2.8 Sweep

The SME offers a digital step-by-step sweep for parameters:

- RF frequency
- LF frequency
- RF level

In addition to the digital step-by-step sweep, an analog sweep for RF frequency and RF level is possible by switching on frequency or amplitude modulation with an internal saw tooth.

Setting a sweep is effected in five basic steps which are shown in the following example, the setting of a frequency sweep:

1. Set sweep range (START and STOP or CENTER and SPAN).

2. Select linear or logarithmic sequence (SPACING).

3. Set step width (STEP) and dwell time (DWELL).

4. Activate marker if desired (MARKER).

5. Switch on sweep (MODE set to AUTO, SINGLE or STEP).

2.8.1 Setting the Sweep Range (START, STOP, CENTER and SPAN)

The sweep range of the RF sweep can be entered in two different ways. Either by entering the START and STOP value or by entering CENTER and SPAN. Please observe that the two parameter sets influence one another. The influence is exerted in the following way:

- START frequency altered: STOP =   unaltered
  CENTER= (START + STOP)/2
  SPAN = (STOP - START)

- STOP frequency altered: START = unaltered
  CENTER= (START + STOP)/2
  SPAN = (STOP - START)

- CENTER frequency altered   SPAN = unaltered
  START = (CENTER - SPAN/2)
  STOP = (CENTER + SPAN/2)

- SPAN frequency altered: CENTER= unaltered
  START = (CENTER - SPAN/2)
  STOP = (CENTER + SPAN/2)

2.8.2   Selecting the Sweep Run (SPACING LIN, LOG)

The sweep run, linear or logarithmic, can be selected using SPACING. For the RF and LF sweep, a linear or logarithmic run is possible. For level sweep, only the logarithmic run is possible.

With the logarithmic sweep, step width STEP is equal to a constant fraction of the present setting. The logarithmic step width is entered in unit % with RF or LF sweep, in unit dB with level sweep.

2.8.3   Operating Modes (MODE)

The following sweep operating modes are available:

AUTO

Sweep from the starting point to the stop point, with automatic restart at the starting point. If another sweep operating mode was activated prior to the AUTO operating mode, continuation is made from the current sweep setting (cf. Fig. 2-52).

IEC bus short commands:

RF sweep:	LF sweep:	Level sweep:
FREQ:MODE SWE	SOUR2:FREQ:MODE SWE	POW:MODE SWE
SWE:MODE AUTO	SOUR2:SWE:MODE AUTO	SWE:POW:MODE AUTO
TRIG:SOUR AUTO	TRIG2:SOUR AUTO	TRIG:SOUR AUTO

SINGLE

Single run from the starting point to the stop point. If SINGLE is selected, the run is not started yet. Function EXECUTE SINGLE SWEEP → to be executed, which can be used to start the run, is displayed below the MODE line (cf. Fig. 2-53).

IEC bus short commands:

RF sweep:	LF sweep:	Level sweep:
FREQ:MODE SWE	SOUR2:FREQ:MODE SWE	POW:MODE SWE
SWE:MODE AUTO	SOUR2:SWE:MODE AUTO	SWE:POW:MODE AUTO
TRIG:SOUR SING	TRIG2:SOUR SING	TRIG:SOUR SING

STEP

Step-by-step, manual run within the sweep limits. Activating STEP stops a running sweep and the cursor wraps to the indication value of CURRENT. The sweep run can now be controlled upwards or downwards in discrete steps using the rotary knob or the numeric keys.

IEC bus short commands:

RF sweep:	LF sweep:	Level sweep:
FREQ:MODE SWE	SOUR2:FREQ:MODE SWE	POW:MODE SWE
SWE:MODE STEP	SOUR2:SWE:MODE STEP	SWE:POW:MODE STEP
TRIG:SOUR SING	TRIG2:SOUR SING	TRIG:SOUR SING

EXT-SINGLE

Single run from the starting point to the stop point as in the case of SINGLE, but triggered by an external trigger signal.

