LimeRFE 0v3

Measurement Results

Version: 1.0
Revision: 3
Date: 08.08.2019

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LimeRFE 0v3 Measurements Summary

No.	Band	TX						RX								
		Gain [dB]			OP1dB [dBm]			Gain [dB]			NF [dB]			IIP3 [dBm]		
		Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max
1	WB 1000	27		45	22		28.5	17		21	4		6	12		17
2	WB 4000	12		34	15.5		24	6		19	1.5		4	13		22
3	HAM 30															
	5 – 30 MHz		31			32.5			20			5			14	
	1 – 5 MHz											/		3		14
4	HAM 145		23			35.5			18			7			11	
5	HAM 435		25			35			16			4.5			10	
6	HAM 1280		20			18.5			16			3			17	
7	HAM 2400		46			31.5			12			3			17.5	
8	HAM 3500		19			20.5			7			4			8	
9	Cell Band 1		40			29			13			6			18	
10	Cell Band 2		42			31			14			5			18	
11	Cell Band 3		42			29.5			14			5			18	
12	Cell Band 7		42			29			9			5.5			20	
13	Cell Band 38		45			29.5			8			5.5			21	

LimeRFE 1v0 Expected Performance Summary

Final LimeRFE version will be 1v0. In comparison to the 0v3 version (prototype that has been measured), version 1v0 will have some additional channels (HAM 50-70, HAM 220, and HAM 920), and some channels will have different design (HAM 1280).
In order to assess the performance of the final LimeRFE 1v0 board, measurement results of the prototype board (LimeRFE 0v3) was combined with simulation results of the new or modified channels. The expected LimeRFE 1v0 performance is summarized in the table below.

No.	Band	TX						RX								
		Gain [dB]			OP1dB [dBm]			Gain [dB]			NF [dB]			IIP3 [dBm]		
		Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max
1	WB 1000	27		45	22		28.5	17		21	4		6	12		17
2	WB 4000	12		34	15.5		24	6		19	1.5		4.0	13		22
3	HAM 30															
	5 – 30 MHz		31			32.5			20			5			14	
	1 – 5 MHz											/		3		14
4	HAM 50-70		30			29			18			5.5			13	
5	HAM 145		23			35.5			18			7			11	
6	HAM 220		23			35			16			7			10	
7	HAM 435		25			35			16			4.5			10	
8	HAM 920		35			29.5			16			4			16	
9	HAM 1280		32			28			16			3			17	
10	HAM 2400		43			31.5			12			3			17.5	
11	HAM 3500		19			20.5			7			4			8	
12	Cell Band 1		37			29			13			6			18	
13	Cell Band 2		39			31			14			5			18	
14	Cell Band 3		39			29.5			14			5			18	
15	Cell Band 7		39			29			9			5.5			20	
16	Cell Band 38		42			29.5			8			5.5			21	

Setup

Measurements results were corrected by 46 dB to account for the setup.

So, approximately, the additional setup contribution is:

@ 2.0 GHz approx. 0.8 dB
@ 2.5 GHz approx. 1.2 dB
@ 3.5 GHz approx. 1.5 dB

This additional setup contribution was not de-embedded from the results.

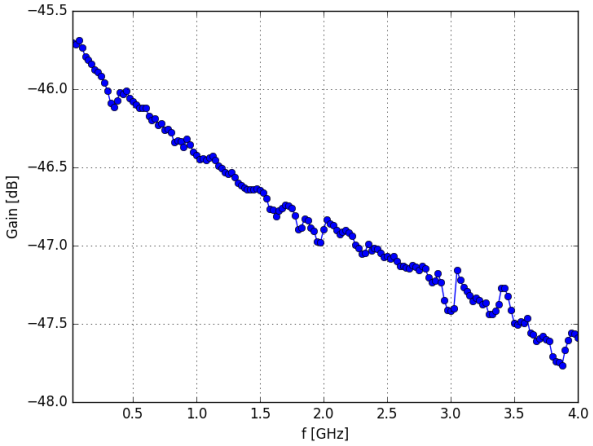

Figure 1: Setup gain

Measurement results are from the board #2.

TX

Wideband 1 – 1000 MHz

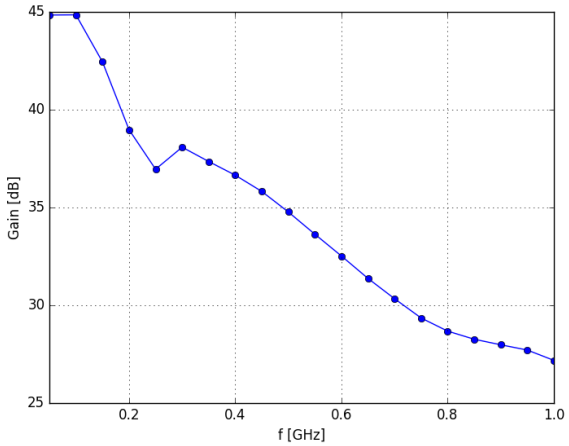

Figure 2: Gain

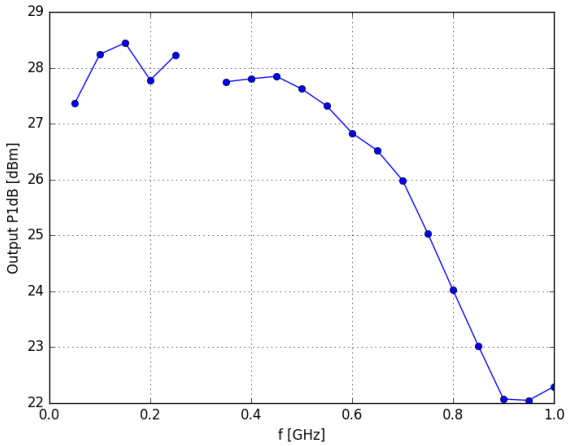

Figure 3: Output P1dB

HF Performance

The following graphs present the performance of the *Wideband 1 – 1000 MHz* channel for HF frequencies.

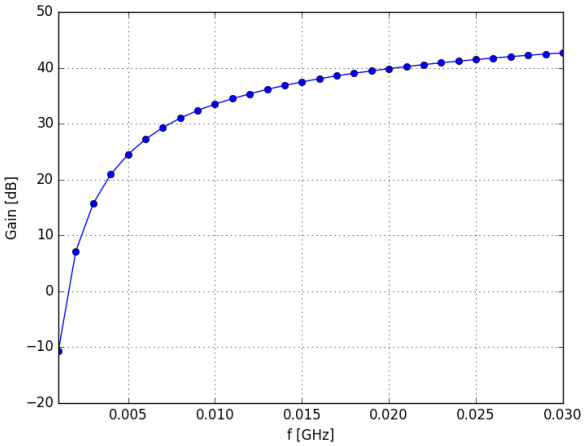

Figure 4: Gain (HF Band)

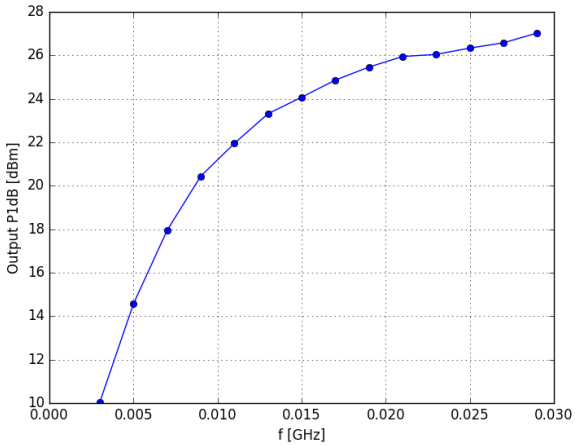

Figure 5: Output P1dB (HF Band)

