SDRplay

Radio Spectrum Processor

SDRplay combines a flexible tuner front-end and USB bridge creating an SDR platform to allow demodulation to take place on the host processor. An open API allows the end user to create demodulators or applications around the platform. This technical information note outlines some of the main specifications of the SDRplay module.

RF Tuning Range

The RF tuning range of the SDRplay module is detailed below. Note there is a frequency gap in coverage between 380MHz and 430MHz and whilst most units will provide some coverage in this region, these are the guaranteed frequency coverage limits

- 0.1MHz – 380MHz
- 430MHz – 2000MHz

Front End Filtering

The front end is protected by a series of passive RF filters. These filters are automatically selected based on the RF frequency programmed. The filter ranges are shown below

- 12 MHz Low Pass Filter
- 12 – 30 MHz Band Pass Filter
- 30 – 60 MHz Band Pass Filter
- 60 – 120MHz Band Pass Filter
- 120 – 250 MHz Band Pass Filter
- 250 – 380 MHz Band Pass Filter
- 430 – 1000 MHz Band Pass Filter
- 1000MHz High Pass Filter

Connectivity

- Single SMA RF connector
- High Speed USB 2.0 socket (type B)

Intermediate Frequencies

The SDR play module supports the following intermediate frequencies

- Zero IF
- 450 kHz IF
- 1.620 MHZ IF
- 2.048 MHz IF

IF Bandwidths

The following IF filter bandwidths are supported

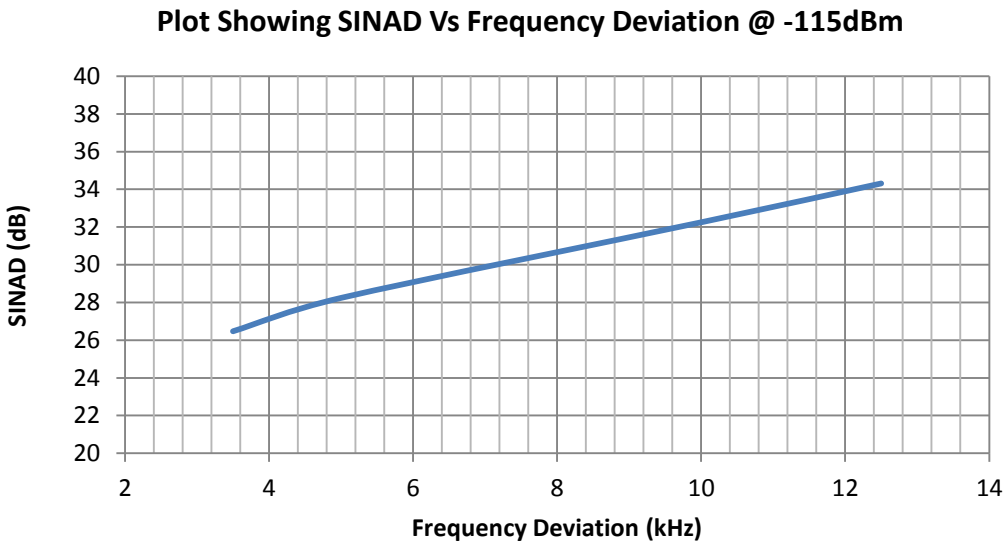
- 200 kHz
- 300 kHz
- 600 kHz
- 1.536 MHz
- 5.000 MHz
- 6.000 MHz

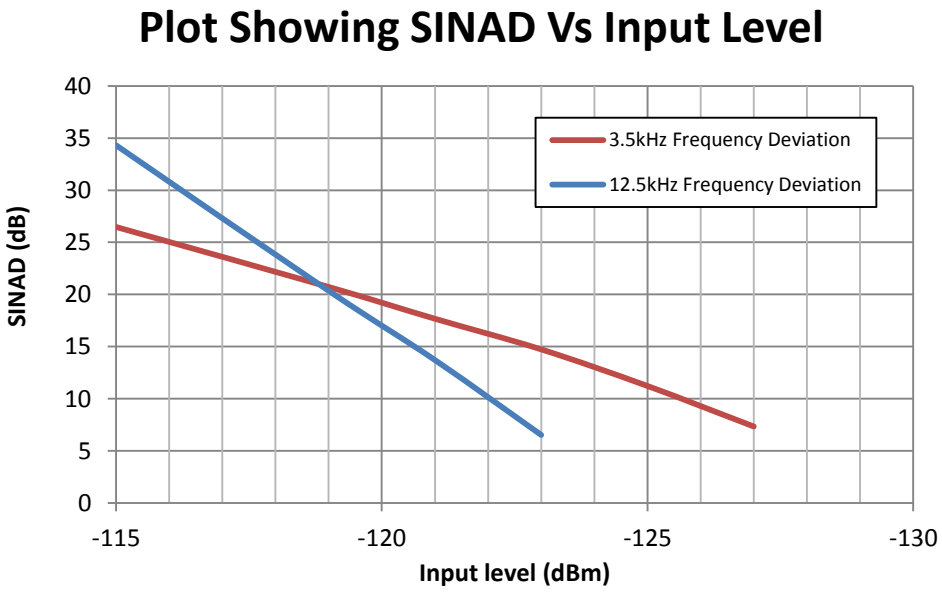
ADC Characteristics

- 12 bit native ADC
- Sample Frequency 2MSPS – 10.66MSPS
- 10.4 ENOB
- 60dB SNR
- 67dB SFDR

Narrow Band FM Characteristics

The plots below show the narrow band FM characteristics of the SDRplay module. The plots show the SINAD performance for different narrow band FM frequency deviations. In addition the SINAD Vs Input level is also shown. These measurements are taken at 145MHz





