F1102 – Extended Frequency Testing

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- AT0249

Michael J. Virostko
Principal Product Application Engineer

Integrated Device Technology

The Analog and Digital Company™

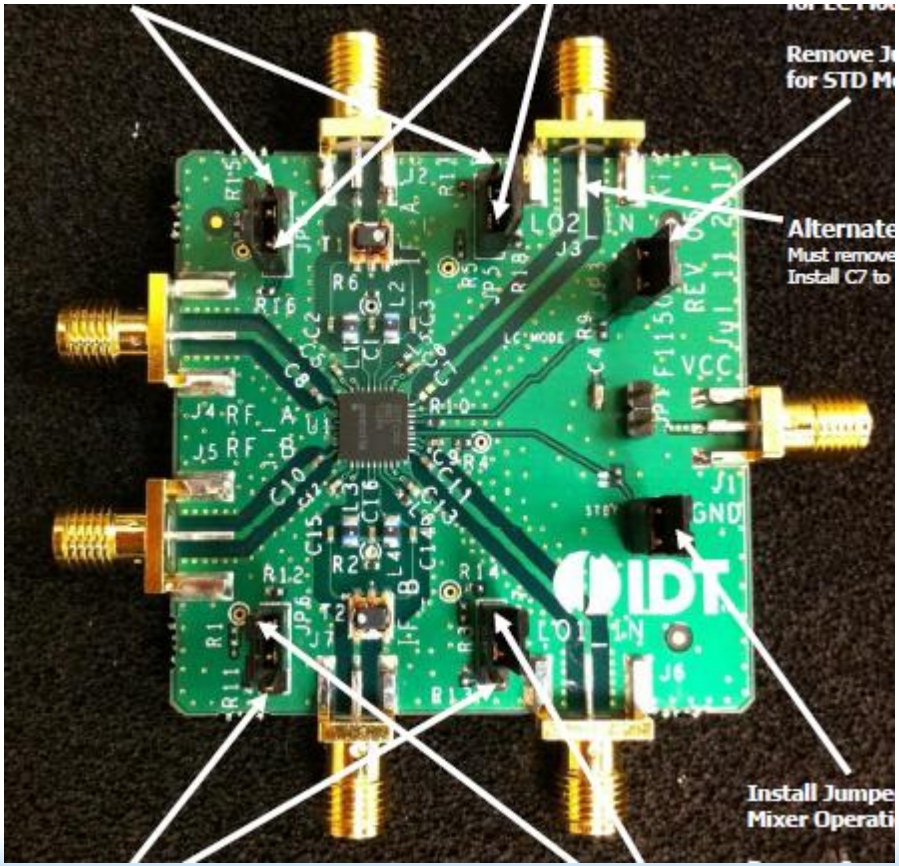
Agenda

- Customer had seen a previous test results of the F1102 mixer in which the frequency range was extended.
- They would like to know if it would work in the following bands:

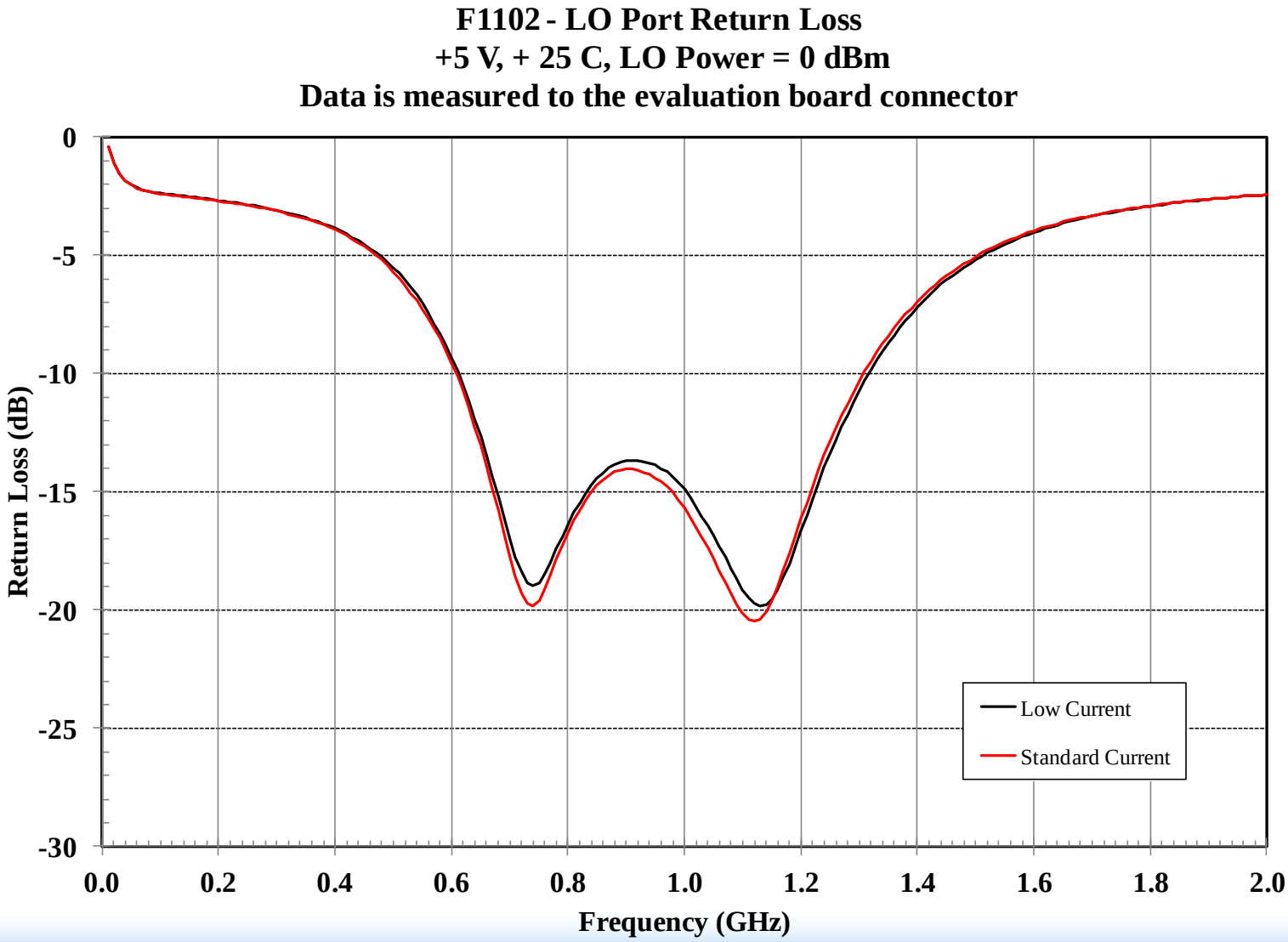
Band	Input [RF] (MHz)		LO (MHz)	Output [IF] (MHz)		
1	150	680	806	956	1486	$f_{IF} = f_{LO} + f_{RF}$
2	863	866	806	1669	1672	$f_{IF} = f_{LO} + f_{RF}$
3	276	282	806	530	524	$f_{IF} = f_{LO} - f_{RF}$
4	136	318	1105	969	787	$f_{IF} = f_{LO} - f_{RF}$
5	55	566	1105	1160	1671	$f_{IF} = f_{LO} + f_{RF}$
6	575	581	1105	530	524	$f_{IF} = f_{LO} - f_{RF}$