Wideband 1000 – 4000 MHz

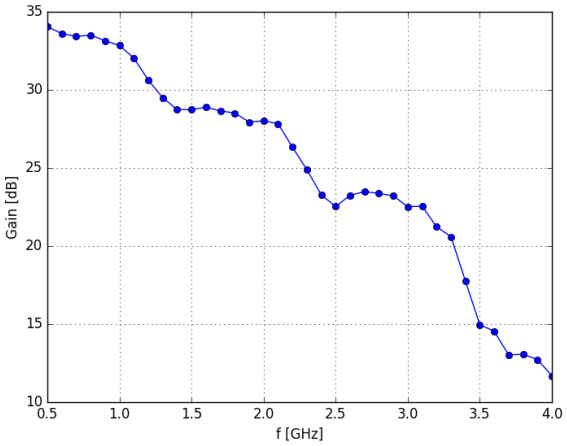

Figure 6: Gain

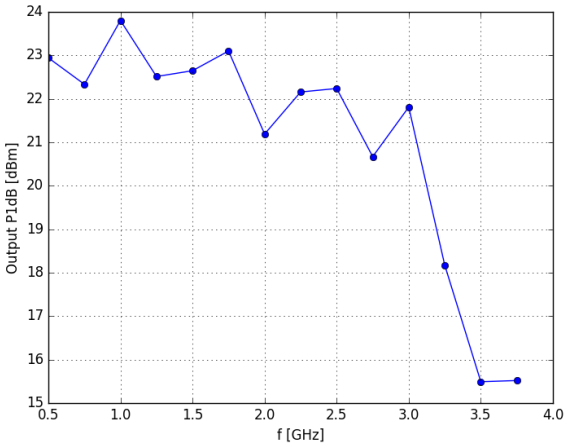

Figure 7: Output P1dB

HAM 30 MHz

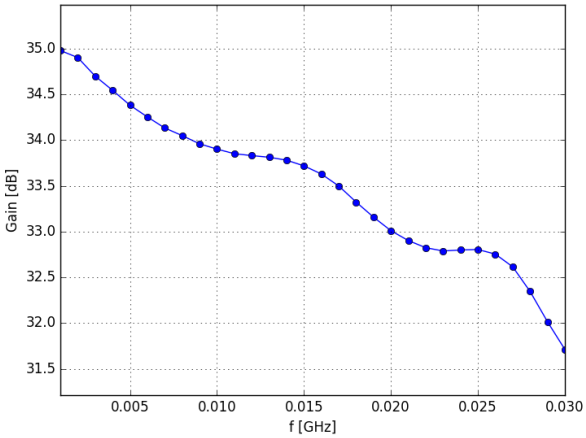

Figure 8: Gain

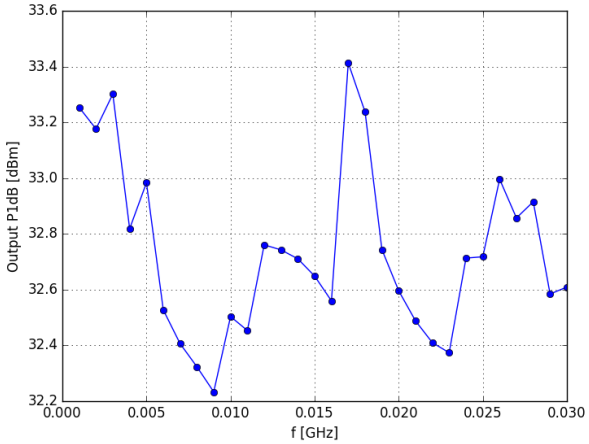

Figure 9: Output P1dB

HAM 145 MHz

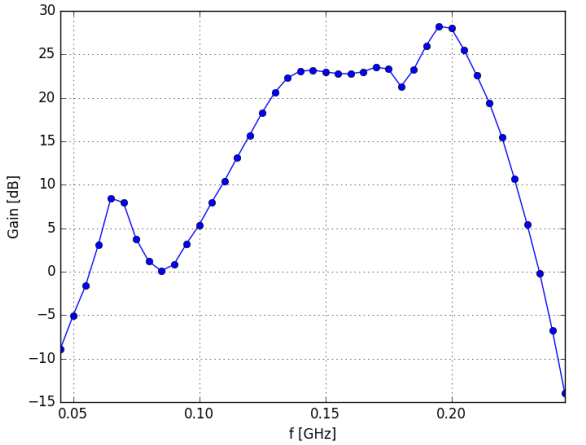

Figure 10: Gain

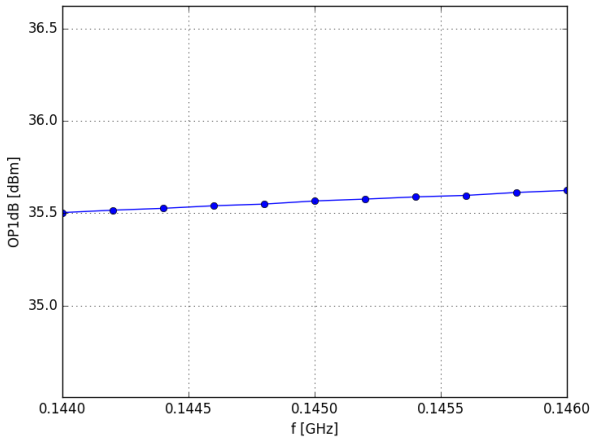

Figure 11: Output P1dB

HAM 435 MHz

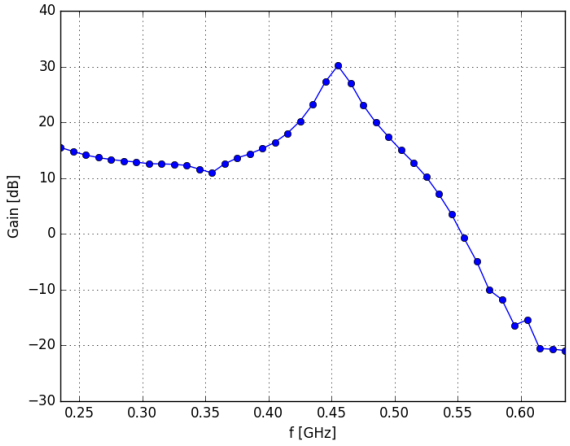

Figure 12: Gain

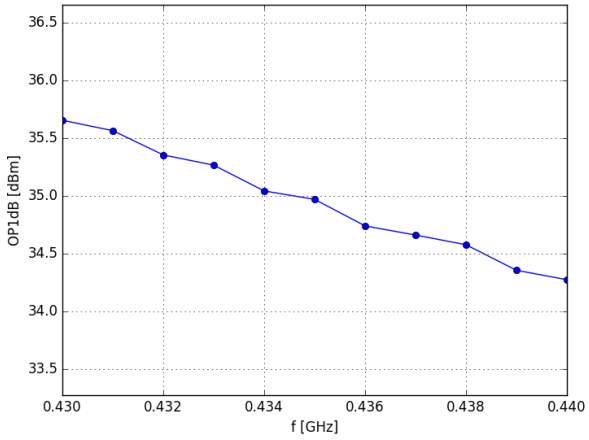

Figure 13: Output P1dB

HAM 1280 MHz

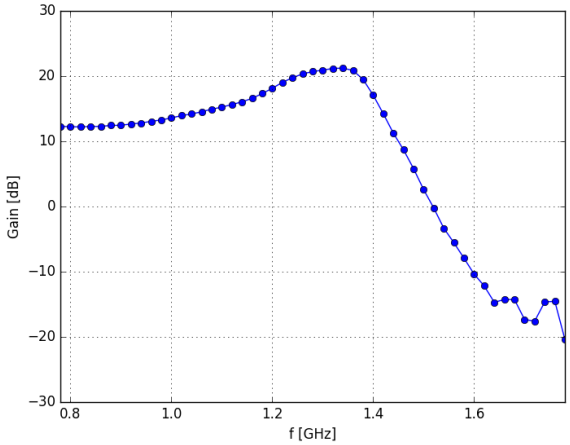

Figure 14: Gain

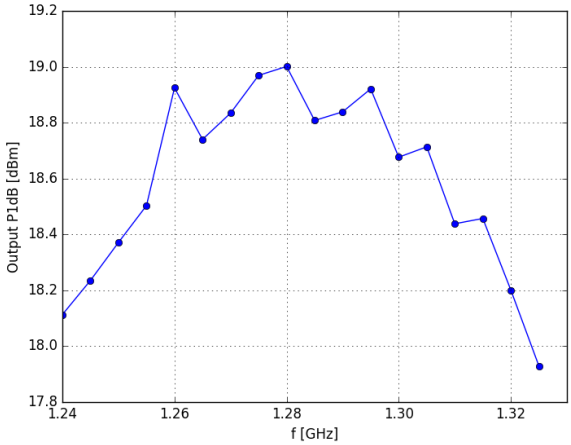

Figure 15: Output P1dB

HAM 2400 MHz