Gain, Noise Figure and IIP3

Frequency (MHz)	MSi001 LNA & Mixer High Gain Mode			MSi001 LNA Low Gain Mode			MSi001 LNA & Mixer Low Gain Mode			LNA Gain Step	Mixer Gain Step
	Gain	Noise Figure	IIP3 Point	Gain	Noise Figure	IIP3 Point	Gain	Noise Figure	IIP3 Point		
60	110.77	6.17	-15.55	87.35	23.12	7.53	68.35	39.05	7.36	23.43	19.00
72	111.91	4.32	-15.42	88.19	21.64	8.13	69.22	35.82	8.22	23.72	18.96
84	111.88	4.23	-15.16	88.24	21.54	8.48	69.26	35.90	8.24	23.64	18.98
96	111.74	4.09	-15.24	87.99	21.45	8.12	69.04	36.00	8.19	23.75	18.95
108	111.21	4.19	-14.98	87.78	21.69	8.19	68.84	36.76	8.29	23.43	18.94
119.99	110.92	4.26	-14.92	87.34	21.68	8.40	68.19	36.90	8.41	23.58	19.15

Frequency (MHz)	MSi001 LNA & Mixer High Gain Mode			MSi001 LNA Low Gain Mode			MSi001 LNA & Mixer Low Gain Mode			LNA Gain Step	Mixer Gain Step
	Gain	Noise Figure	IIP3 Point	Gain	Noise Figure	IIP3 Point	Gain	Noise Figure	IIP3 Point		
120	112.24	4.22	-15.34	87.83	18.73	9.20	68.35	28.78	8.89	24.42	19.48
146	112.50	3.50	-15.30	88.29	18.47	9.45	69.22	28.01	8.99	24.21	19.07
172	112.51	3.45	-15.32	88.32	18.37	9.46	69.26	27.89	9.28	24.19	19.05
198	112.26	3.82	-14.91	87.92	18.45	9.56	69.04	28.35	9.30	24.34	18.88
224	111.77	4.17	-14.43	87.48	19.06	9.86	68.84	29.29	9.70	24.29	18.63
249.99	110.95	4.14	-14.14	86.70	19.88	10.04	68.19	30.88	9.95	24.24	18.51

Frequency (MHz)	MSi001 LNA & Mixer High Gain Mode			MSi001 LNA Low Gain Mode			MSi001 LNA & Mixer Low Gain Mode			LNA Gain Step	Mixer Gain Step
	Gain	Noise Figure	IIP3 Point	Gain	Noise Figure	IIP3 Point	Gain	Noise Figure	IIP3 Point		
250	108.13	6.45	-27.75	82.76	23.04	0.86	63.70	40.81	0.42	25.37	19.06
276	106.89	6.57	-27.97	82.28	23.65	0.70	63.20	41.80	0.50	24.62	19.07
302	106.80	5.44	-28.00	82.36	23.57	0.58	63.30	41.68	0.63	24.44	19.06
328	106.94	4.83	-28.10	82.31	23.54	0.39	63.24	41.91	0.79	24.63	19.08
354	106.10	5.19	-27.94	81.51	23.68	0.60	62.40	41.58	0.82	24.59	19.11
380	103.45	6.57	-27.52	79.55	23.35	0.74	60.37	41.09	0.75	23.90	19.18

