Last updated: 2 Sep 2021

Phase Noise Conversion to Phase Jitter RMS ps Using Second-Order Filter

Offset Frequency (Hz)	Raw Data (dBc/Hz)	Anti-log of Raw Data	Apply Trapezoidal Rule	Jitter Filter (dB)	Apply Jitter Filter (dB)	Perform Anti-log	Apply Trapezoidal Rule
1,E+01	-115	3,16E-12		-62	-177	2,20E-18	
3,E+01	-120	1,00E-12	4,16E-11	-52	-172	6,25E-18	8,44599E-17
6,E+01	-122	6,31E-13	2,45E-11	-46	-168	1,58E-17	3,30353E-16
1,E+02	-123	5,01E-13	2,26E-11	-42	-165	3,48E-17	1,01152E-15
3,E+02	-125	3,16E-13	8,17E-11	-32	-157	1,98E-16	2,32321E-14
6,E+02	-126	2,51E-13	8,51E-11	-26	-152	6,26E-16	1,23589E-13
1,E+03	-125	3,16E-13	1,13E-10	-22	-147	2,18E-15	5,61457E-13
3,E+03	-126	2,51E-13	5,67E-10	-12	-138	1,48E-14	1,69567E-11
6,E+03	-126	2,51E-13	7,54E-10	-7	-133	5,02E-14	9,75203E-11
1,E+04	-129	1,26E-13	7,54E-10	-4	-133	5,16E-14	2,03666E-10
3,E+04	-128	1,58E-13	2,84E-09	-1	-129	1,37E-13	1,88224E-09
6,E+04	-127	2,00E-13	5,37E-09	0	-127	1,92E-13	4,92718E-09
1,E+05	-130	1,00E-13	5,99E-09	0	-130	9,86E-14	5,80857E-09
3,E+05	-132	6,31E-14	1,63E-08	0	-132	6,30E-14	1,61559E-08
6,E+05	-133	5,01E-14	1,70E-08	0	-133	5,01E-14	1,69552E-08
1,E+06	-135	3,16E-14	1,63E-08	0	-135	3,15E-14	1,63186E-08
3,E+06	-138	1,58E-14	4,75E-08	0	-138	1,55E-14	4,70393E-08
6,E+06	-140	1,00E-14	3,88E-08	0	-140	9,17E-15	3,70113E-08
1,E+07	-141	7,94E-15	3,59E-08	-1	-142	6,35E-15	3,10578E-08
3,E+07	-140	1,00E-14	1,79E-07	-5	-145	3,08E-15	9,43154E-08
6,00E+07	-140	1,00E-14	3,00E-07	-10	-150	1,00E-15	6,11538E-08
1,00E+08	-141	7,94E-15	3,59E-07	-14	-155	3,06E-16	2,61102E-08

Enter Carrier Frequency and Jitter Filter Cutoff Frequencies Below:

Carrier (Hz) =	155520000	Hz
Filter Pole 1 =	12000	Hz
Filter Pole 2 =	20000000	Hz

This spreadsheet applies to jitter filters of type:

As/((s+w1)(s+w2)) | where A is DC gain

UNFILTERED Phase Jitter: (Columns A-D)

Integration =	1,027E-06	
Phi (rms rad) =	1,433E-03	
Phase Jitter (rms s) =	**1,466E-12**	This is the RMS phase jitter in seconds from the raw data (before applying jitter filter)