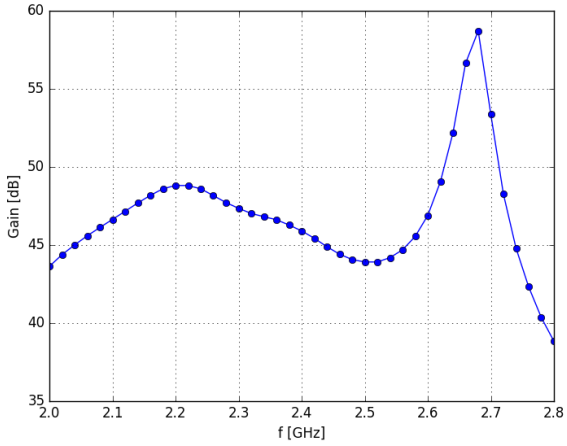

Figure 16: Gain

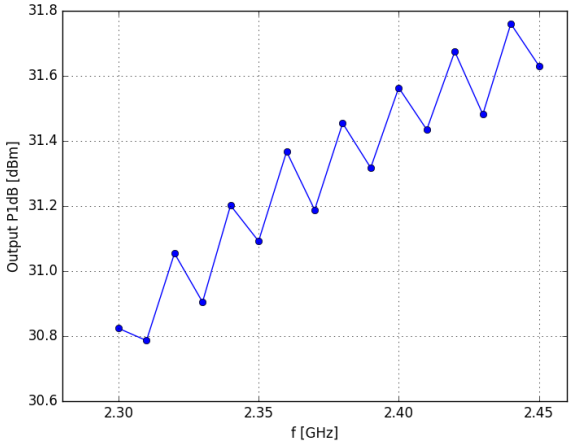

Figure 17: Output P1dB

HAM 3500 MHz

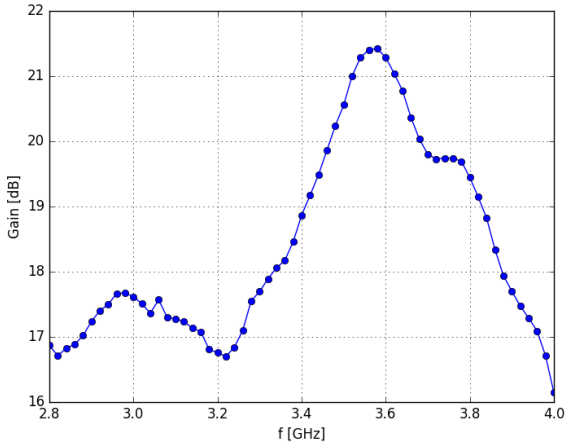

Figure 18: Gain

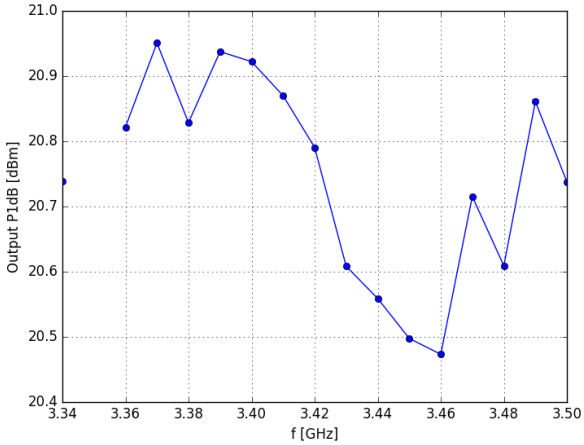

Figure 19: Output P1dB

Cellular Band 1

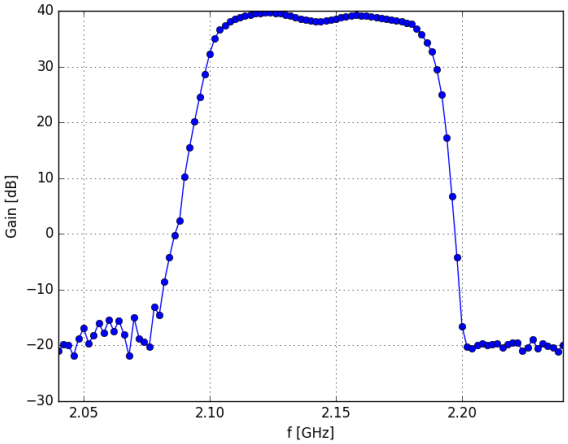

Figure 20: Gain

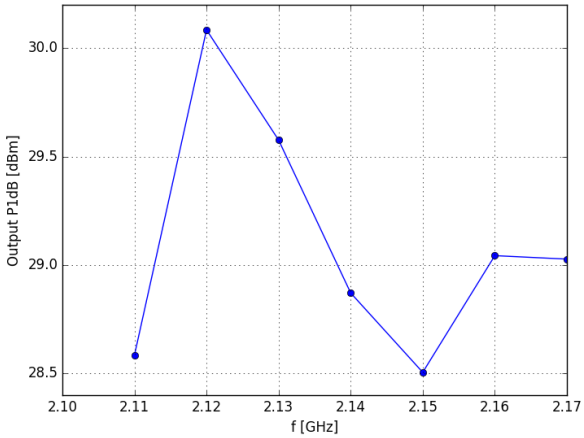

Figure 21: Output P1dB

Cellular Band 2

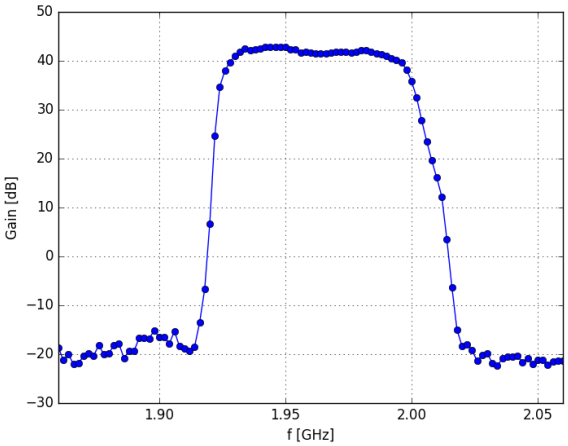

Figure 22: Gain

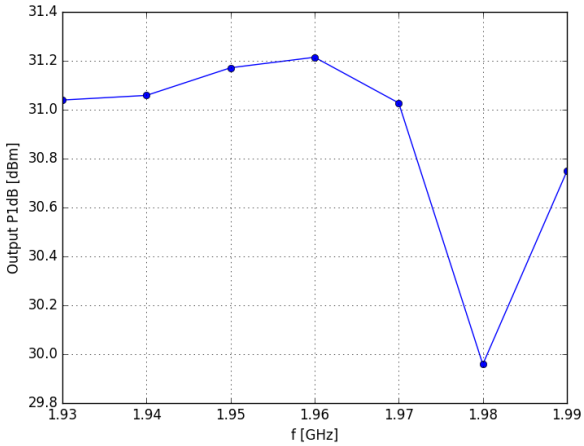

Figure 23: Output P1dB

Cellular Band 3

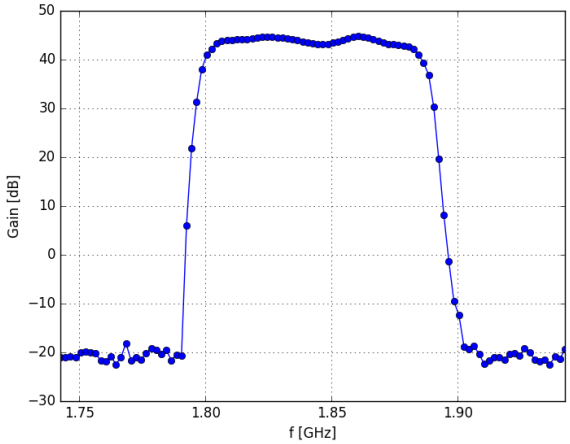

Figure 24: Gain

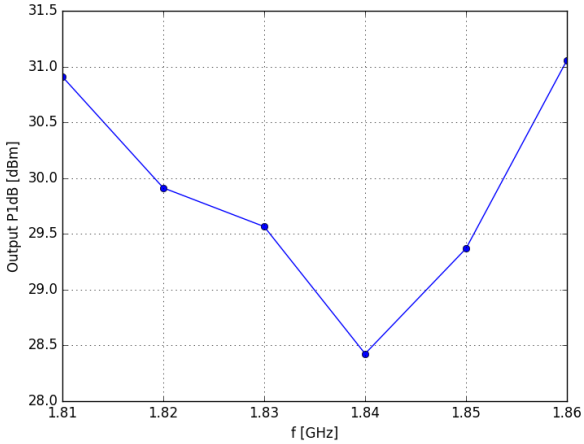

Figure 25: Output P1dB

Cellular Band 7

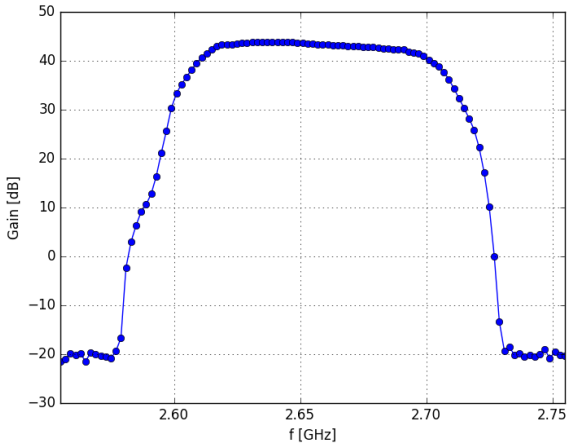

