Polynomial coefficients

Berkay İPEK

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1 Introduction

In this document, we will analyze calibration coefficients for different cases. As a signal, 2GHz, will be utilized. In each section, a different polynomial and memorial order combination will be considered. Memory order of 3,5 and polynomial order of 3,5,7 will be analyzed. For each possible combination, the magnitude of each coefficients and spectrum waveform will be present. Also, memory with linear polynomials will be applied to each scenario.

Input and output voltage waveform spectrum are shown below

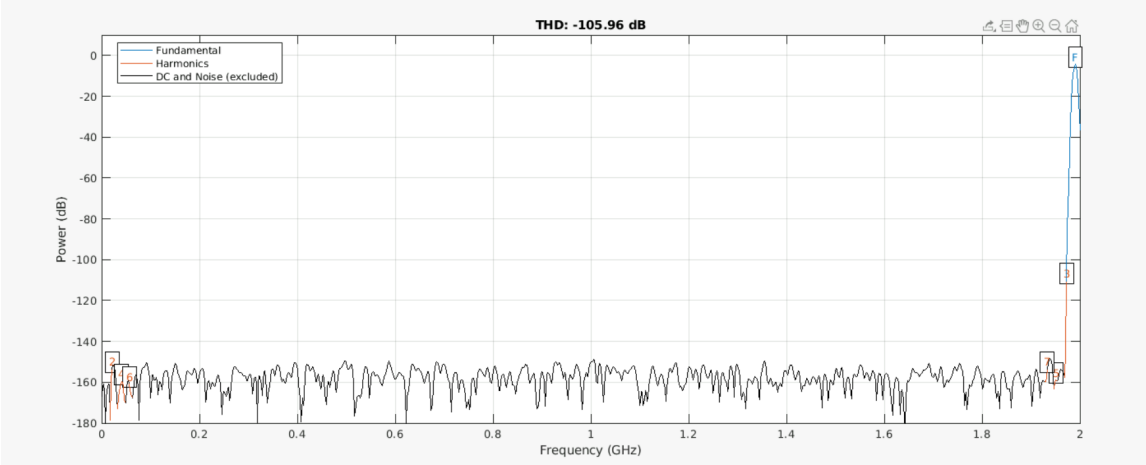

Figure 1: Input Voltage Waveform

Figure 2: Output Voltage Waveform

2 Combinations

2.1 Memory order: 3 and Polynomial order: 3

Norm Coeff	$x(t)$	$x(t)^3$
t	1	-37.7
$t-1$	1.1	-38.1
$t-2$	-0.92	36.6
$t-3$	-1.1	37.1

Table 1: Normalized Polynomial Terms at Different Time Steps

After calibration, the voltage spectrum is as follows:

