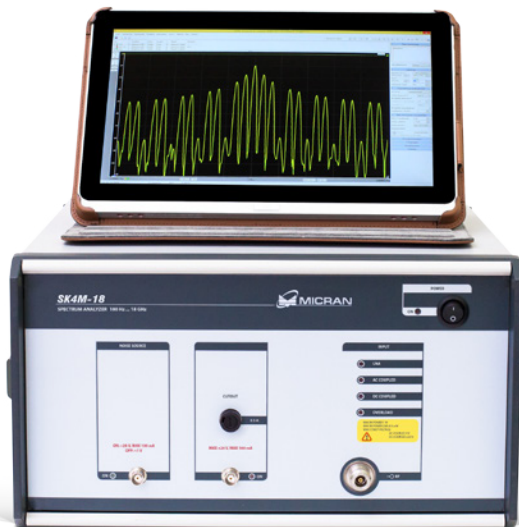


ACCURACY – SPEED – QUALITY

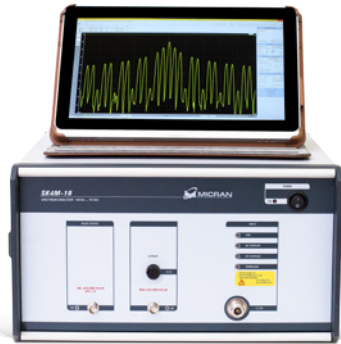
## MICRAN SK4 SERIES SPECTRUM ANALYZERS

- SK4M-18 : 100 Hz to 20 GHz
- SK4M-50 : 100 Hz to 50 GHz



# Micran SK4 series Spectrum Analyzers

- Frequency Range from 100 Hz to 20/50 GHz
- TOI up to +20 dBm
- DANL -165 dBm/Hz
- Low Phase Noise -125 dBc/Hz at 1 GHz and 100 kHz offset
- High Frequency Reference Accuracy  $\pm 1 \times 10^{-7}$
- Resolution Bandwidth Range from 1 Hz to 10 MHz
- Built-in input attenuator and ovenized pre-selector
- Built-in low-noise amplifier from 100 Hz up to 3.2 GHz.



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## Description

Micran SK4 Spectrum Analyzers are used to measure level and frequency of harmonic components of periodic signal, and also the spectral power density of stationary random process. This instrument can be used when producing and maintaining various radio and microwave hardware. SK4 Spectrum analyzer can measure the various parameters of transmitters, radio-receiver paths and other active microwave devices.

SK4 series includes two types of devices varying in operating frequency range:

- SK4M-18: 100 Hz to 20 GHz
- SK4M-50: 100 Hz to 50 GHz

SK4M is controlled via external personal computer with installed "Graphit SK4M". SK4M is connected to PC via Ethernet interface. Multichannel synchronization system provides a precision connection with other instruments. SCPI control commands allow to integrate SK4M into automated test and measurement systems. Depending on a composition of hardware options SK4M are divided into modifications. Hardware options can be added for selected modifications of SK4M that allows extending the analyzer functionality.

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## Main capabilities

### Input RF Connector Type

Input RF connector type is determined by the SK4M options:

- Option 11R – type N (female)
- Option 13N – type 3.5 mm NMD (male)
- Option 05N – type 2.4 mm NMD (male)

Available only for SK4M-50.

### Built-In Low-Noise Amplifier (Option MUA)

The amplifier increases sensibility of analyzer up to -166 dBm/Hz. Also it allows for wider noise measurements application.

### Built-In Bias-Tee (Option APA)

Power supply adapter allows to measure amplifiers and converters with DC voltage fed through the coaxial central conductor. Max voltage is  $\pm 20$  V, max current 500 mA. Activated adapter limits min frequency of analyzer to 20MHz.

### Built-In DC Blocking Capacitor (Option RKA)

This option provides analyzer's input circuits with protection from DC up to 20 V, making easier to operate when measuring active microwave devices. Activated blocking capacitor limits low operating frequency of analyzer to 20MHz.

### Noise Figure Measurements (Option IKS)

It is a program option that allows the noise figure

and gain of devices measuring, by Y-factor method. When using this option, you need a noise source (supplied separately) and it is recommended to use the MUA option.