Figure 26: Gain

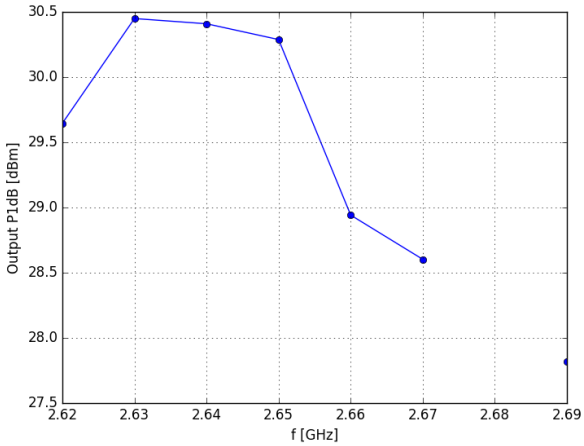

Figure 27: Output P1dB

Cellular Band 38

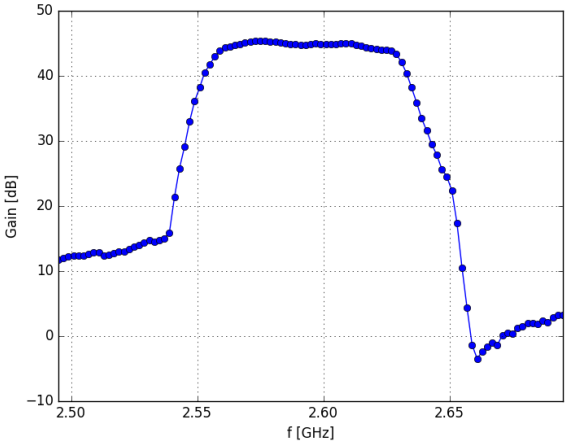

Figure 28: Gain

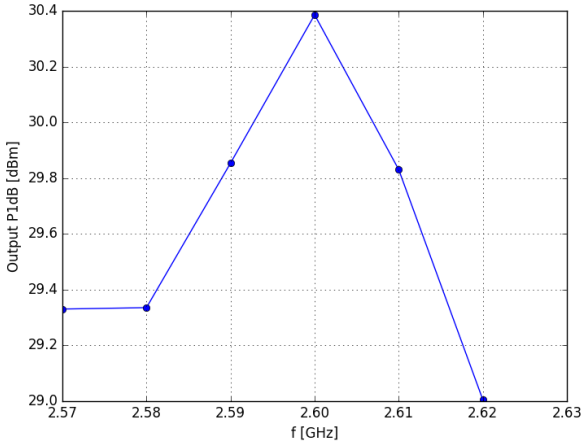

Figure 29: Output P1dB

RX

Wideband 1 – 1000 MHz

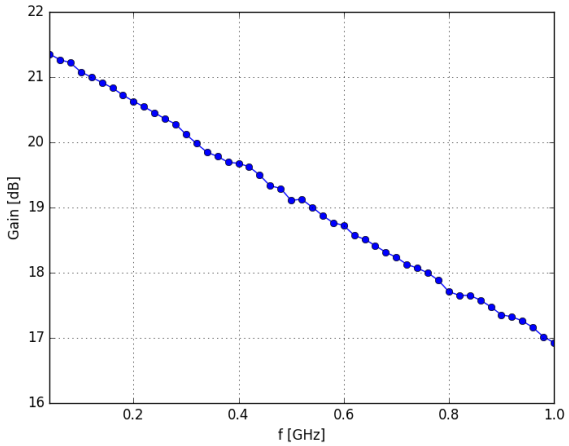

Figure 30: Gain

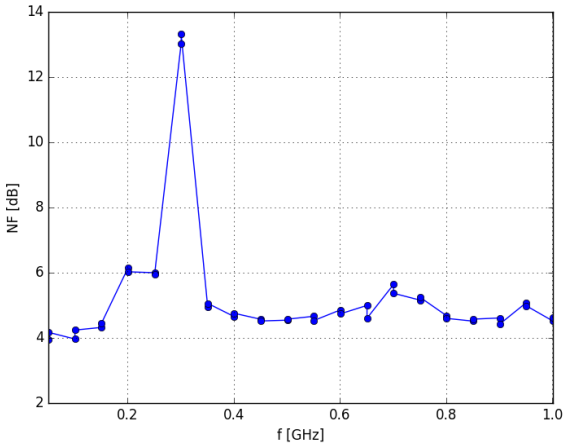

*Figure 31: Noise Figure **

*** Note:** Extreme NF values resulted from inadequate EM isolation of the measured device. These values have not been taken into account in the Summary.

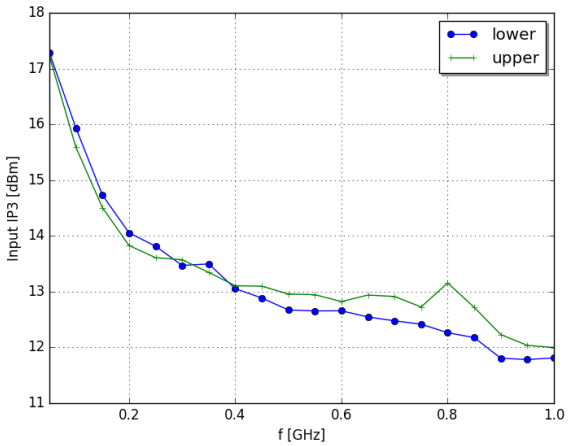

Figure 32: Input IP3

HF Performance

The following graphs present the performance of the *Wideband 1 – 1000 MHz* channel for HF frequencies.

