

EMC immunity to IEC / EN 61000-4-39 and IEC / EN 60601-1-2



Radiated magnetic fields

In today's connected world the use of technology and the number of electrical and electronic devices we use continues to expand. The term "smart" and "connected" is now applied not just to sophisticated electronic products but also the simplest household appliances.

Many of these smart products are mobile, sometimes wearable, and will generate radio-frequency fields, including magnetic fields, that can cause performance and/or safety issues to other adjacent electronic devices. To minimise the risk of interference, electrical and electronic devices are required to be tested for immunity to the fields generated by other devices in close proximity. This document considers two such standards - IEC / EN 61000-4-39 and IEC / EN 60601-1-2 - and provides information regarding the equipment needed to perform the test.



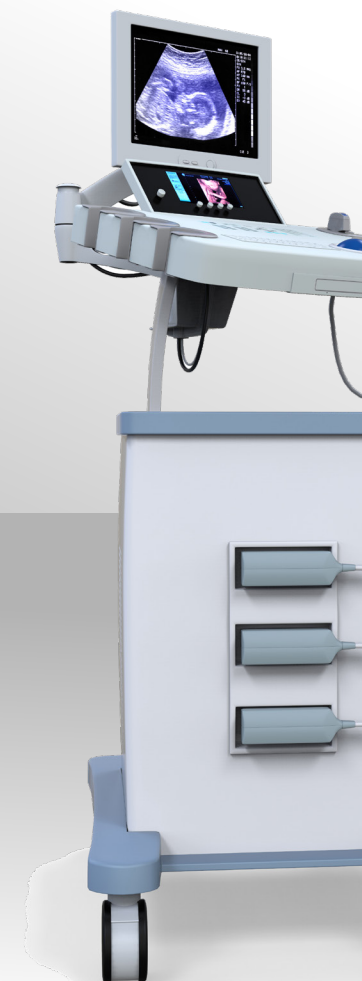
IEC / EN 61000-4-39

This section of IEC 61000 specifies immunity requirements for electrical and electronic equipment when exposed to radiated electromagnetic energy from RF transmitters used in the immediate vicinity. It specifies test severity levels and the required test procedures.

IEC / EN 60601-1-2

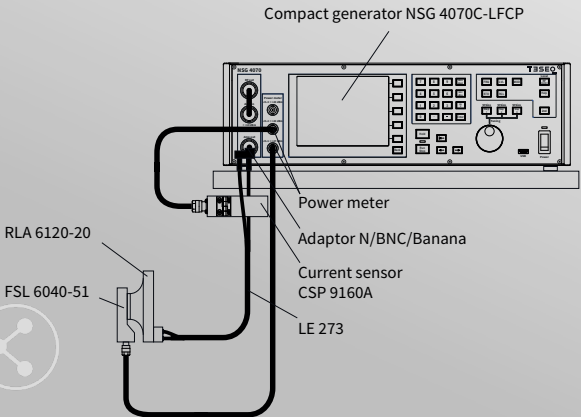
The design of ME Equipment will incorporate electronic components and pcb layouts that could be sensitive to radiated magnetic fields. Therefore it is essential that ME Equipment is sufficiently immune to this phenomenon and its potential risk to operational performance and safety.

Due to the risk of interference, it is now a requirement of IEC/EN 60601-1-2 to test for immunity to magnetic field in close proximity to ME Equipment. The requirement to test covers both ME Equipment in a Professional setting (hospital, clinic etc.) and in the Home.

