

Lab 2 Report

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I. MEASURING P1dB

In this section of the lab, we will measure the 1-dB compression point of the amplifier using the same setup as in Experiment 2.

1. Pre-set and configure the spectrum analyzer.
2. Set the synthesizer output frequency to 2.4 GHz.
3. Adjust the output power of the TPI synthesizer from -20 dBm to 10 dBm in 1 dBm increments. The spectrum display is shown in Fig. 1.

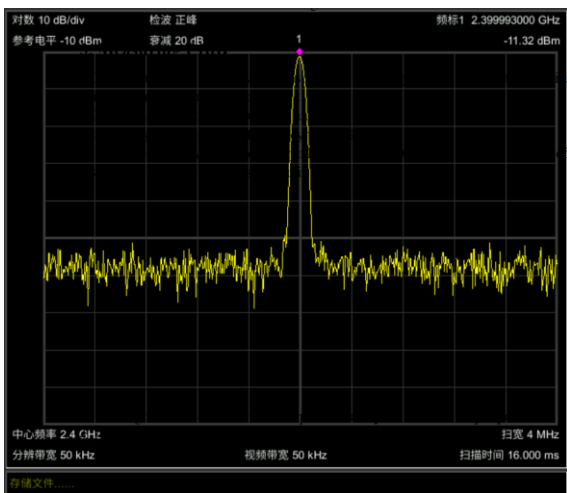


Fig. 1. Screenshot of the spectrum analyzer at -20dB output power.

4. Plot the measured output power vs. the input power.

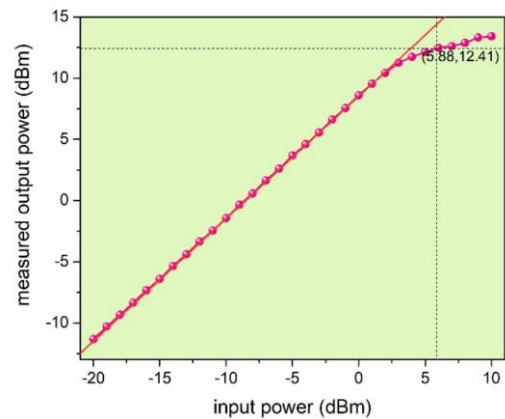


Fig. 2. Measured output power as a function of input power.

The output 1 dB compression point for the amplifier is about (5.88, 12.41). The measured IP1dB=12.41dBm, which is slightly smaller than the 19.5dBm on the data sheet.

II. MEASURING IP3

1. For the IP3 measurement, we need two input signals with a slight frequency offset. Set up the measurement as illustrated by Fig. 3.

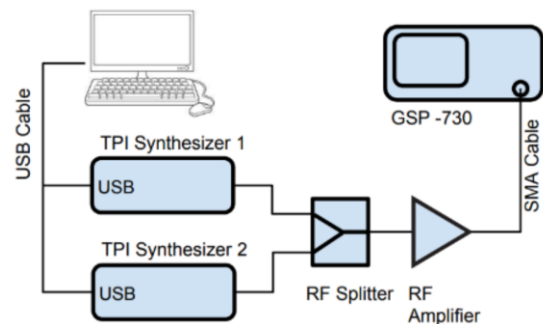


Fig. 3. Amplifier IP3 measurement setup.

2. Preset and configure the spectrum analyzer.
3. Configure the two TPI synthesizers.
4. The spectrum analyzer screen should look like the following (Fig. 4).

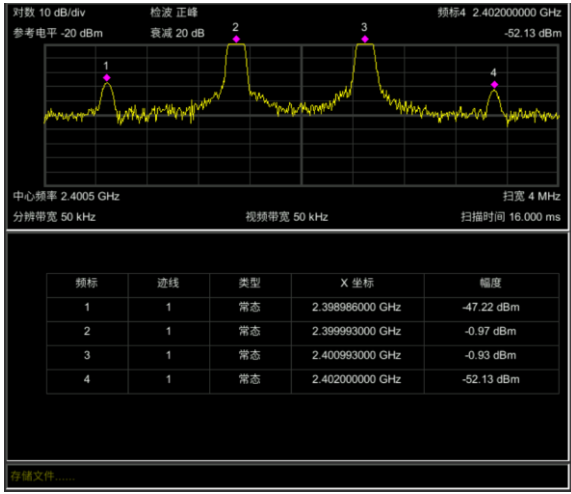


Fig. 4. Screenshot of the amplifier two-tone measurement.