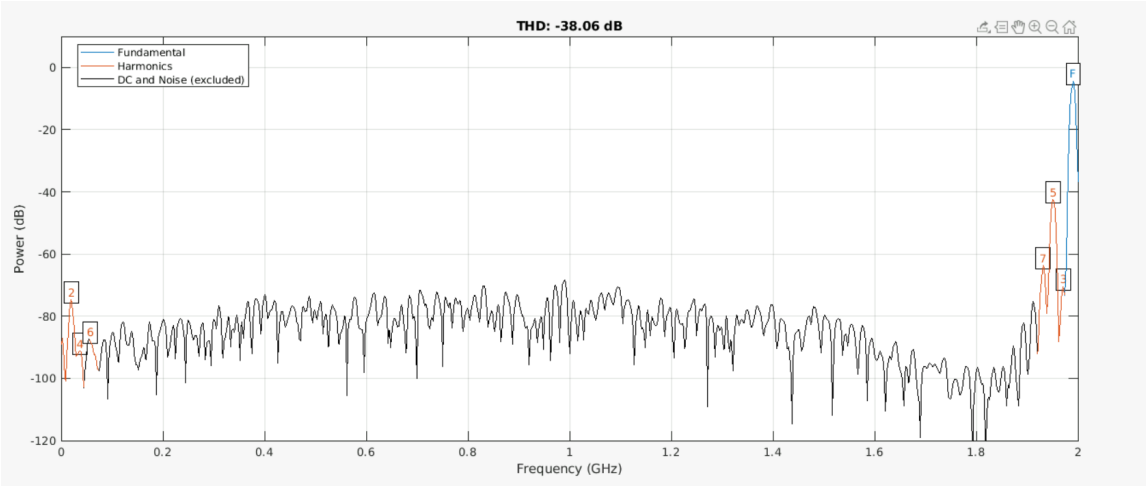

Figure 3: Calibrated Voltage Waveform

THD value is **-38 dB**.

Now, only linear memorial part will be considered.

Norm Coeff	$x(t)$	$x(t)^3$
t	1	0.003
$t-1$	0.001	No-Exist
$t-2$	-0.007	No-Exist
$t-3$	1.2	No-Exist

Table 2: Normalized Polynomial with Linear Memory Terms at Different Time Steps

After calibration, the voltage spectrum is as follows:

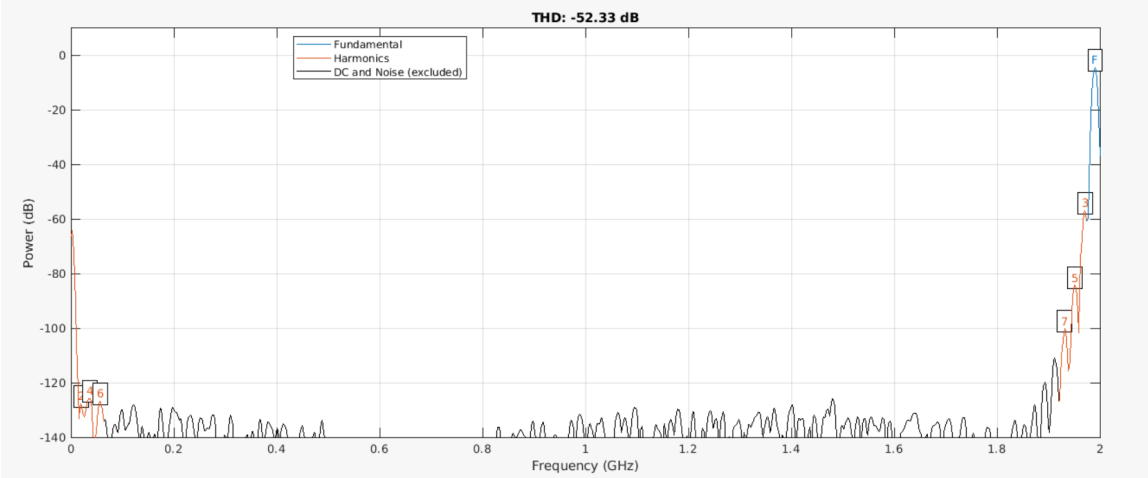

Figure 4: Calibrated Voltage Waveform with linear memory

THD value is **-52.3 dB**.

2.2 Memory order: 3 and Polynomial order: 5

Norm Coeff	$x(t)$	$x(t)^3$	$x(t)^5$
t	1	-37.8	9.4
$t-1$	1.1	-38.2	9.9
$t-2$	-0.9	36.7	-8.4
$t-3$	-1.1	37.3	-8.9

Table 3: Normalized Polynomial Terms at Different Time Steps

After calibration, the voltage spectrum is as follows:

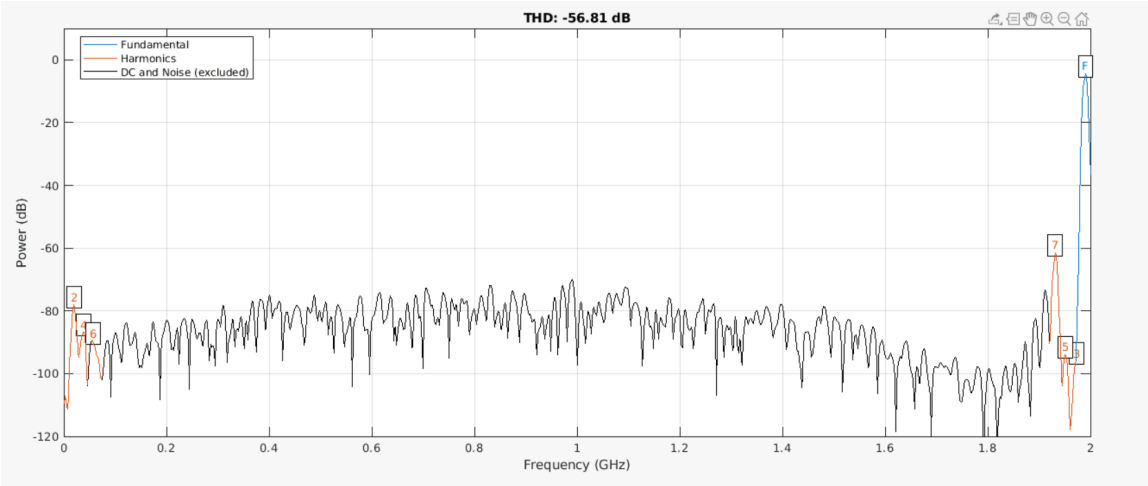

Figure 5: Calibrated Voltage Waveform

THD value is **-56.8 dB**.

Now, only linear memorial part will be considered.

Norm Coeff	$x(t)$	$x(t)^3$	$x(t)^5$
t	1	0.02	-0.002
$t-1$	0.01	No-Exist	No-Exist
$t-2$	-0.008	No-Exist	No-Exist
$t-3$	1.21	No-Exist	No-Exist

Table 4: Normalized Polynomial with Linear Memory Terms at Different Time Steps

After calibration, the voltage spectrum is as follows:

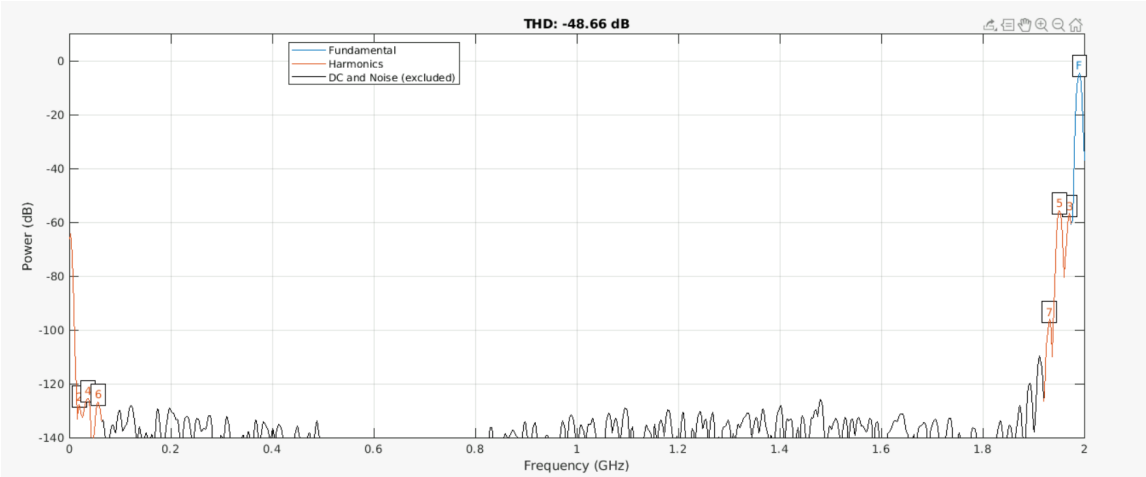

Figure 6: Calibrated Voltage Waveform with linear memory

THD value is **-48.6 dB**.