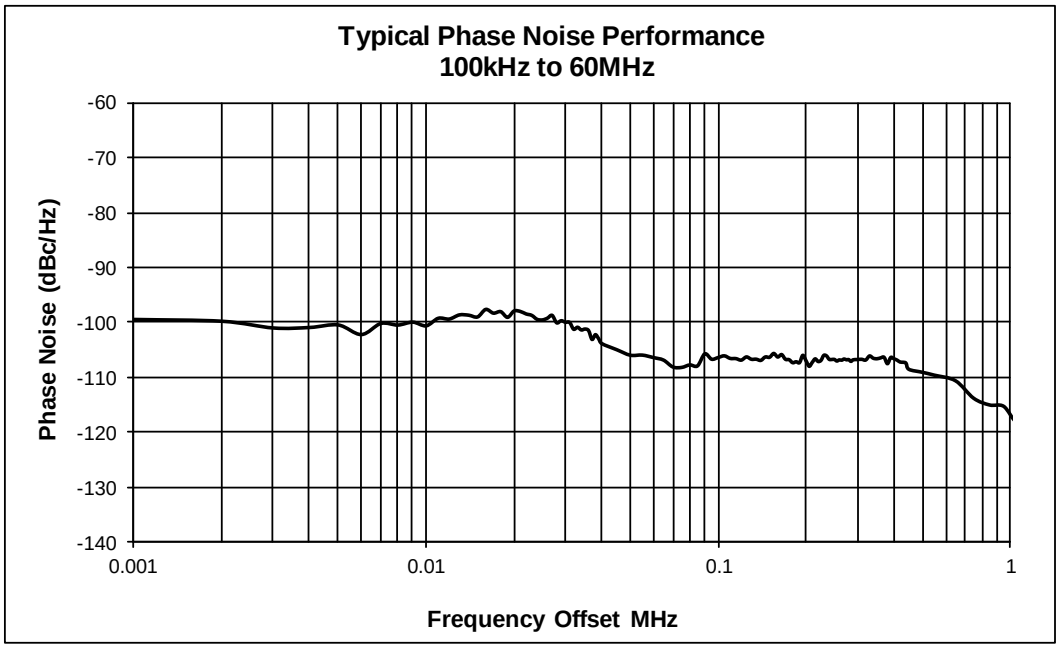
Gain, Noise Figure and IIP3

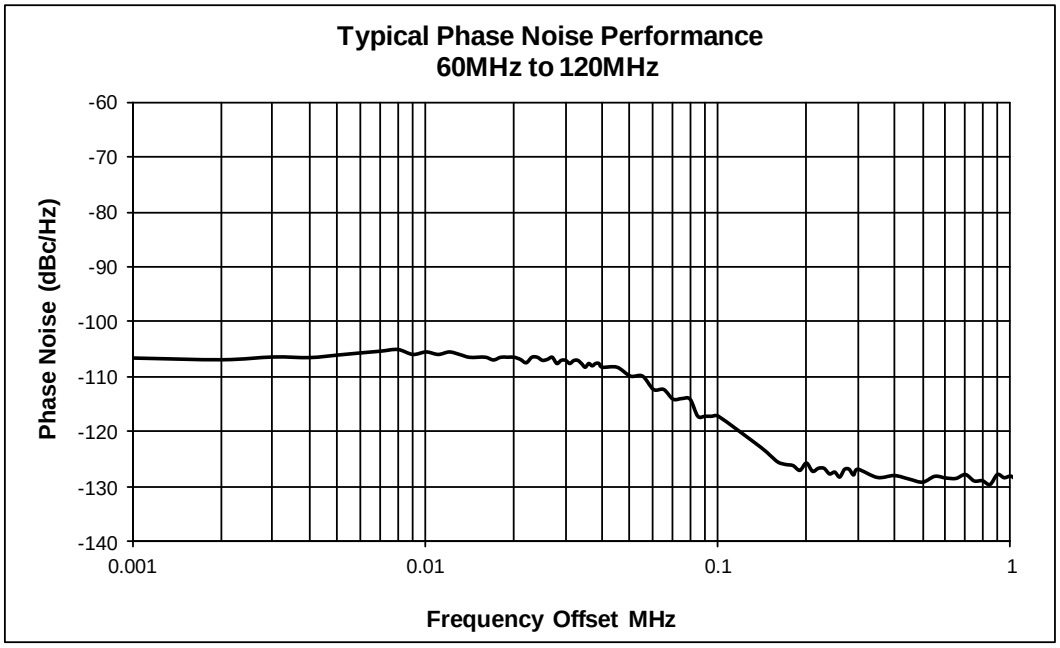
Frequency (MHz)	MSi001 LNA & Mixer High Gain Mode			MSi001 LNA Low Gain Mode			MSi001 LNA & Mixer Low Gain Mode			LNA Gain Step	Mixer Gain Step
	Gain	Noise Figure	IIP3 Point	Gain	Noise Figure	IIP3 Point	Gain	Noise Figure	IIP3 Point		
420	104.49	3.57	-17.96	95.21	5.52	-9.24	75.86	14.72	-9.04	9.28	19.35
480	104.50	3.54	-17.93	94.93	5.51	-9.16	75.59	14.80	-8.93	9.56	19.34
540	104.36	3.40	-17.94	94.95	5.36	-9.08	75.63	14.53	-9.17	9.41	19.32
600	104.67	3.35	-17.85	95.25	5.25	-9.16	75.99	14.22	-9.17	9.42	19.26
660	104.75	3.46	-17.98	95.09	5.37	-9.01	75.78	14.35	-8.95	9.67	19.30
720	104.13	3.59	-17.74	94.27	5.79	-8.71	74.91	15.22	-8.76	9.86	19.36
780	103.06	3.99	-17.63	93.15	6.62	-8.51	73.73	16.46	-8.40	9.91	19.42
840	101.82	4.25	-17.38	92.00	7.25	-8.51	72.52	17.30	-8.33	9.82	19.48
900	101.18	4.84	-17.49	91.38	7.35	-8.64	71.85	17.52	-8.63	9.79	19.53
960	101.44	4.75	-17.77	91.56	7.48	-9.00	72.06	17.34	-8.97	9.88	19.50
999.99	101.49	4.41	-17.92	91.71	7.15	-9.13	72.23	17.04	-9.29	9.78	19.48

Frequency (MHz)	MSi001 LNA & Mixer High Gain Mode			MSi001 LNA Low Gain Mode			MSi001 LNA & Mixer Low Gain Mode			LNA Gain Step	Mixer Gain Step
	Gain	Noise Figure	IIP3 Point	Gain	Noise Figure	IIP3 Point	Gain	Noise Figure	IIP3 Point		
1000	103.76	5.81	-14.25	101.94	7.28	-11.43	82.60	17.93	-11.45	1.82	19.34
1100	105.14	5.19	-14.86	102.87	6.81	-12.07	83.52	15.90	-11.94	2.27	19.35
1200	108.24	3.97	-15.62	105.04	6.08	-13.33	85.66	15.36	-13.00	3.20	19.39
1300	112.21	3.34	-16.93	107.78	4.92	-14.40	88.38	15.01	-14.51	4.43	19.40
1400	113.37	3.43	-16.89	108.62	4.89	-13.91	89.26	14.97	-13.83	4.75	19.36
1500	112.10	3.94	-15.02	107.06	5.65	-12.04	87.65	15.68	-11.84	5.04	19.41
1600	110.29	4.42	-13.75	105.14	6.41	-11.46	85.61	17.10	-11.11	5.16	19.52
1700	109.06	4.23	-13.33	103.94	6.28	-11.00	84.39	17.14	-11.02	5.12	19.55
1800	108.58	4.21	-13.21	103.34	6.13	-10.93	83.81	17.10	-10.84	5.24	19.53
1900	107.62	4.70	-13.19	103.44	6.99	-10.77	83.97	17.05	-10.65	4.18	19.47
2000	104.98	6.38	-13.04	102.16	7.88	-10.75	82.75	18.19	-10.70	2.83	19.41

