

BERTScope Option XSSC

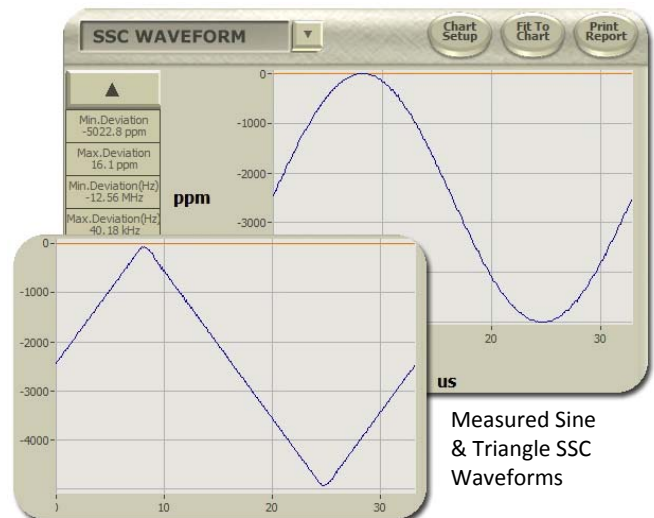
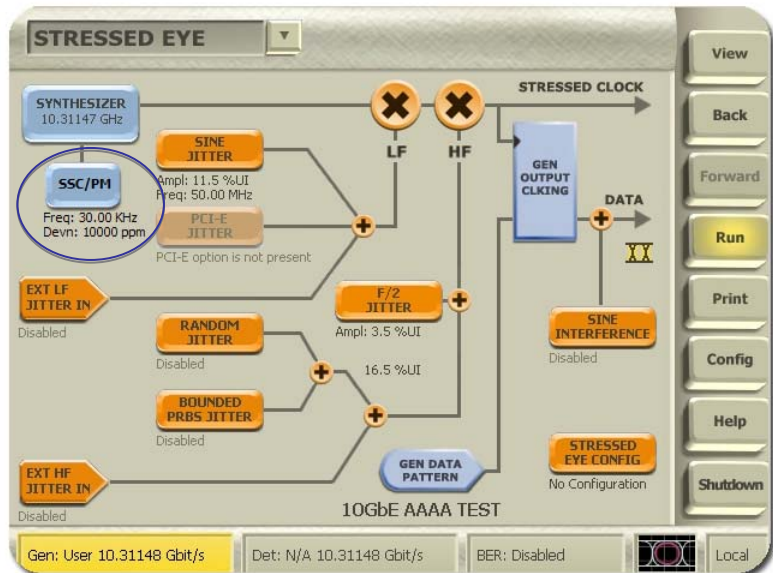
Extended Sinusoidal Jitter & SSC Generation

Option XSSC for the BERTScope family adds the following capabilities, beyond those available in BERTScope S models:

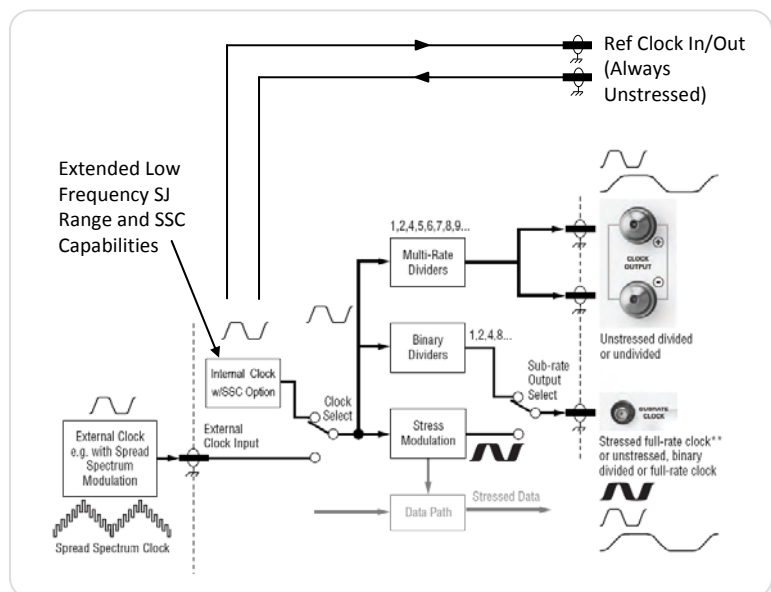
- Higher amplitudes of sinusoidal jitter at lower modulation frequencies allow full compliance testing of jitter tolerance and transfer, as well as generation with BERTScope DCRj for SONET/SDH. In addition, full jitter tolerance compliance testing for XAUI, XFP telecom, and CEI telecom ingress and egress is provided.
- Broader range of frequencies and amplitudes of Spread Spectrum Clocking (SSC) modulation capabilities.
- Expanded rear panel reference clock frequencies:
 - 10, 100, 106.25, 133.33, 156.25, 166.67, 200 MHz, for phase locking to other systems, or supplying a clock for target devices.
- Front panel clock and substrate clock outputs will be phase modulated when low frequency SJ is enabled, rear panel reference interfaces are not.