2.3 Memory order: 5 and Polynomial order: 3

Norm Coeff	$x(t)$	$x(t)^3$
t	1	-37.86
$t-1$	0.93	-31.3
$t-2$	-1.47	57.5
$t-3$	-1.33	43.98
$t-4$	0.57	-21.37
$t-5$	0.4	-14.18

Table 5: Normalized Polynomial Terms at Different Time Steps

After calibration, the voltage spectrum is as follows:

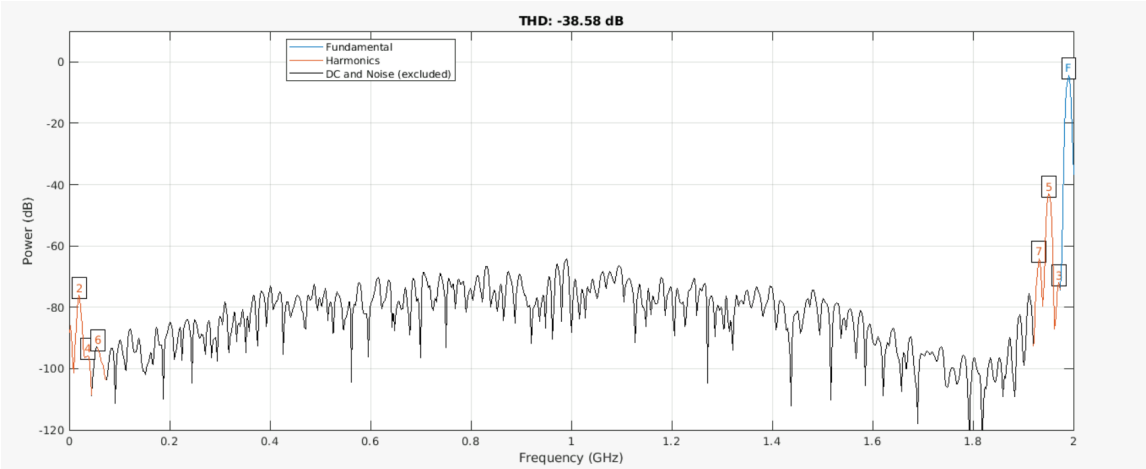

Figure 7: Calibrated Voltage Waveform

THD value is **-38.5 dB**.

Now, only linear memorial part will be considered.

Norm Coeff	$x(t)$	$x(t)^3$
t	1	0.0066
$t-1$	0.0314	No-Exist
$t-2$	-0.0238	No-Exist
$t-3$	0.0164	No-Exist
$t-4$	-0.009	No-Exist
$t-5$	1.35	No-Exist

Table 6: Normalized Polynomial with Linear Memory Terms at Different Time Steps

After calibration, the voltage spectrum is as follows:

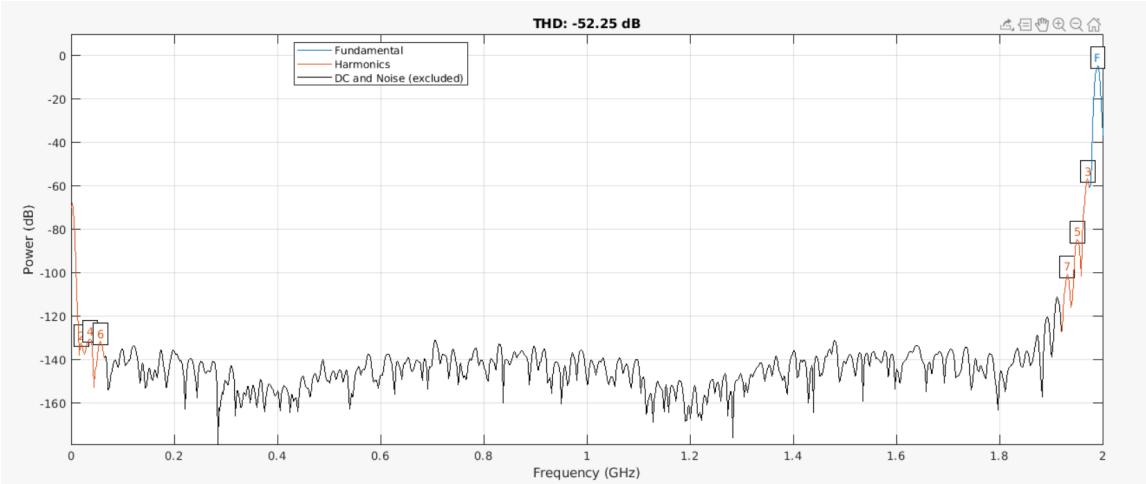

Figure 8: Calibrated Voltage Waveform with linear memory

THD value is **-52.25 dB**.

