Tracking Generator

FSE-B8/9/10/11

Technical Information

Subject to change [16.12.1996, 1ESP, Schmitt]

Adds scalar network measurements to the spectrum analyzers FSEA, FSEB, and FSEM30

- Frequency range:
  9 kHz to 3.5 GHz / 7 GHz
- Dynamic range for
  attenuation >90 dB
  I/Q modulator in FSE-B9/11
- Output level: 0 to –20 dBm
  optional: 0 to –90 dBm
- Versatile scalar measurement
  personality built-in

ROHDE&SCHWARZ

Tracking Generator FSE-B8/9/10/11

Technical Information

Scalar Network Analysis with High Dynamic Range

The tracking generator options FSE-B8, FSE-B9, FSE-B10 and FSE-B11 add scalar network measurements to the FSE-family of spectrum analyzers. Gain, frequency response, and ripple, as well as isolation or return loss, can be measured easily with high dynamic range. The high selectivity with resolution bandwidth down to 1 kHz and below allows measurements in the presence of other signals and without limitations by harmonics of the generator or device under test. The high sensitivity makes an FSE spectrum analyzer with built-in tracking generator option especially well suited for shielding measurements.

Tracking generators FSE-B8 and FSE-B9 are designed for use in the FSEA and cover the frequency range from 9 kHz to 3.5 GHz. Tracking generators FSE-B10 and FSE-B11 are designed for use in the FSEB and FSEM30 with a frequency range of 9 kHz to 7 GHz. All tracking generators can be equipped with option FSE-B12, a 0 to 70 dB attenuator. This changes the minimum output level down to –90 dBm, so that modules with a very high gain response that require a low input level can be measured.

Versatile Measurement Personality Built-in

Standard functions available make scalar measurements easy and reliable:

- Easy-to-use calibration function with interpolation
- Normalization for return loss measurements with short, open, or both
- Automatic 3-dB-bandwidth measurement
- Shape factor 60/3 dB or 60/6 dB
- Limit lines with PASS/FAIL indication
- Up to 200 dB display range to compensate for normalized frequency responses
- Frequency adjustable down to 3 kHz with reduced output level

I/Q modulation

Tracking generators FSE-B9 and FSE-B11 include an I/Q modulator which allows you to generate phase and amplitude modulation. A dual-channel arbitrary waveform synthesizer (e.g., the ADS Waveform Synthesizer) can be used as a modulation source. The arbitrary data, which have to be loaded into the ADS can be generated with the IQSIM-K software. In combination with the computer function Option FSE-B15 and the second IEEE interface FSE-B17, this software can be run on the FSE itself to control the ADS via the IEEE bus without the need for an extra computer. In this way, signals can be generated easily in accord with different digital mobile communication standards such as GSM, TETRA, NADC, DECT, etc.

Frequency Offset up to ±200 MHz

With a frequency offset of up to ±200 MHz between the tracking generator output frequency and the analyzer receive frequency, measurements on frequency converting modules become as easy as measuring filters. By using the negative frequency offset, inverse sideband conversion can be measured. Frequency offset and I/Q modulation can not be used simultaneously.