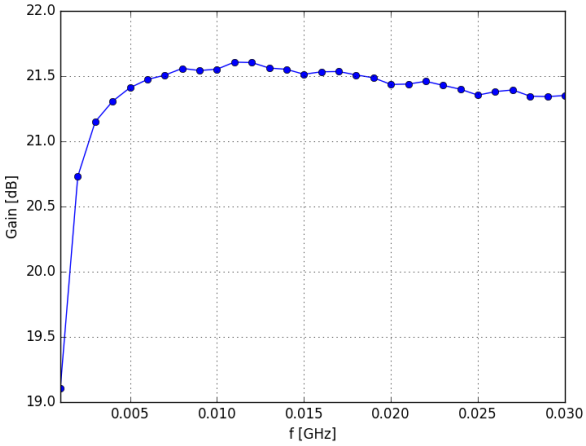

Figure 33: Gain (HF Band)

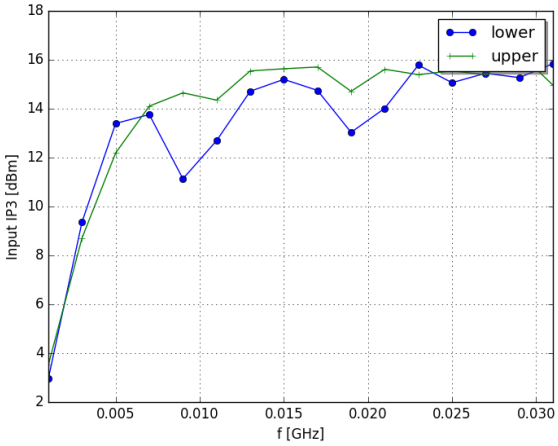

Figure 34: Input IP3 (HF Band)

Wideband 1000 – 4000 MHz

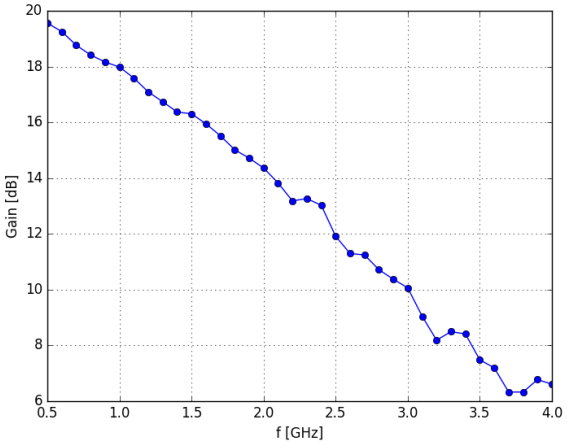

Figure 35: Gain

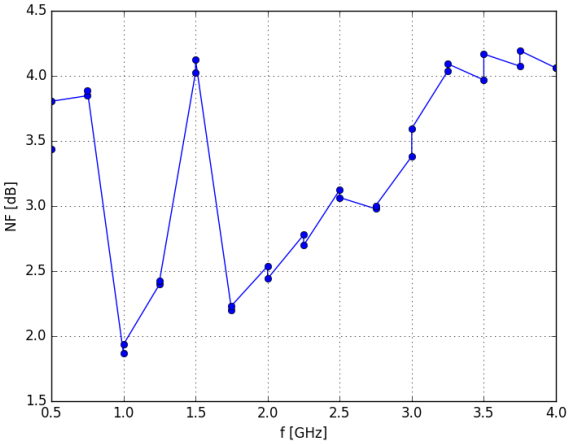

Figure 36: Noise Figure

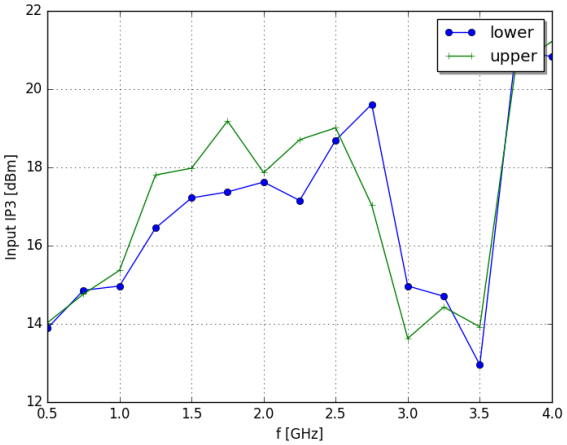

Figure 37: Input IP3

HAM 30 MHz

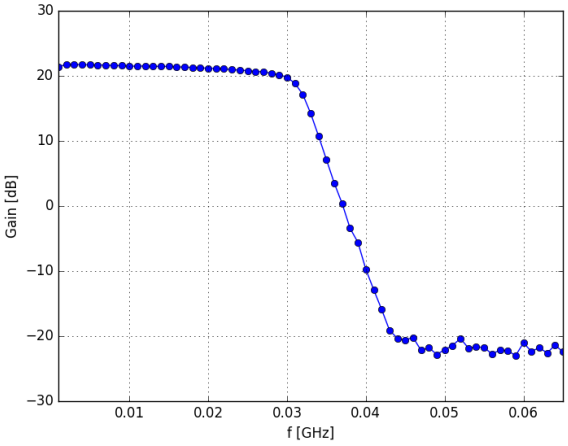

Figure 38: Gain

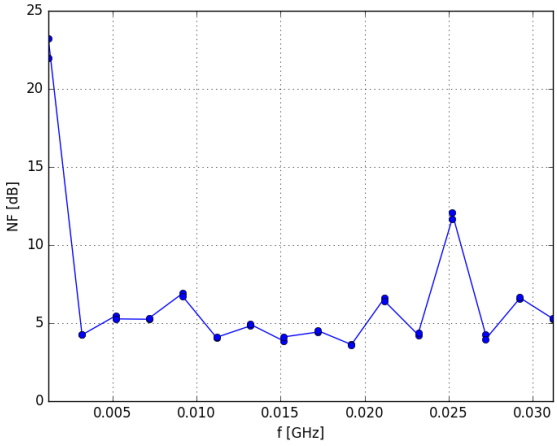

*Figure 39: Noise Figure **

*** Note:** Extreme NF values resulted from inadequate EM isolation of the measured device. These values have not been taken into account in the Summary. NF measurements below 10 MHz are not valid, since the noise head used was not calibrated at these frequencies.

