

# Option R&S SMU-B90 Supplement to Operating Manual R&S SMU200A Vector Signal Generator

Firmware Version 2.05.104.33 and higher

The new firmware version for the R&S Vector Signal Generator offers phase coherence as a new functionality that could not be reported yet in the current operating manual. The feature requires the option R&S SMU-B90, FM&PhiM Modulator and Low Phase Noise for Local Oscillator coupling which can be used to generate a 2X2 or 4X4 MIMO signal.

The following description is to provide you with comprehensive information about the new features.

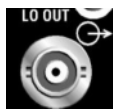
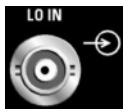
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## Local Oscillator - LO Coupling

The local oscillator coupling functionality is available for instruments equipped with the option R&S SMU-B90. The local oscillator signal is put out at the LO OUT connector (rear of instrument). In the external local oscillator mode, an external signal must be input at the LO IN connector.

### Input and output local oscillator



**LO IN**

Input for external LO signals.

**LO OUT**

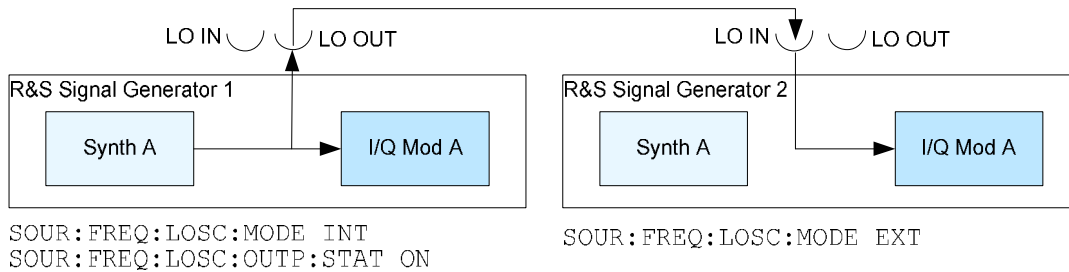
Output for internal LO signals.

See data sheet and "Local Oscillator - LO Coupling"

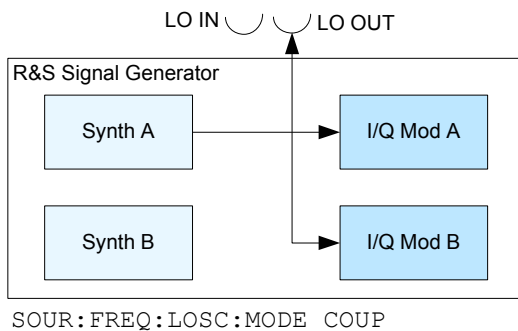
### Typical Applications - LO Coupling

The LO Coupling function can be used to generate a 2X2 or 4X4 MIMO signal.

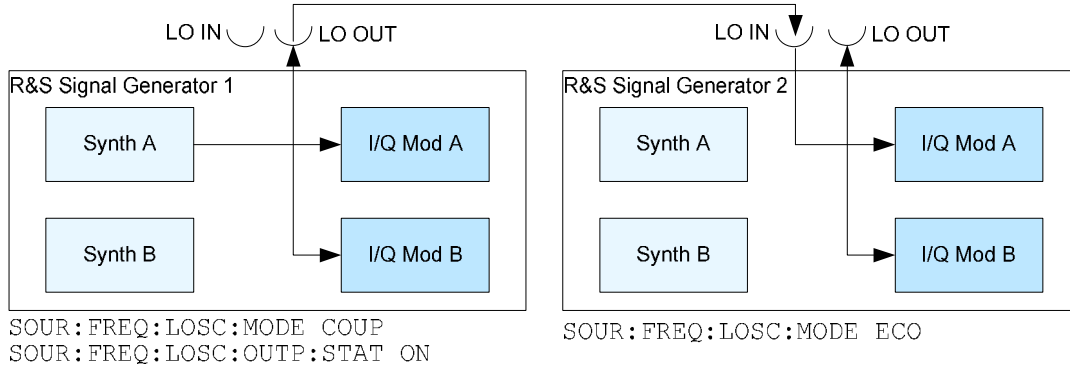
- Generation of 2x2 MIMO signal with two R&S Signal Generators, working in External mode.