### Phase Noise Measurements (Option IFS)

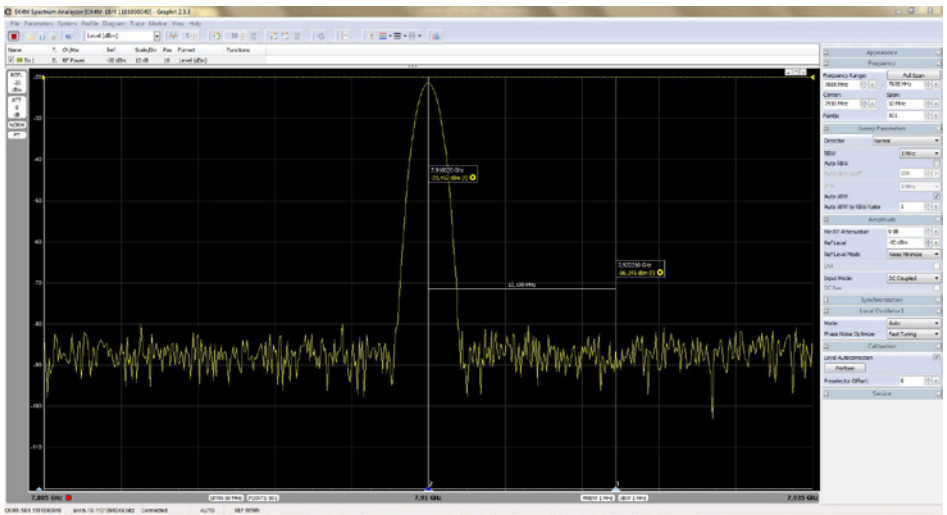
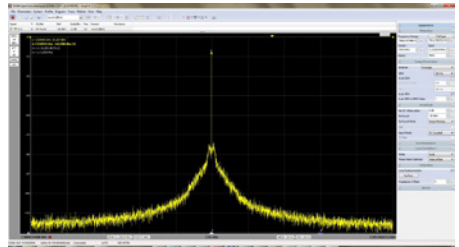
It is a program option that allows the phase noise of harmonic signals sources measuring.

### Measurable parameters

- Individual harmonic component levels and frequencies
- Spectrum shape
- Harmonic distortion
- Phase noise

## Software

- User-friendly interface
- Versatile report generating system
- Custom profiles save/load for different measurement setups
- Formulae editor for complex mathematical calculations
- Unlimited memory traces
- Adjustable markers system



## Specification

### Key measurement functions

#### Frequency range

##### SK4M-18

Option 11R

100 Hz ... 18 GHz,  
Type N female input connector

Option 13N

100 Hz ... 20 GHz,  
Type 3.5 NMD male input connector

##### SK4M-50

Option 05N

100 Hz ... 50 GHz,  
Type 2.4 NMD male input connector

#### Frequency Reference Accuracy over 1 year period

$\pm 1 \times 10^{-7}$

#### Phase noise, at 1 GHz with offset of:

10 Hz

-60 dBc/Hz

100 Hz

-95 dBc/Hz

1 kHz

-115 dBc/Hz

10 kHz

-120 dBc/Hz

100 kHz

-125 dBc/Hz

1 MHz

-150 dBc/Hz

10 MHz

-160 dBc/Hz

#### Residual frequency modulation at 1 GHz

<1 Hz/s

#### Resolution bandwidth (RBW)

Range (-3 dB bandwidth)

1 Hz to 1 kHz with step 1/2/3/5/7 Hz step  
1 kHz to 10 MHz with 1/3 Hz step  
special filters 140/6366 Hz

RBW switching uncertainty (Relative to reference BW of 10kHz)

1 Hz to 10 MHz

$\pm 0.05$  dB

RBW accuracy (-3 dB bandwidth)

1 Hz to 1 kHz

$\pm 1$  %

3 Hz to 300 kHz

$\pm 6$  %

1 Hz to 3 MHz

$\pm 12$  %

10 MHz

$\pm 15$  %

#### Power level measurement range

Displayed average noise level (DANL) to +30 dBm

#### Input power, max

DC voltage

0 V ( $\pm 20$  V for AC coupled input)

Sine wave (input att. = 0 dB)