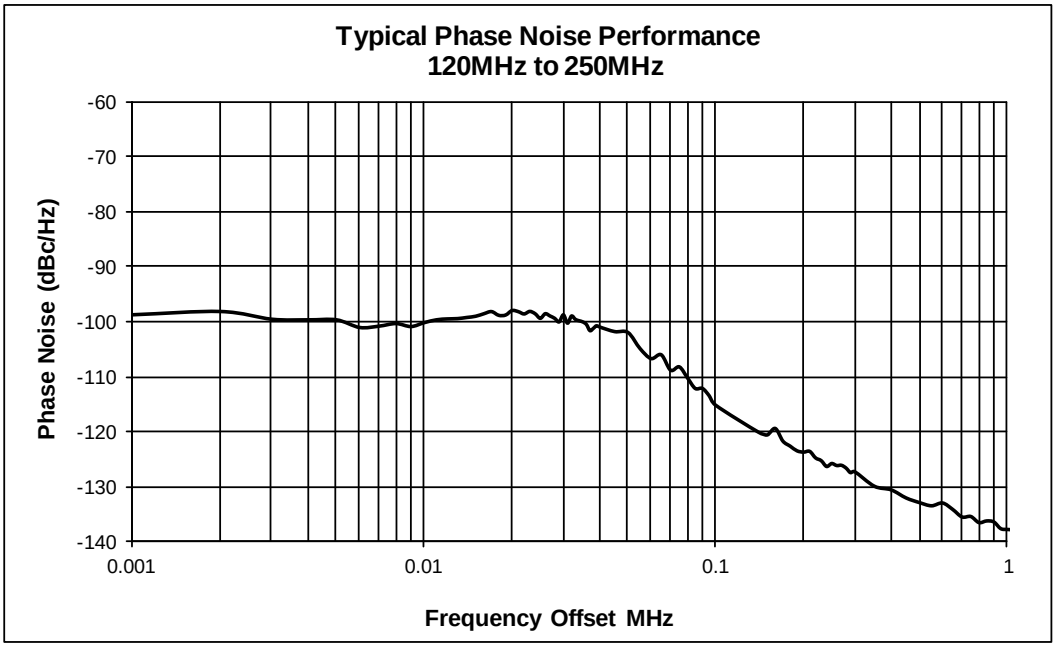
Phase Noise

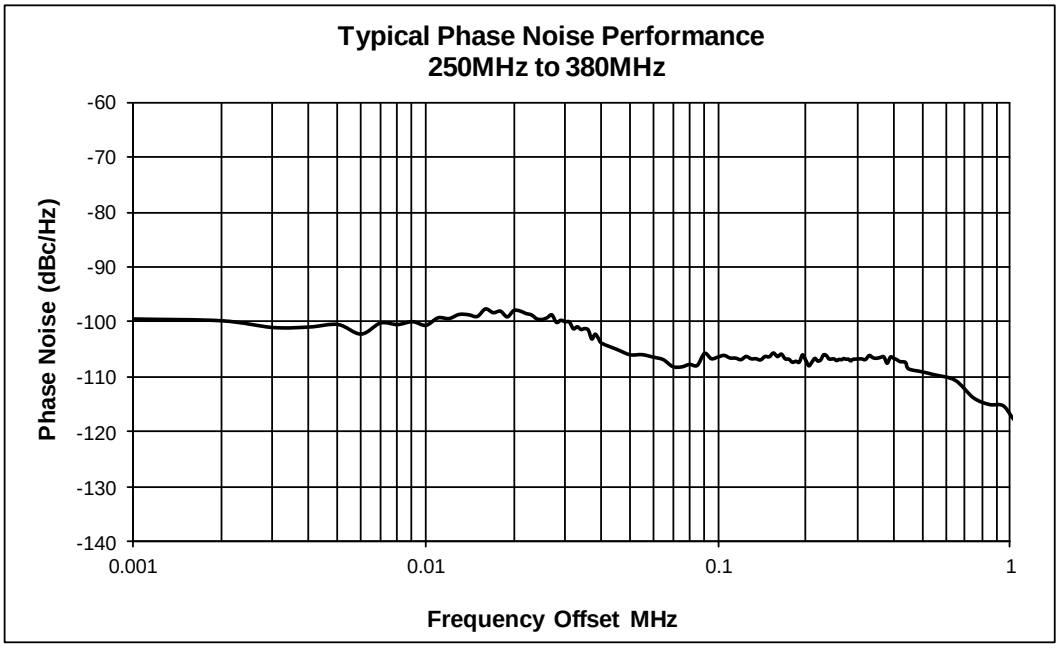
The tables below show typical phase noise plots for the SDRplay module. An example of the phase noise performance for different frequency coverage areas has been considered.