Circuit Modifications

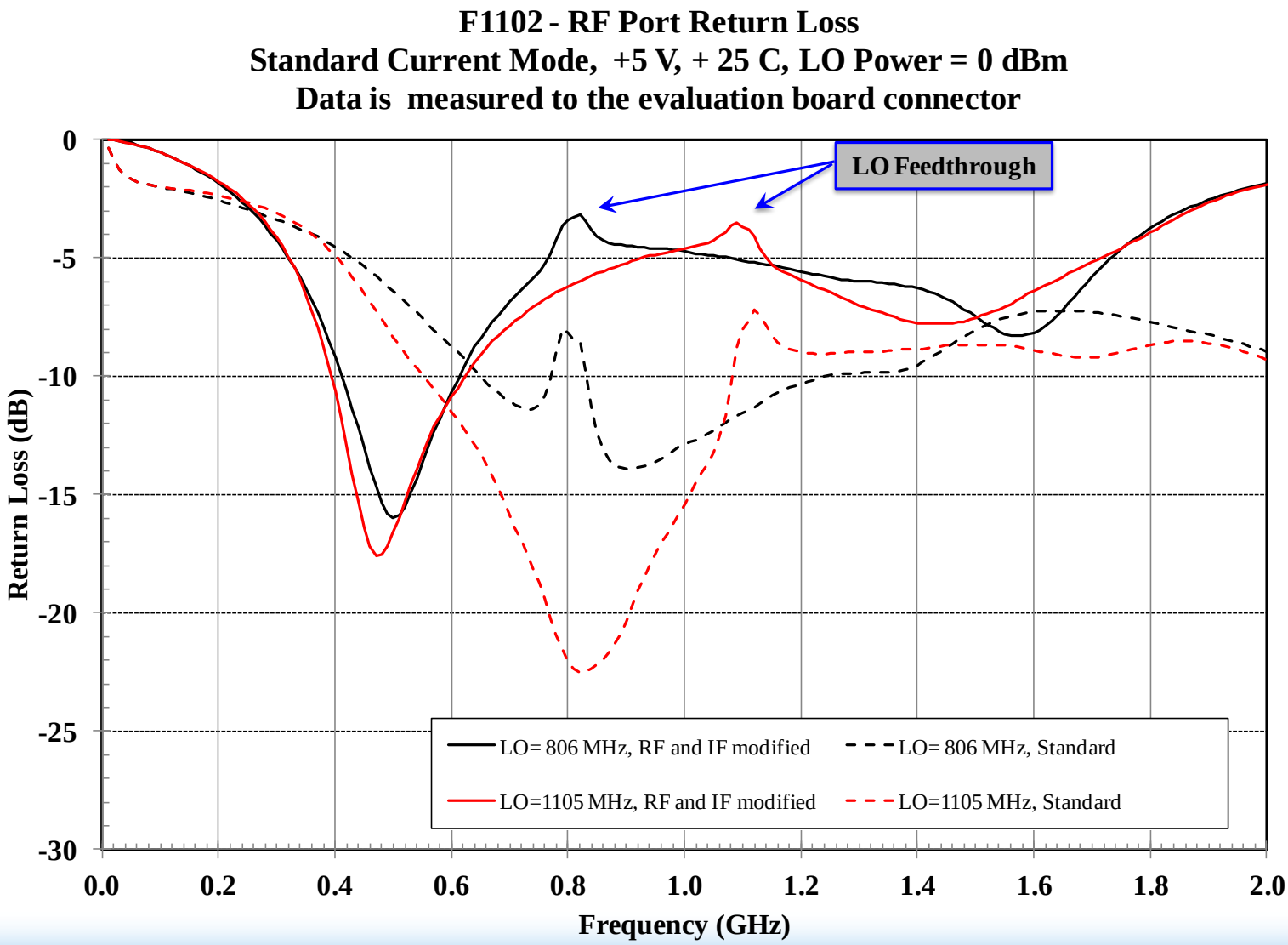
- The previous report, AT0225-F1102 Extended Frequency Range R01.pdf, modified the three ports for operation.
- Key Components
  - RF Path
    - ✓C8=C10 = 18 pF
    - ✓Added Shunt 3.0 pF
    - ✓Tuned for 400 MHz
  - LO Path
    - ✓C11 = 6.8 pF
  - IF Path
    - ✓T1=T2 = TC4-6TG2+ (1.5-600 MHz)



