IEC 61000-4-39 WITH NSG 4070D

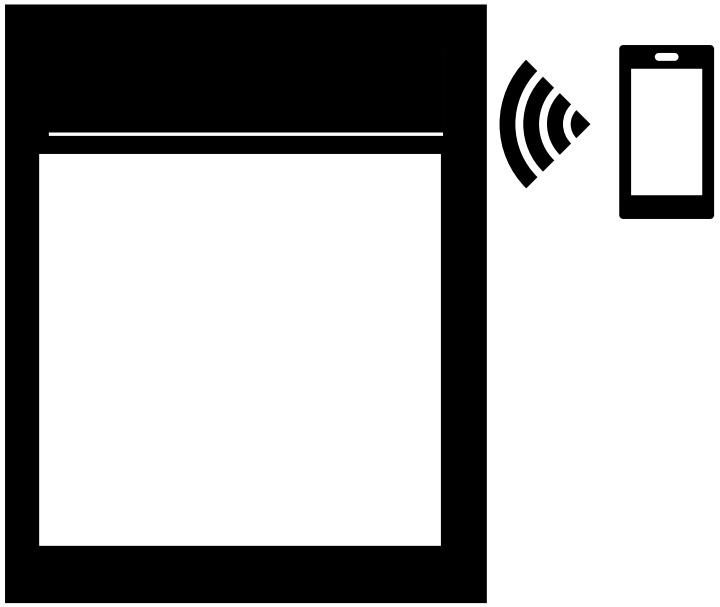
AHMED ALTANANY

AGENDA

- Introduction/Scope of the standard
- Level
- Coupling Devices and selection
- Calibration Setup
  - CDN/CDN S
  - KEM Clamp
  - CIP 150 Ohm and 50 Ohm system
- Testing
- Running the calibration and testing with NSG 4070D

SCOPE OF THE STANDARD

- The test method in this document describes a consistent method to assess the immunity of an equipment or system against RF signal in close proximity



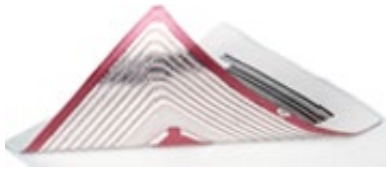
INTRODUCTION

- Examples of RF sources in the near field
- generated by motors, power transformers, switching power supplies, higher-powered
- electronic article surveillance (EAS) gates or transmitters of radio-frequency identification
- (RFID) systems, inductive charging systems and near field communication (NFC) devices
- Wireless services (DECT, mobile phones, UMTS/WiFi/WiMAX/ Bluetooth etc.) see table on the right

Frequency band in MHz	Service
380 to 390	TETRA 400
430 to 470	GMRS 460, FRS 460
704 to 787	LTE Band 13, 17
800 to 960	GSM 800/900, TETRA 800, iDEN 820, CDMA 850, LTE Band 5
1447.9 to 1462.9	LTE Band 21
1700 to 1990	GSM 1800, CDMA 1900, GSM 1900, DECT, LTE Band (1, 3, 4, 25), UMTS
2400 to 2570	Bluetooth, WLAN, 802.11 b/g/n, RFID 2450, LTE Band 7
5100 to 5800	WLAN 802.11 a/n

INTRODUCTION

- There is a possibility that such an RF source could come within a short distance and affect the environment. Critical situations are in airplanes, cars and in the medical environment.
- The advice to switch off the devices is often not possible.
- The way out is to make the devices immune against near field disturbances.



STANDARD REQUIREMENTS

- Frequency: from 9 kHz to 150 kHz, 150 kHz to 26 MHz, and from 230 MHz to 6 GHz
- Frequency Step Size: 10 Hz, 100 Hz and 1000 Hz depends on the frequency
- System impedance: Common mode 150 Ω
- Levels: 1 A/m, 3 A/m, 10 A/m and 30 A/m with ±10 % tolerance
- Modulation: AM modulation 1 kHz (± 100 Hz) 80 % (+5 %/ - 20 %), or PM modulation with 50% duty cycle @ 2 Hz or 1 kHz, 20 dB on/off ratio
- Dwell Time: ≥ 2s
- Coupling Device: radiation loop and Horn Antenna
- Distance: 50 mm ±3 mm
- Generator output impedance: 50 Ω
- Harmonics: ≥6 dBc for CW up to 3rd Harmonic

IEC 61000-4-39

AMETEK
COMPLIANCE TEST SOLUTIONS

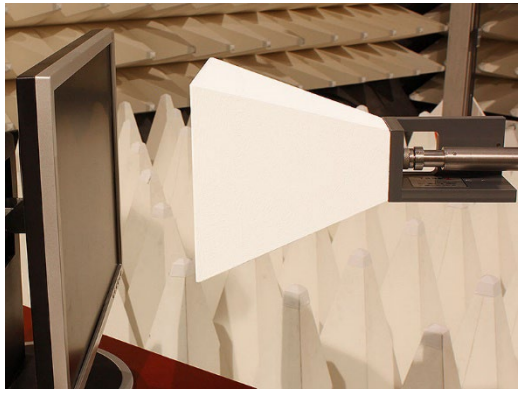
Testing IEC 61000-4-39

H Field
9 kHz – 150 kHz
120 mm Loop

H Field
150 kHz – 26 MHz
100 mm Loop

RF Field
26 MHz – 380 MHz
TBD

RF Field
380 MHz – 6 GHz
TEM Horn



IEC 61000-4-39 OVERVIEW

Test procedures 61000-4-39

Magnetic field
9 kHz – 150 kHz – 26 MHz
Loop

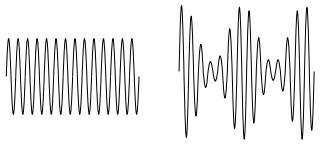
RF Field
26 MHz – 385 MHz
TBD

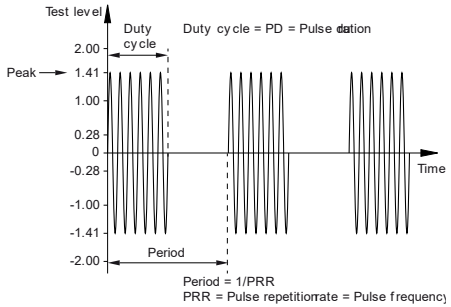
RF Field
385 MHz – 6 GHz
TEM Horn

IEC 61000-4-39 OVERVIEW

IEC 61000-4-39

Field Generation	9 kHz to 150 kHz Magnetic Field Immunity	150 kHz to 26 MHz Magnetic Field Immunity	26 MHz to 380 MHz RF Field Immunity	380 MHz to 6 GHz RF Field Immunity
	Radiation Loop	Radiation Loop		Radiation Loop
Diameter	120 mm ± 10 mm	100 mm ± 10 mm		--
Number of turns	20	3		--
Distance to EUT	50 mm ± 3 mm	50 mm ± 3 mm		100 mm ± 5 mm
Sensor	Field sensor probe	Field sensor probe		RF Field sensor
Diameter	40 mm ± 2 mm	40 mm ± 2 mm		--
Number of turns	51	1		--
Test levels	A/m	A/m		A/m
1, 2, 3, 4, X	1, 3, 10, 30, special	0.1, 0.3, 1, 3, special		10, 30, 100, 300, special
Modulation	AM	PM		PM
Frequency	1 kHz	2 Hz, 1 kHz		2 Hz, 217 Hz, 1 kHz
Mod. Parameter	80 %	50 % duty cycle		50 % duty cycle
On/ off ratio	--	20 dB		20 dB
Level calibration	CW	CW		CW





IEC 61000-4-39 OVERVIEW

IEC 61000-4-39

	9 kHz to 150 kHz Magnetic Field Immunity	**150 kHz to 26 MHz** Magnetic Field Immunity	**26 MHz to 380 MHz** RF Field Immunity	**380 MHz to 6 GHz** RF Field Immunity
Field Generation	Radiation Loop	Radiation Loop		Radiation Loop
Diameter	120 mm ± 10 mm	100 mm ± 10 mm		--
Number of turns	20	3		--
Distance to EUT	50 mm ± 3 mm	50 mm ± 3 mm		100 mm ± 5 mm
Sensor	Field sensor probe	Field sensor probe		RF Field sensor
Diameter	40 mm ± 2 mm	40 mm ± 2 mm		--
Number of turns	51	1		--

APPLICATION IEC 60601-1-2

- First use of IEC 61000-4-39 in IEC 60601-1-2
- IEC 60601-1-2 with the title: Medical electrical equipment – Part 1-2: General requirements for basic safety and essential performance – Collateral Standard: Electromagnetic disturbances – Requirements and tests.