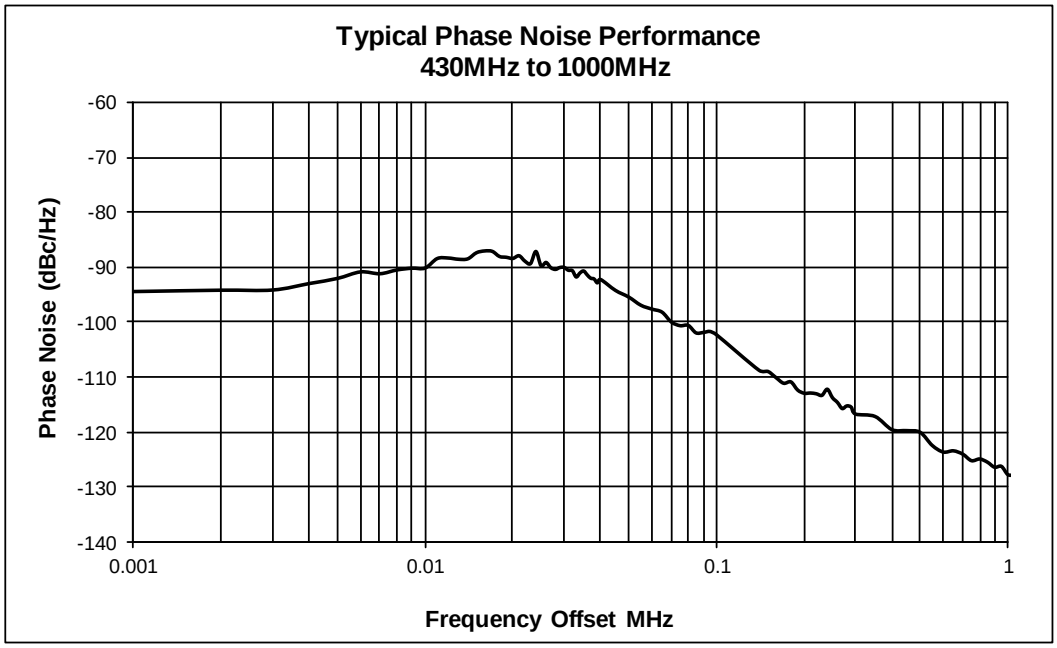


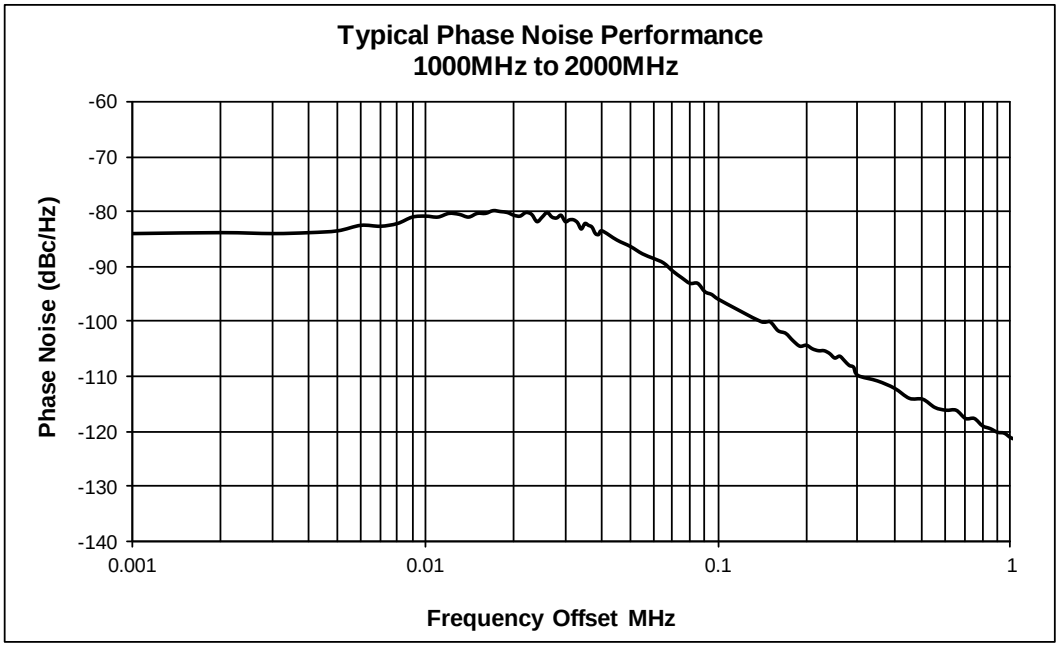
Phase Noise


Typical Phase Noise Performance
120MHz to 250MHz
Phase Noise (dBc/Hz)
-60
-70
-80
-90
-100
-110
-120
-130
-140
0.001
0.01
0.1
1
Frequency Offset MHz


Typical Phase Noise Performance
250MHz to 380MHz
Phase Noise (dBc/Hz)
-60
-70
-80
-90
-100
-110
-120
-130
-140
0.001
0.01
0.1
1
Frequency Offset MHz

Phase Noise

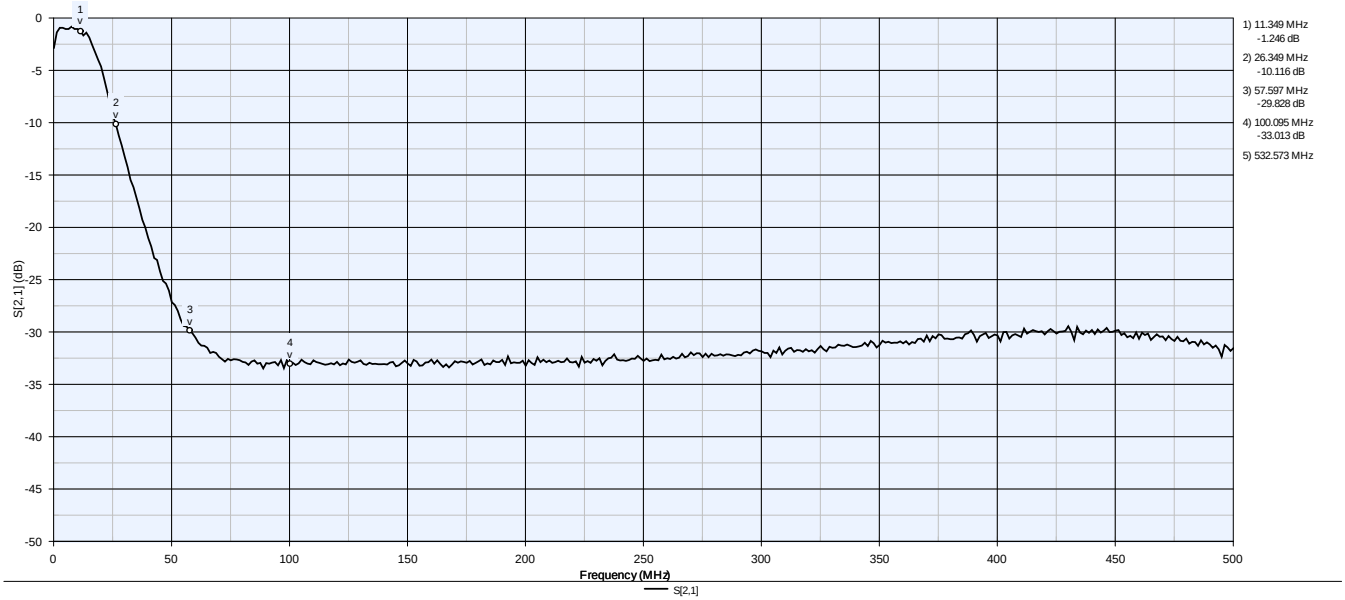

Typical Phase Noise Performance
430MHz to 1000MHz
Phase Noise (dBc/Hz)
-60
-70
-80
-90
-100
-110
-120
-130
-140
0.001
0.01
0.1
1
Frequency Offset MHz