IEC-bus short commands:

RF sweep:	LF sweep:	Level sweep:
FREQ:MODE SWE	SOUR2:FREQ:MODE SWE	POW:MODE SWE
SWE:MODE AUTO	SOUR2:SWE:MODE AUTO	SWE:POW:MODE AUTO
TRIG:SOUR EXT	TRIG2:SOUR EXT	TRIG:SOUR EXT

EXT-STEP   Step-by-step run by means of the external trigger signal. Each trigger event triggers a single step.

IEC-bus short commands:

RF sweep:	LF sweep:	Level sweep:
FREQ:MODE SWE	SOUR2:FREQ:MODE SWE	POW:MODE SWE
SWE:MODE STEP	SOUR2:SWE:MODE STEP	SWE:POW:MODE STEP
TRIG:SOUR EXT	TRIG2:SOUR EXT	TRIG:SOUR EXT

OFF   The sweep operating mode is switched off.

IEC-bus short commands:

RF sweep:	LF sweep:	Level sweep:
FREQ:MODE CW	SOUR2:FREQ:MODE CW	POW:MODE CW

2.8.4   Trigger Input

An external signal at the rear input triggers the sweep in the EXT-SINGLE and EXT-STEP operating modes. The polarity of the active trigger edge can be set in menu UTILITIES - AUX I/O EXT TRIG SLOPE .

2.8.5   Sweep Outputs

Outputs X-AXIS, BLANK and MARKER are available at the rear of the instrument to control and trigger oscilloscopes or XY recorders.

X-AXIS   With sweep switched on, this output supplies a voltage ramp of 0 to 10 V for the X-deflection of an oscilloscope or an XY recorder.

BLANK   This output supplies a signal (0V/5V) to trigger and blank an oscilloscope or for the PEN LIFT control of an XY recorder. The polarity and the period of the signal can be set under UTILITIES - AUX I/O - BLANK POLARITY and - BLANK TIME.

MARKER This output becomes active when the sweep run has reached the mark. The MARKER signal can be used for the brightness control of an oscilloscope. Up to three marks can be set in order to mark certain positions in the sweep run. The polarity of the signal can be set in menu UTILITIES - AUX I/O - MARKER POLARITY. The period of the active signal is equal to the dwell time (DWELL) of a step.
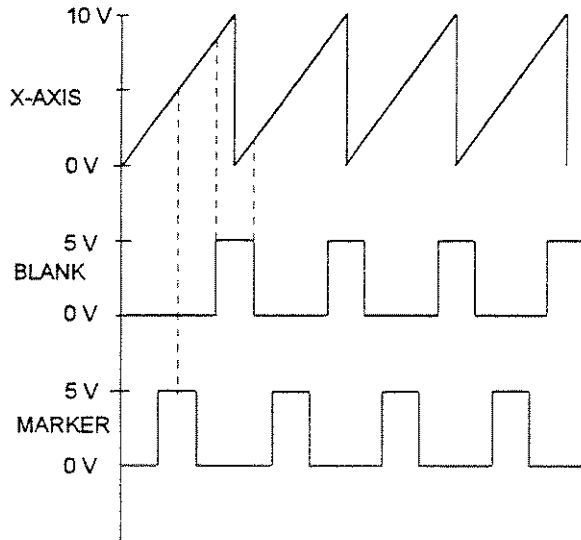
Signal examples:

Fig. 2-52   Signal example sweep: MODE = AUTO, BLANK TIME = NORMAL
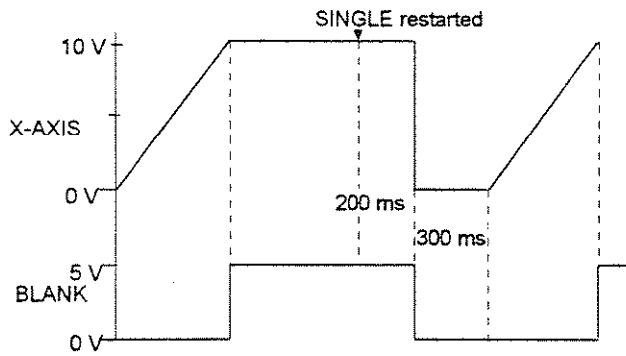

Fig. 2-53   Signal example sweep: MODE = SINGLE, BLANK TIME = LONG

2.8.6   RF-Sweep

Menu SWEEP - FREQ offers access to settings for RF sweep.