Increased Capabilities to Make Your Testing Easier

Existing telecoms standards and some emerging serial bus standards have sinusoidal jitter (SJ) requirements for receiver interference tolerance testing that go beyond the standard capabilities of BERTScope S models. With this in mind, Option XSSC significantly increases both the low frequency SJ range, and also enhances the spread spectrum clocking (SSC) modulation available. Option XSSC meets or exceeds the requirements of existing SJ tests, and is able to apply SSC simultaneously with high frequency SJ. In addition, the capabilities of the rear panel reference input & output have been enhanced, allowing the BERTScope to be frequency locked to a number of rates in addition to 10 MHz, and to be able to supply a high quality reference output appropriate for several common system clocks.



Measured Sine & Triangle SSC Waveforms



Low Frequency SJ

The new low frequency SJ capability varies in maximum modulation amplitude range, depending upon clock rate. The graph shows the available range from 6.0 to 12.5 GHz. For clock frequencies lower than this, the SJ maximum amplitude at a given modulation frequency must be scaled down by the value of 'n' given in Table 1.

For reference, the high frequency SJ range (UI) available from the standard BERTScope S is shown in Table 2.

SJ modulation frequencies higher than 100 MHz may be obtained by using the Sinusoidal Interference output on the rear of the instrument, and feeding it to the Jitter Insertion Input on the front panel. This allows SJ from 100 MHz to at least 1 GHz.

Example jitter tolerance SJ requirements met or exceeded:

- SONET - OC-192, OC-48, OC-12
- SDH - STM-64, STM-16, STM-4
- Fibre Channel – 1x, 2x, 4x, 8x, 10x
- Ethernet – 1GbE, XAUI, 10GBASE-R, 10GBASE-KR etc.
- SATA 1.5, 3, 6 Gb/s
- SAS 1.5, 3, 6 Gb/s
- FB-DIMM, FB-DIMM-2
- PCI-Express
- OIF-CEI 6G, 11G
- USB 3.0
- XFP MSA
- DVI

Examples are shown in graphs on the following pages.