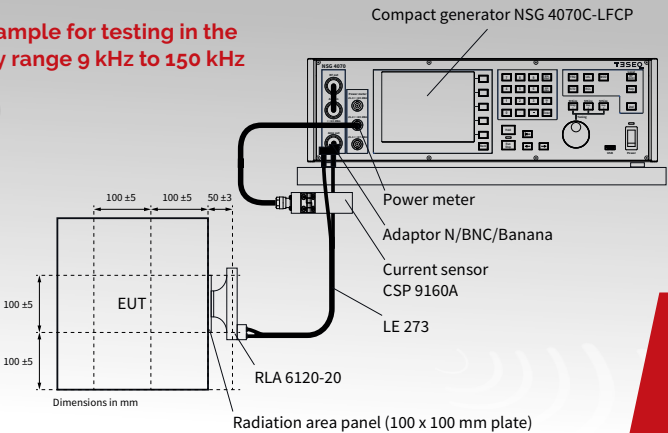


TEST SETUP | 9 kHz to 150 kHz
IEC / EN 61000-4-39

Set up example for test level setting in the frequency range 9 kHz to 150 kHz



Set up example for testing in the frequency range 9 kHz to 150 kHz

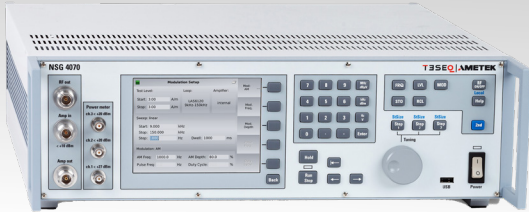


Test levels

FREQUENCY RANGE	9 kHz to 150 kHz
LEVEL	TEST FIELD STRENGTH (A/m)
1	1
2	3
3	10
4	30

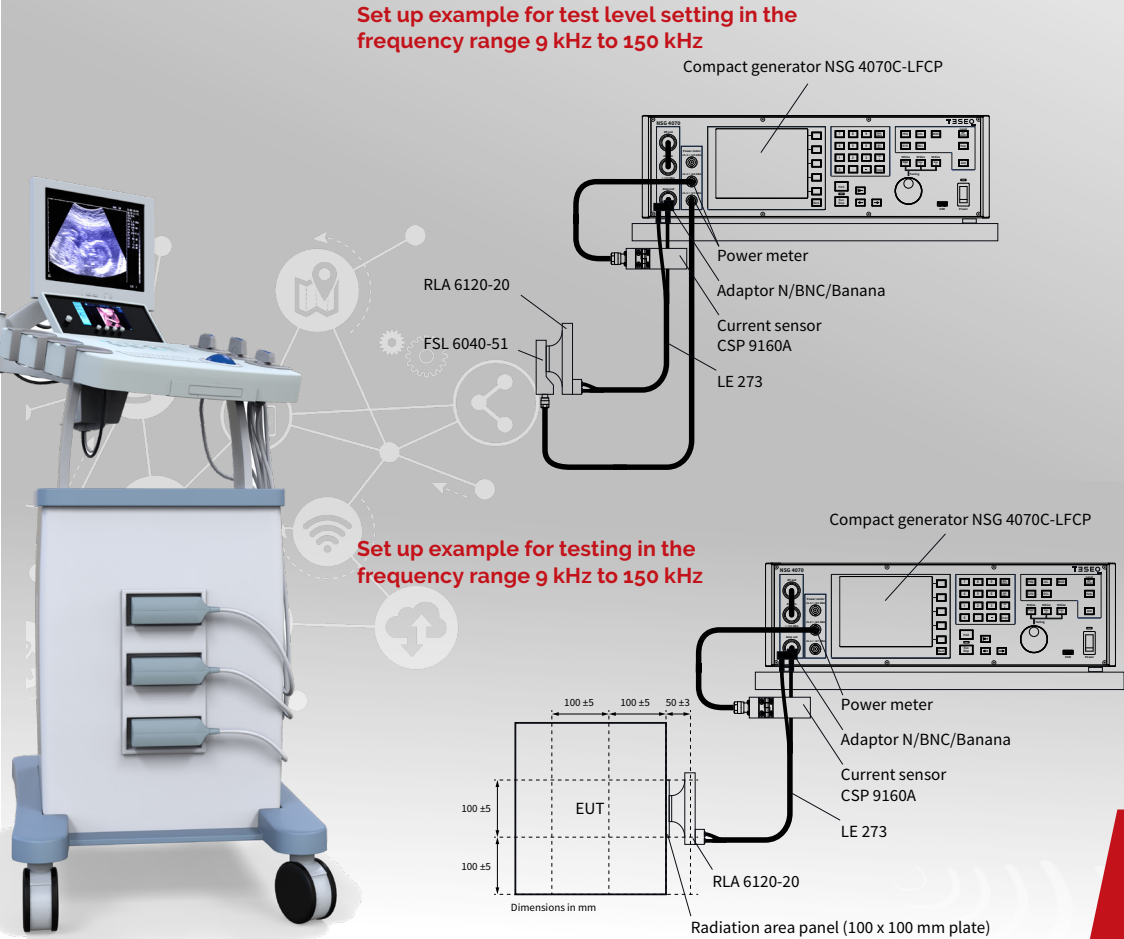
Modulation

FREQUENCY RANGE	9 kHz to 150 kHz
MODULATION	AM
FREQUENCY	1 kHz
PARAMETER	80%
on/off RATIO	-
LEVEL SETTING	CW



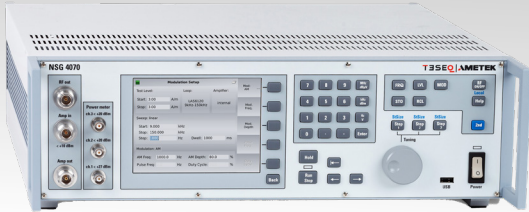
Teseq NSG 4070C-LFCP

TEST SETUP | 9 kHz to 150 kHz
IEC / EN 60601-1-2



Test specification

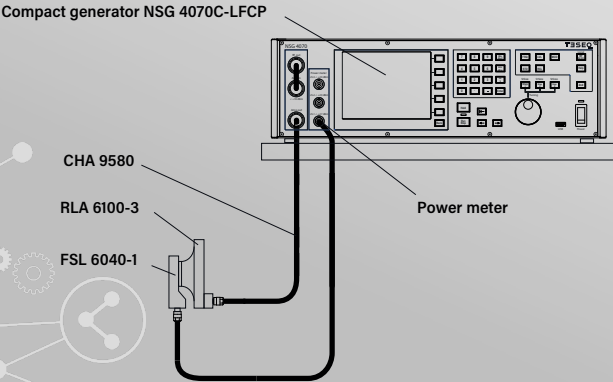
	30 kHz Magnetic field immunity	134.2 kHz Magnetic field immunity