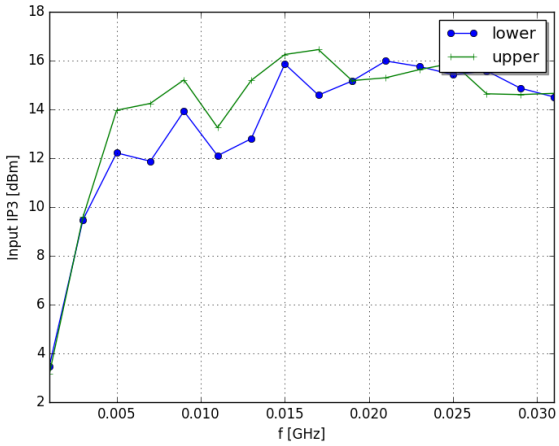

*Figure 40: Input IP3 ***

**** Note:** Why does the IP3 deteriorates for frequencies below 5 MHz? This issues will be further investigated.

HAM 145 MHz

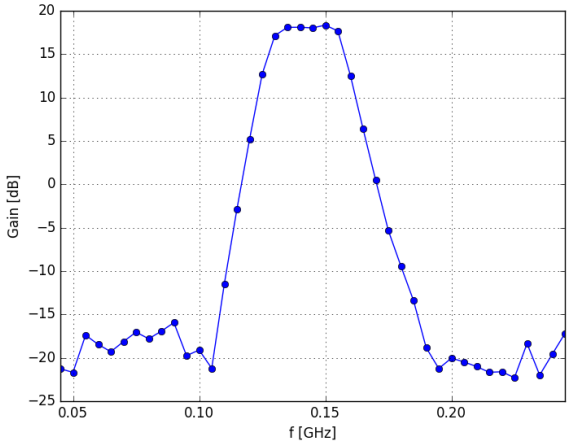

Figure 41: Gain

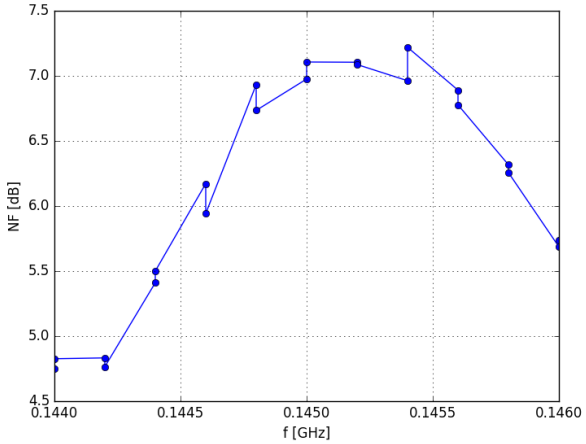

Figure 42: Noise Figure

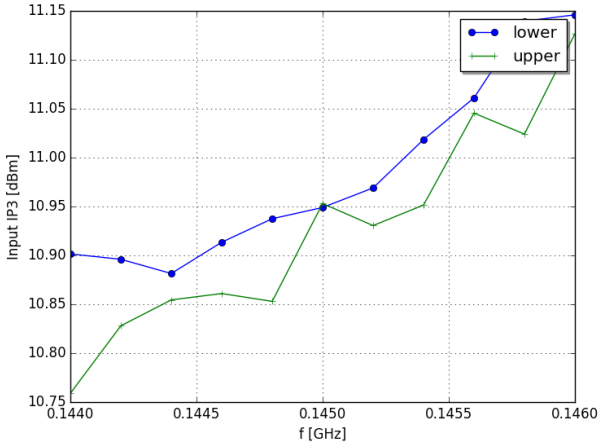

Figure 43: Input IP3

HAM 435 MHz

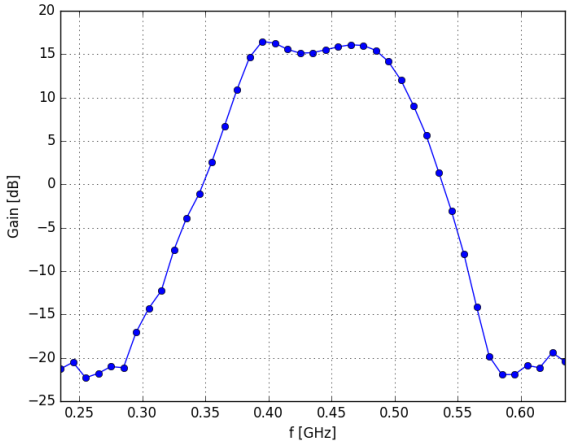

Figure 44: Gain

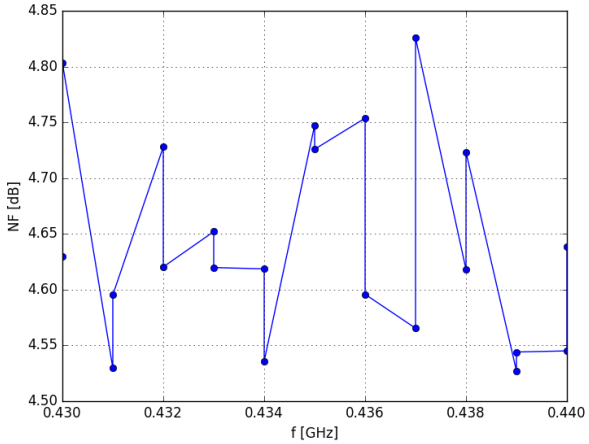

Figure 45: Noise Figure

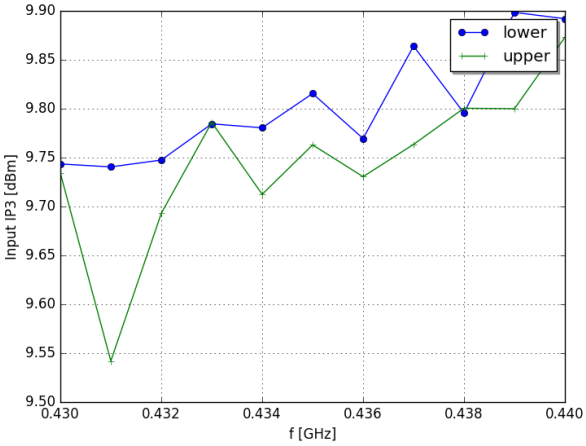

Figure 46: Input IP3

HAM 1280 MHz

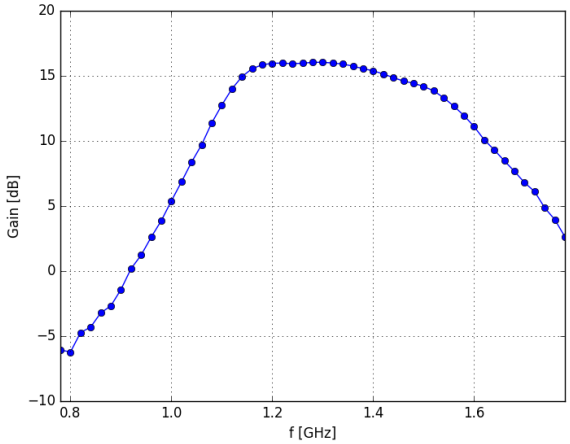

Figure 47: Gain

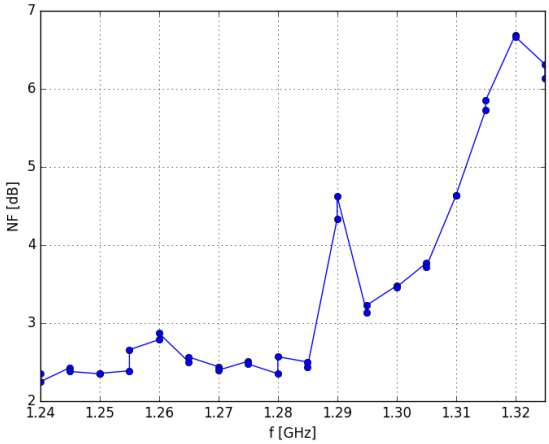

*Figure 48: Noise Figure **

*** Note:** Extreme NF values resulted from inadequate EM isolation of the measured device. These values have not been taken into account in the Summary.

