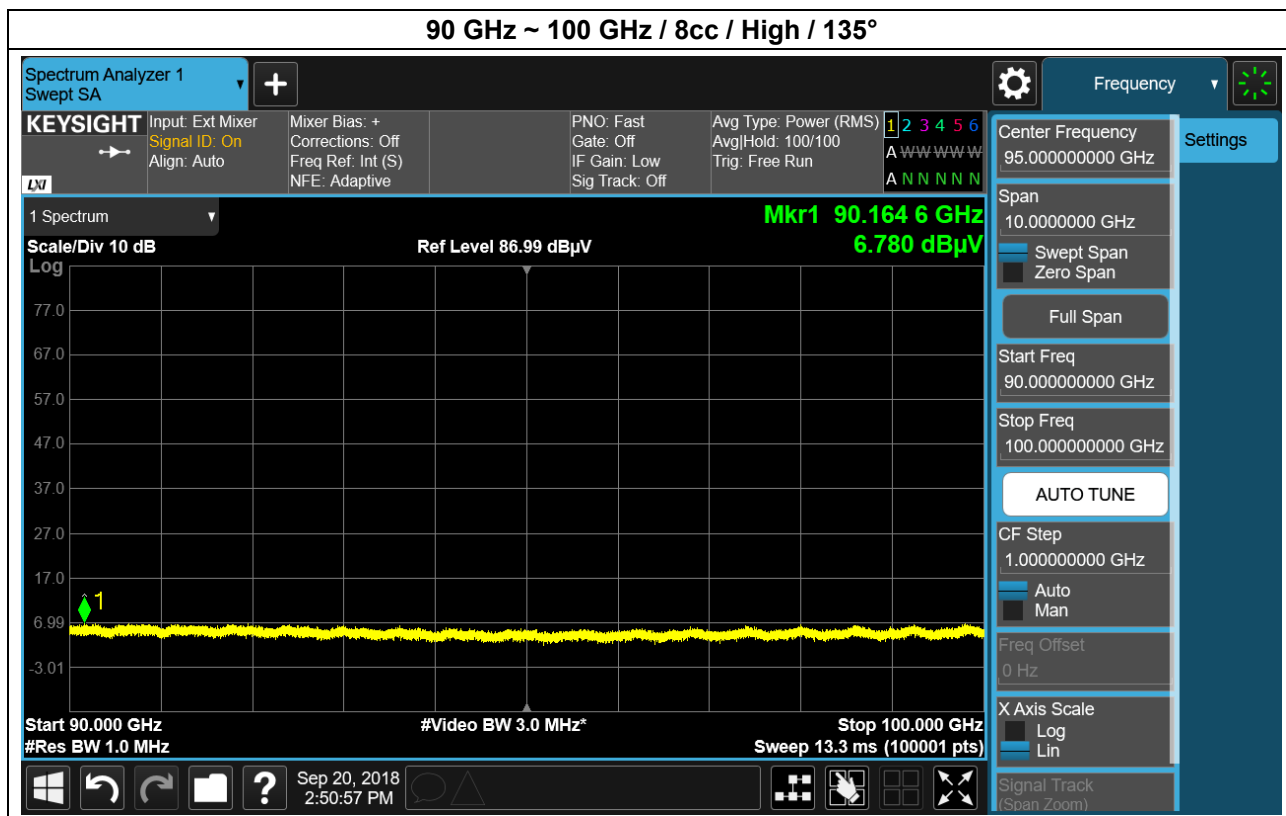
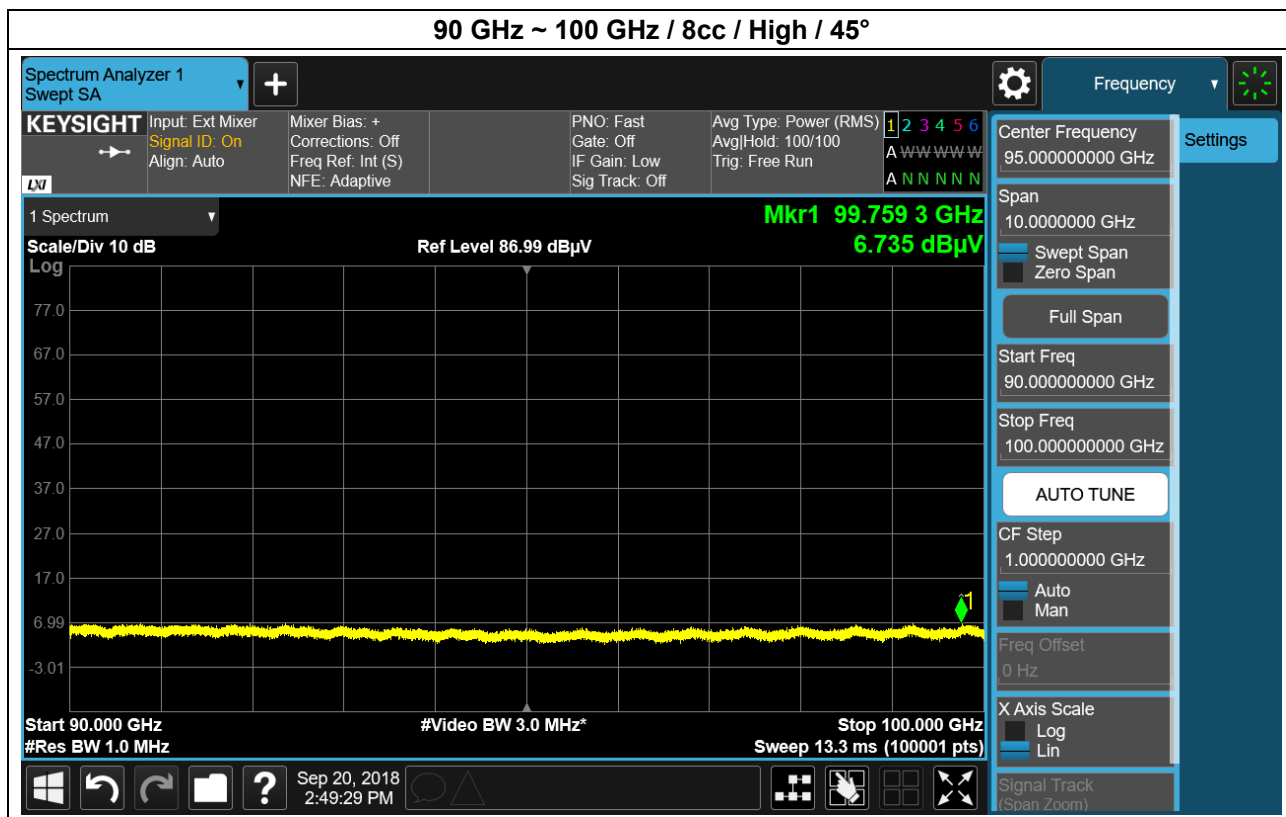