Menu selection: SWEEP - FREQ

```
START FREQ          100.000 000 0  MHz          LEVEL    - 30.0 dBm
STOP FREQ           500.000 000 0  MHz
                         RF-SWP

FREQUENCY    FREQ     START FREQ              100.000 000 0 MHz
LEVEL        LEVEL    STOP FREQ              500.000 000 0 MHz
MODULATION   LFGEN    CENTER FREQ            300.000 000 0 MHz
DIGITAL MOD           SPAN                   400.000 000 0 MHZ
LF OUTPUT             CURRENT FREQ           100.000 000 0 MHz
SWEEP
LIST                  SPACING                      LIN  LOG
MEM SEQ              STEP LIN                1.000 000 0 MHz
UTILITIES            DWELL                        15.0 ms
HELP                 MODE    OFF AUTO SINGLE STEP EXT-SINGLE EXT-STEP
                     EXECUTE SINGLE SWEEP ▶
                     RESET SWEEP ▶

                     MARKER 1 FREQ             100.000 0 MHz
                     MARKER 1 STATE               OFF  ON
                     AMPLITUDE MARKER 1           OFF  ON
                     MARKER 2 FREQ             200.000 0 MHz
                     MARKER 2 STATE               OFF  ON
                     AMPLITUDE MARKER 2           OFF  ON
                     MARKER 3 FREQ             300.000 0 MHz
                     MARKER 3 STATE               OFF  ON
                     AMPLITUDE MARKER 3           OFF  ON
```

Fig. 2-54   Menu SWEEP - FREQ

START FREQ	Input value of the starting frequency. IEC bus short command :FREQ:STAR 100MHz
STOP FREQ	Input value of the stop frequency. IEC bus short command :FREQ:STOP 500MHz
CENTER FREQ	Input value of the center frequency. IEC bus short command :FREQ:CENT 300MHz
SPAN	Input value of the span. IEC bus short command :FREQ:SPAN 100MHz
CURRENT FREQ	Indication of the current frequency value. Operating mode STEP: Input value of the frequency.
STEP LIN (LOG)	Input value of the step width. Depending on whether SPACING LIN or LOG is selected, STEP LIN or STEP LOG is displayed. IEC bus short command :SWE:STEP:LIN 1MHz

DWELL	Input value of the dwell time per step.
	IEC bus short command : SWE:DWEL 10ms
SPACING	Input value of the dwell time per step.
	IEC bus short command : SWE:SPAC LIN
MODE	Selection of the sweep operating mode (cf. Section 2.8.3)..
	IEC bus short commands : FREQ:MODE SWE; : SWE:MODE AUTO; : TRIG:SOUR SING

EXECUTE SINGLE SWEEP ↗

Starts a single sweep run. This action to be executed is only indicated and is only effective if MODE SINGLE has been selected.

IEC bus short command : TRIG

RESET SWEEP ↗

Sets the starting frequency.

IEC bus short command : ABOR

MARKER 1 FREQ
MARKER 2 FREQ
MARKER 3 FREQ

Input value of the frequency for the marker selected

IEC bus short command : MARK1:FREQ 100MHz

MARKER 1 STATE
MARKER 2 STATE
MARKER 3 STATE

Switching on/off the marker selected

IEC bus short command : MARK1 OFF

AMPLITUDE MARKER1
AMPLITUDE MARKER 2
AMPLITUDE MARKER 3

Switching on/off the amplitude marker selected

OFF   Input value of the frequency for the marker selected

ON   Amplitude marker is switched on. On reaching the mark the output level is reduced by 1 dB.