IEC 60601-1-2 (MEDICAL PRODUCTS) OVERVIEW

IEC 60601-1-2

	30 kHz Magnetic Field Immunity	**134.2 kHz to 26 MHz** Magnetic Field Immunity	**13.56 MHz** Magnetic Field Immunity	**380 MHz to 5.8 GHz** RF Field Immunity
Field Generation	**Radiation Loop**	**Radiation Loop**	**Radiation Loop**	**Radiation Loop**
Diameter	120 mm ± 10 mm	120 mm ± 10 mm	100 mm ± 10 mm	--
Number of turns	20	20	3	--
Distance to EUT	50 mm ± 3 mm	50 mm ± 3 mm	50 mm ± 3 mm	100 mm ± 5 mm
Sensor	**Field sensor probe**	**Field sensor probe**	**Field sensor probe**	**RF Field sensor**
Diameter	40 mm ± 2 mm	40 mm ± 2 mm	40 mm ± 2 mm	--
Number of turns	51	51	1	--
Test levels	**A/m**	**A/m**	**A/m**	**V/m**
1	8	65	7.5	9 to 28
Modulation	**--**	**PM**	**PM**	**PM**
Frequency	--	2.1 kHz	50 kHz	18 Hz, 217 Hz
Mod. Parameter	--	50 % duty cycle	50 % duty cycle	50 % duty cycle
On/ off ratio	--	--	--	--
Level calibration	CW	CW	CW	CW

IEC 60601-1-2 AMETEK OFFERING

IEC 60601-1-2

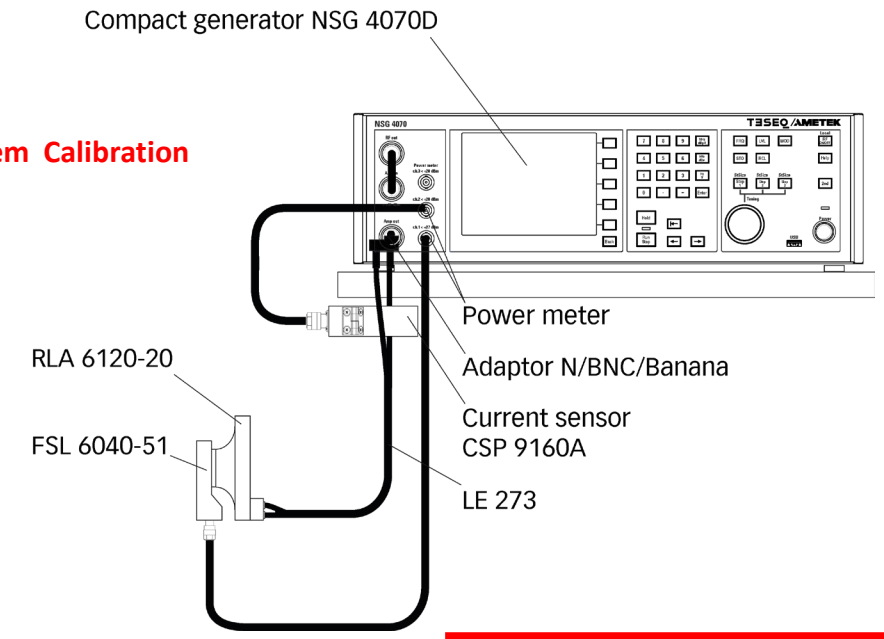
	30 kHz Magnetic Field Immunity	**134.2 kHz to 26 MHz** Magnetic Field Immunity	**13.56 MHz** Magnetic Field Immunity	**380 MHz to 5.8 GHz** RF Field Immunity
Field Generation	Radiation Loop	Radiation Loop	Radiation Loop	Radiation Loop
Diameter	120 mm ± 10 mm	120 mm ± 10 mm	100 mm ± 10 mm	--
Number of turns	20	20	3	--
Distance to EUT	50 mm ± 3 mm	50 mm ± 3 mm	50 mm ± 3 mm	100 mm ± 5 mm
Sensor	Field sensor probe	Field sensor probe	Field sensor probe	RF Field sensor
Diameter	40 mm ± 2 mm	40 mm ± 2 mm	40 mm ± 2 mm	--
Number of turns	51	51	1	--