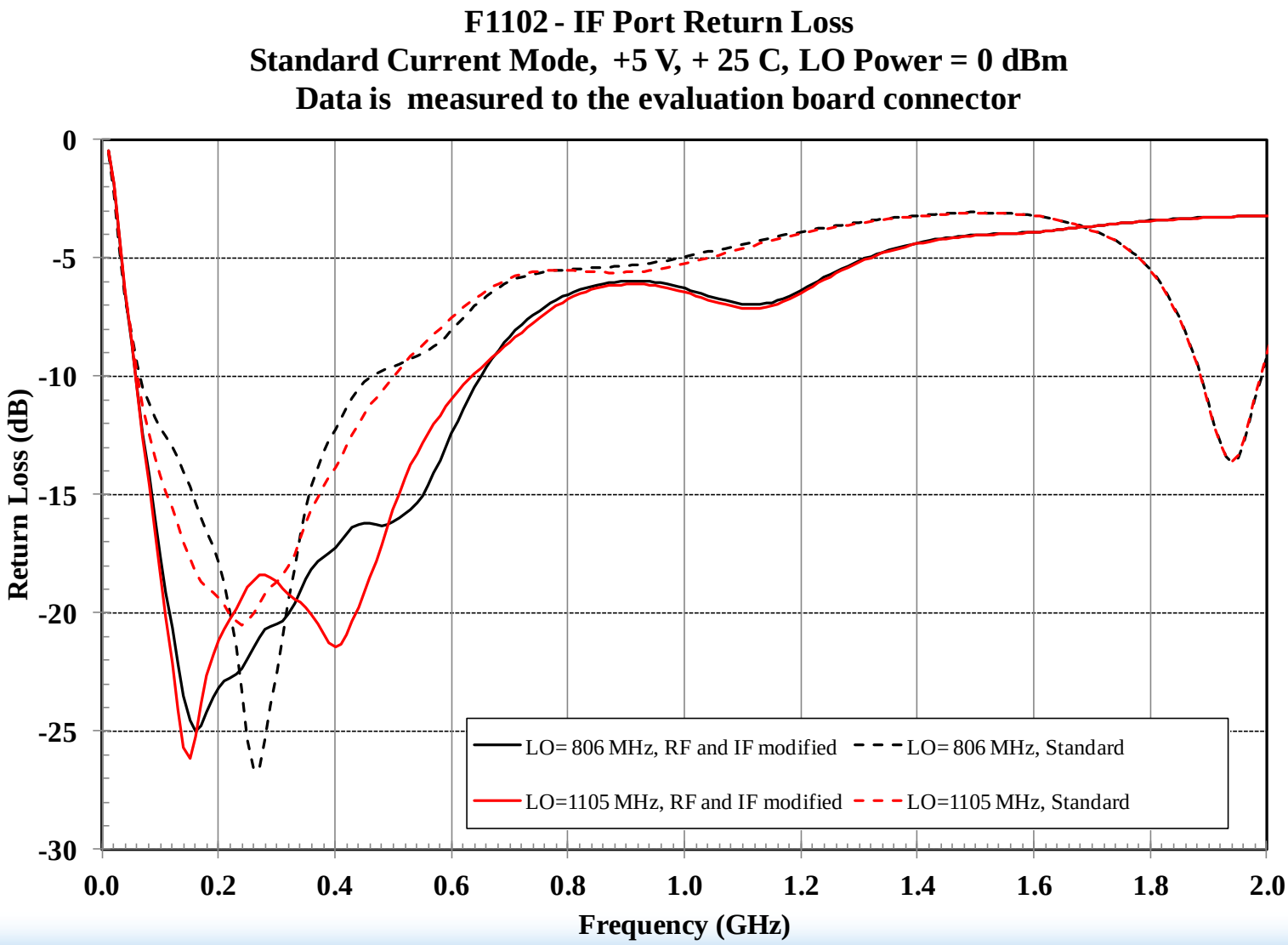
LO Return


F1102 - LO Port Return Loss
+5 V, + 25 C, LO Power = 0 dBm
Data is measured to the evaluation board connector
Return Loss (dB)
0
-5
-10
-15
-20
-25
-30
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
Frequency (GHz)
Low Current
Standard Current