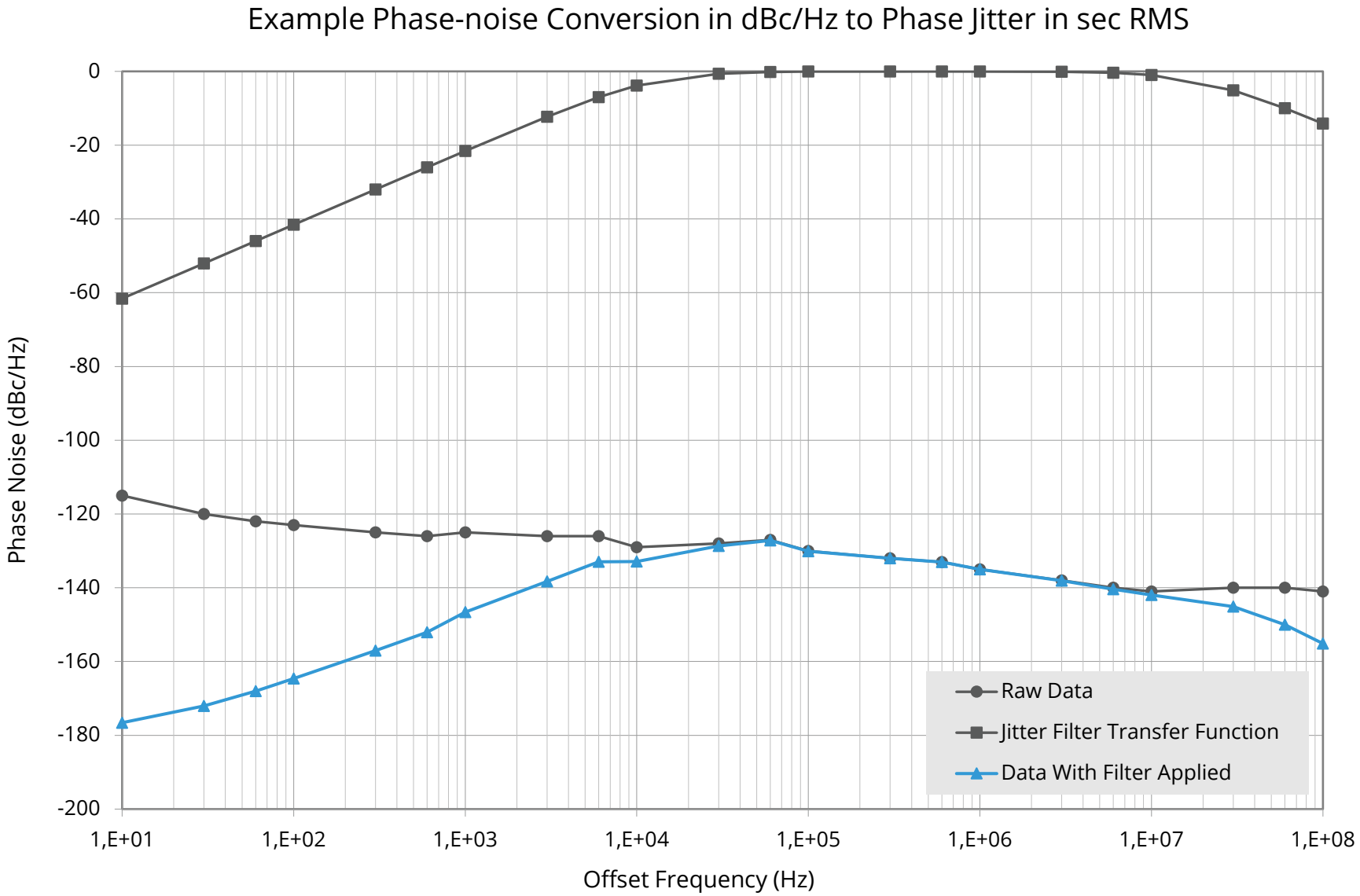
FILTERED Phase Jitter: (Columns A-J)

Integration =	3,591E-07	
Phi (rms rad) =	8,474E-04	
Phase Jitter (rms s) =	**8,672E-13**	This is the RMS phase jitter in seconds after applying the jitter filter to the raw data

INSTRUCTIONS:

For LARGE data sets (hundreds of offset frequencies)
1. Obtain measured (x,y) data as (offset frequency, dBc/Hz)
2. Remove spurs in measured (x,y) data
3. Copy & paste this (x,y) data into columns A and B, starting with row 8
4. Fill Down columns C-J to include all rows of measured data
5. Change cells O8 to O10 to desired carrier frequency and jitter filter corner frequencies.
6. Integrated results are shown in cells O19 (unfiltered) and O26 (filtered)
7. View graphed results by clicking in the "Graph" tab below

Note: This spreadsheet calculator assumes the entered data accurately represents a piecewise linear fit to the actual plotted data on a LINEAR-LINEAR scale. Breaking this assumption causes the Trapezoidal Rule to introduce error that over-estimates the resulting integrated phase jitter result. This means the entered data should have many closely spaced data points. The data shown above is just for example to illustrate the mechanics of the calculator.


Example Phase-noise Conversion in dBc/Hz to Phase Jitter in sec RMS
Phase Noise (dBc/Hz)
0
-20
-40
-60
-80
-100
-120
-140
-160
-180
-200
1,E+01
1,E+02
1,E+03
1,E+04
1,E+05
1,E+06
1,E+07
1,E+08
Offset Frequency (Hz)
Raw Data
Jitter Filter Transfer Function
Data With Filter Applied