TEST LEVEL	A/m 8	A/m 65
MODULATION	...	PM
FREQUENCY	...	2.1 kHz
PARAMETER	...	50% duty cycle
ON/OFF RATIO	...	...
LEVEL SETTING	CW	CW



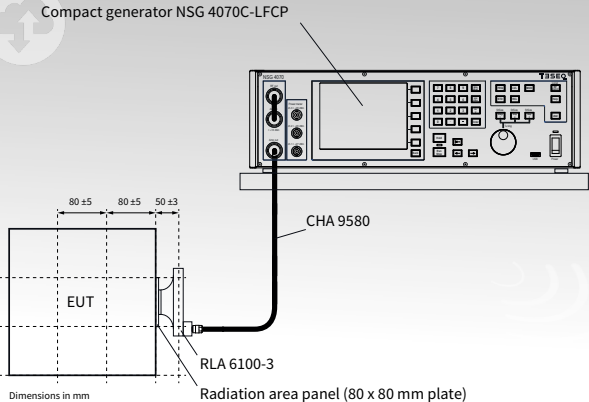
Teseq NSG 4070C-LFCP

TEST SETUP | 150 kHz to 26 MHz
IEC / EN 61000-4-39

Set up example for test level setting in the frequency range 150 kHz to 26 MHz



Set up example for testing in the frequency range 150 kHz to 26 MHz

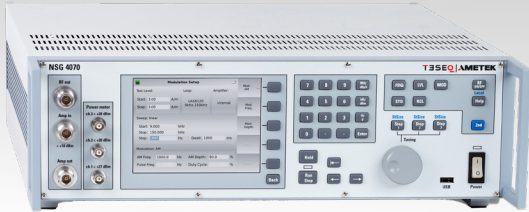


Test levels

FREQUENCY RANGE	150 kHz to 26 MHz
LEVEL	TEST FIELD STRENGTH (A/m)
1	0.1
2	0.3
3	1
4	3

Modulation

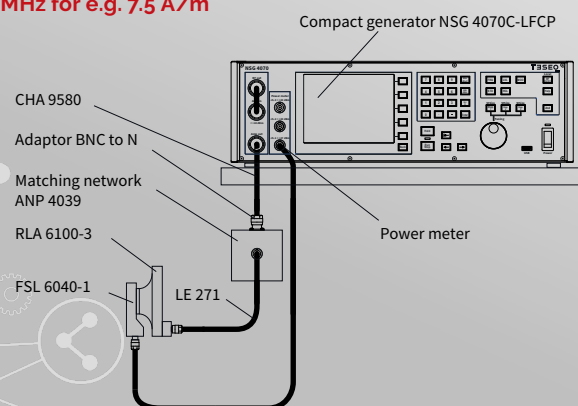
FREQUENCY RANGE	150 kHz to 26 MHz
MODULATION	PM
FREQUENCY	2 Hz, 1 kHz
PARAMETER	50% duty cycle
on/off RATIO	20 dB
LEVEL SETTING	CW