RF Port Return Loss Comparison



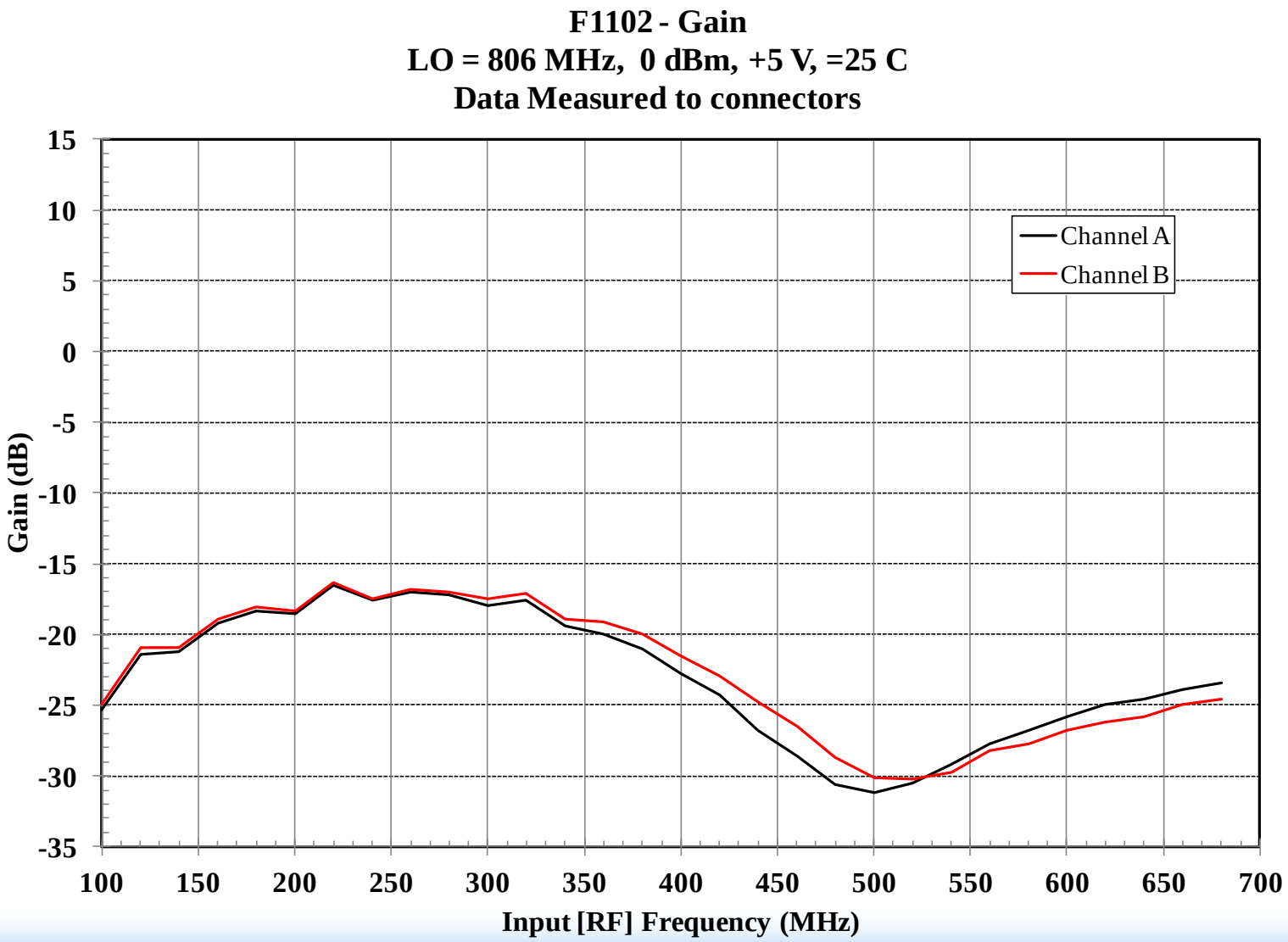
IF Port Return Loss Comparison



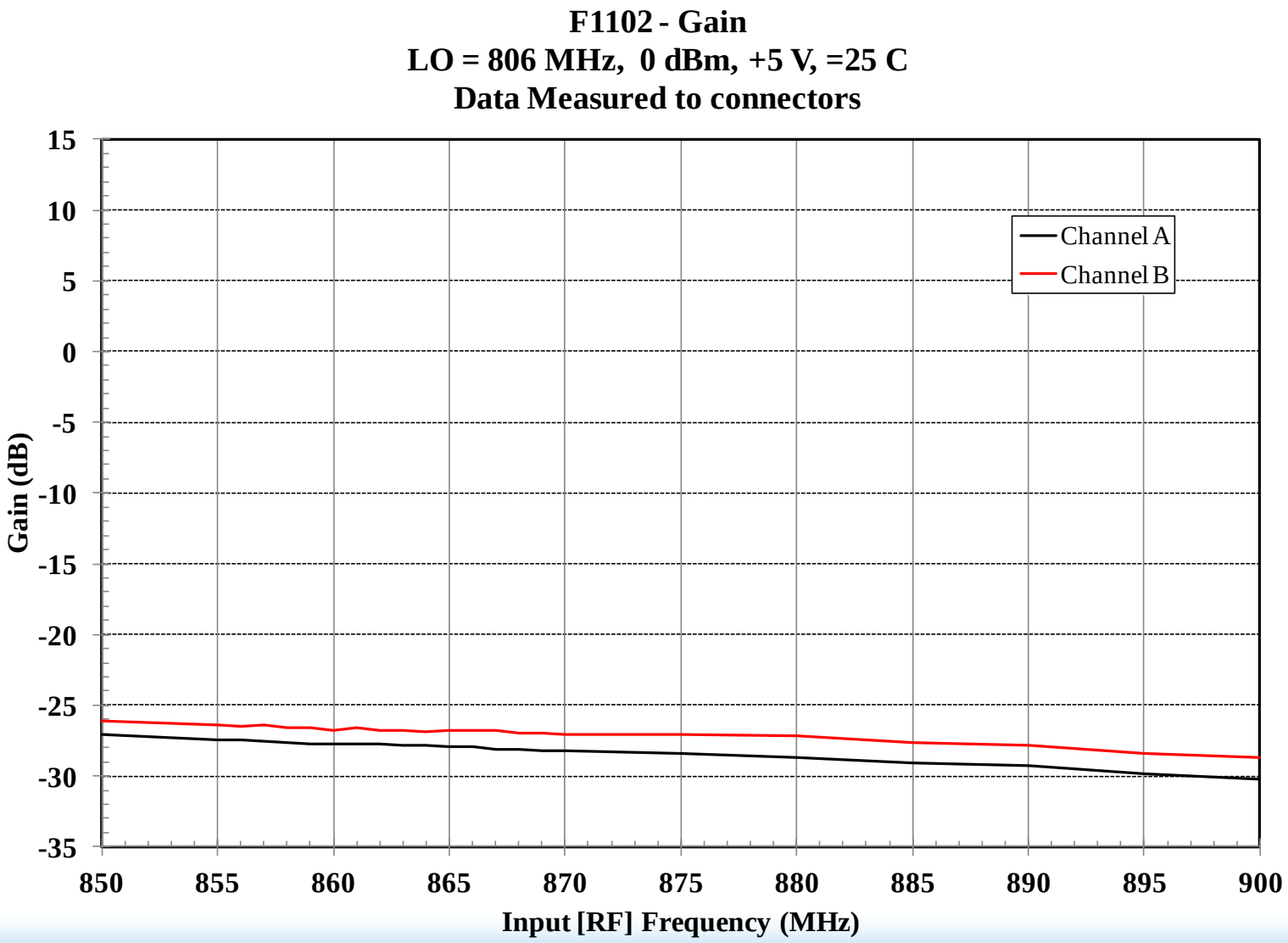
Comments

- The LO port modification was not added since the return loss using the standard 150 pF capacitor had a good return loss over the band of 600 to 1300 MHz.
- The modification for the RF Port shows a steep increase below 400 MHz. This may show poor performance for these frequencies.
- The addition of the high frequency IF transformer does add bandwidth but does show poor performance above 800 MHz.
- The original design of the F1102 has the
  - RF: 400 to 1000 MHz
  - IF: 50 to 300 MHz