5.6. FREQUENCY STABILITY

FCC Rules

Test Requirements:

§ 2.1055 Measurements required: Frequency stability.

(a) The frequency stability shall be measured with variation of ambient temperature as follows:

- (1) From -30° to $+50^{\circ}$ centigrade for all equipment except that specified in paragraphs (a) (2) and (3) of this section.

Test Procedures:

The measurement is performed in accordance with Section 5.6.4 and 5.6.5 of ANSI C63.26.

5.6.4 Frequency stability over variations in temperature

- a) Supply the EUT with a nominal 60 Hz ac voltage, dc voltage, or install a new or fully charged battery in the EUT.
- b) If possible a dummy load should be connected to the EUT because an antenna near the metallic walls of an environmental test chamber could affect the output frequency of the EUT. If the EUT is equipped with a permanently attached, adjustable-length antenna, the EUT should be placed in the center of the chamber with the antenna adjusted to the shortest length possible.
- c) Turn on the EUT, and tune it to the center frequency of the operating band.
- d) Couple the transmitter output to the measuring instrument through a suitable attenuator and coaxial cable. If connection to the EUT output is not possible, make the measurement by connecting an antenna to the measuring instrument with a suitable length of coaxial cable and placing the measuring antenna near the EUT (e.g., 15 cm away).