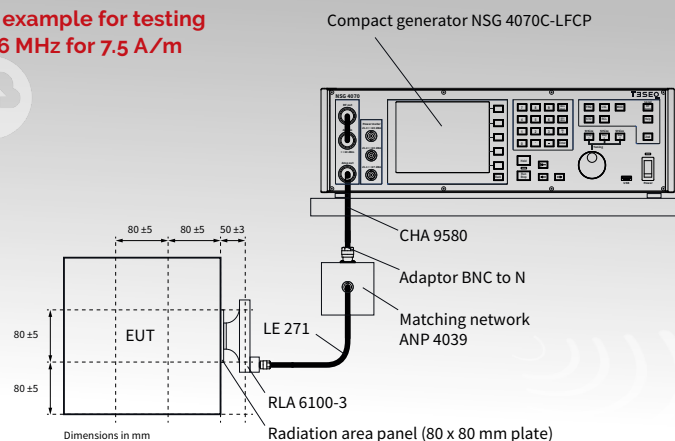
Teseq NSG 4070C-LFCP

TEST SETUP | 13.56 MHz
IEC / EN 60601-1-2

Set up example for test level setting at 13.56 MHz for e.g. 7.5 A/m



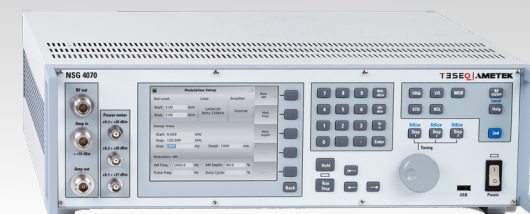
Set up example for testing
at 13.56 MHz for 7.5 A/m



Test specification

Test specification for ENCLOSURE PORT IMMUNITY to proximity magnetic fields

	13.56 MHz Magnetic field immunity
TEST LEVEL	A/m 7.5
MODULATION	PM
FREQUENCY	50 kHz
PARAMETER	50% duty cycle
ON/OFF RATIO	...
LEVEL SETTING	CW



 Teseq **NSG 4070C-LFCP**

TEST SOLUTIONS

MAGNETIC FIELD TESTING IN THE CLOSE PROXIMITY

NSG 4070C-LFCP

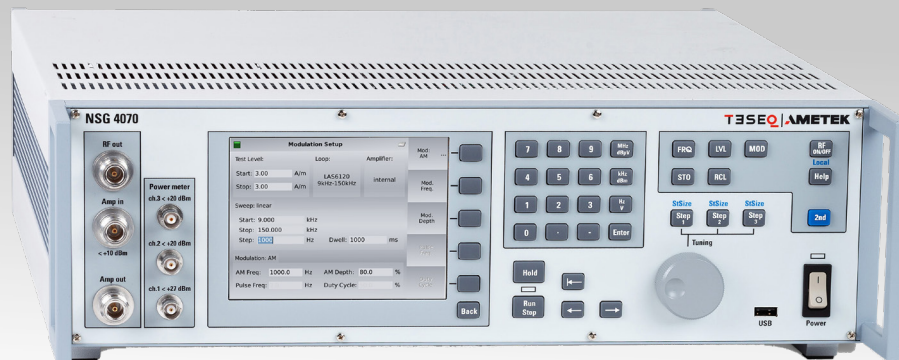
MAGNETIC FIELD TESTING IN THE CLOSE PROXIMITY

NSG 4070C-LFCP

- Integrated signal generator 4 kHz to 1 GHz
- 3 power meter inputs 4 kHz to 1 GHz
- Integrated class A power amplifier 100 W, 9 kHz to 50 MHz
- Multiple EUT monitoring options
- 5.7" TFT color display
- Internal, menu-based control software
- Whisper mode

The NSG 4070C-LFCP is a universal device for standard-compliant and development-accompanying EMC immunity tests in the application area of magnetic field testing in the close proximity according to IEC/EN 61000-4-39 and IEC/EN 60601-1-2. The NSG 4070C-LFCP integrates signal generator, directional coupler, power amplifier, power meter and EUT monitoring interfaces. The NSG 4070C-LFCP can be operated quickly, conveniently and easily via the front panel as a free-standing device. Test and measurement data can be conveniently transferred for documentation purposes via a USB stick. The NSG 4070C-LFCP can be remote controlled via LAN, electrical or optical RS232 as well as USB.