IEC bus short command : MARK1:AMPL OFF

2.8.7   LEVEL Sweep

Menu SWEEP - LEVEL offers access to settings for LEVEL sweep.
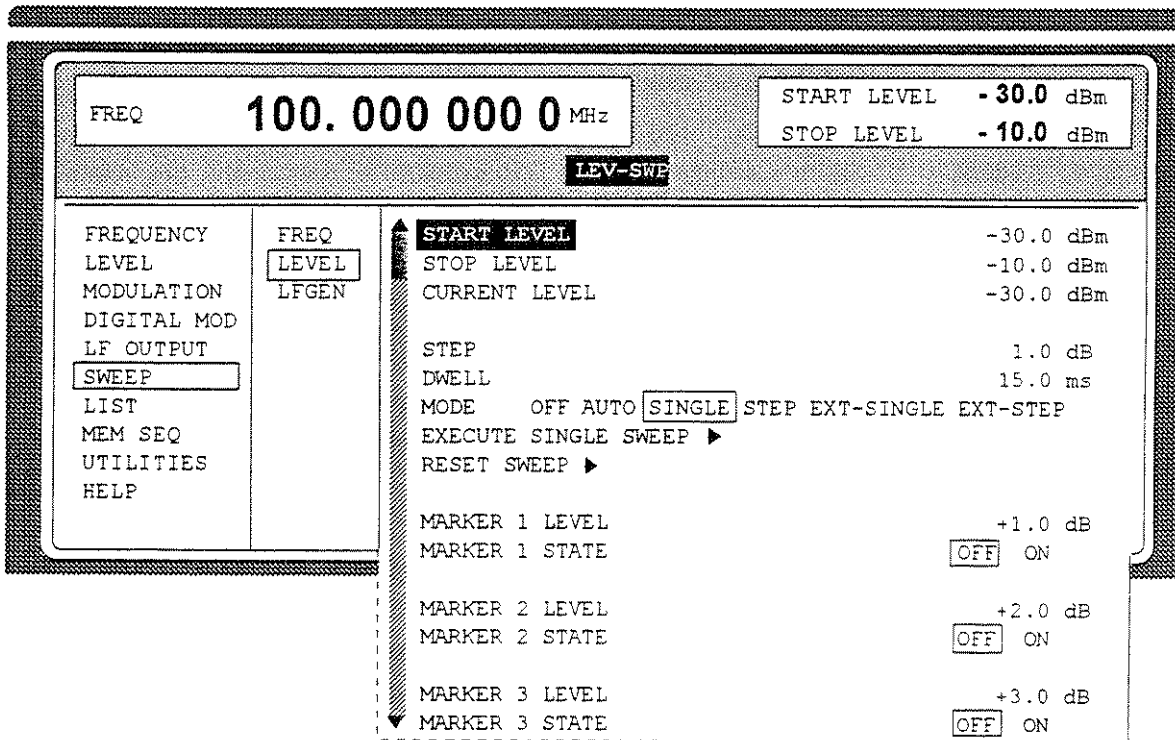
Menu selection: SWEEP - LEVEL

```
┌──────────────────────────────────────────────────────────────────────────┐
│  FREQ     100. 000 000 0 MHz          START LEVEL   -30.0 dBm              │
│                                       STOP  LEVEL   -10.0 dBm              │
│                           LEV-SWP                                           │
│  FREQUENCY    FREQ      START LEVEL                      -30.0 dBm          │
│  LEVEL        LEVEL     STOP  LEVEL                      -10.0 dBm          │
│  MODULATION   LFGEN     CURRENT LEVEL                    -30.0 dBm          │
│  DIGITAL MOD                                                                │
│  LF OUTPUT             STEP                                1.0 dB           │
│  SWEEP                 DWELL                              15.0 ms           │
│  LIST                  MODE     OFF AUTO SINGLE STEP EXT-SINGLE EXT-STEP    │
│  MEM SEQ               EXECUTE SINGLE SWEEP ▶                               │
│  UTILITIES             RESET SWEEP ▶                                        │
│  HELP                                                                       │
│                        MARKER 1 LEVEL                    +1.0 dB           │
│                        MARKER 1 STATE                    OFF  ON           │
│                                                                            │
│                        MARKER 2 LEVEL                    +2.0 dB           │
│                        MARKER 2 STATE                    OFF  ON           │
│                                                                            │
│                        MARKER 3 LEVEL                    +3.0 dB           │
│                        MARKER 3 STATE                    OFF  ON           │
└──────────────────────────────────────────────────────────────────────────┘
```