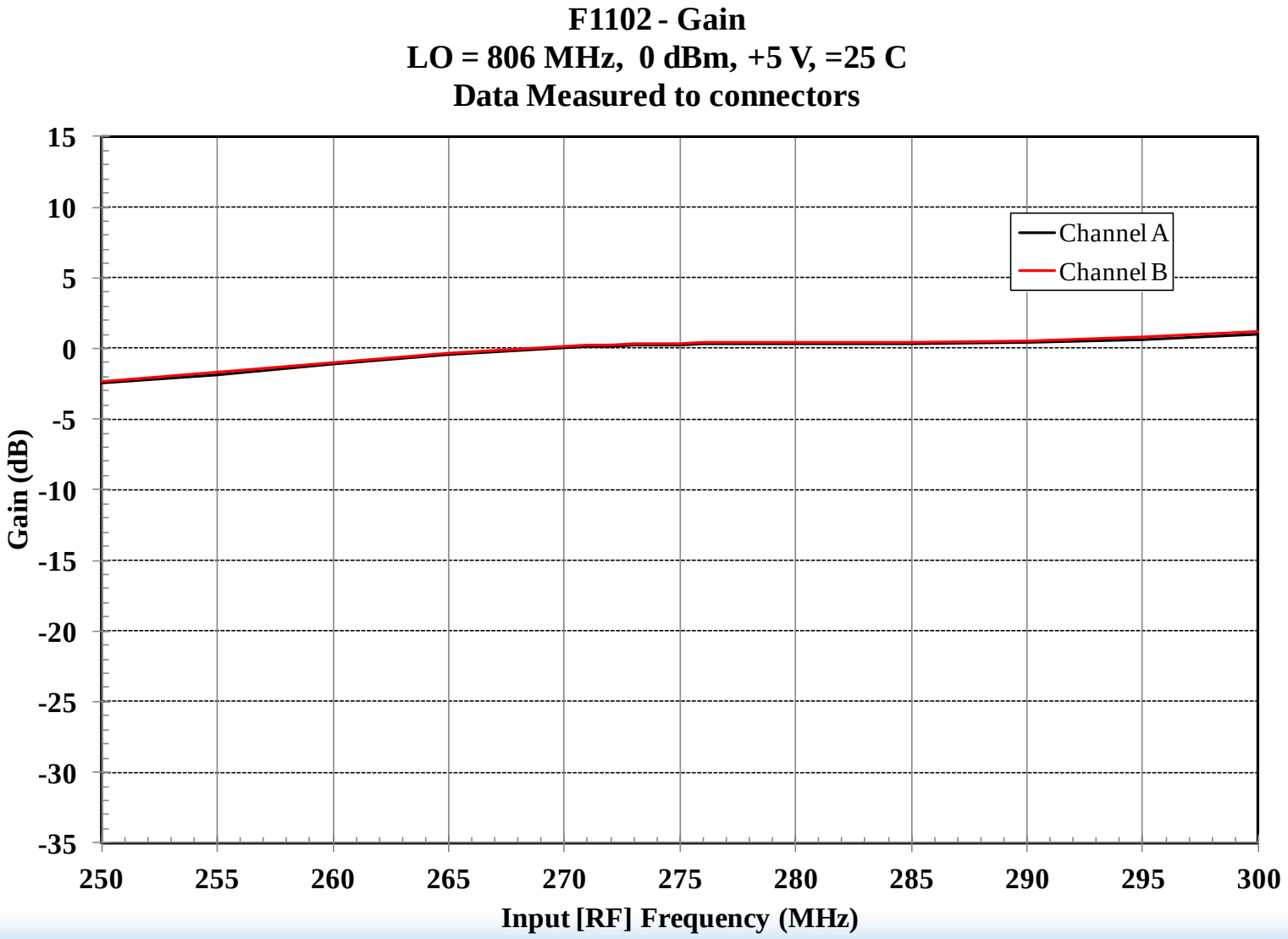
Gain – Band 1


F1102 - Gain
LO = 806 MHz, 0 dBm, +5 V, =25 C
Data Measured to connectors
Channel A
Channel B
Gain (dB)
15
10
5
0
-5
-10
-15
-20
-25
-30
-35
100
150
200
250
300
350
400
450
500
550
600
650
700
Input [RF] Frequency (MHz)