NOTE—An instrument that has an adequate level of accuracy as specified by the procuring or regulatory authority is the recommended measuring instrument.

- e) Adjust the location of the measurement antenna and the controls on the measurement instrument to obtain a suitable signal level (i.e., a level that will not overload the measurement instrument, but is strong enough to allow measurement of the operating or fundamental frequency of the EUT). Adjust the detector bandwidth and span settings to achieve a resolution capable of accurate frequency measurements over the applicable frequency stability limits.
- f) Turn the EUT off, and place it inside the environmental temperature chamber. For devices that have oscillator heaters, energize only the heater circuit.
- g) Set the temperature control on the chamber to the highest temperature specified in the regulatory requirements for the type of device, and allow the oscillator heater and the chamber temperature to stabilize. Unless otherwise instructed by the regulatory authority, this temperature should be 50°C .
- h) While maintaining a constant temperature inside the environmental chamber, turn on the EUT and allow sufficient time for the EUT temperature to stabilize.
- i) Measure the frequency.

- j) Switch off the EUT, but do not switch off the oscillator heater.
- k) Lower the chamber temperature to the next level that is required by the standard and allow the temperature inside the chamber to stabilize. Unless otherwise instructed by the regulators, this temperature step should be 10 °C.
- l) Repeat step h) through step k) down to the lowest specified temperature. Unless otherwise instructed by the regulators, this temperature should be -30 °C. When the frequency stability limit is stated as being sufficient such that the fundamental emissions stay within the authorized bands of operation, a reference point shall be established at the applicable unwanted emissions limit using a RBW equal to the RBW required by the unwanted emissions specification of the applicable regulatory standard. These reference points measured using the lowest and highest channel of operation shall be identified as f_L and f_H respectively. The worst-case frequency offset determined in the above methods shall be added or subtracted from the values of f_L and f_H and the resulting frequencies must remain within the band.
- m) Omitted

5.6.5 Frequency stability when varying supply voltage

- a) Couple the transmitter output to the measuring instrument through a suitable attenuator and coaxial cable. If connection to the EUT output is not possible make the measurement by connecting an antenna to the measuring instrument with a suitable length of coaxial cable and placing the measuring antenna near the EUT (e.g., 15 cm away)
- b) Supply the EUT with nominal ac or dc voltage. The supply voltage shall be measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided. Effects on frequency of transmitter keying (except for broadcast transmitters) and any heating element cycling at the nominal supply voltage and at each extreme also shall be shown.
- c) Turn on the EUT, and couple its output to a frequency counter or other frequency-measuring instrument.
- d) Tune the EUT to the center frequency of the operating band. Adjust the location of the measurement antenna and the controls on the measurement instrument to obtain a suitable signal level (i.e., a level that will not overload the measurement instrument, but is strong enough to allow measurement of the operating or fundamental frequency of the EUT). Adjust the detector bandwidth and span settings to achieve a resolution capable of accurate frequency measurements over the applicable frequency stability limits.
NOTE—An instrument that has an adequate level of accuracy as specified by the procuring or regulatory authority is the recommended measuring instrument.
- e) Measure the frequency.
- f) Unless otherwise specified, vary primary supply voltage from 85% to 115% of the nominal value for other than hand carried battery equipment.
- g) For hand carried, battery powered equipment, reduce the primary ac or dc supply voltage to the battery operating end point, which shall be specified by the manufacturer.
- h) Repeat the frequency measurement.

NOTE—For band-edge compliance, it can be required to make these measurements at the low and high

channel of the operating band.

Note:

- 1) The results of the frequency stability test shown above the frequency deviation measured values are very small and similar trend for each path, so we are attached only the worst case data.
- 2) Test signal is CW signal for frequency stability.