Available low frequency SJ range

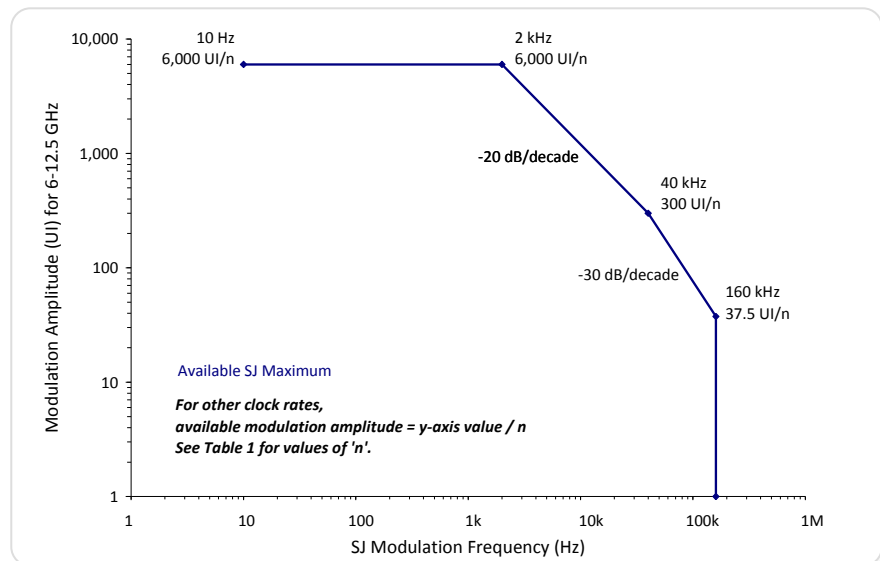
Table 1: Available Low Frequency SJ Range (UI) Available with Option XSSC

Clock Frequency (GHz)	n	Max. UI at modulation freq. 10 Hz to 2 kHz	Max. UI at modulation freq. 40 kHz	Max. UI at modulation freq. 160 kHz
6.0 – 12.5	1	6000	300	37.5
3.0 – 5.99	2	3000	150	18.75
1.5 – 2.99	4	1500	75	9.375
0.75 – 1.49	8	750	37.5	4.6875
0.375 - 0.749	16	375	18.75	2.3475
0.1875 - 0.3749	32	187.5	9.375	1.1875
0.100 - 0.18749	64	93.75	4.6875	0.5859375

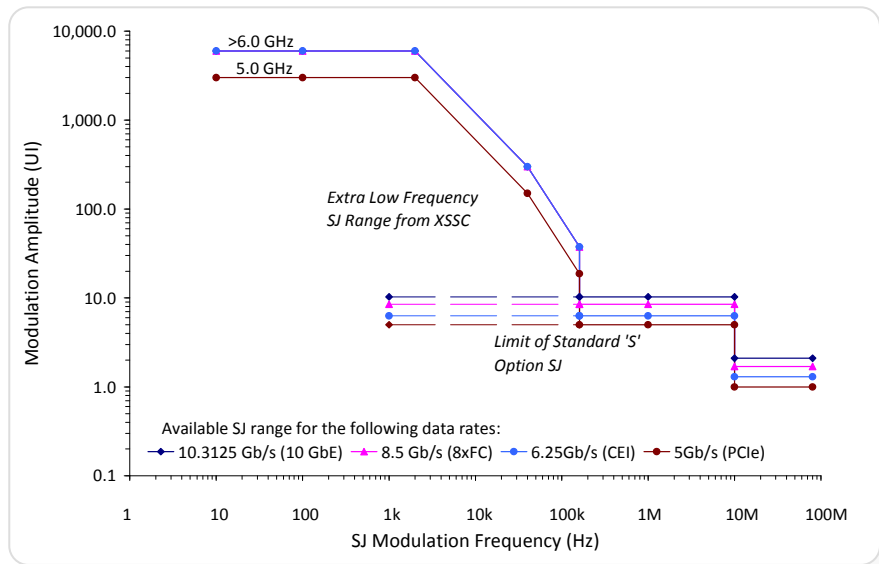
Table 2: Minimum available SJ in standard BERTScope S models

Data Rate (Gb/s)	Internal SJ Frequency Range		
	1 kHz - 10 MHz	10 MHz - 80 MHz	80 - 100 MHz
10.313	10.3	2.1	1.1
9.9545	10.0	2.0	1.0
8.5	8.5	1.7	0.9
6.25	6.3	1.3	0.7
6	6.0	1.2	0.6
5	5.0	1.0	0.5
4.25	4.3	0.9	0.5
3.125	3.1	0.6	0.3
3	3.0	0.6	0.3
2.5	2.5	0.5	0.3
2.4883	2.5	0.5	0.3
2.125	2.1	0.4	
1.5	1.5	0.3	