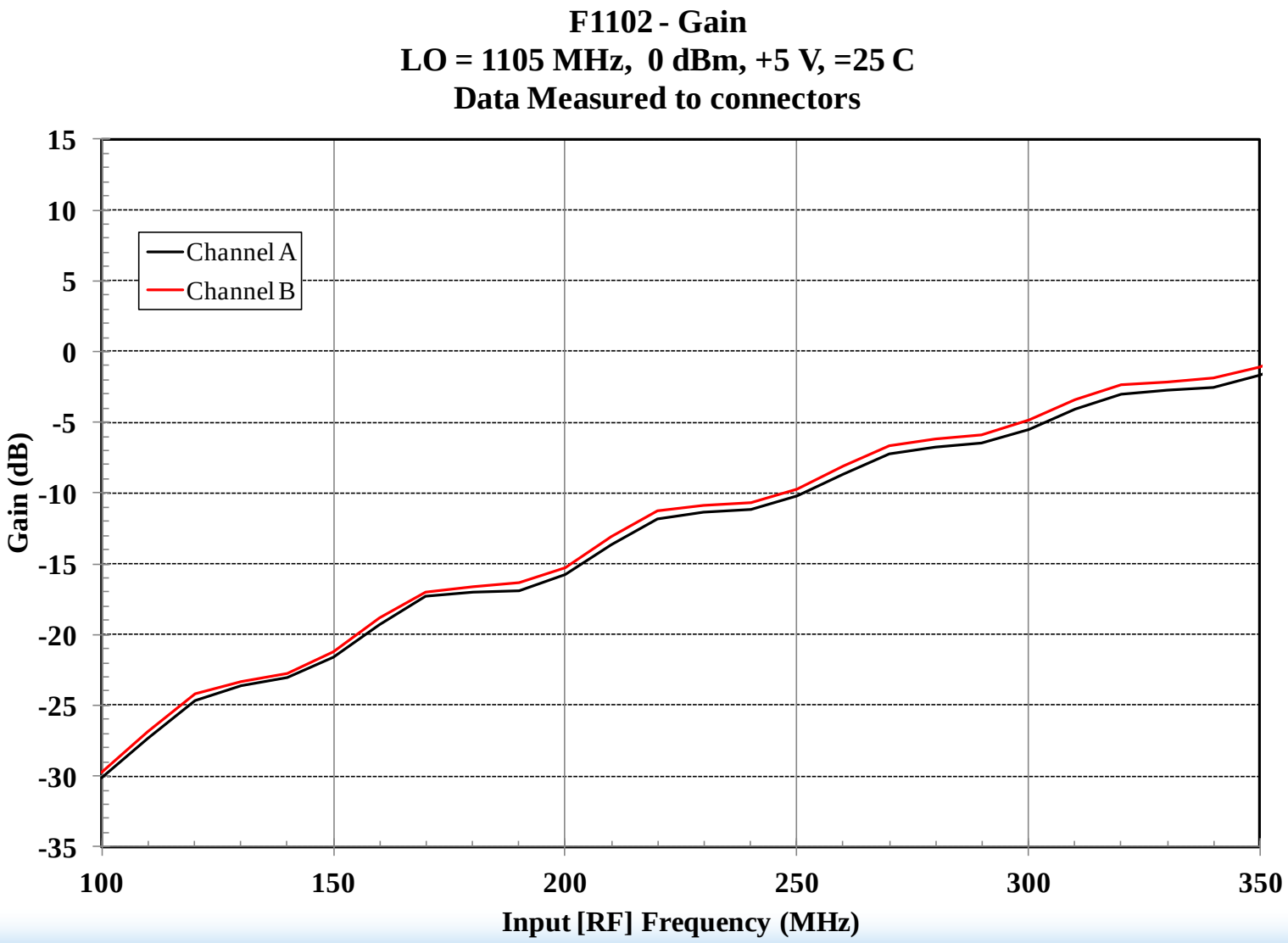
Gain – Band 2


F1102 - Gain
LO = 806 MHz, 0 dBm, +5 V, =25 C
Data Measured to connectors
Channel A
Channel B
Gain (dB)
15
10
5
0
-5
-10
-15
-20
-25
-30
-35
850
855
860
865
870
875
880
885
890
895
900
Input [RF] Frequency (MHz)