Test Results:

Reference: Voltage = DC -48 V at 20°C, Frequency = 27 925.0 MHz

Voltage (%)	Temp.(°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (Hz)	ppm
100 %	+20(Ref)	27 925 019 612. 0	19612.000	0.000	0.00000
	-30	27 925 019 614. 7	19614.700	2.700	0.00010
	-20	27 925 019 608. 7	19608.700	-3.300	-0.00012
	-10	27 925 019 617. 3	19617.300	5.300	0.00019
	0	27 925 019 611. 3	19611.300	-0.700	-0.00003
	+10	27 925 019 616. 7	19616.700	4.700	0.00017
	+30	27 925 019 610. 0	19610.000	-2.000	-0.00007
	+40	27 925 019 611. 3	19611.300	-0.700	-0.00003
	+50	27 925 019 608. 7	19608.700	-3.300	-0.00012
115 %	+20	27 925 019 618. 0	19618.000	6.000	0.00021
85 %	+20	27 925 019 609. 3	19609.300	-2.700	-0.00010

6. Annex A_MIXER CERTIFIED DOCUMENTS

교정 성적서 CALIBRATION CERTIFICATE

경기도 이천시 마장면 서이천로 578번길 74
TEL : 031-645-6900, FAX : 031-645-6969



성적서발급번호(Certificate No) : IC-2017-51314
교정번호(Calibration No) : C-2017-57749

페이지(page) : 1 of 3

- 의뢰자 (Client)**
 - 기관명 (Name) : (주)에이치시티
 - 주소 (Address) : 경기도 이천시 마장면 서이천로 578번길 74
- 측정기 (Calibration Subject)**
 - 기기명 (Description) : 고주파 스펙트럼 분석기 (HARMONIC MIXER)
 - 제작회사 및 형식 (Manufacturer and Model Name) : OML / WR19
 - 기기번호 (Serial Number) : M19HWD
- 교정일자 (Date of Calibration)** : 2017.09.26 **차기교정예정일자** : 2018.09.26
(The due date of next Calibration)
- 교정환경 (Environment)**
 - 온도(Temperature) : (23.6 ± 0.2) °C - 습도(Humidity) : (49 ± 1) % R.H.
 - 교정장소 (Location) : 교정표준실 (Permanent Calibration Lab)
- 측정표준의 소급성 (Traceability)**
교정방법 및 소급성 서술 (Calibration method and/or brief description)
상기 기기는 고주파 스펙트럼 분석기의 교정절차(HCT-CS-125-40641)에 따라 국가측정표준기관으로부터 측정의 소급성이 확보된 아래의 표준장비를 이용하여 교정되었습니다.

교정에 사용한 표준장비 명세 (List of used standards/specifications)

기기명 (Description)	제작회사 및 형식 (Manufacturer and Model Name)	기기번호 (Serial Number)	차기교정예정일자 (The due date of next Calibration)	교정기관 (Calibration laboratory)
PSG ANALOG SIGNAL GENERATOR	AGILENT E8257D	MY46130629	2017/11/02	(주)에이치시티
EPM-P SERIES POWER METER	AGILENT E4417A	GB41291582	2018/06/13	(주)에이치시티
POWER SENSOR	AGILENT 8487A	MY41092450	2018/01/05	Keysight Technologies
POWER SENSOR	KEYSIGHT V8486A	MY56330017	2017/12/07	Keysight Technologies
WR-19 MULTIPLIER SOURCE MODULE	OML S19MS-A	160516-1	2018/09/26	(주)에이치시티

- 교정결과 (Calibration result)** : 교정결과 참조 (Refer to attachment)
- 측정불확도 (Measurement uncertainty)** : 교정결과 참조 (Refer to attachment)
신뢰수준 약 95 %, $k = 2$ (Confidence level about 95 %, $k = 2$)

확 인 (affirmation)	작성자 (Measurements performed by)	승인자 (Approved by)
	성명 (Name) 김 광 철	직위 (Title) 기술책임자(Technical Cal. Manager) (정) 성명 (Name) 이 승 찬

위 성적서는 국제시험기관인정협력체(International Laboratory Accreditation Cooperation) 상호인정협정(Mutual Recognition Arrangement)에 서명한 한국인정기구(KOLAS)로부터 공인 받은 분야의 교정결과입니다.