Table of Compatibility

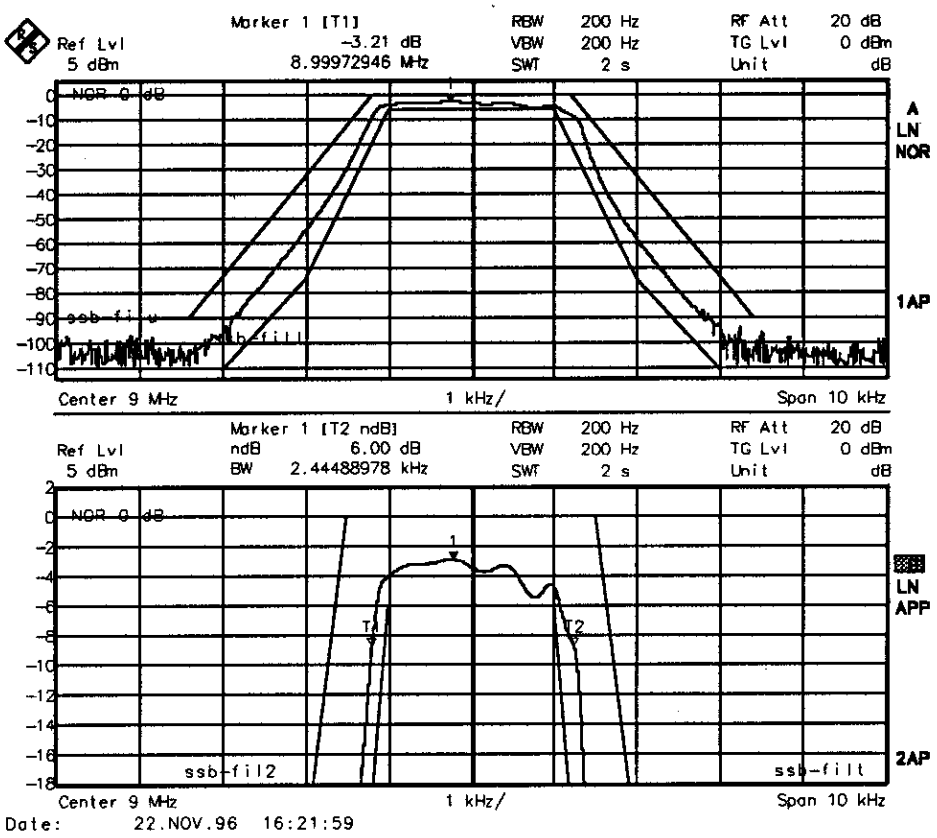
	FSEA20	FSEA30	FSEB20	FSEB30	FSEM20	FSEM30
FSE-B8	•	•	n/a	n/a	n/a	n/a
FSE-B9	•	•	n/a	n/a	n/a	n/a
FSE-B10	n/a	n/a	•	•	n/a	n/a
FSE-B11	n/a	n/a	•	•	n/a	n/a
FSE-B12	•	•	•	•	n/a	•

• = Compatible.
n/a = Not compatible.

Tracking Generator FSE-B8/9/10/11

Technical Information

Application: Measurement of filter insertion loss and stopband attenuation.



[1] In Split Screen mode, the insertion loss can be evaluated with high resolution at the same time as the stopband attenuation with high dynamic range. The marker directly indicates the insertion loss response at 6-dB bandwidth. Using the limit lines, fast GO/NO GO checks can be made.

FSE-B8/9/10/11/12 Tracking Generator Characteristics

Specifications are guaranteed under the following conditions: five-minute warm-up time at ambient temperature, specified environmental conditions met, calibration cycle adhered to, and total calibration performed. Data without tolerances: approximate value only. Data designated “nominal” apply to design parameters and are not tested.

Frequency

Frequency Range –
FSE-B8, FSE-B9: 9 kHz to 3.5 GHz.
FSE-B10, FSE-B11: 9 kHz to 7 GHz.

Minimum Start Frequency – 3kHz typical.

Frequency Offset – ± 200 MHz.

Spurious –
Harmonics (f > 50 MHz): 25 dB.
Other: 30 dB.

Amplitude

Output Level Range –
Without FSE-B12: –20 to 0 dBm (Attenuator for TG).
With FSE-B12: –90 to 0 dBm.
Resolution: 0.1 dB.

Level Error –
At 120 MHz, 0 dBm: <1 dB.

Frequency Response (referred to 120 MHz, for sweep time >100 ms, start frequency >2 * RBW and start frequency >SPAN/1000, without FSE-B12) –
9 kHz to1 GHz: <2,0 dB.
1 GHz to 3.5 GHz: <3.0 dB.
3.5 GHz to 7 GHz: <3 dB typical.

Additional Frequency Response with FSE-B12 –
9 kHz to 3.5 GHz/7 GHz: <1.0 dB.

Level Control – Internal, external. External requires negative detector voltage 0 to –0.5V.

Dynamic Range

Measurement Range Gain –
Without FSE-B12: 50 dB.
With FSE-B12: 120 dB.

Measurement Range Attenuation –
f > 10 MHz, RBW = 1 kHz: >90 dB (120 dB typical).

Modulation –
Start Frequency: > 200 kHz.
Modulation Source: External.
Modulation Types: AM, FM, I/Q.
Modulation Inputs (AM, FM): BNC, >10 kΩ.

NOTE: AM/FM and I/Q-modulation cannot be operated parallel.

AM Modulation –
Mode: EXT AM.
Modulation Depth: 0 to 80%.
Modulation Frequency Range: 1 kHz to 20kHz.