Typical Phase Noise Performance
1000MHz to 2000MHz
Phase Noise (dBc/Hz)
-60
-70
-80
-90
-100
-110
-120
-130
-140
0.001
0.01
0.1
1
Frequency Offset MHz

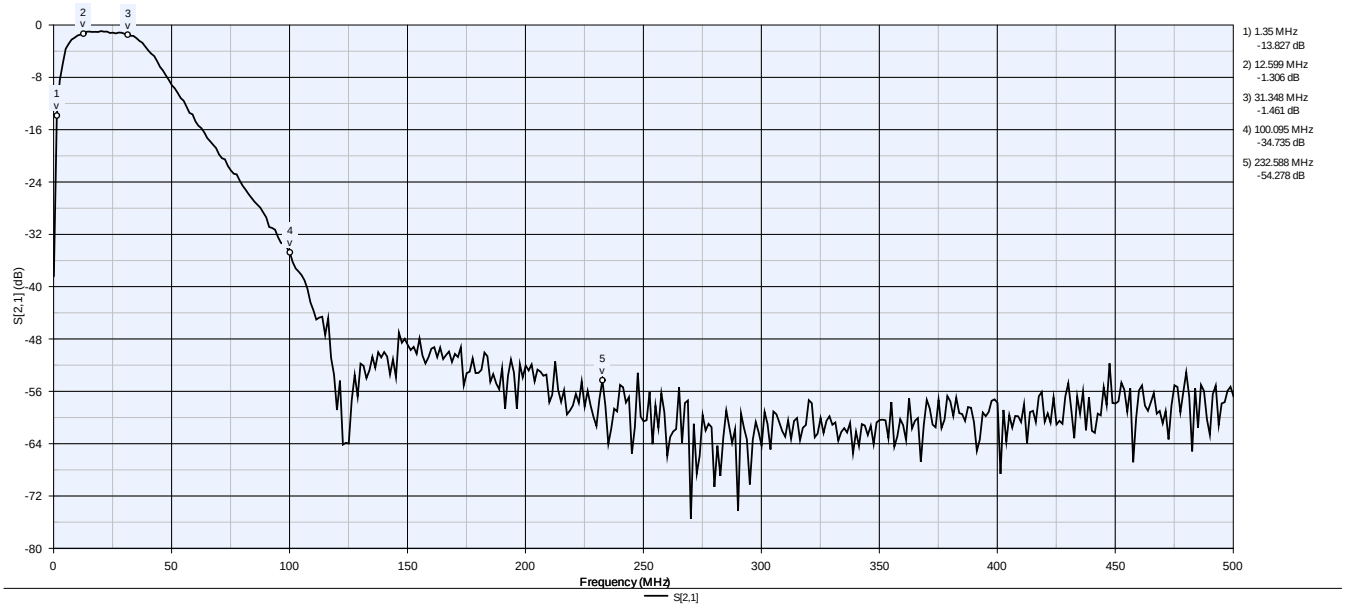
Front End Filtering

The front end is protected by a series of passive RF filters. These filters are automatically selected based on the RF frequency programmed. The frequency response of the different RF filters is shown.