2017. 09. 26
한국인정기구 인장 (주)에이치시티 대표이사
Accredited by KOLAS, Republic of KOREA President, HCT Co., Ltd.



(주) 이 성적서는 측정기의 정밀정확도에 영향을 미치는 요소(과부하, 온도, 습도 등)의 급격한 변화가 발생한 경우에는 무효가 됩니다.

※ 고객전용사이트(<http://www.callab.co.kr>)에서 성적서의 진위여부 확인이 가능합니다.

※ 성적서의 원본은 상단에 HCT로고가 들어간 위변조 방지 용지에 인쇄되어 발급되며, 원본 복사시에는 복사본이라는 표시가 처리됩니다.

F-02P-02-008 (Rev.02)

교정 성적서

CALIBRATION CERTIFICATE

경기도 이천시 마장면 서이천로 578번길 74
TEL : 031-645-6900, FAX : 031-645-6969



성적서발급번호(Certificate No) : IC-2017-51313

교정번호(Calibration No) : C-2017-57748

페이지(page) : 1 of 3

1. 의뢰자 (Client)

- 기관명 (Name) : (주)에이치시티
- 주소 (Address) : 경기도 이천시 마장면 서이천로 578번길 74

2. 측정기 (Calibration Subject)

◇ 등록번호 : 288235

- 기기명 (Description) : 고주파 스펙트럼 분석기 (HARMONIC MIXER)
- 제작회사 및 형식 (Manufacturer and Model Name) : OML / WR12
- 기기번호 (Serial Number) : M12HWD

3. 교정일자 (Date of Calibration) : 2017.09.26

차기교정예정일자 : 2018.09.26
(The due date of next Calibration)

4. 교정환경 (Environment)

- 온도(Temperature) : (23.6 ± 0.2) °C
- 습도(Humidity) : (49 ± 1) % R.H.
- 교정장소 (Location) : 교정표준실(Permanent Calibration Lab)

5. 측정표준의 소급성 (Traceability)

교정방법 및 소급성 서술 (Calibration method and/or brief description)

상기 기기는 고주파 스펙트럼 분석기의 교정절차(HCT-CS-125-40641)에 따라 국가측정표준기관으로부터 측정의 소급성이 확보된 아래의 표준장비를 이용하여 교정 되었음.

교정에 사용한 표준장비 명세 (List of used standards/specifications)

기기명 (Description)	제작회사 및 형식 (Manufacturer and Model Name)	기기번호 (Serial Number)	차기교정예정일자 (The due date of next Calibration)	교정기관 (Calibration laboratory)
PSG ANALOG SIGNAL GENERATOR	AGILENT E8257D	MY46130629	2017/11/02	(주)에이치시티
EPM-P SERIES POWER METER	AGILENT E4417A	GB41291582	2018/06/13	(주)에이치시티
POWER SENSOR	KEYSIGHT V8486A	MY56330017	2017/12/07	Keysight Technologies
POWER SENSOR	KEYSIGHT W8486A	MY56370005	2017/12/05	Keysight Technologies
WR-12 MULTIPLIER SOURCE MODULE	OML S12MS-A	160419-1	2018/09/26	(주)에이치시티

6. 교정결과 (Calibration result)

: 교정결과 참조 (Refer to attachment)

7. 측정불확도 (Measurement uncertainty)

: 교정결과 참조 (Refer to attachment)

신뢰수준 약 95 %, k = 2 (Confidence level about 95 %, k = 2)

확 인 (affirmation)	작성자 (Measurements performed by)		승인자 (Approved by)	
	성명 (Name)	김 광 철	직위 (Title)	기술책임자(Technical Cal. Manager) (정)
			성명 (Name)	이 승 찬

위 성적서는 국제시험기관인정협력체(International Laboratory Accreditation Cooperation) 상호인정협정(Mutual Recognition Arrangement)에 서명한 한국인정기구(KOLAS)로부터 공인 받은 분야의 교정결과입니다.