Sine wave (input att. > 10 dB)

#### Absolute Amplitude Accuracy<sup>1</sup> at 100 MHz

$\pm 0.1$  dB

#### Nonlinearity of displayed level at fixed frequency<sup>2</sup> of 100 MHz

$\pm 0.02$  dB

#### Uncertainty of Reference level setting at fixed frequency of 100 MHz

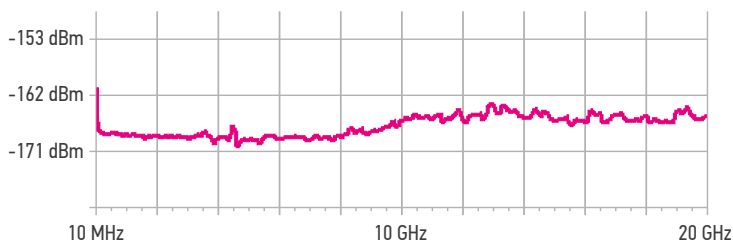
$\pm 0.1$  dB

Frequency response, referenced to 100 MHz, 10 dB referenced to 10 dB attenuator		
100 Hz to 19 MHz	±0.5 dB	
20 MHz to 3.2 GHz	±0.5 dB	
3.3 GHz to 9 GHz	±1.0 dB	
10 GHz to 20 GHz	±1.5 dB	
20 GHz to 50 GHz	±2.5 dB	
<b>Input attenuation switching uncertainty, at fixed frequency 100 MHz, referenced to 10 dB attenuator</b>	±0.1 dB	
<b>Displayed average noise level (DANL), 10 dB input attenuator 1 Hz RBW</b>	<b>Option MUA On</b>	<b>Option MUA Off</b>
10 kHz to 10 MHz	-	-155 dBm
20 MHz to 3.2 GHz	-167 dBm	-153 dBm
3.2 to 9 GHz	-166 dBm	-142 dBm
9 to 20 GHz	-164 dBm	-138 dBm
20 to 26.5 GHz	-155 dBm	-130 dBm
26.5 to 40 GHz	-150 dBm	-125 dBm
40 to 44 GHz	-149 dBm	-124 dBm
44 to 50 GHz	-147 dBm	-122 dBm
<b>Third-order intercept point (TOI)</b>	<b>Option MUA On <sup>3</sup></b>	<b>Option MUA Off <sup>4</sup></b>
20 MHz to 3.2 GHz	-10 dBm	+20 dBm
3.2 GHz to 20 GHz	-10 dBm	+20 dBm
20 GHz to 50 GHz	-10 dBm	+15 dBm
<b>Second-harmonic intercept point (SHI)</b>	<b>Option MUA On <sup>5</sup></b>	<b>Option MUA Off <sup>6</sup></b>
10 MHz to 1.6 GHz	5 dBm	+50 dBm
1.6 to 10 GHz	5 dBm	+100 dBm
10 GHz to 25 GHz	5 dBm	+100 dBm
<b>Input impedance</b>	50 Ohm	
<b>RF Input VSWR, 10 dB input attenuator</b>	< 2:1	

Note:

- <sup>1</sup> – 10 dB input attenuator, RBW 10 kHz, power level -30dBm
- <sup>2</sup> – 10 dB input attenuator, input power range from 10 dBm to -90 dBm, logarithmic scale.
- <sup>3</sup> – Two tones, each at -30 dBm, spaced by 5 times IF filter bandwidth, 0 dB input attenuator
- <sup>4</sup> – Two tones, each at -10 dBm, spaced by 5 times IF filter bandwidth, 0 dB input attenuator
- <sup>5</sup> – SHI, tone at -50 dBm, 0 dB input attenuator
- <sup>6</sup> – SHI, tone at -10 dBm, 0 dB input attenuator

#### SK4M-18 DANL at +23°C ±3°C, RBW 1 Hz, VBW 10 kHz, LNA on



## Noise Source Selection

Option IKS allows the devices noise figure and gain measuring, by Y-factor method. To use this option, you need noise source.

The GSHM2 series have two types noise sources. First type have a 15 dB ENR and the second — 6 dB ENR.