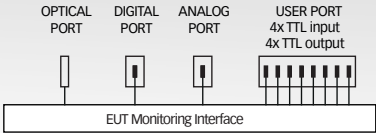
The wide frequency range of the signal generator and the power meter offer the possibility to connect external amplifiers and directional couplers. In combination with a remote control software, external power amplifiers and directional couplers, further applications can be covered, such as testing of conducted disturbances induced by high frequency fields according to IEC/EN 61000-4-6, automotive BCI tests e.g. according to ISO 11452-4 as well as high frequency electromagnetic fields according to IEC/EN 61000-4-3 or IEC/EN 61000-4-20. For EUT monitoring, the NSG 4070C-LFCP offers a variety of interfaces for flexibility in laboratory use.



In order to start with predefined parameter settings the optional test software icd.control is recommended. The software offers a large standard database and predefined drives for using external measuring devices. More complex systems including radiated tests can be controlled by using the software solution CIS (Compliance Immunity Software).

INSTRUMENT MODULES

NSG 4070C-LFCP



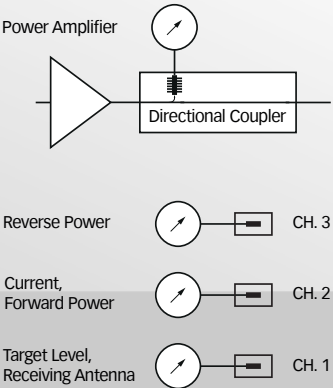
Modules of NSG 4070C-LFCP

The heart of the device is the signal generator, which generates the sinusoidal signal over the wide frequency range from 4 kHz to 1 GHz and in the level range -60 dBm to +10 dBm. The built-in modulator allows amplitude and pulse modulation. The NSG 4070C-LFCP contains extended parameters for pulse modulation and allows up to three envelopes to be interleaved. One input allows modulation from an external source.

The output of the signal generator is connected to the internal power amplifier via a bridge. Next to the amplifier a directional coupler is connected to measure the forward power.

The NSG 4070C-LFCP can measure forward and reverse power via an external directional coupler. For this application, power meter inputs 2 and 3 are located on the front panel. The power meter input 1 is intended for adjusting the target value. The power meter input 2 of NSG 4070C-LFCP is intended for connecting the current probe in the range 9 kHz to 150 kHz.

The EUT monitoring interface allows the simple and fast integration of the interfaces of the EUT to be monitored. The TTL inputs and outputs of the NSG 4070C-LFCP can be used to integrate additional equipment for monitoring test specimens. The optical EUT monitoring input can detect the status of an indicator lamp. When using the extensive EUT monitoring functions, the user receives a meaningful test result with assignment of the events to the respective test frequency. Subsequent design changes to the EUT can thus be qualified more quickly.