- Generation of 2x2 MIMO signal with one R&S Signal Generator, working in Coupled A->B mode.



- Generation of 4x4 MIMO signal with two R&S Signal Generators, R&S Signal Generator 1 working in Coupled A->B mode and R&S Signal Generator 2 working in External Coupled A->B mode.

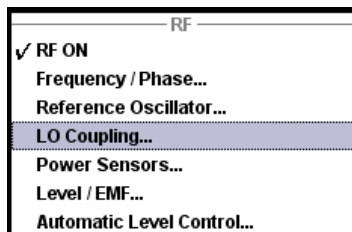


## LO Coupling Menu

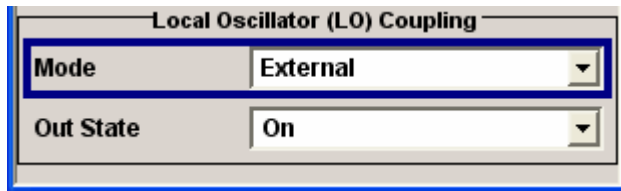
The **LO Coupling** menu is opened either in the **RF/A Mod** function block or using the **[MENU]** key under **RF/A Mod**.

The menu is available only for instruments equipped with the option R&S SMU-B90.

This option enables phase coherent RF outputs of two or more RF paths of one or more instruments.



The local oscillator coupling is set in the lower areas of the group menu. The upper areas are for setting the frequency and phase of the RF output signal and for setting the reference oscillator; see operating Manual, chapter Instrument Settings, section "RF Frequency and Phase - Frequency - Phase and section RF Reference Frequency - Frequency Oscillator".



The menu is used to select the mode of the LO coupling and to switch on/off the state of the local oscillator output.

## Mode - LO Coupling

Selects the mode of the local oscillator coupling.

### Internal

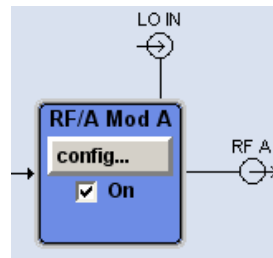
This mode corresponds to a normal operation; the internal local oscillators are used for each RF path.

Remote-control command:

```
SOUR:FREQ:LOSC:MODE INT
```

### External

An external signal is used for path A.



In case of a two-path instrument, the internal local oscillator signal is used for path B.

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#### Note:

Selection of LO Coupling **External** mode, disables all parameters in the **Frequency/Phase/Ref Osc** menu of the corresponding path.

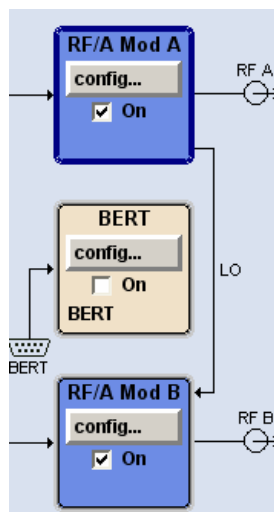
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Remote-control command:

```
SOUR:FREQ:LOSC:MODE EXT
```

**Coupled A -> B** (the parameter is enabled for two-path instruments only)

The local oscillator signal of path A is used also for path B (see also section "[Typical Applications](#)").



**Note:**

Selection of LO Coupling **Coupled A->B** mode, disables all parameters in the **Frequency/Phase/Ref Osc** menu of the other path.  
The frequency of path A will be set to the smaller of both frequencies of path A and B.