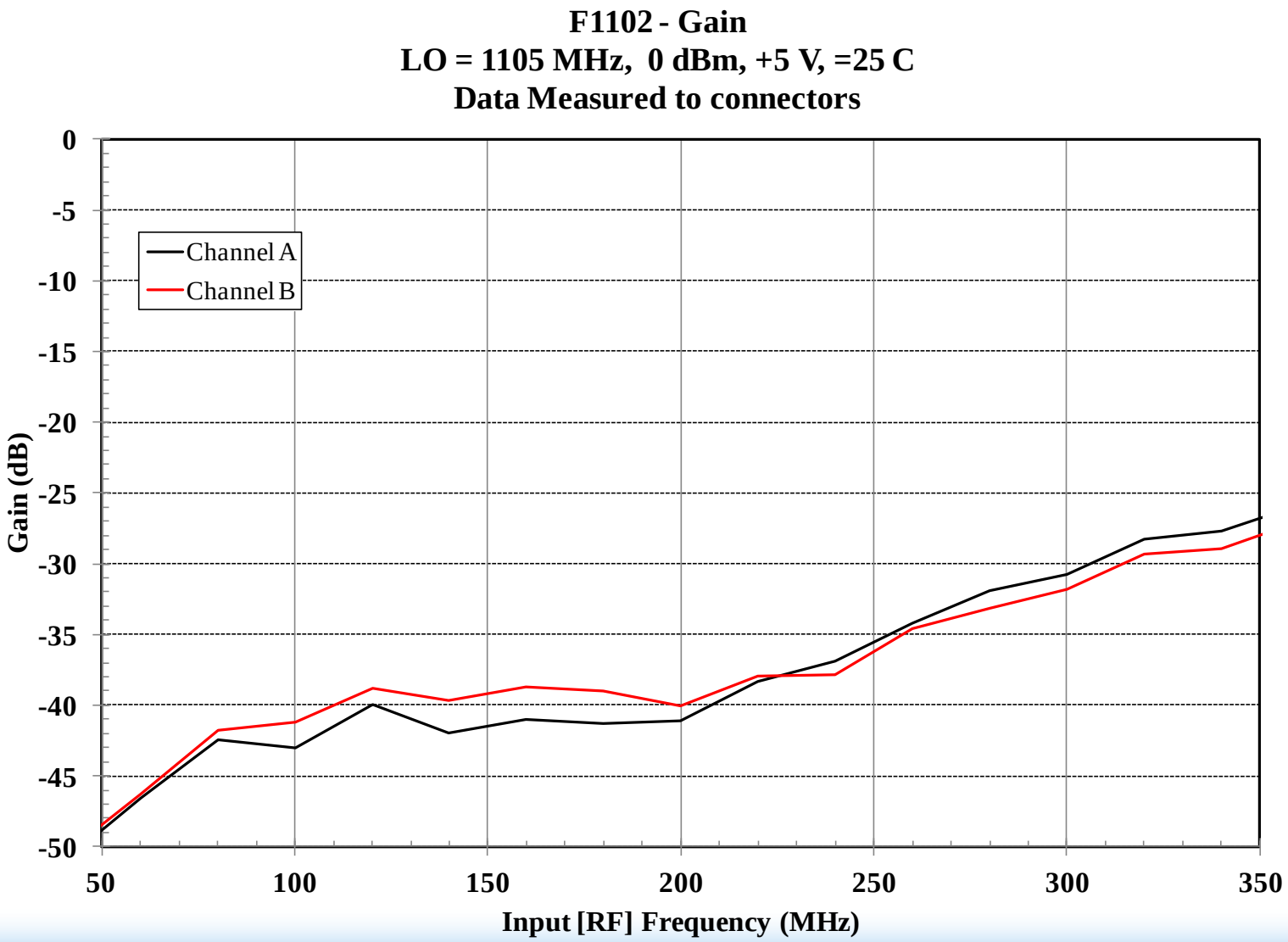
Gain – Band 3


F1102 - Gain
LO = 806 MHz, 0 dBm, +5 V, =25 C
Data Measured to connectors
Channel A
Channel B
Gain (dB)
15
10
5
0
-5
-10
-15
-20
-25
-30
-35
250
255
260
265