0 – 12MHz Low Pass Filter

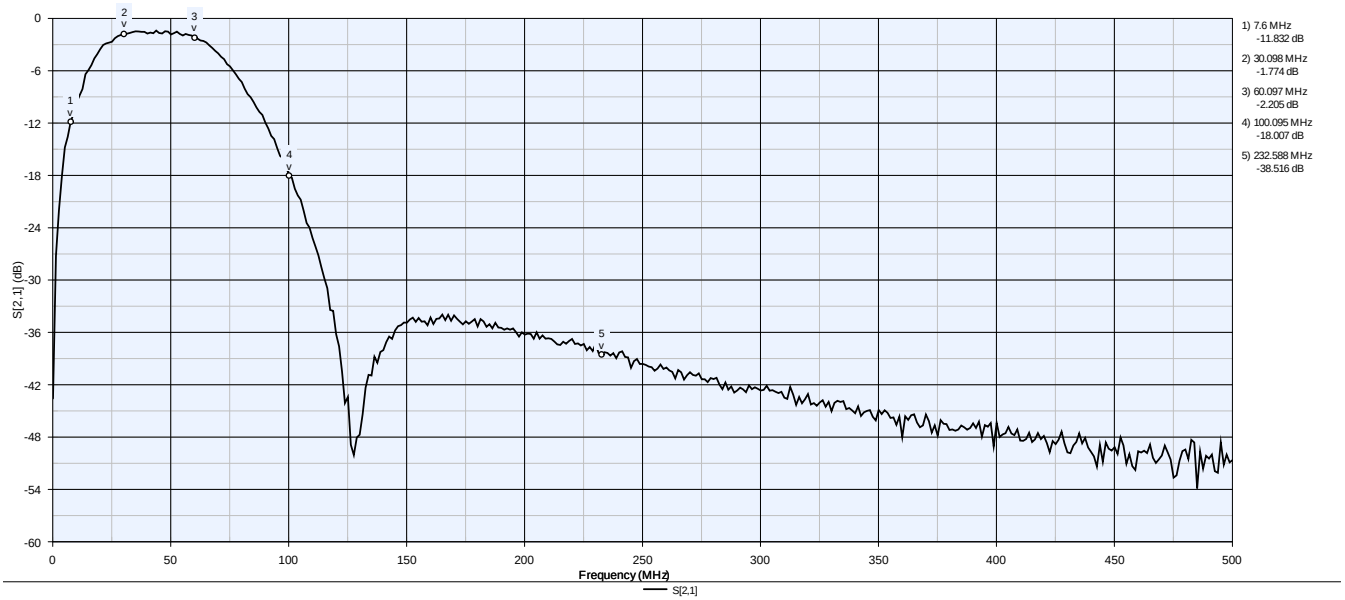


12 - 30MHz Band Pass Filter

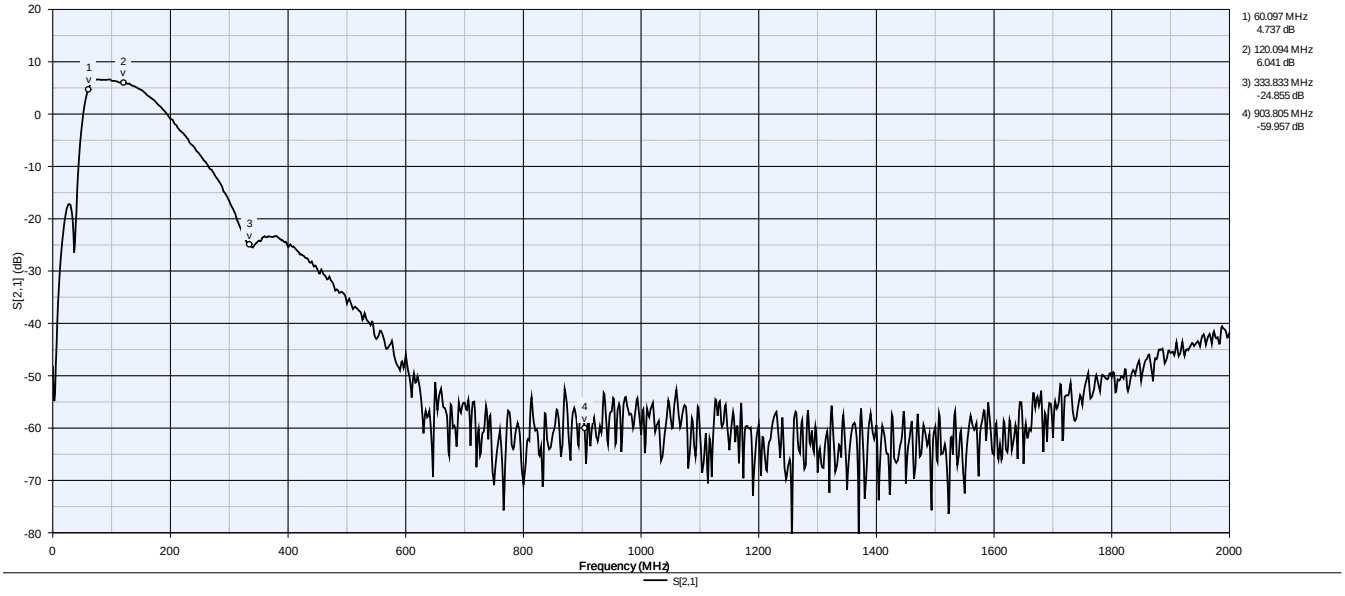


Front End Filtering

30 – 60MHz Band Pass Filter

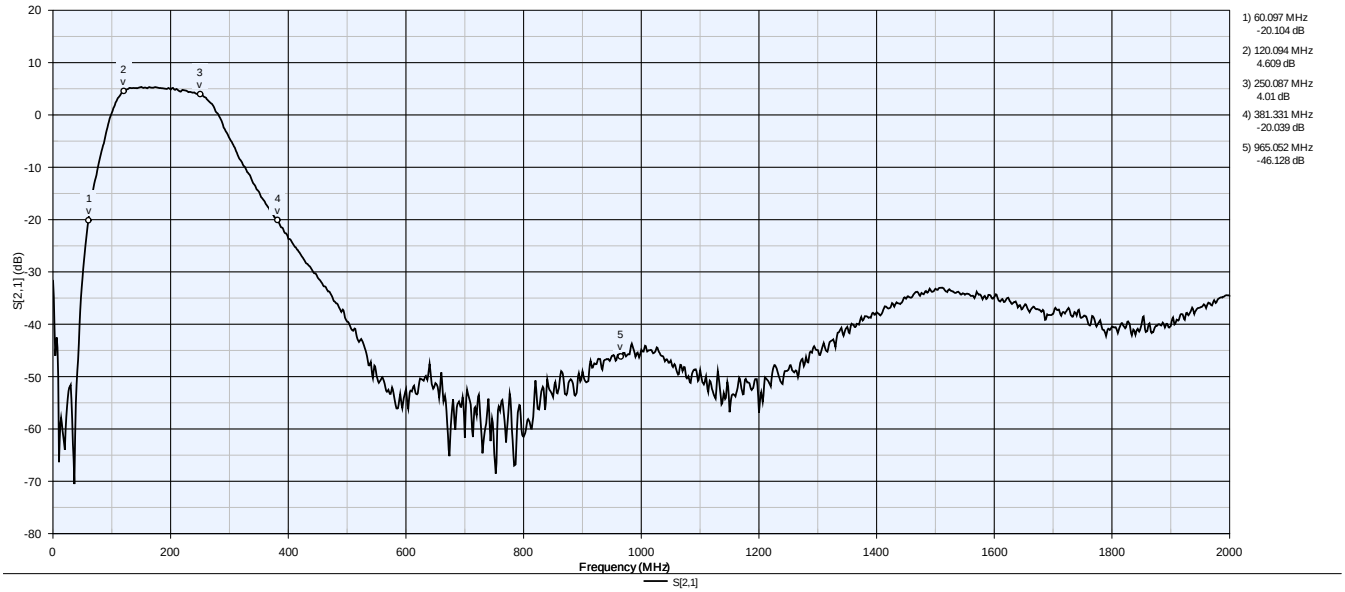


60 - 120MHz Band Pass Filter