Equipment

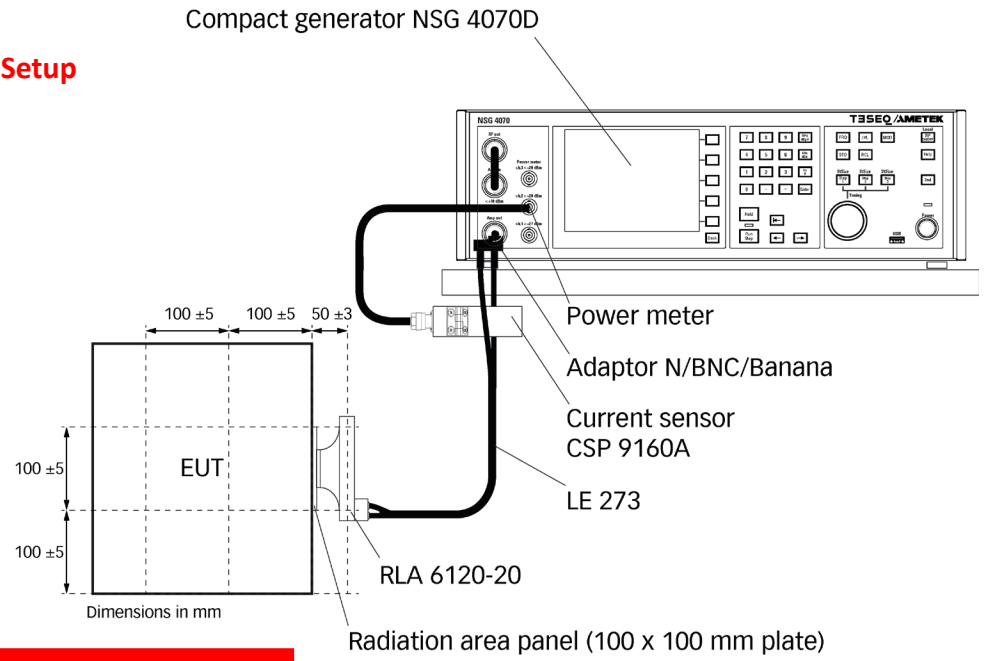
MEASUREMENTS FROM 9 KHZ TO 150 KHZ

NSG 4070D-A400M-100 + LAS 6120

System Calibration



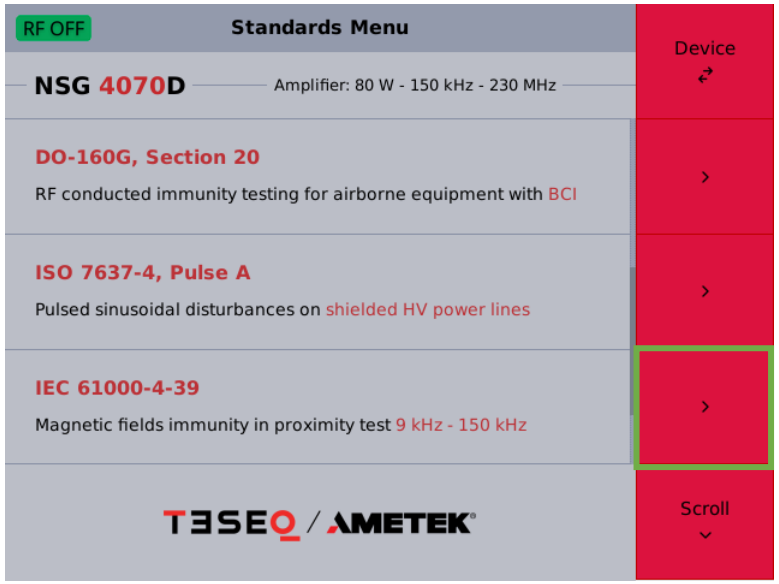
Test Setup

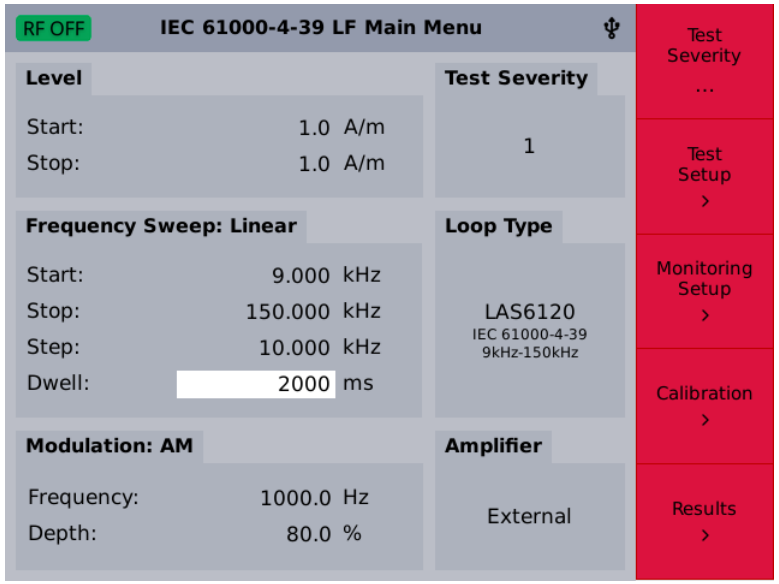


Model	Item Number
NSG 4070D-A400M-100	262106
NSG 4070D-LFCP license	**56-262143**
icd.control (optional)	257512
LAS 6120	258280

FW SETTINGS (9 KHZ TO 150 KHZ)

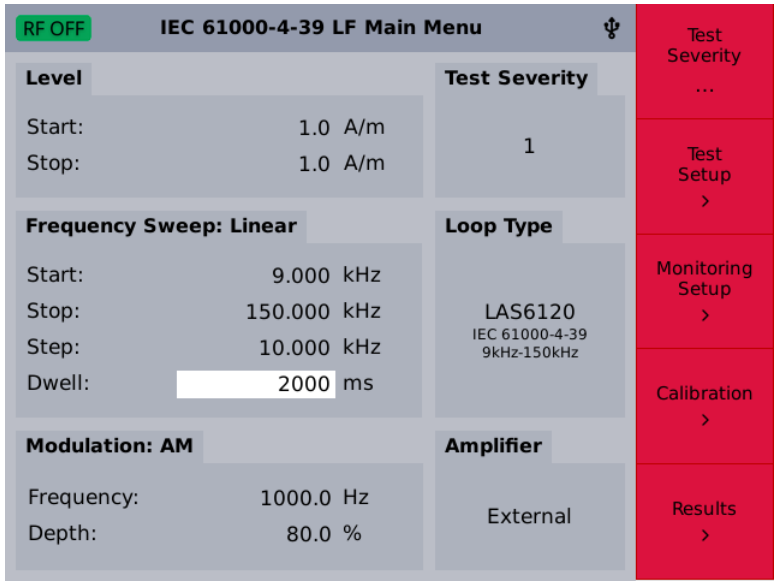
- Select the standard
  - Select the appropriate test severity (level)
  - Test Setup allows you to choose the loop type, amplifier and edit the dwell time

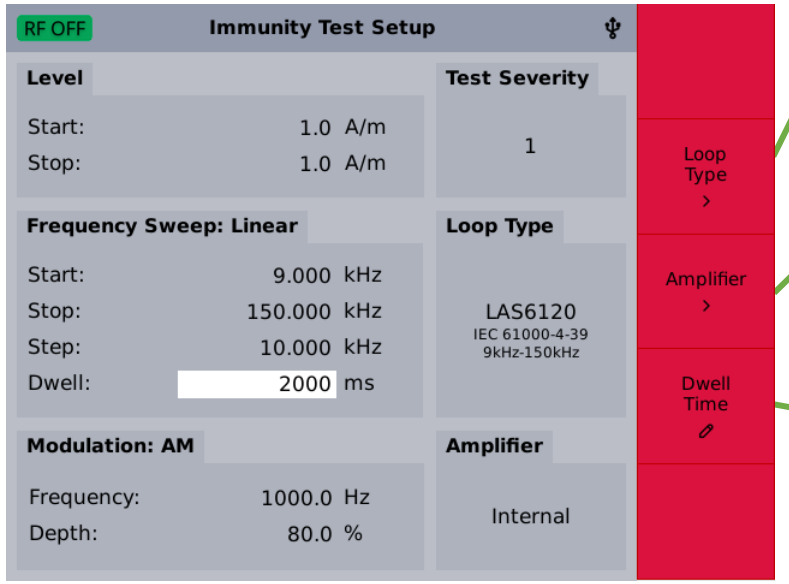


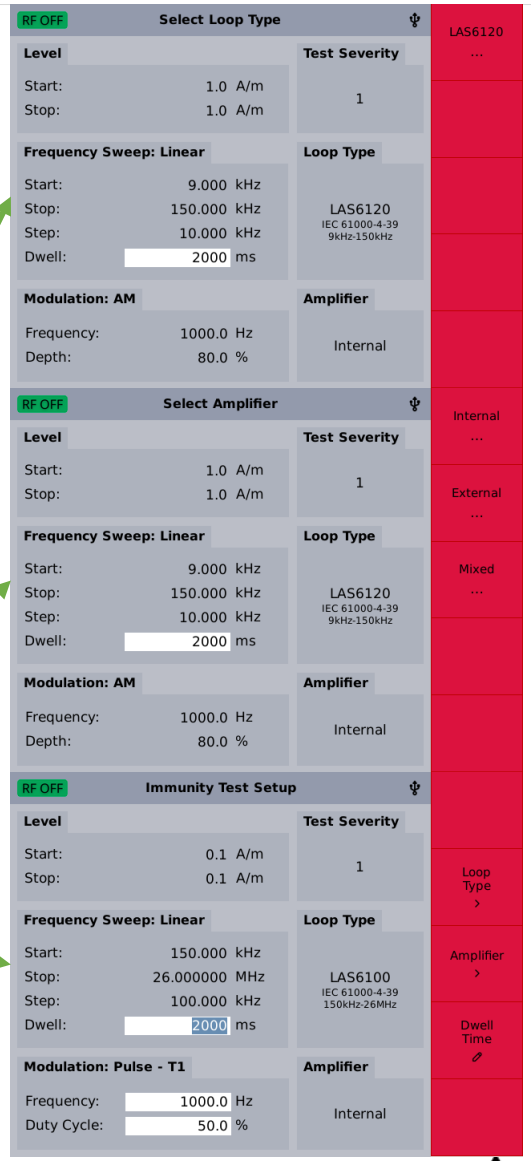


FW SETTINGS (9 KHZ TO 150 KHZ)

- Test Setup allows you to choose the loop type, amplifier and edit the dwell time