2.4 Memory order: 5 and Polynomial order: 5

Norm Coeff	$x(t)$	$x(t)^3$	$x(t)^5$
t	1	-20.3	-151.7
$t-1$	-2.66	111	-165
$t-2$	2.9	-139	302
$t-3$	10.7	-398	327
$t-4$	-3.4	163.7	-157
$t-5$	-8.6	293.7	-168

Table 7: Normalized Polynomial Terms at Different Time Steps

After calibration, the voltage spectrum is as follows:

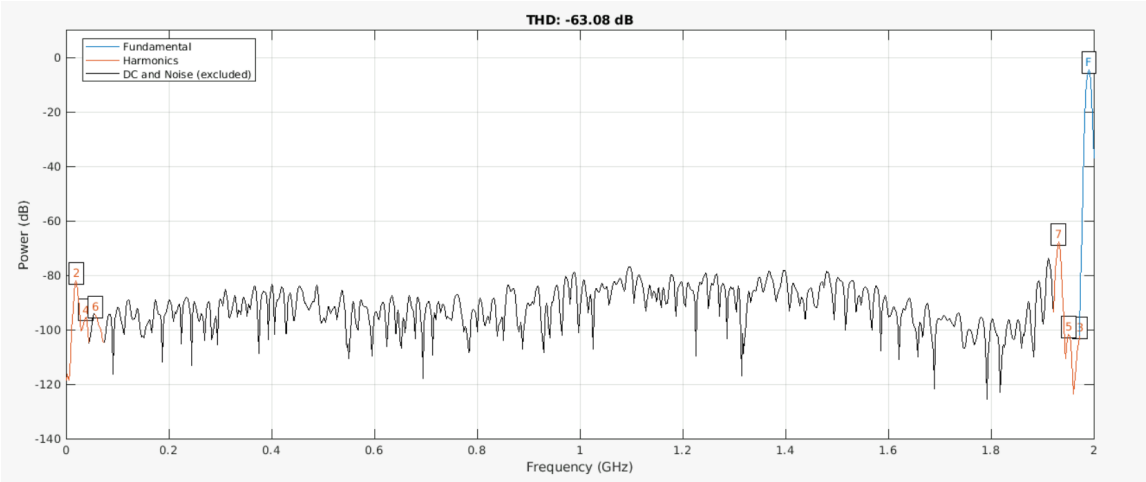

Figure 9: Calibrated Voltage Waveform

THD value is **-63.1 dB**.

Now, only linear memorial part will be considered.

Norm Coeff	$x(t)$	$x(t)^3$	$x(t)^5$
t	1	0.05	-0.05
$t-1$	0.03	No-Exist	No-Exist
$t-2$	-0.02	No-Exist	No-Exist
$t-3$	0.02	No-Exist	No-Exist
$t-4$	-0.009	No-Exist	No-Exist
$t-5$	1.35	No-Exist	No-Exist

Table 8: Normalized Polynomial with Linear Memory Terms at Different Time Steps

After calibration, the voltage spectrum is as follows:

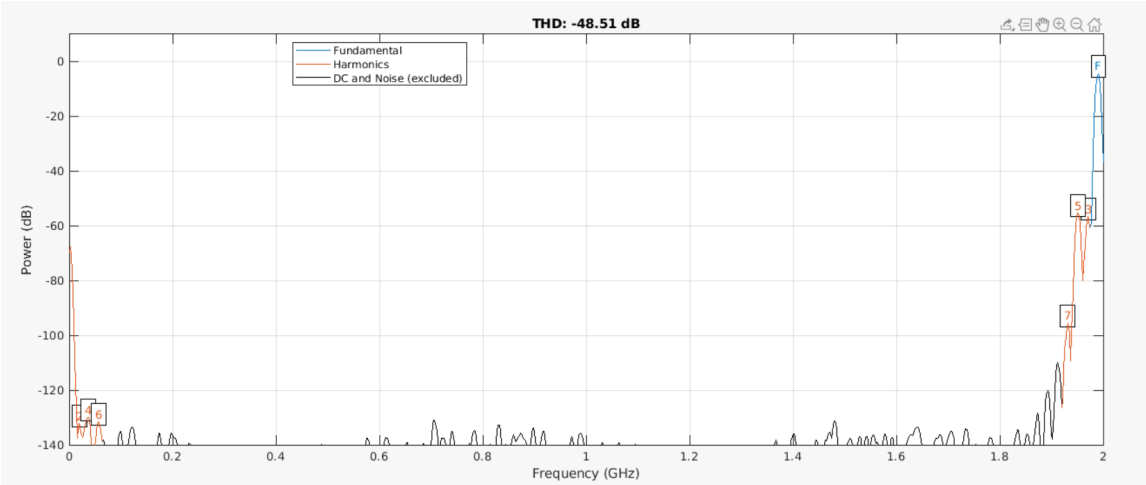

Figure 10: Calibrated Voltage Waveform with linear memory

THD value is **-48.5 dB**.

2.5 Memory order: 5 and Polynomial order: 7

Norm Coeff	$x(t)$	$x(t)^3$	$x(t)^5$	$x(t)^7$
t	1	-14.87	-324.16	403.21
$t-1$	-3.2145	140.5157	-476.25	401.3425
$t-2$	3.224	-165.55	865.48	-840.98
$t-3$	12.14	-470.17	1159.6	-833.74
$t-4$	-3.68	186.6	-566.21	460.96
$t-5$	-9.5	341.16	-714.96	456.52

Table 9: Normalized Polynomial Terms at Different Time Steps

After calibration, the voltage spectrum is as follows:

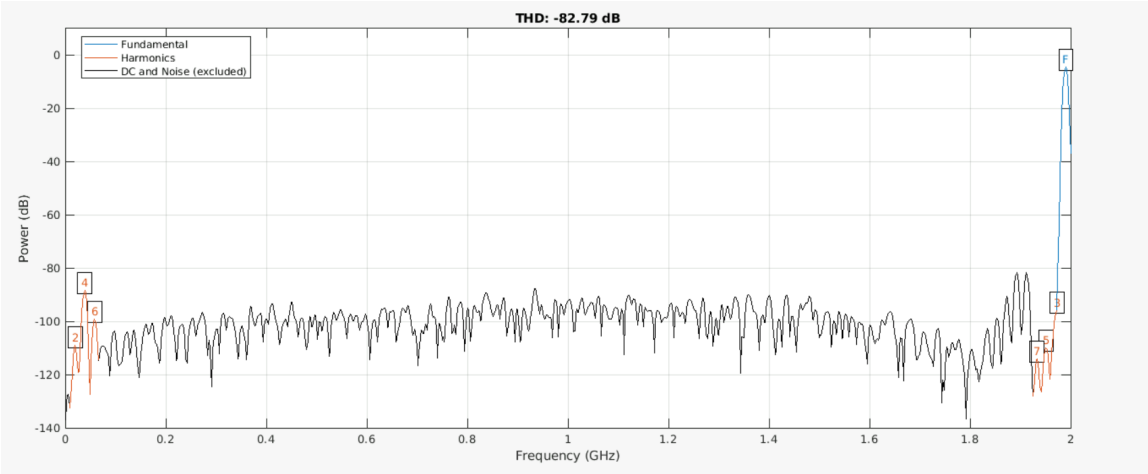

Figure 11: Calibrated Voltage Waveform

THD value is **-82.8 dB**.

Now, only linear memorial part will be considered.