**15 dB ENR noise source is suitable for:**

- In case of general-purpose measurements up to 30 dB DUT gain

**6 dB ENR noise source is suitable for:**

- Active devices measurement, when changes in the source impedance are affected to accuracy
- DUT with gain more then 30dB

Specification	GSHM2
Uncertainty	$\pm 0.22$ dB
Voltage supply	$28 \pm 0.28$ V
Current supply	< 35 mA
Type connector	BNC (female)
Operation temperature range	+5 to +40 °C
Dimensions, (H, D, W)	140x30x25 mm
Weight	< 0.15 kg



Noise source	Frequency range	ENR	SWR	Type connectors
GSHM2-18A-01 GSHM2-18A-11	10 MHz to 18 GHz	4 to 7 dB	<1.25:1	type III (male) type N (male)
GSHM2-18B-01 GSHM2-18B-11	10 MHz to 18 GHz	13 to 16 dB	<1.30:1	type III (male) type N (male)
GSHM2-20A-03 GSHM2-20A-13	10 MHz to 20 GHz	4 to 7 dB	<1.25:1	type IX var 3 (male) type 3.5 mm (male)
GSHM2-20B-03 GSHM2-20B-13	10 MHz to 20 GHz	13 to 16 dB	<1.30:1	type IX var 3 (male) type 3.5 mm (male)

### Power to Voltage Conversion

dBm	mW	Volts RMS	Volts Pk/Pk	dBV	dBuV
-40	0.0001	0.0022	0.0063	-53.01	66.99
-39	0.0001	0.0025	0.0071	-52.01	67.99
-38	0.0002	0.0028	0.0080	-51.01	68.99
-37	0.0002	0.0032	0.0089	-50.01	69.99
-36	0.0003	0.0035	0.0100	-49.01	70.99
-35	0.0003	0.0040	0.0112	-48.01	71.99
-34	0.0004	0.0045	0.0126	-47.01	72.99
-33	0.0005	0.0050	0.0142	-46.01	73.99
-32	0.0006	0.0056	0.0159	-45.01	74.99
-31	0.0008	0.0063	0.0178	-44.01	75.99
-30	0.0010	0.0071	0.0200	-43.01	76.99
-29	0.0013	0.0079	0.0224	-42.01	77.99
-28	0.0016	0.0089	0.0252	-41.01	78.99
-27	0.0020	0.0100	0.0283	-40.01	79.99
-26	0.0025	0.0112	0.0317	-39.01	80.99
-25	0.0032	0.0126	0.0356	-38.01	81.99
-24	0.0040	0.0141	0.0399	-37.01	82.99
-23	0.0050	0.0158	0.0448	-36.01	83.99
-22	0.0063	0.0178	0.0502	-35.01	84.99
-21	0.0079	0.0199	0.0564	-34.01	85.99
dBm	mW	Volts RMS	Volts Pk/Pk	dBV	dBuV
-20	0.010	0.022	0.063	-33.01	86.99
-19	0.013	0.025	0.071	-32.01	87.99
-18	0.016	0.028	0.080	-31.01	88.99
-17	0.020	0.032	0.089	-30.01	89.99
-16	0.025	0.035	0.100	-29.01	90.99
-15	0.032	0.040	0.112	-28.01	91.99
-14	0.040	0.045	0.126	-27.01	92.99
-13	0.050	0.050	0.142	-26.01	93.99
-12	0.063	0.056	0.159	-25.01	94.99
-11	0.079	0.063	0.178	-24.01	95.99
-10	0.100	0.071	0.200	-23.01	96.99
-9	0.126	0.079	0.224	-22.01	97.99
-8	0.159	0.089	0.252	-21.01	98.99
-7	0.200	0.100	0.283	-20.01	99.99
-6	0.251	0.112	0.317	-19.01	100.99
-5	0.316	0.126	0.356	-18.01	101.99
-4	0.398	0.141	0.399	-17.01	102.99
-3	0.501	0.158	0.448	-16.01	103.99
-2	0.631	0.178	0.502	-15.01	104.99
-1	0.794	0.199	0.564	-14.01	105.99
dBm	mW	Volts RMS	Volts Pk/Pk	dBV	dBuV
0	1.00	0.22	0.63	-13.01	106.99
1	1.26	0.25	0.71	-12.01	107.99
2	1.59	0.28	0.80	-11.01	108.99
3	2.00	0.32	0.89	-10.01	109.99
4	2.51	0.35	1.00	-9.01	110.99
5	3.16	0.40	1.12	-8.01	111.99
6	3.98	0.45	1.26	-7.01	112.99
7	5.01	0.50	1.42	-6.01	113.99
8	6.31	0.56	1.59	-5.01	114.99
9	7.94	0.63	1.78	-4.01	115.99
10	10.00	0.71	2.00	-3.01	116.99
11	12.59	0.79	2.24	-2.01	117.99
12	15.85	0.89	2.52	-1.01	118.99
13	19.95	1.00	2.83	-0.01	119.99
14	25.12	1.12	3.17	0.99	120.99
15	31.62	1.26	3.56	1.99	121.99
16	39.81	1.41	3.99	2.99	122.99
17	50.12	1.58	4.48	3.99	123.99
18	63.10	1.78	5.02	4.99	124.99
19	79.43	1.99	5.64	5.99	125.99