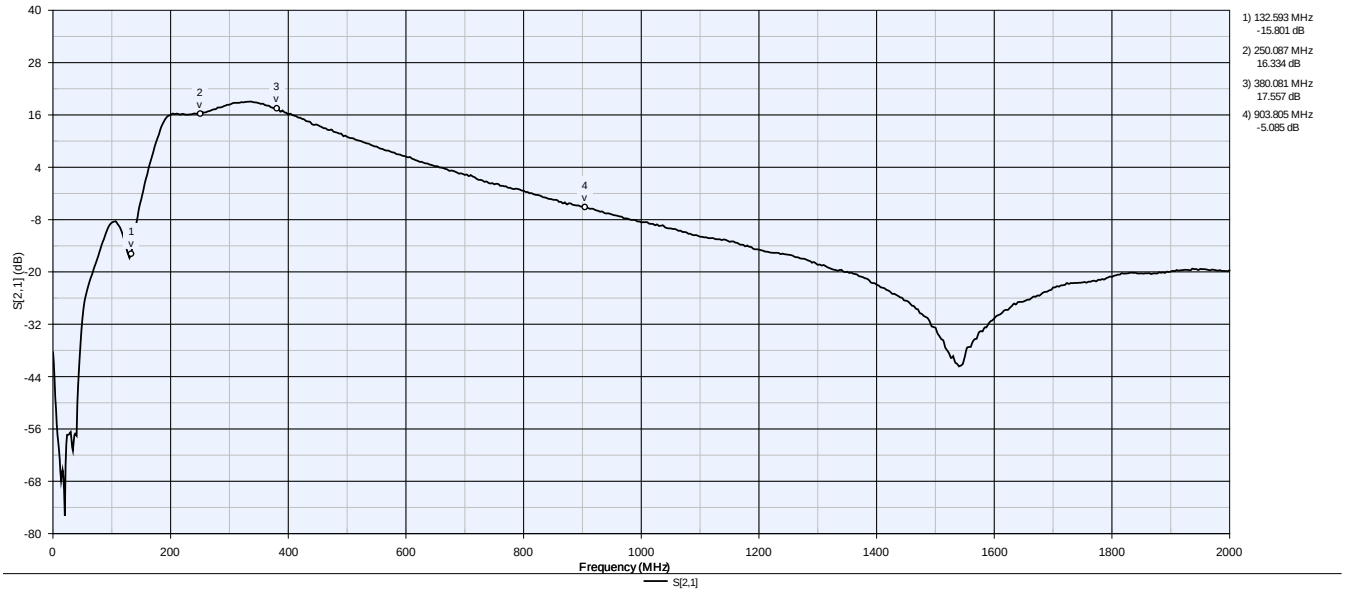


Front End Filtering

120 - 250MHz Band Pass Filter

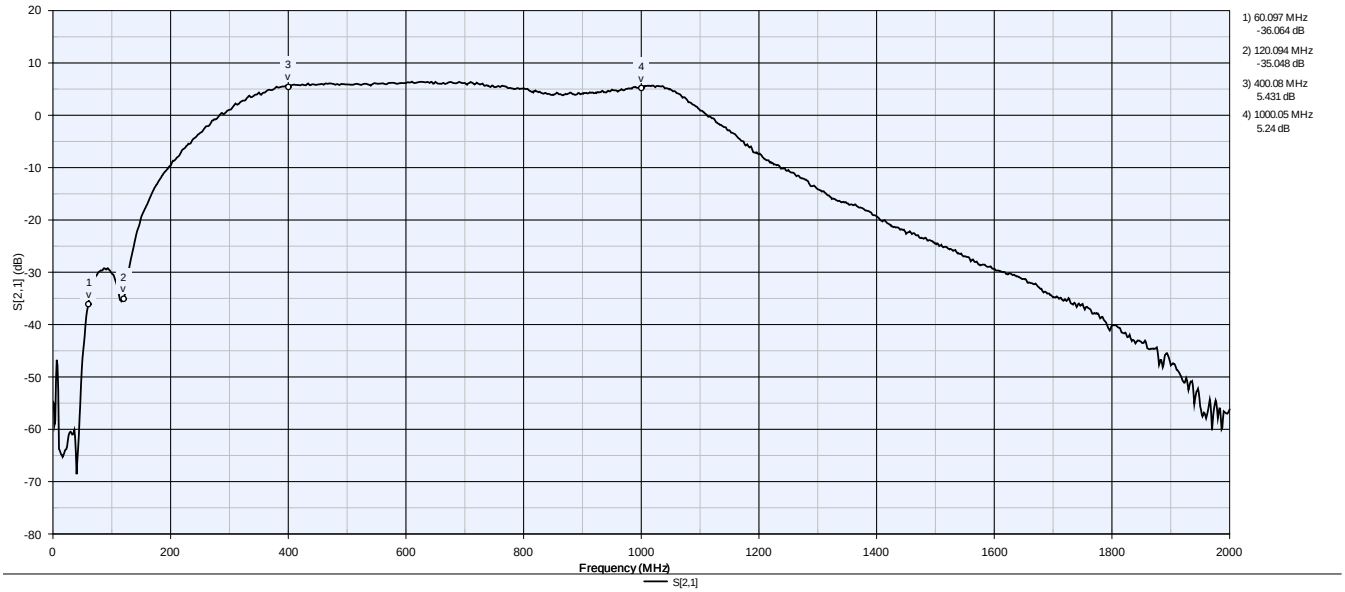


250 - 380MHz Band Pass Filter



Front End Filtering

430 - 1000MHz Band Pass Filter



1000 - 2000MHz Band Pass Filter