FM Modulation –
Mode: EXT FM.
Deviation: 1 MHz max.
Modulation Frequency Range: 1 kHz to 100kHz, at Mod. index <2 π ∗ 75.

I/Q-Modulation (FSE-B9 and FSE-B11 only)

Modulations Inputs I and Q –
Connectors: BNC.
Input Impedance: 50 Ω.
VSWR: <1.4 typical.
Input Voltage for Full-scale Magnitude: ±0.5V.

Modulation Frequency Response –
f_{mod} = DC to 5 MHz: <1 dB.
f_{mod} = DC to 10 MHz: < 1 dB typical.

Vector DC-error (referred to full-scale I response) –
Q input, input voltage: $\sqrt{I^2 + Q^2}$ ≤0.5 V.
Carrier 120 MHz:
25° C ±5° C: < 1.5%.
5° C to 40° C: < 3%.
Carrier 10 MHz to 3.5/7 GHz:
25° C ±5°C: <1.5% typical.
5° C to 40° C: <3% typical.

Amplitude Error –
At 25° C ±5° C:

$$\leq 20\log\left(\frac{\sqrt{I^2 + Q^2} \pm 5\text{ mV}}{\sqrt{I^2 + Q^2}}\right)\text{ dB} + 0.25\text{ dB}$$

At 5° C to 40° C:

$$\leq 20\log\left(\frac{\sqrt{I^2 + Q^2} \pm 5\text{ mV}}{\sqrt{I^2 + Q^2}}\right)\text{ dB} + 0.25\text{ dB}$$

Phase Error –
At 25° C ±5° C:

$$\leq 0.5\text{ Grad} + \arctan\left(\frac{5\text{ mV}}{\sqrt{I^2 + Q^2}}\right)\text{ Grad}$$

At 5° C to 40° C:

$$\leq 1\text{ Grad} + \arctan\left(\frac{10\text{ mV}}{\sqrt{I^2 + Q^2}}\right)\text{ Grad}$$

I and Q: voltage at the I and Q input in mV.

Residual Carrier (at 0V input voltage at I and Q, referenced to full-scale input) –
25° C ±5° C, 120 MHz: 0.5%.
5° C to 40° C, 10 MHz to 3.5 GHz/7 GHz: <0.5% typical.

Inputs and Outputs

Front Panel –
RF Output: Type N female, 50 Ω.
VSWR (level = –20 dBm): < 2.0:1 typical.

Rear Panel –
TG-IN I / AM / ALC: BNC female.
TG IN Q / FM: BNC female.

Ordering Information

Option FSE-B8 Tracking Generator for FSEA
9 kHz to 3.5 GHz.

Option FSE-B9 Tracking Generator with I/Q Generator for FSEA
9 kHz to 3.5 GHz.

Option FSE-B10 Tracking Generator for FSEB, FSEM30
9 kHz to 7 GHz.

Option FSE-B11 Tracking Generator with I/Q Generator for FSEB, FSEM30
9 kHz to 7 GHz.

Option FSE-B12 Attenuator for Tracking Generator Options FSE-B8, FSE-B9, FSE-B10, FSE-B11

RECOMMENDED ACCESSORIES

- ☐ VSWR Bridge, 40 kHz to 4 GHz – Order ZRC.
- ☐ VSWR Bridge, 50 MHz to 3,000 MHz – Order ZRB2.
- ☐ Calibration Kit (N, Load, Short, Open) – Order ZCAN.
- ☐ Matching Pads, 75 Ω L Section – Order RAM.
- ☐ Matching Pads, 75 Ω; Series Resistor, 25 Ω – Order RAZ.

RECOMMENDED ACCESSORIES FOR I/Q MODULATION

- ☐ I/Q Signal Generation Software (requires ADSWaveform Synthesizer) – Order IQSIM-K.
- ☐ ADS Waveform Synthesizer (dual channel) – Order ADS.

For further information, contact Tektronix:

World Wide Web: http://www.tek.com; USA 1(800)426-2200

From other areas, contact: Tektronix, Inc. Export Sales, P.O. Box 500, M/S 50-255, Beaverton, Oregon 97077-0001, USA (503)627-1916

Or contact Rohde & Schwarz: Phone: 49 89 41 29 0, Fax: 49 89 41 29 35 67, World Wide Web: http://www.rsd.dc

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