dBm	mW	Volts RMS	Volts Pk/Pk	dBV	dBuV
20	100	2.24	6.32	6.99	126.99
21	126	2.51	7.10	7.99	127.99
22	159	2.82	7.96	8.99	128.99
23	200	3.16	8.93	9.99	129.99
24	251	3.54	10.02	10.99	130.99
25	316	3.98	11.25	11.99	131.99
26	398	4.46	12.62	12.99	132.99
27	501	5.01	14.16	13.99	133.99
28	631	5.62	15.89	14.99	134.99
29	794	6.30	17.83	15.99	135.99
30	1000	7.07	20.00	16.99	136.99
31	1259	7.93	22.44	17.99	137.99
32	1585	8.90	25.18	18.99	138.99
33	1995	9.99	28.25	19.99	139.99
34	2512	11.21	31.70	20.99	140.99
35	3162	12.57	35.57	21.99	141.99
36	3981	14.11	39.91	22.99	142.99
37	5012	15.83	44.77	23.99	143.99
38	6310	17.76	50.24	24.99	144.99
39	7943	19.93	56.37	25.99	145.99
dBm	W	Volts RMS	Volts Pk/Pk	dBV	dBuV
40	10.00	22.36	63.25	26.99	146.99
41	12.59	25.09	70.96	27.99	147.99
42	15.85	28.15	79.62	28.99	148.99
43	19.95	31.59	89.34	29.99	149.99
44	25.12	35.44	100.24	30.99	150.99
45	31.62	39.76	112.47	31.99	151.99
46	39.81	44.62	126.19	32.99	152.99
47	50.12	50.06	141.59	33.99	153.99
48	63.10	56.17	158.87	34.99	154.99
49	79.43	63.02	178.25	35.99	155.99
50	100.00	70.71	200.00	36.99	156.99

### Band Designation

Frequency	Wavelength	Russian	IEEE	EU, NATO, US ECM
< 3 Hz	< 10 000 km		TLF	
30 Hz	1 000 km	КНЧ	ELF	
300 Hz	100 km	СНЧ	SLF	
3 kHz	10 km	ИЧЧ	ULF	
30 kHz	1 000 m	ОЧЧ	VLF	A
300 kHz	100 m	НЧ	LF	
3 MHz	10 m	СЧ	MF	
30 MHz	100 sm	ВЧ	HF	
250 MHz	12 sm	ОВЧ	VHF	
300 MHz	10 sm			B
500 MHz	6 sm			C
1 GHz	3 sm	УВЧ	UHF	D
2 GHz	1.5 sm			E
3 GHz	10 mm		S	F
4 GHz	7.5 mm			G
6 GHz	5 mm		C	H
8 GHz	3.75 mm			I
10 GHz	3 mm			
12 GHz	2.5 mm			
18 GHz	1.67 mm			
20 GHz	1.5 mm			
27 GHz	1.11 mm			
30 GHz	1 mm			
40 GHz	0.75 mm			
60 GHz	0.5 mm			
75 GHz	0.4 mm			
100 GHz	0.3 mm			
110 GHz	0.27 mm			
300 GHz	0.1 mm			



There is no reason to refuse...

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