5. Sweep the output power of both TPI synthesizers from -25 dBm to 5 dBm. Record the measured fundamental and IM3 signal power. When the input signal reaches about -9dBm, the two IM3 signals show different power levels, choose one of them.

6. Plot the measured fundamental and IM3 signal power vs. the input power.

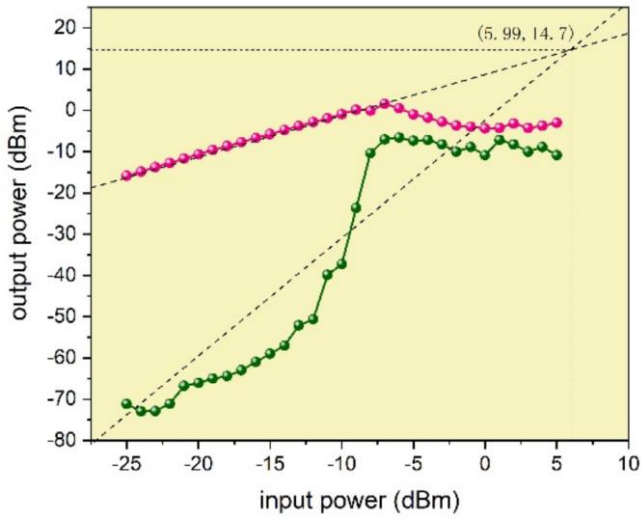


Fig. 5. Measured fundamental and IM3 signal power as a function of input power.

The output IP3 (OIP3) point for the amplifier is about (5.99,14.7). The measured OIP3=14.7dBm, compared with the 30dBm in the datasheet, there is a big difference. It may be because the data measured by the spectrometer beat too fast leading to reading errors, or because of gain changes and nonlinear memory effects, or because of errors in the chip itself. The specific reasons still need to be explored.

III. APPENDIX

f Hz GAIN	Gain	f Hz LPF	output Vpp V	f Hz LPF+GAIN	output Vpp V
100	29.03	100	2.94	100	3.013
500	29.82	1k	2.94	1k	3.076
1k	30.45	2k	2.93	2k	3.104
5k	30.1	3k	2.92	3k	3.078
10k	30.05	4k	2.903	4k	3.065
30k	28.7	5k	2.863	5k	3.047
50k	28.35	6k	2.809	6k	2.914
70k	28.19	7k	2.753	7k	2.912
90k	28.22	8k	2.696	8k	2.863
100k	28.08	9k	2.618	9k	2.753
200k	23.84	10k	2.566	10k	2.693
300k	21.75	11k	2.456	11k	2.562
350k	20.96	12k	2.38	12k	2.523
400k	18.42	13k	2.264	13k	2.406
500k	16.24	14k	2.198	14k	2.287
600k	14.39	15k	2.086	15k	2.216
700k	13.02	16k	1.986	16k	2.103
800k	11.33	17k	1.845	17k	1.969
900k	10.95	18k	1.755	18k	1.893
1M	9.47	19k	1.657	19k	1.775
		20k	1.548	20k	1.632
		30k	0.672	30k	0.713
		40k	0.2812	40k	0.2523
		50k	0.1328	50k	0.1196
		60k	0.09216	60k	0.06875
		70k	0.0661	70k	0.02979
		80k	0.06096	80k	0.02874
		90k	0.05492	90k	0.02172
		100k	0.03316	100k	0.02148
		150k	0.06775	150k	0.01441

Fig. 6. Appendix data.