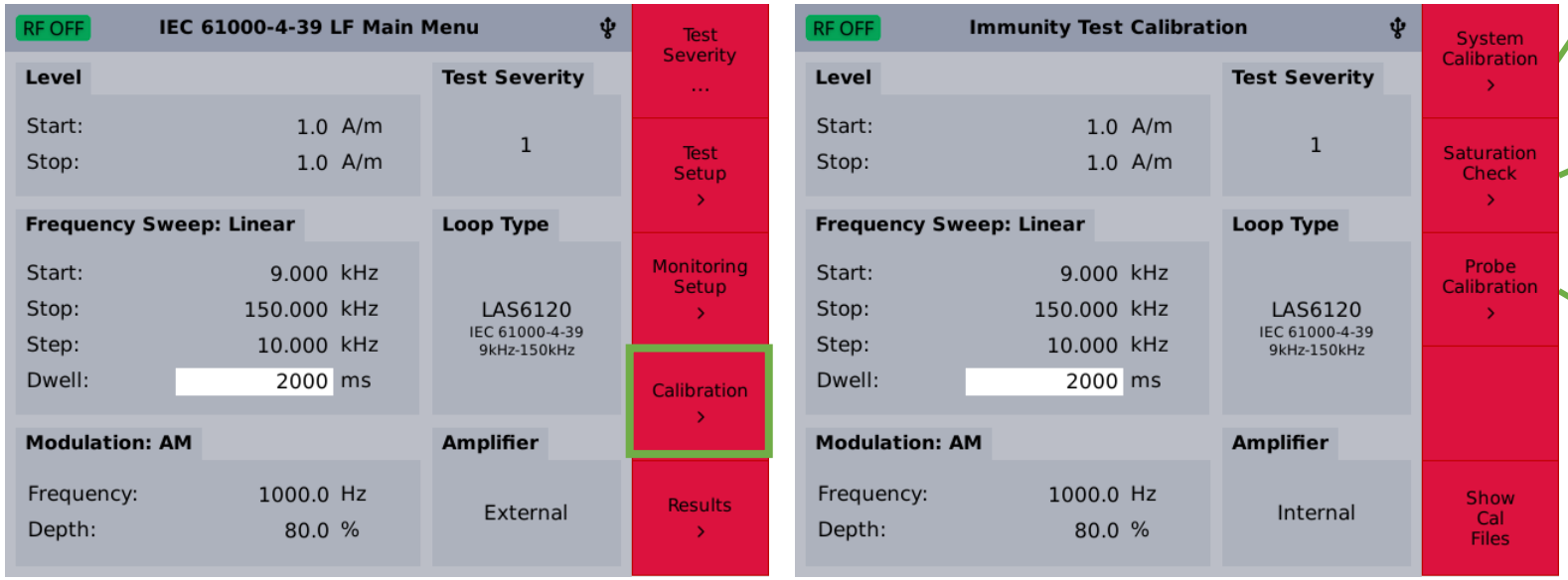


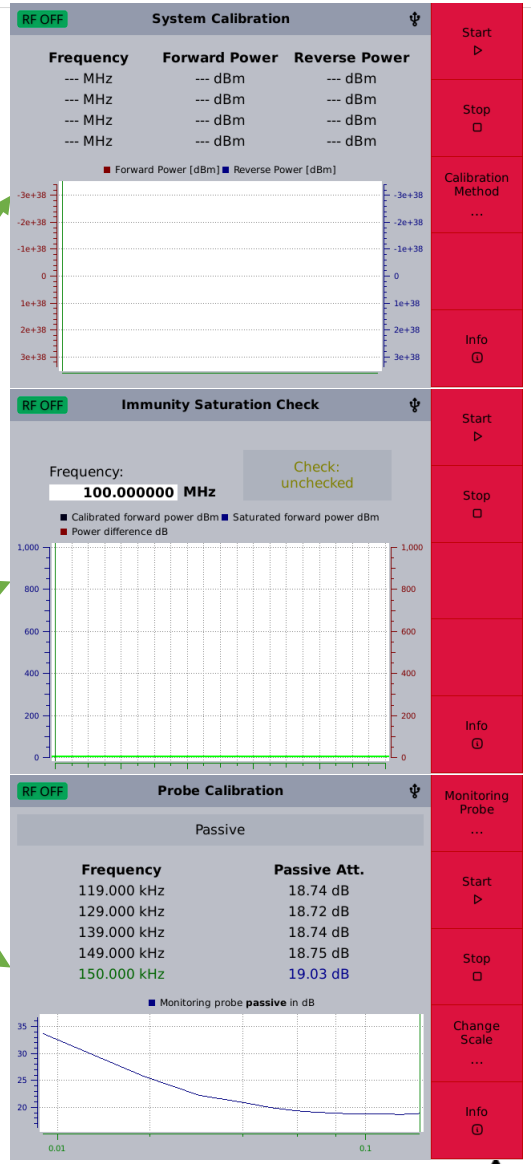
FW SETTINGS (9 KHZ TO 150 KHZ)

Calibration

Sends the user to the calibration routine:

- System calibration
- Saturation Check
- Probe calibration

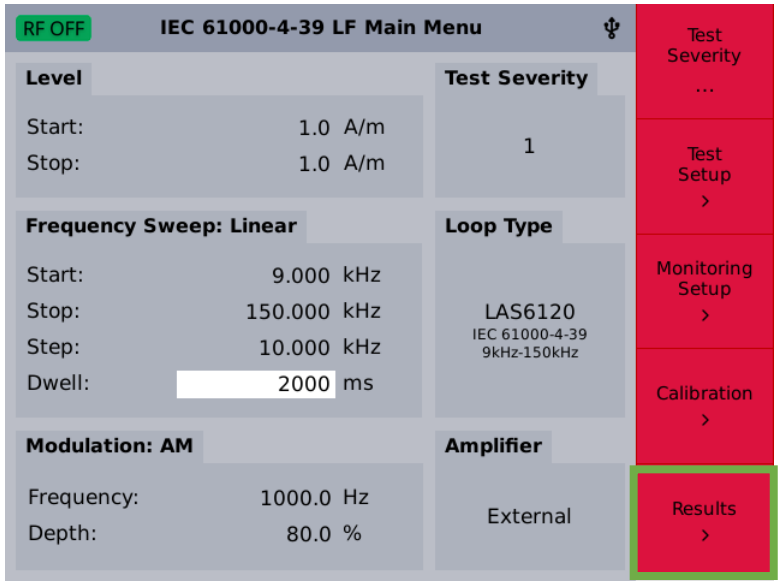




FW SETTINGS (9 KHZ TO 150 KHZ)

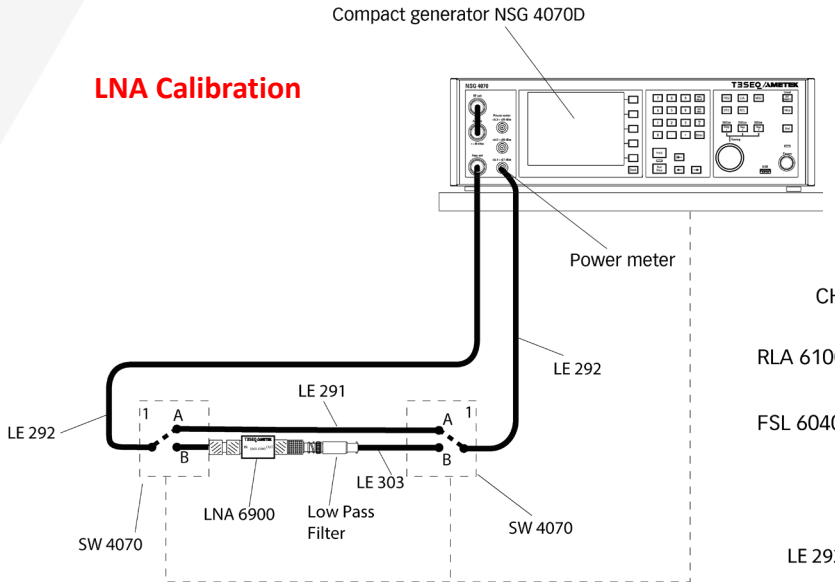
Results will go the test menu

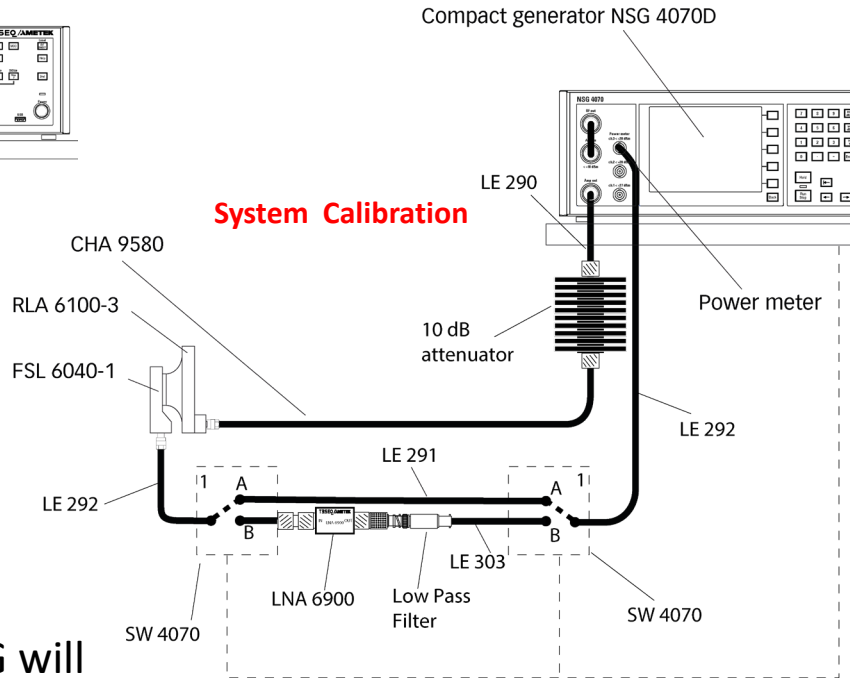
- It will be activated only with hard key Run Stop