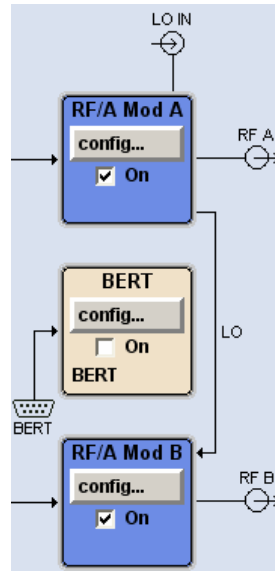
Remote-control command:

SOUR:FREQ:LOSC:MODE COUP

**External Coupled A -> B**

(the parameter is enabled for two-path instruments only)

An external signal is input on the LO IN connector and used for the coupled paths A and B (see also section "*Typical Applications*").



**Note:**

Selection of LO Coupling **External Coupled A->B** mode, disables all parameters in the **Frequency/Phase/Ref Osc** menu of both paths.

Remote-control command:

SOUR:FREQ:LOSC:MODE ECO

**Out State - LO Coupling**

Switches on/off the LO output.

**On**

The internal local oscillator signal used with path A is also available on the LO OUT connector (in order to couple two instruments).

Remote-control command:

SOUR:FREQ:LOSC:OUTP:STAT ON

**Off**

The LO OUT signal is switched off.

Remote-control command:

SOUR:FREQ:LOSC:OUTP:STAT OFF

## Remote Control Commands

### Supplement to SOURce:FREQUENCY Subsystem

In the case of two-path instruments with two RF paths, the numerical suffix under SOURce distinguishes between RF output A and RF output B:

SOURce[1] = RF output A

SOURce2 = RF output B

The keyword SOURce is optional with commands for RF output A and can be omitted. For RF output B, the command must contain the keyword together with the suffix 2.

In case of one-path instruments, the keyword SOURce is optional and can be omitted.

Command	Parameters	Default unit	Remark
[SOURce<[1]2>:]FREQUENCY:LOSCillator:MODE	INTernal   EXTernal   COUPlec   ECOuplec		
[SOURce<[1]2>:]FREQUENCY:LOSCillator:OUTPut:STATe	ON   OFF		

### SOURce-FREQUENCY - LO Coupling Mode

**[SOURce:]FREQUENCY:LOSCillator:MODE** INTernal | EXTernal | COUPlec | ECOuplec

Selects the mode of the local oscillator coupling.

**Parameters:**     **INTernal**

The signal of the internal local oscillator is used. This mode corresponds to a normal operation.

**EXTernal**

An external signal is used for path A.

In case of two-paths instrument, an internal LO signal is used for path B.

**Note:**

*Selection of LO Coupling **External** mode, disables all parameters of the SOURce-FREQUENCY Subsystem of the corresponding path.*

**COUplec**

(the parameter is enabled for two-path instruments only)  
The LO signal of path A (master) is coupled to path B.

**Note:**

*Selection of LO Coupling **Coupled A->B** mode, disables all parameters of the SOURCE-FREQUENCY Subsystem of the other path.  
The frequency of path A will be set to the smaller of both frequencies of path A and B.*

**ECOuplec**

(the parameter is enabled for two-path instruments only)

An external signal is input on the LO IN connector and used for the coupled paths A and B.

**Note:**

*Selection of LO Coupling **External Coupled A->B** mode, disables all parameters of the SOURCE-FREQUENCY Subsystem of both paths.*

**Example:**

"FREQ:LOSC:MODE ECO"

'sets the LO coupling mode to External Coupled A->B.

*RST value	Resolution	SCPI
INT	-	Compliant

**SOURCE-FREQUENCY - LO Coupling Out State**

**[SOURCE:]FREQUENCY:LOSCillator:OUTPUT:STATE ON | OFF**

Switches on/off the LO output.

**Example:**

"FREQ:LOSC:OUTP:STAT ON"

'switches on the LO output state.

*RST value	Resolution	SCPI
OFF	-	Compliant