2017. 09. 26

한국인정기구 인정
Accredited by KOLAS, Republic of KOREA

쥬에이치시티 대표이사
President, HCT Co., Ltd.



※ 이 성적서는 측정기의 정밀정확도에 영향을 미치는 요소(과부하, 온도, 습도 등)의 급격한 변화가 발생한 경우에는 무효가 됩니다.

※ 고객전용사이트(<http://www.callab.co.kr>)에서 성적서의 진위여부 확인이 가능합니다.

※ 성적서의 원본은 상단에 HCT로로그램이 들어간 위변조 방지 용지에 인쇄되어 발급되며, 원본 복사시에는 복사본이라는 표시가 처리됩니다.

F-02P-02-008 (Rev.02)

교정성적서 CALIBRATION CERTIFICATE

경기도 이천시 마장면 서이천로 578번길 74
TEL : 031-645-6900, FAX : 031-645-6969



성적서발급번호(Certificate No) : IC-2017-51315

교정번호(Calibration No) : C-2017-57750

페이지(page) : 1 of 3

1. 의뢰자 (Client)

- 기관명 (Name) : (주)에이치시티
- 주소 (Address) : 경기도 이천시 마장면 서이천로 578번길 74

2. 측정기 (Calibration Subject)

◇ 등록번호 : 288236

- 기기명 (Description) : 고주파 스펙트럼 분석기 (HARMONIC MIXER)
- 제작회사 및 형식 (Manufacturer and Model Name) : OML / WR08
- 기기번호 (Serial Number) : M08HWD

3. 교정일자 (Date of Calibration) : 2017.09.26

차기교정예정일자 : 2018.09.26

(The due date of next Calibration)

4. 교정환경 (Environment)

- 온도(Temperature) : (23.6 ± 0.2) °C
- 습도(Humidity) : (49 ± 1) % R.H.
- 교정장소 (Location) : 교정표준실(Permanent Calibration Lab)

5. 측정표준의 소급성 (Traceability)

교정방법 및 소급성 서술 (Calibration method and/or brief description)

상기 기기는 고주파 스펙트럼 분석기의 교정절차(HCT-CS-125-40641)에 따라 국가측정표준기관으로부터 측정의 소급성이 확보된 아래의 표준장비를 이용하여 교정 되었음.

교정에 사용한 표준장비 명세 (List of used standards/specifications)

기기명 (Description)	제작회사 및 형식 (Manufacturer and Model Name)	기기번호 (Serial Number)	차기교정예정일자 (The due date of next Calibration)	교정기관 (Calibration laboratory)
PSG ANALOG SIGNAL GENERATOR	AGILENT E8257D	MY46130629	2017/11/02	(주)에이치시티
EPM-P SERIES POWER METER	AGILENT E4417A	GB41291582	2018/06/13	(주)에이치시티
POWER SENSOR	KEYSIGHT W8486A	MY56370005	2017/12/05	Keysight Technologies
WR-08 MULTIPLIER SOURCE MODULE	OML S08MS-A	160419-1	2018/09/26	(주)에이치시티

6. 교정결과 (Calibration result)

: 교정결과 참조 (Refer to attachment)

7. 측정불확도 (Measurement uncertainty)

: 교정결과 참조 (Refer to attachment)

신뢰수준 약 95 %, $k = 2$ (Confidence level about 95 %, $k = 2$)

확 인 (affirmation)	작성자 (Measurements performed by)	승인자 (Approved by)
	성명 (Name) 김 광 철	직위 (Title) 기술책임자(Technical Cal. Manager) (정) 이 승 찬 성명 (Name) 이 승 찬

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2017. 09. 26

한국인정기구 인정
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(주)에이치시티 대표이사
President, HCT Co., Ltd.



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F-02P-02-008 (Rev.02)

7. Annex B_EUT AND TEST SETUP PHOTO

Please refer to test setup photo file no. as follows;

No.	Description
1	HCT-RF-1809-FC101-P