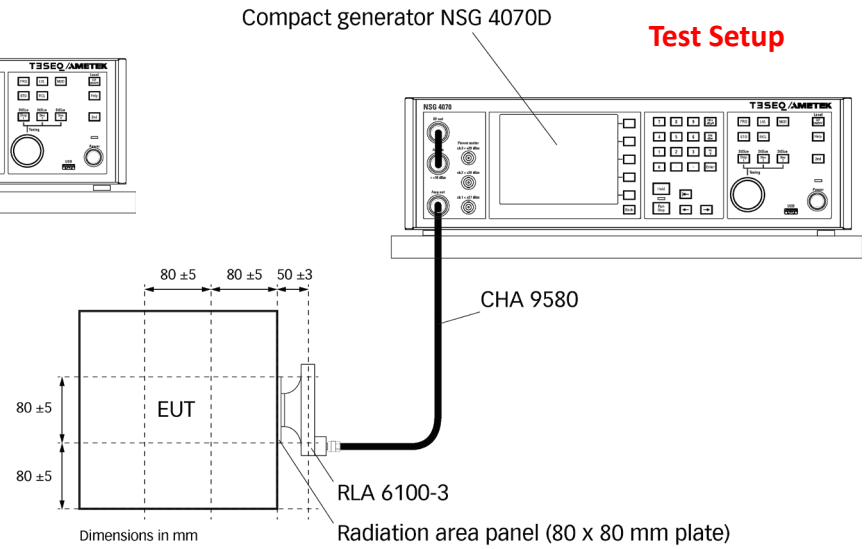


MEASUREMENTS FROM 150 KHZ TO 26 KHZ

NSG 4070D-A400M-100 + NSG 4070D-LFCP Kit + LAS 6100







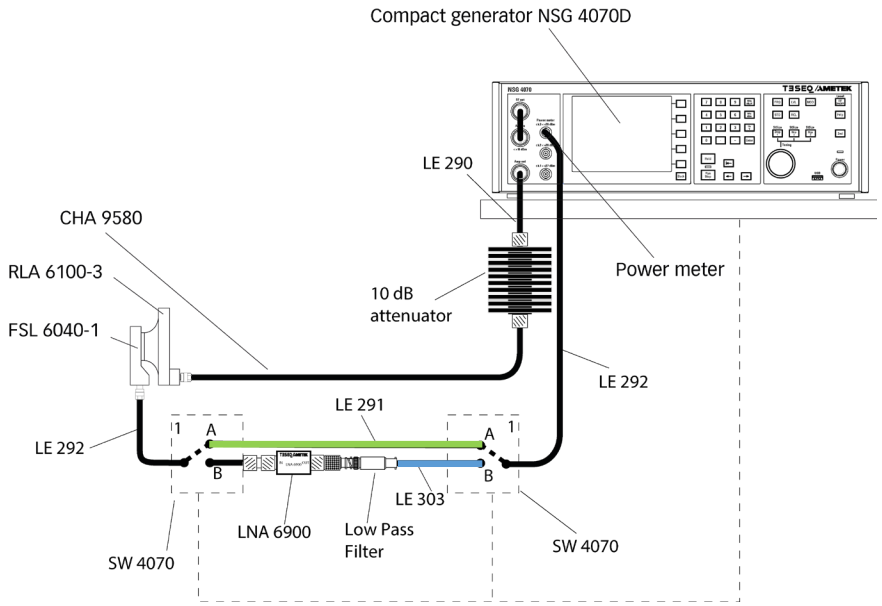
Bypass is path A
Adaptive is both paths and the NSG will control the Switch

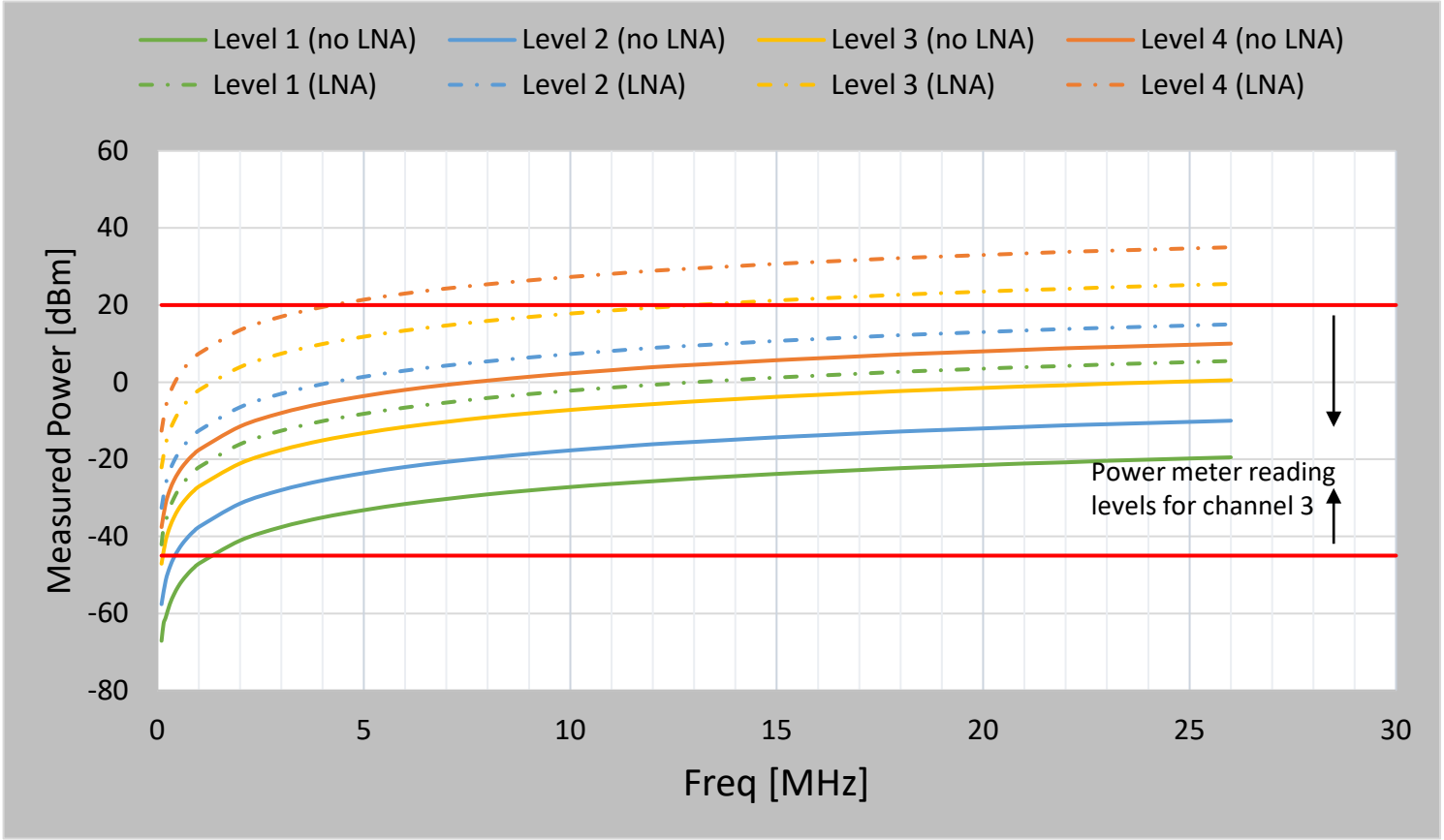
For pre-compliance, no need for the kit and you can do over-calibration method

Model	Item Number
NSG 4070D-A400M-100	262106
NSG 4070D-LFCP license	**56-262143**
icd.control (optional)	257512
LAS 6100	258281
NSG 4070D-LFCP Kit	**262121**

MEASUREMENTS FROM 150 KHZ TO 26 KHZ

- The power from sensor loop (FSL 4040-1) is below all channel meters minimum reading.
  - LFCP kit is needed
- For low level -> LNA path (A)
- For high level -> Bypass path (B)