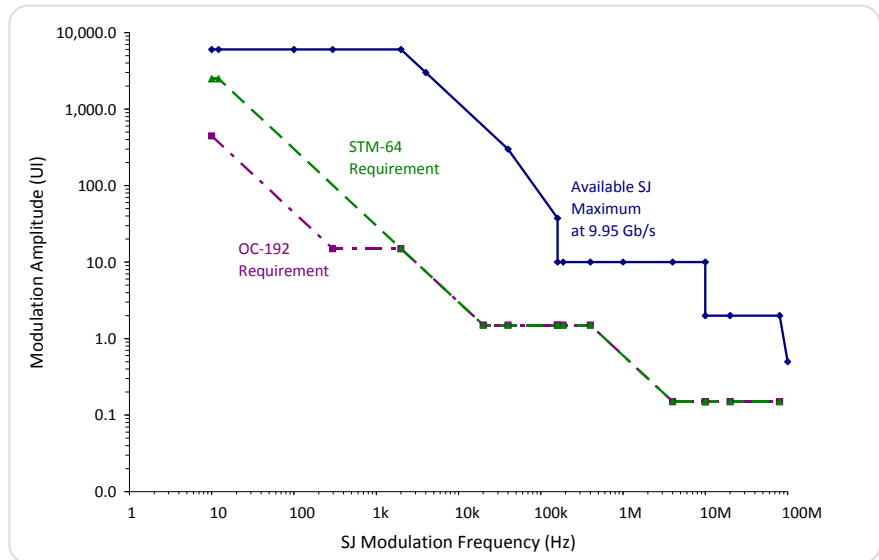
SJ adjustable from 0 UI to levels greater than or equal to range in table



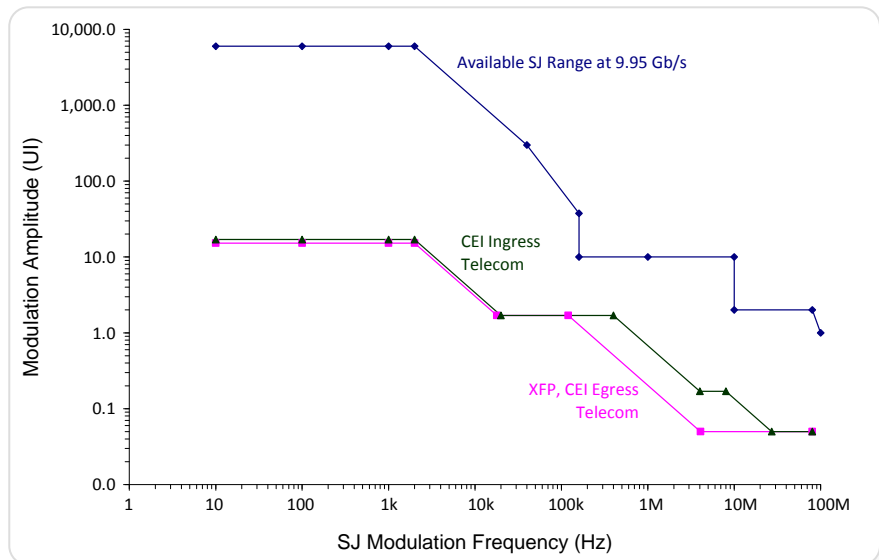
Available SJ ranges at selected data rates.