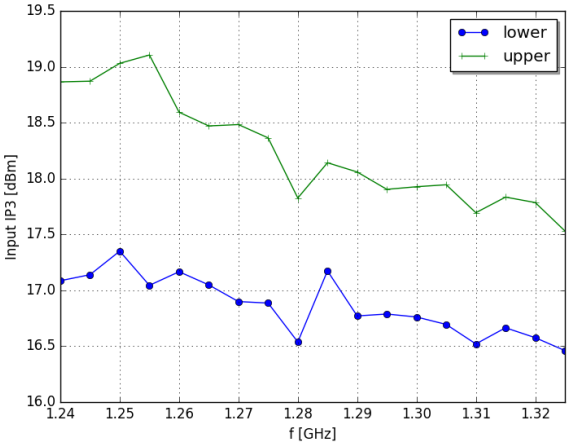

Figure 49: Input IP3

HAM 2400 MHz

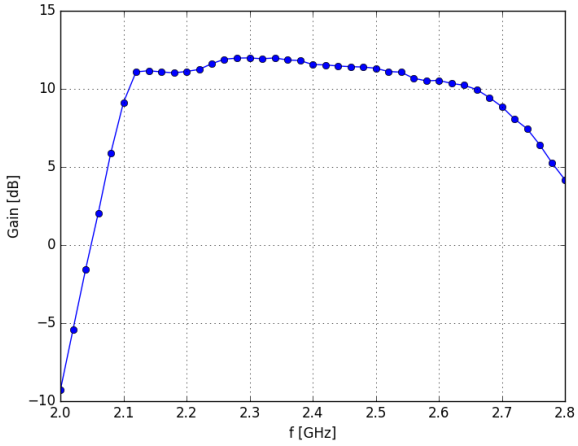

Figure 50: Gain

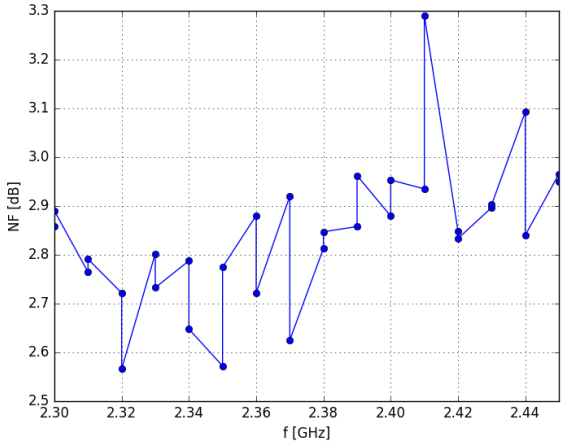

Figure 51: Noise Figure

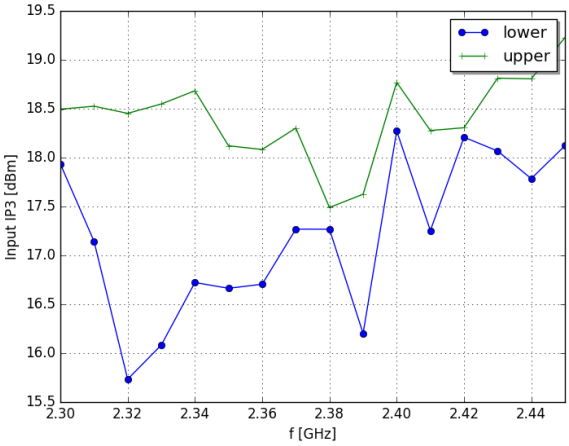

Figure 52: Input IP3

HAM 3500 MHz

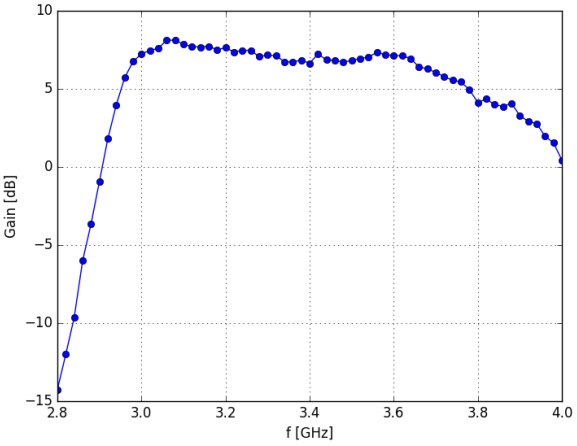

Figure 53: Gain

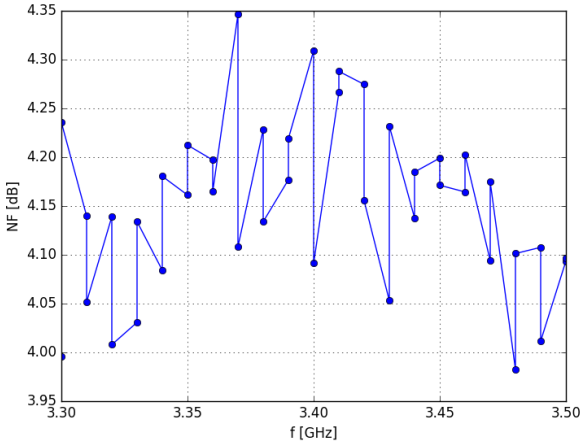

Figure 54: Noise Figure

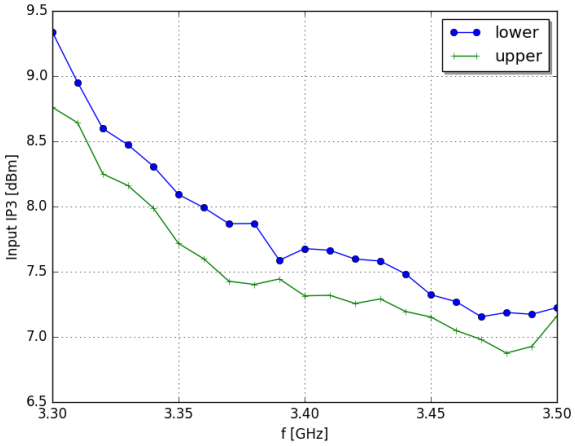

Figure 55: Input IP3

Cellular Band 1

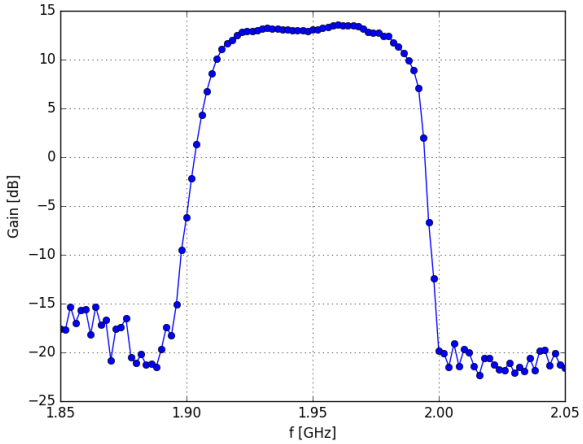

Figure 56: Gain

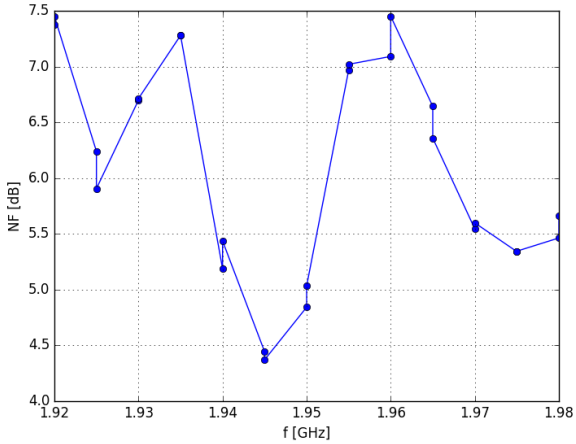

*Figure 57: Noise Figure **

*** Note:** Extreme NF values resulted from inadequate EM isolation of the measured device. These values have not been taken into account in the Summary.

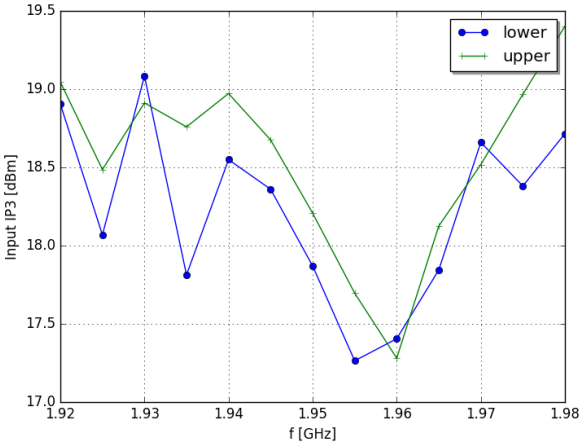

Figure 58: Input IP3

Cellular Band 2

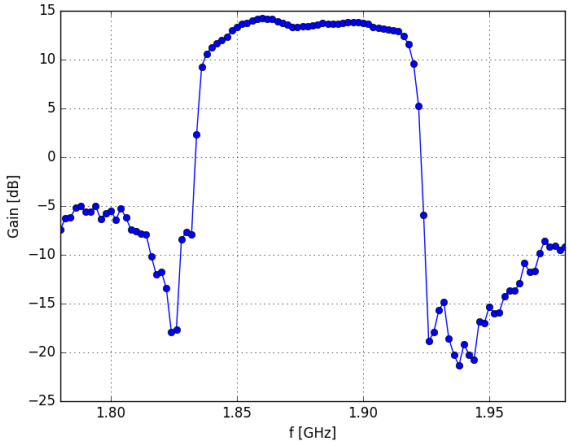

Figure 59: Gain

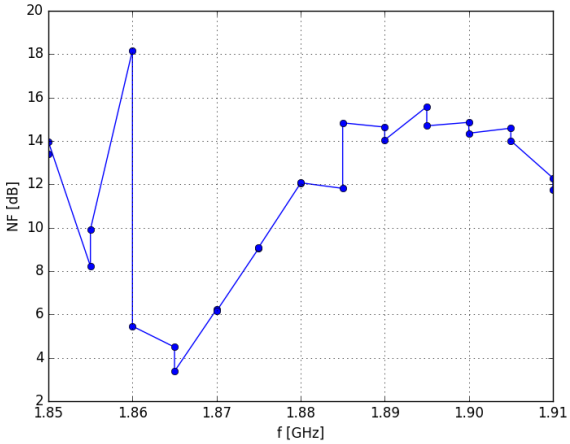

*Figure 60: Noise Figure **

*** Note:** Extreme NF values resulted from inadequate EM isolation of the measured device. These values have not been taken into account in the Summary.