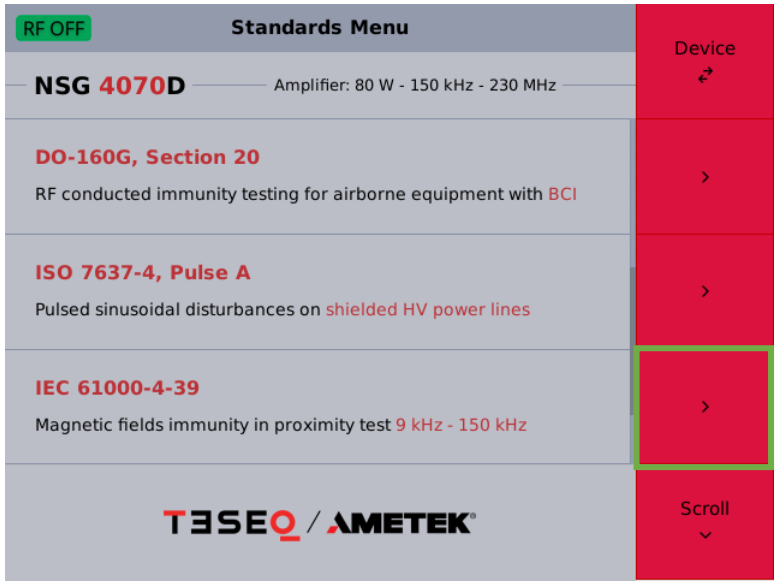


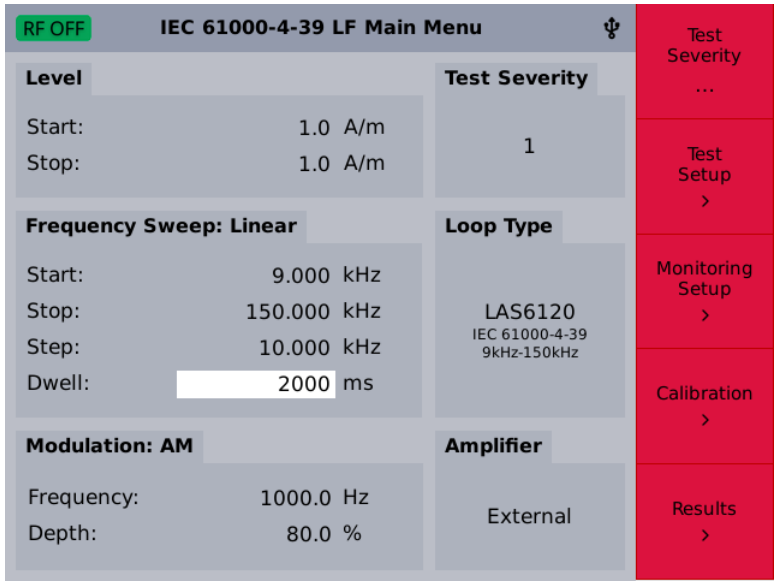


FW SETTINGS (150 KHZ TO 26 KHZ)

Select the standard

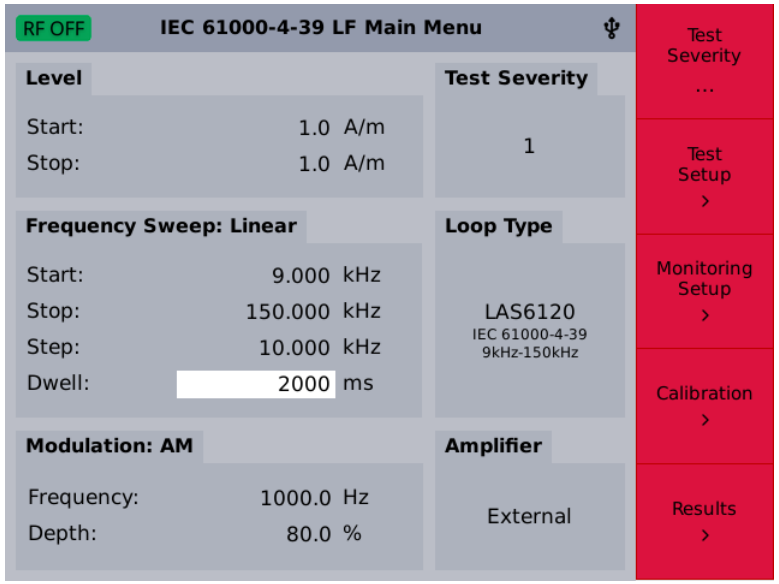
- Select the appropriate test severity (level)
- Test Setup allows you to choose the loop type, amplifier and edit the dwell time

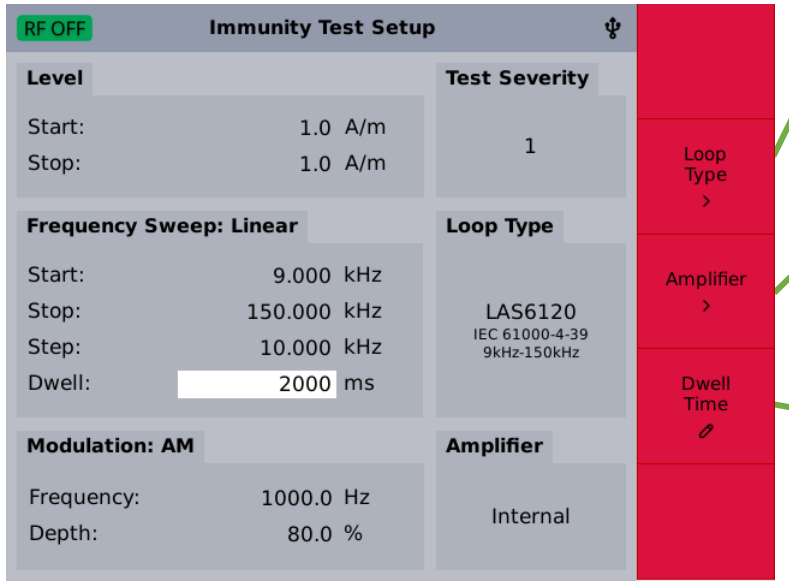


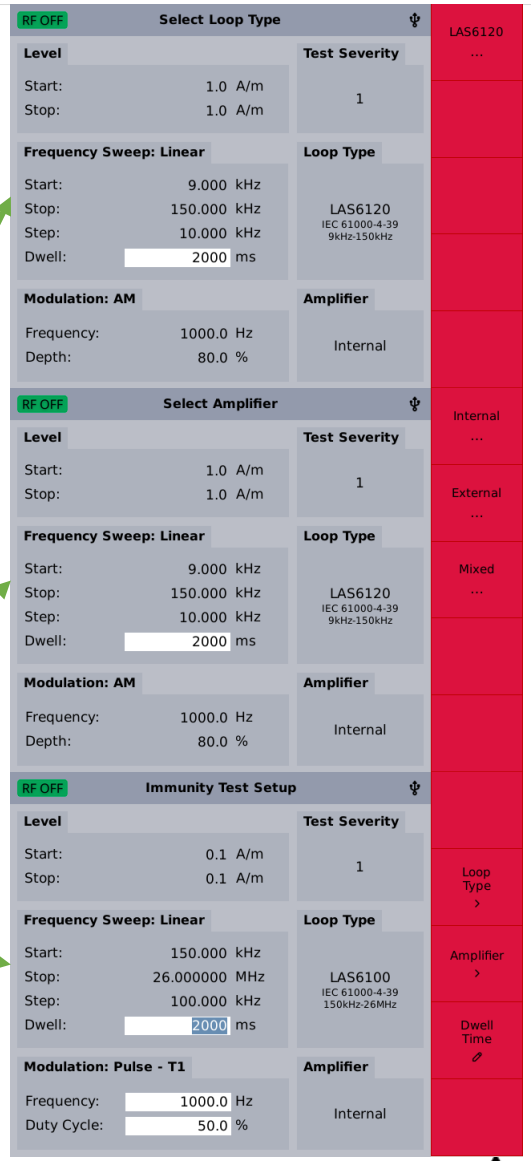


FW SETTINGS (150 KHZ TO 26 KHZ)

- Test Setup allows you to choose the loop type, amplifier and edit the dwell time