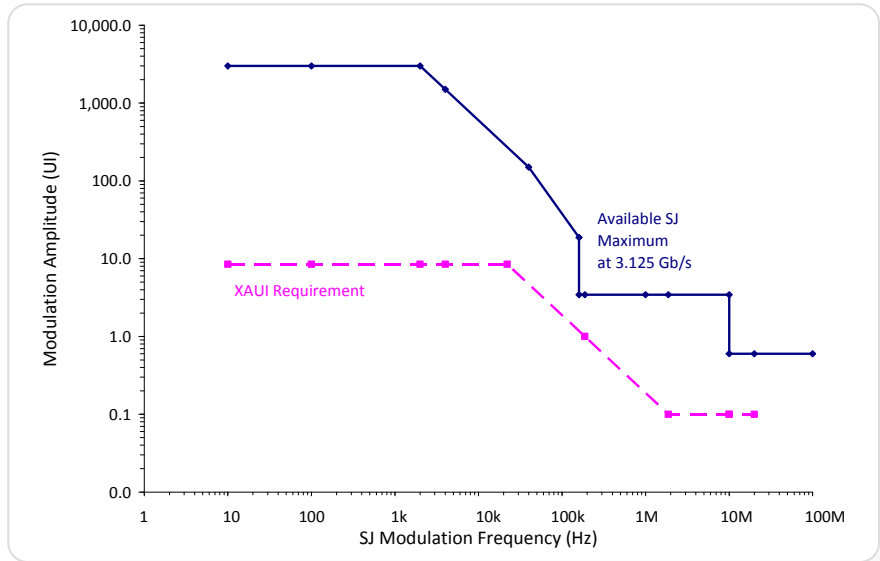
Telecom



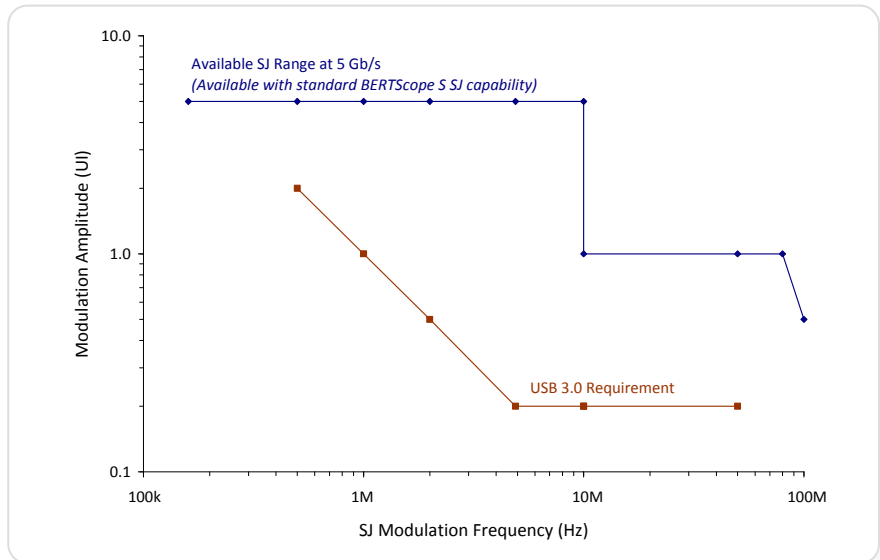
XFP, CEI 11G



XAUI



USB 3.0

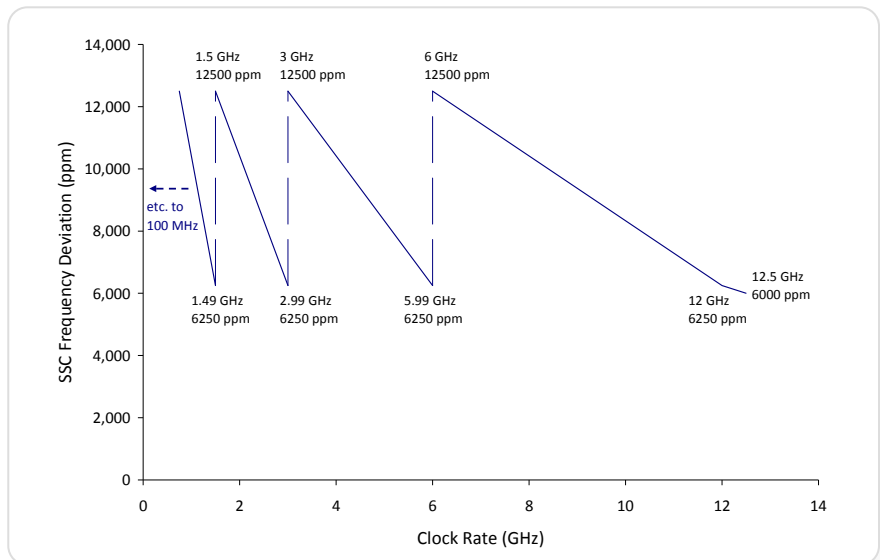


SSC Deviation

The graph, right, shows the maximum SSC frequency deviation magnitudes for a range of clock frequencies for SSC modulation frequencies from 20 – 40 kHz.