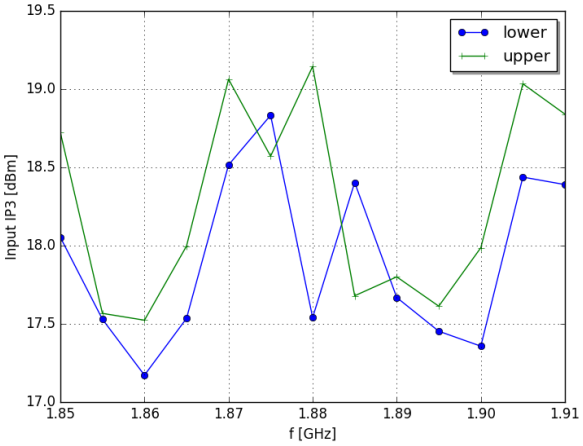

Figure 61: Input IP3

Cellular Band 3

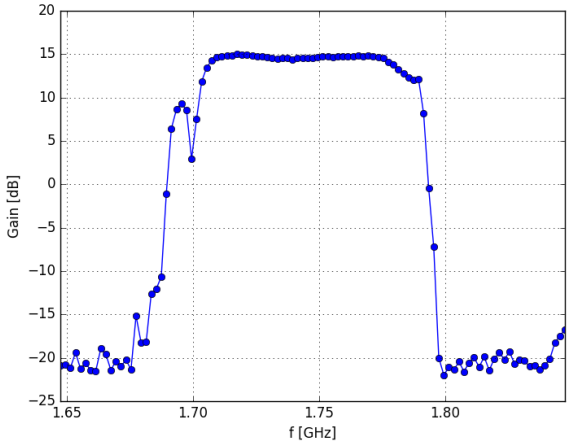

Figure 62: Gain

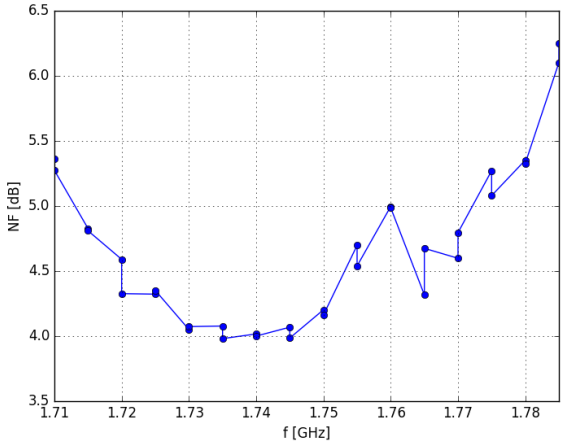

Figure 63: Noise Figure

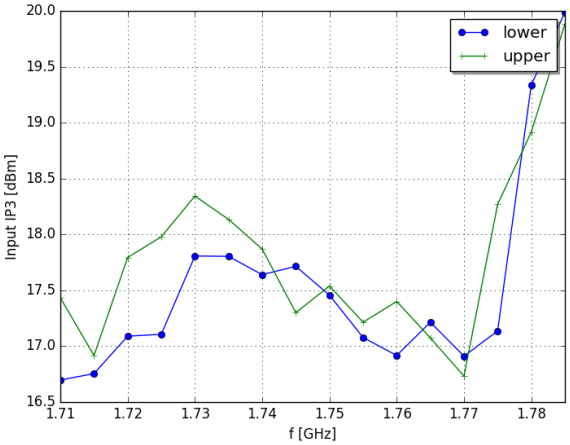

Figure 64: Input IP3

Cellular Band 7

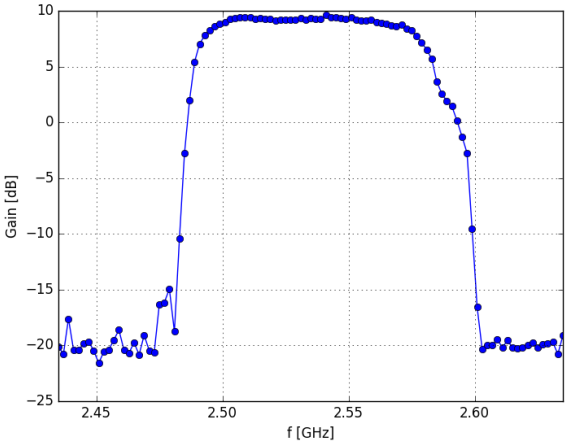

Figure 65: Gain

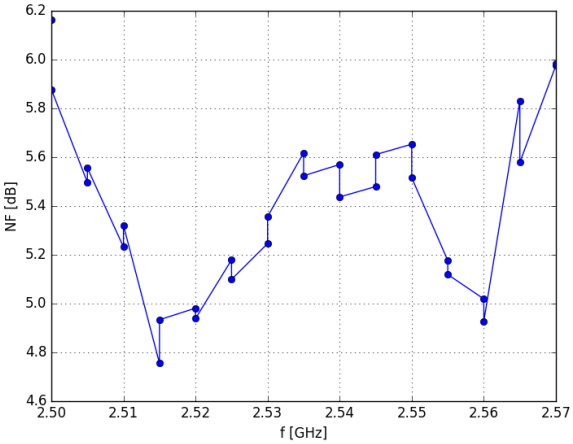

Figure 66: Noise Figure

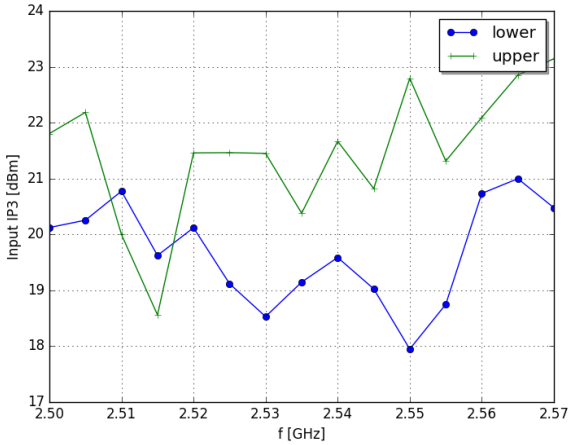

Figure 67: Input IP3

Cellular Band 38

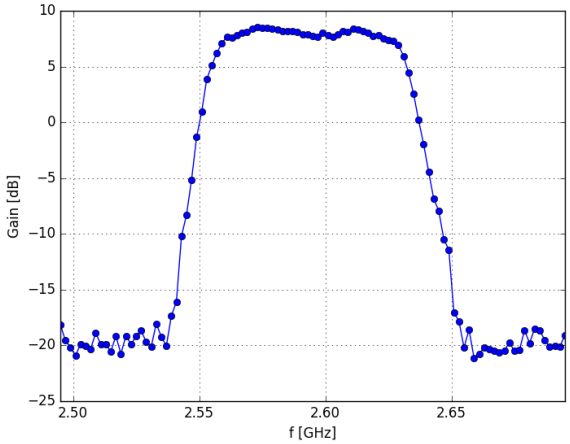

Figure 68: Gain

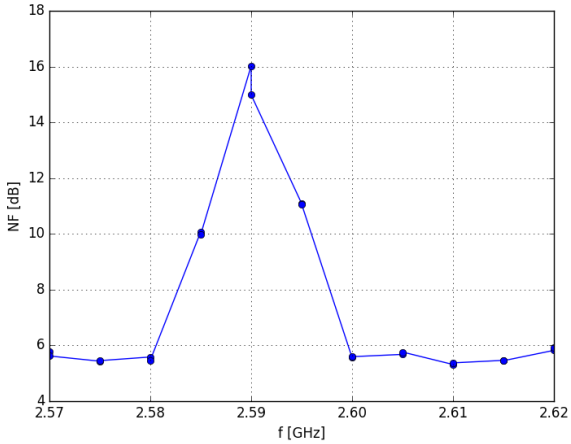

*Figure 69: Noise Figure **

*** Note:** Extreme NF values resulted from inadequate EM isolation of the measured device. These values have not been taken into account in the Summary.

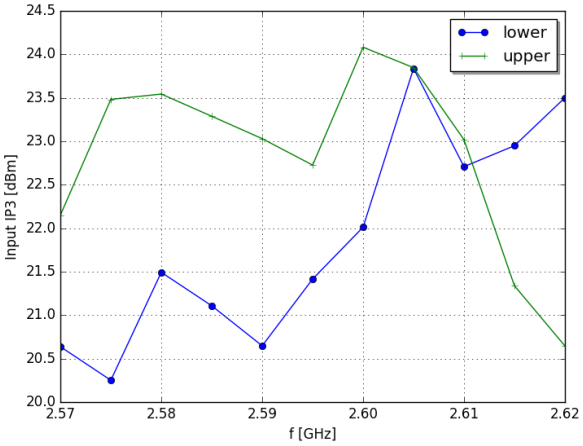

Figure 70: Input IP3