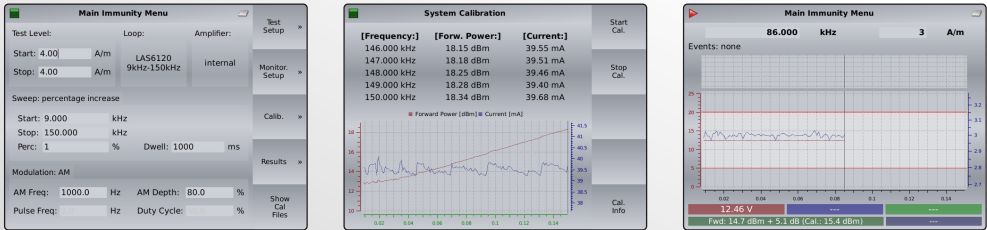


MODES OF OPERATION

NSG 4070C-LFCP



Immunity mode



During the EMC tests, the test object undergoes different tests at different test stations. Among other things, short set-up times are an advantage so that the operating personnel can efficiently test the EUT. Switching on and testing expresses the wish of many users. With its unique menu-driven operation, the NSG 4070C-LFCP fulfils this wish to operate magnetic field testing according to IEC / EN 61000-4-39 and IEC / EN 60601-1-2 from the front panel of the device. On-site testing of machines and systems is possible with the NSG 4070C-LFCP. The NSG 4070C-LFCP contains configurations that the operator can load or modify according to the test being performed. This allows the parameter setting to be carried out with a user activity and in the shortest possible time. To execute a test, an existing system calibration file would have to be loaded or generated. Thanks to the very fast power meters and firmware optimized for fast measurement, the NSG 4070C-LFCP takes less than a minute to calibrate for IEC / EN 61000-4-39 the range 9 kHz to 150 kHz or 150 kHz to 26 MHz. During the test, the display changes to show the current frequency, level, EUT monitoring channels and their states. The response to EUT monitoring events can be adjusted. Irrespective of the EUT monitoring, the sweep can be interrupted with the "HOLD" key to manually change the frequency and level, for example, to further investigate the reaction of the DUT. Test results can be saved and reloaded as required. Based on a loaded test, tests can be repeated easily as the test configuration and system calibration data are included. When the test result is saved on a USB stick, a simple test report in PDF format and CSV format is also saved.

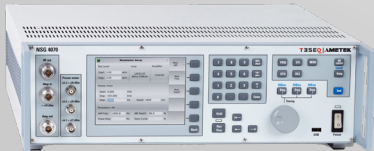
Generator and Power Meter mode

In addition to the Immunity menu for performing the EMC test, the NSG 4070C-LFCP, with two further menus, offers the option of operating the device as a stand-alone signal generator. The measured values of the power meters are displayed in the power meter menu. The operator can easily check his system and measure cables and attenuators.



ORDERING INFORMATION

NSG 4070C-LFCP



NSG 4070C-LFCP

System for magnetic field testing in the closed proximity NSG 4070C-LFCP, 4 kHz to 1 GHz RF generator and power meter; 9 kHz to 50 MHz power amplifier 100 W; spare fuses (2); RS232 cable (Nullmodem); USO 4013 (USB to serial / optical converter with 20 m optical cable); LAN cable, crossover, 3 m; keyboard (English); mains cable GB, CH, USA / JP, EU; operating manual



NSG 4070C-LFCP
with rack mounting kit (option: NSG 4070 Rack)

Model No. and options

Part number	Description
259700	NSG 4070C-LFCP System for magnetic field testing in the close proximity, frequency range 9 kHz - 50 MHz, 4 kHz - 1 GHz RF generator and power meter, power amplifier with 100 W, 9 kHz - 50 MHz, USO 4013 (USB to serial / optical converter with 20 m optical cable), RS232 cable, LAN cable, keyboard (English), mains cable GB, CH, USA / JP, EU
253840	NSG 4070 Rack Rack mounting kit for NSG 4070 (red handles)
97-259700	NSG 4070C-LFCP-TC Traceable calibration (ISO17025), order only with the device
98-259700	NSG 4070C-LFCP-DAkKS DAkKS calibration (ISO17025), order only with the device
258280	LAS 6120 Loop antenna set (25 Hz) 9 kHz to 150 kHz, includes RLA 6120-20 (radiating loop antenna), spacer, radiation area panel (100 mm x 100 mm plate), TPF 6120 (tripod fixture), FSL 6040-51 (field sensing loop antenna), CSP 9160A (current sensor), LE 273 (two wire cable, with 4 mm banana plugs, 3 m), 2x RF cable (BNC(m)-BNC(m) 1 m, RG58), 2x N-BNC adaptor, banana to BNC adaptor, user manual and ISO 17025 traceable calibration certificate (scope of calibration FSL 6040-51 and CSP 9160A)
258281	LAS 6100 Loop antenna set 150 kHz to 30 MHz, includes RLA 6100-3 (radiating loop antenna), spacer, radiation area panel (80 mm x 80 mm plate), TPF 6100 (tripod fixture), FSL 6040-1 (field sensing loop antenna), ANP 4039 (matching network for 13.56 MHz), CHA 9580 (N(m)-BNC(m), 2 m, RG223), RF cable (BNC(m)-BNC(m), 1 m, RG58) LE 271 (SHV(f)-BNC(m), 1 m, RG58), N-BNC adaptor, user manual and ISO 17025 traceable calibration certificate (scope of calibration FSL 6040-1)



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