The SSC frequency deviation from 6-12 GHz is also available as the clock range is divided by 2ⁿ, down to a lower clock frequency of 100 MHz.

For SSC modulation frequencies higher than the calibrated range of 20-40 kHz, the available deviation magnitude is reduced. For example, at 160 kHz, the available range is divided by 2.



Specifications

Parameter	Min	Max	Typical	Units	Notes
Operating Temperature Range	0	40		°C	
Spread Spectrum Clocking (SSC)					
Clock Frequency Range	0.1	12.5		GHz	Capable of entire bit rate range of BERTScope model; BSA 12500B example given.
Clock Frequency resolution			1	Hz	
SSC Frequency (Calibrated)	20	40		kHz	
SSC Frequency (Uncalibrated)	40	160		kHz	Available frequency deviation reduces above 40 kHz to approximately half at 160 kHz.
SSC Frequency Deviation Magnitude					Values given for 6 – 12.5 GHz clock. The SSC frequency deviation from 6-12 GHz is also available as the clock range is divided by 2 ⁿ , down to a lower clock frequency of 100 MHz. See graph on page 4.
6 GHz clock, 20 - 40 kHz SSC modulation frequency		12,500		ppm	
12 GHz clock, other conditions as above.		6,250		ppm	
12.5 GHz clock, other conditions as above.		6,000		ppm	
SSC Modulation Type					Down-Spread, Up-Spread, Center-Spread (Same range for each).
SSC Frequency Resolution			1	Hz	
SSC Amplitude Resolution			1	ppm	
SSC Amplitude Accuracy			2	%	Within calibrated modulation freq. range
SSC Modulation Waveforms Supported					Triangle to 40 kHz, Sinusoidal
BERTScope Outputs Impacted					Clock, Data, Sub-Rate Clock, Trigger
Stress Impairment Availability					Stresses available simultaneously when SSC is switched on, including high frequency SJ, excluding phase modulation.
Phase Modulation (Low Frequency SJ)					
Modulation Frequency	0.01	160		kHz	Operation range in addition to high frequency SJ range available in BERTScope S.
Modulation Waveform					Sine
Modulation Frequency Resolution			1	Hz	
Modulation Amplitude Resolution			0.01	UI	UI = Unit Interval of clock frequency
Modulation Amplitude Accuracy			2	%	
BERTScope Outputs Impacted					Clock, Data, Sub-Rate Clock, Trigger
Modulation Range					See Table 1, Page 2

Reference Input & Output Specifications

Parameter	Min	Max	Typical	Units	Notes
Reference Input (Rear Panel Connector)					
Supported Input Frequencies			10, 100, 106.25, 133.33, 156.25, 166.67, 200	MHz	Input frequency tolerance ± 1000 ppm
Input Level	-6	+6		dBm	50 Ω SMA female, AC coupled. Equates to $\sim 325 - 1,250$ mV pp
Reference Output (Rear Panel Connector)					
Supported Output Frequencies					As Reference Input
Output Level			+4	dBm	50 Ω SMA female, AC coupled. Equates to ~ 1 V pp

Ordering Information:

BSA7500B Opt-XSSC	Add Extended Spread Spectrum Clocking (SSC) to BSA 7500B
BSA12500B Opt-XSSC	Add Extended Spread Spectrum Clocking (SSC) to BSA 12500B
BSA7500B Up-XSSC	Upgrade BSA7500B to Extended Spread Spectrum Clocking (SSC)
BSA12500B Up-XSSC	Upgrade BSA12500B to Extended Spread Spectrum Clocking (SSC)

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