Norm Coeff	$x(t)$	$x(t)^3$	$x(t)^5$	$x(t)^7$
t	1	0.18	-0.462	0.36
$t-1$	0.0315	No-Exist	No-Exist	No-Exist
$t-2$	-0.024	No-Exist	No-Exist	No-Exist
$t-3$	0.0165	No-Exist	No-Exist	No-Exist
$t-4$	-0.0092	No-Exist	No-Exist	No-Exist
$t-5$	1.3708	No-Exist	No-Exist	No-Exist

Table 10: Normalized Polynomial with Linear Memory Terms at Different Time Steps

After calibration, the voltage spectrum is as follows:

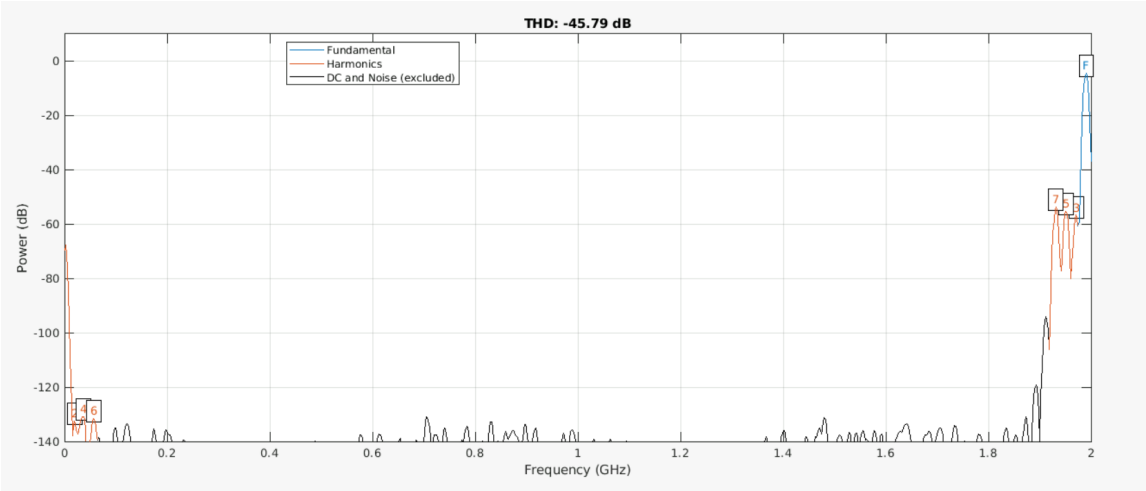

Figure 12: Calibrated Voltage Waveform with linear memory

THD value is **-45.8 dB**.

2.6 Memory order: 7 and Polynomial order: 7

Norm Coeff	$x(t)$	$x(t)^3$	$x(t)^5$	$x(t)^7$
t	1	-12.18	-220.48	268.22
$t-1$	-1.73	73.13	-150.77	93.16
$t-2$	2.006	-100.21	472.53	-442.53
$t-3$	2.08	-62.38	0.2013	66.2931
$t-4$	-2.63	97.88	-111.65	23.6
$t-5$	5.26	-227.9	624.85	-479.3
$t-6$	0.6202	13.008	-145.65	159.37
$t-7$	-6.2	223.04	-488.6	329.72

Table 11: Normalized Polynomial Terms at Different Time Steps

After calibration, the voltage spectrum is as follows:

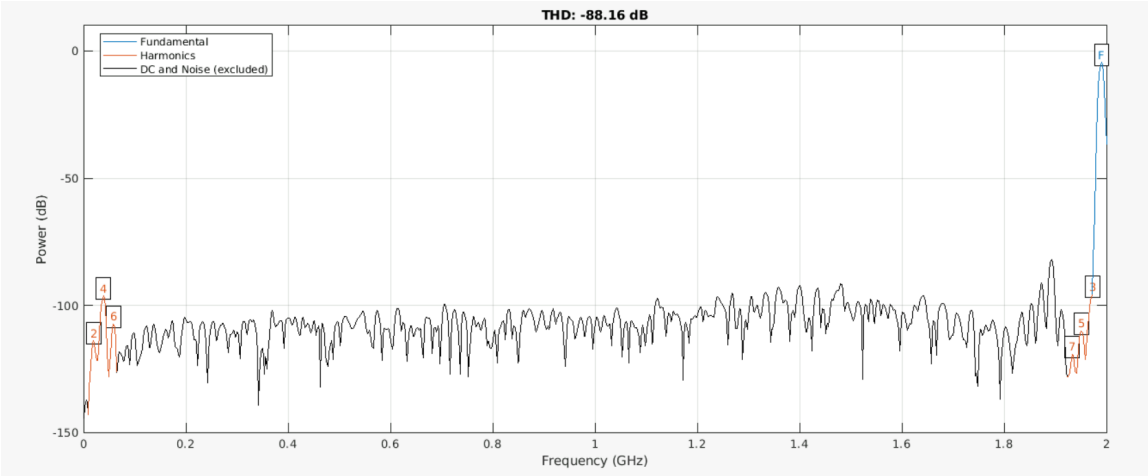

Figure 13: Calibrated Voltage Waveform

THD value is **-88.16 dB**.

Now, only linear memorial part will be considered.

Norm Coeff	$x(t)$	$x(t)^3$	$x(t)^5$	$x(t)^7$
t	1	0.03	-0.739	0.58
$t-1$	0.053	No-Exist	No-Exist	No-Exist
$t-2$	-0.044	No-Exist	No-Exist	No-Exist
$t-3$	0.036	No-Exist	No-Exist	No-Exist
$t-4$	-0.027	No-Exist	No-Exist	No-Exist
$t-5$	0.02	No-Exist	No-Exist	No-Exist
$t-6$	-0.011	No-Exist	No-Exist	No-Exist
$t-7$	1.526	No-Exist	No-Exist	No-Exist

Table 12: Normalized Polynomial with Linear Memory Terms at Different Time Steps

After calibration, the voltage spectrum is as follows:

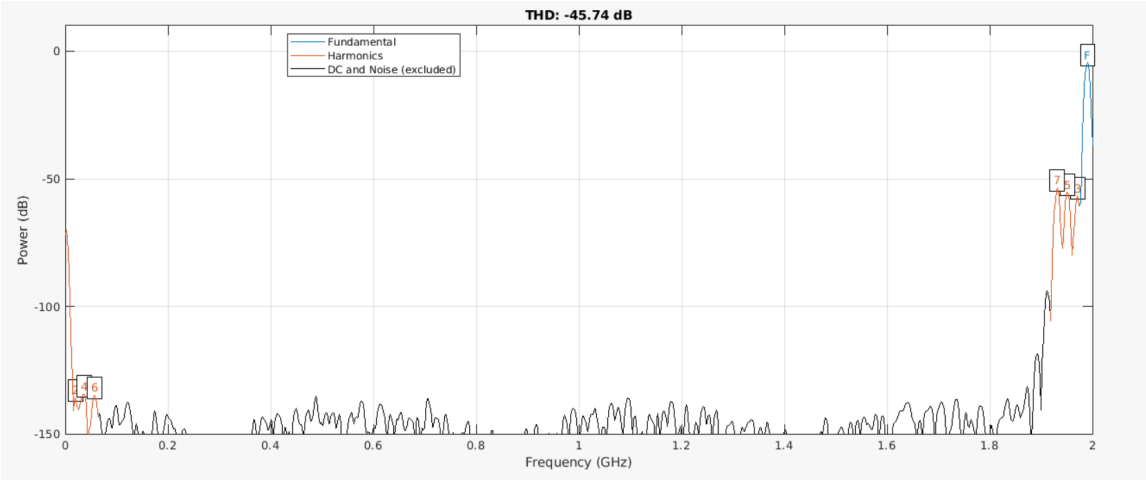

Figure 14: Calibrated Voltage Waveform with linear memory

THD value is **-45.74 dB**.