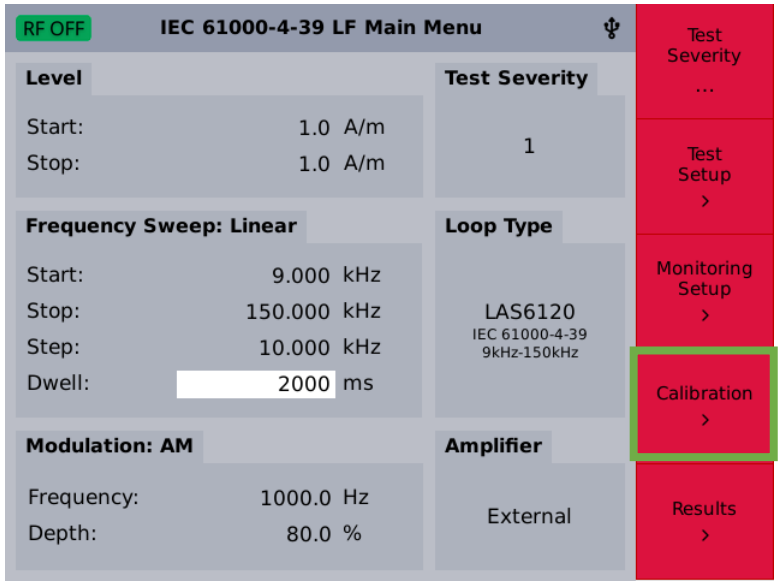
FW SETTINGS (150 KHZ TO 26 KHZ)

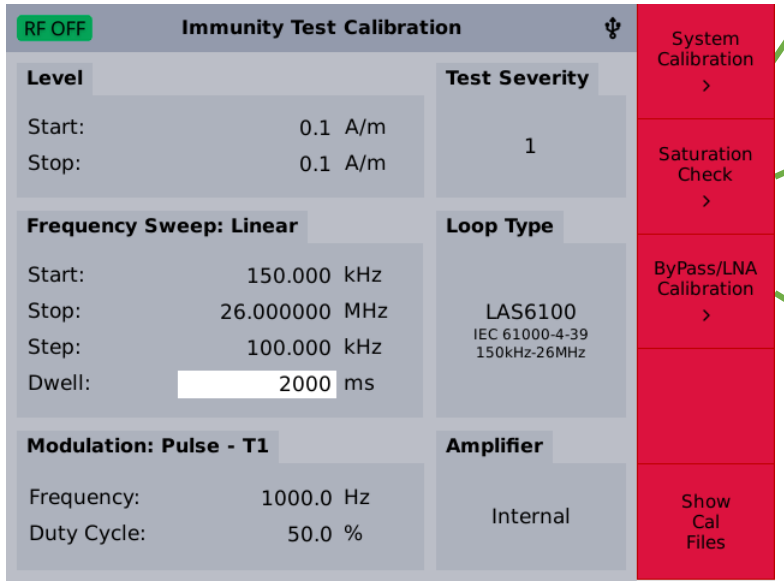
Calibration

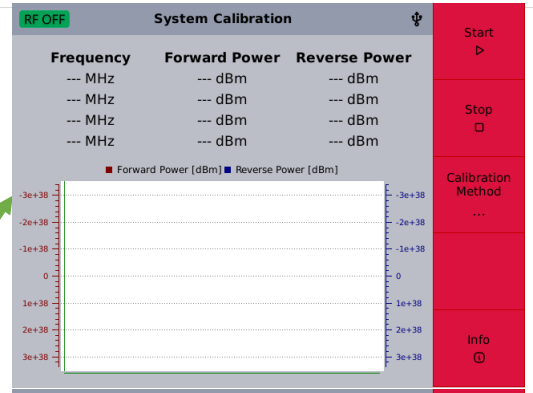
Sends the user to the calibration routine:

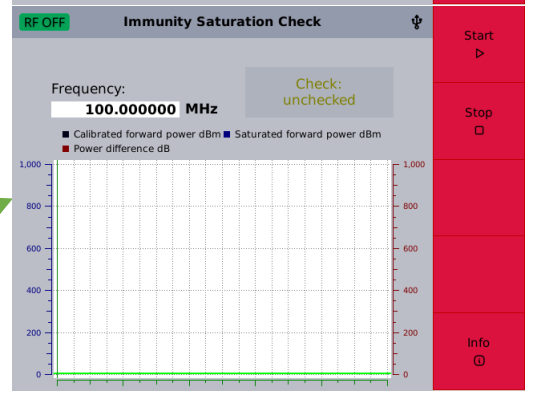
System calibration, Calibration method decides if:

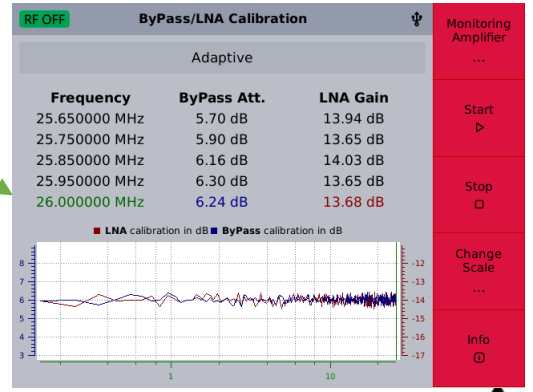
- LNA will be used or
- Over-Calibration: Calibration with high level and interpolate the low level (This is pre-compliance and does not require license or NSG 4070D LFCP kit).









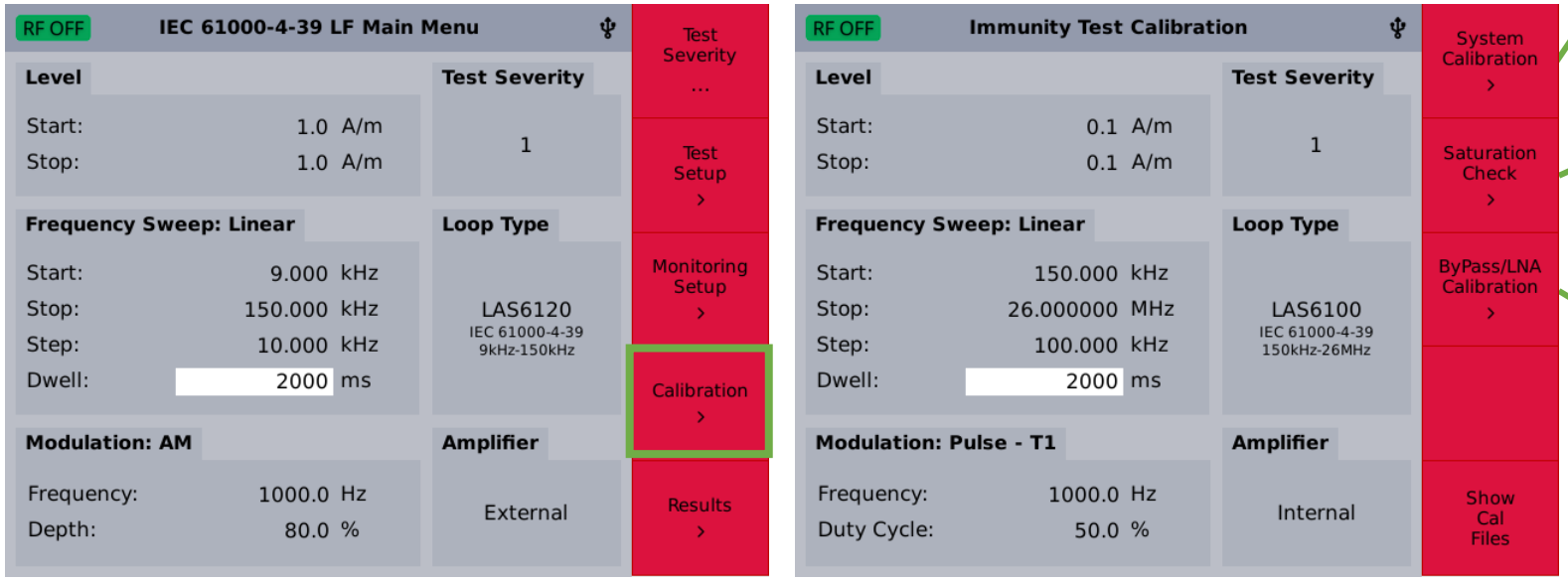


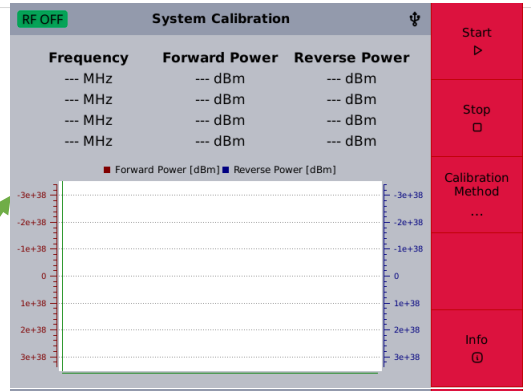
FW SETTINGS (150 KHZ TO 26 KHZ)