Fig. 2-55   Menu SWEEP - LEVEL

START LEVEL

Input value of the starting level.
IEC bus short command   : POW : STAR -30dBm

STOP LEVEL

Input value of the stop levell.
IEC bus short command   : POW : STOP -10dBm

CURRENT LEVEL

Indication of the current level.
Operating mode STEP: Input value of the level.

STEP

Input value of the step width.
IEC bus short command   : SWE : POW : STEP 1dB

DWELL

Input value of the dwell time per step
IEC bus short command   : SWE : POW : DWEL 15ms

MODE

Selection of the sweep operating mode (cf. Section 2.8.3).
IEC bus short command   : POW : MODE SWE;
                          : SWE : POW : MODE AUTO;
                          : TRIG : SOUR SING

EXECUTE SINGLE SWEEP ➜   Starts a single sweep run. This action to be executed is only indicated and is only effective if MODE SINGLE is selected.

IEC bus short command   : TRIG

RESET SWEEP ➜   Sets the starting level.

IEC bus short command   : ABOR

MARKER 1 LEVEL
MARKER 2 LEVEL
MARKER 3 LEVEL   Input value of the level for the marker selected.

IEC bus short command   :MARK1:PSW:POW 0dBm

MARKER 1 STATE
MARKER 2 STATE
MARKER 3 STATE   Switching on/off the marker selected.

IEC bus short command   :MARK1:PSW OFF

2.8.8   LF-Sweep

Menu SWEEP - LF GEN offers access to settings for LF sweep.

Note: *Settings LF SWEEP and SOURCE LFGEN2 SHAPE NOI deactivate one another.*

Menu selection: SWEEP - LF GEN2

Fig. 2-56   Menu SWEEP - LF GEN

START FREQ

Input value of the starting frequency.

IEC bus short command   `:SOUR2:FREQ:STAR 100kHz`

STOP FREQ

Input value of the stop frequency.

IEC bus short command   `:SOUR2:FREQ:STOP 50kHz`

CURRENT FREQ

Indication of the current frequency value.
Operating mode STEP: Input value of the frequency.

STEP

Input value of the step width.

IEC bus short command   `:SOUR2:SWE:STEP:LIN 1kHz`

DWELL

Input value of the dwell time per step.

IEC bus short command   `:SOUR2:SWE:DWEL 15ms`

SPACING

Selection of the sweep run, linear or logarithmic.

IEC bus short command   `:SOUR2:SWE:SPAC LIN`

MODE

Selection of the sweep operating mode (cf. Section 2.8.3).

IEC bus short command   `:SOUR2:FREQ:MODE SWE`
                                          `:SOUR2:SWE:MODE AUTO`
                                          `:TRIG2:SOUR SING`

EXECUTE SINGLE SWEEP →

Starts a single sweep run. This action to be executed is only indicated and is only effective if MODE SINGLE is selected.

IEC bus short command   `:TRIG`

RESET SWEEP →

Sets the starting frequency.

IEC bus short command   `:ABOR`

MARKER 1 FREQ
MARKER 2 FREQ
MARKER 3 FREQ

Input value of the frequency for the marker selected.

IEC bus short command   `:SOUR2:MARK1:FREQ 1kHz`

MARKER 1 STATE
MARKER 2 STATE
MARKER 3 STATE

Switching on/off the marker selected.

IEC bus short command   `:SOUR2:MARK1 OFF`