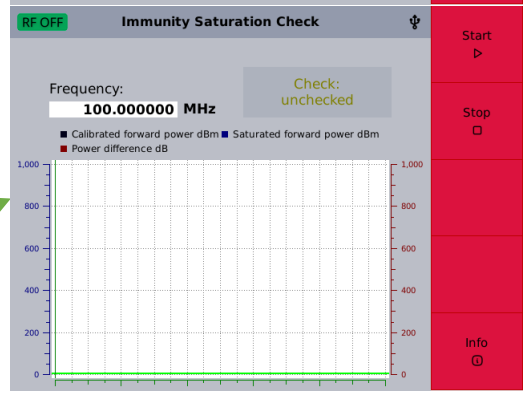
Calibration

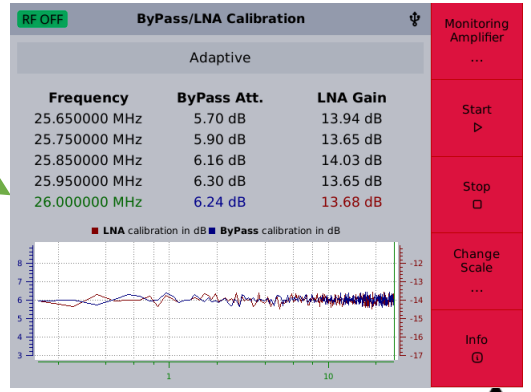
Sends the user to the calibration routine:

- System calibration
- Saturation Check
- ByPass/LNA Calibration
  - This cycle between bypassing the LNA or adaptive or only LNA





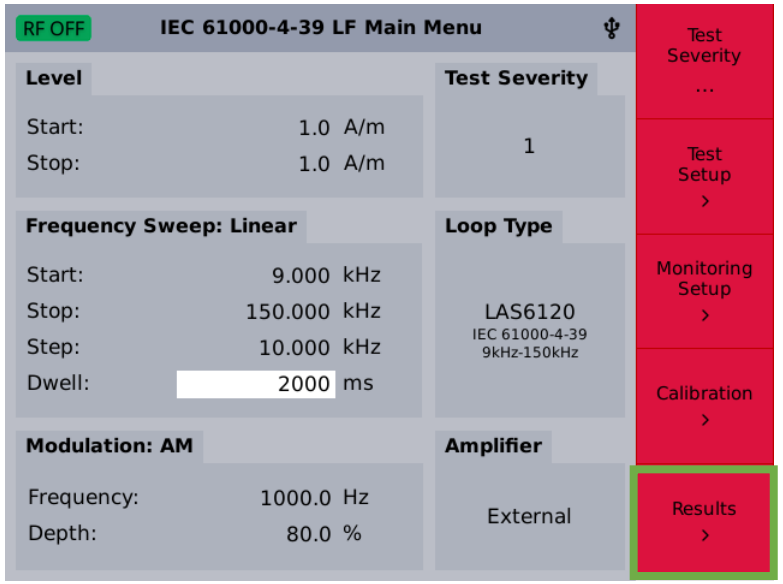




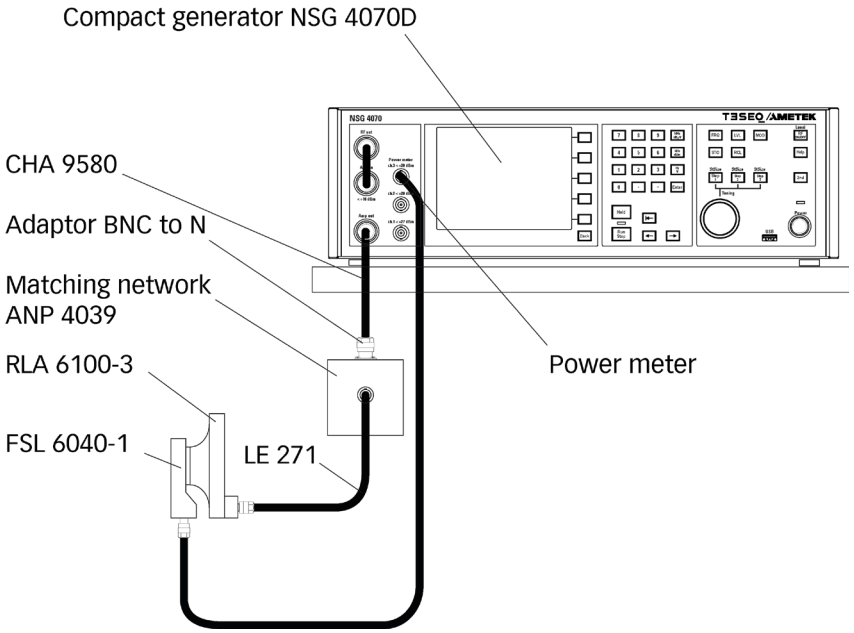
FW SETTINGS (150 KHZ TO 26 KHZ)

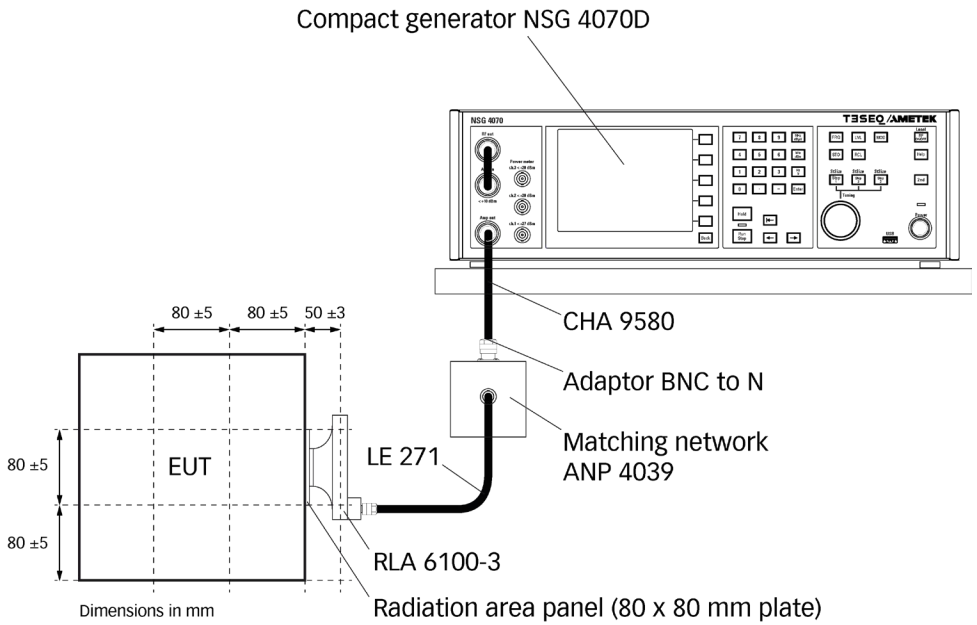
Results will go the test menu

- It will be activated only with hard key Run Stop



MEASUREMENTS FOR 13.56 MHZ





Model	Item Number
NSG 4070D-A400M-100	262106
NSG 4070D-LFCP license	56-262143
icd.control (optional)	257512
LAS 6100	258281

ADVANTAGES OF THE SOLUTION WITH NSG 4070D

- Dedicated system for compliance testing
- Time saving due to Pre-programmed routine
- Reduces the risk of incorrect measurements and destroyed hardware through software guidance and recommended hardware
- NSG 4070D allows movement around a larger EUT
- Optional icd.control software for advanced requirements incl. additional application and standards
- Combination with directional coupler and power amplifier allows testing 4-6, BCI and more

Thank you!