270
275
280
285
290
295
300
Input [RF] Frequency (MHz)

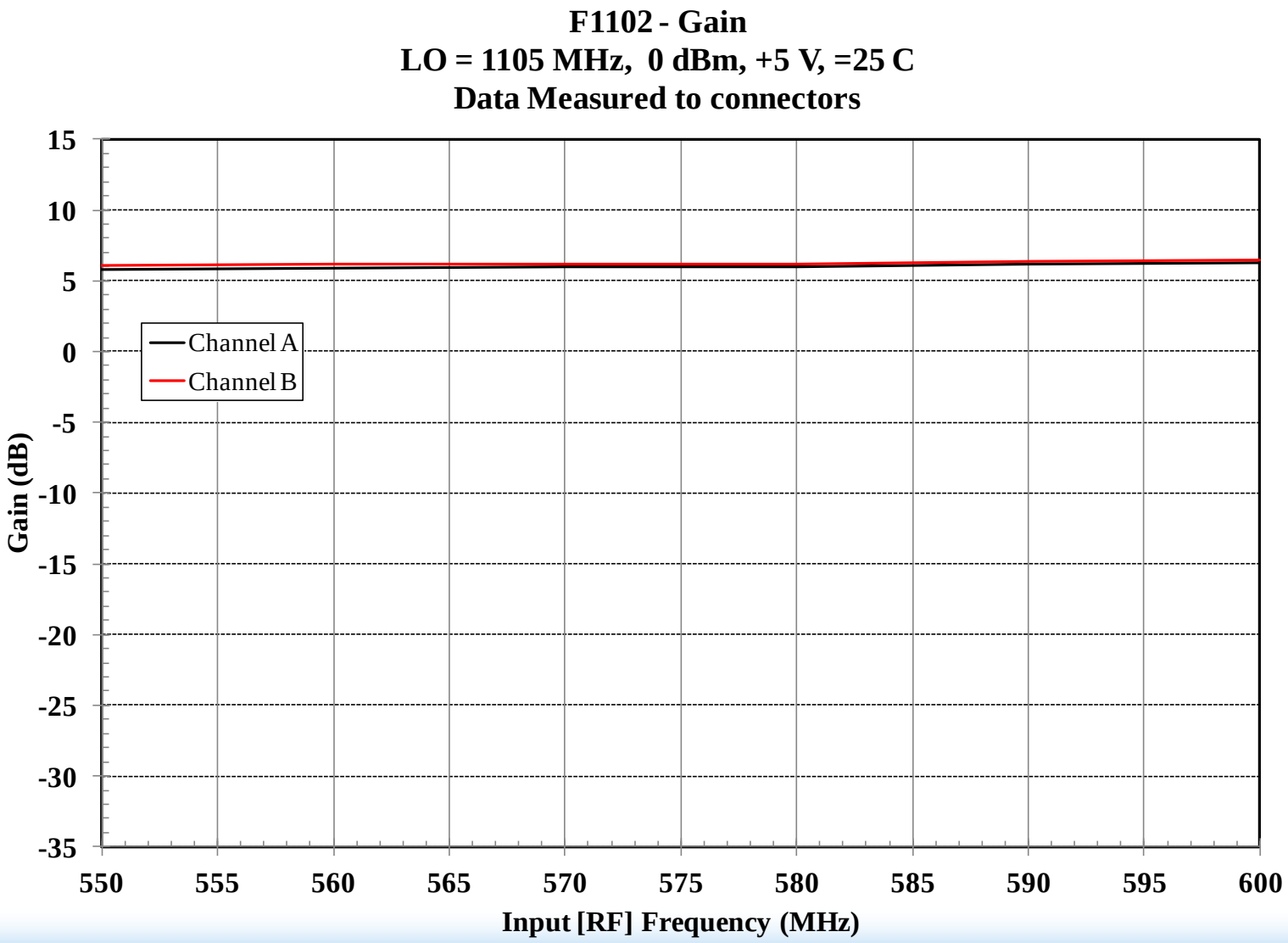
Gain – Band 4


F1102 - Gain
LO = 1105 MHz, 0 dBm, +5 V, =25 C
Data Measured to connectors
Channel A
Channel B
Gain (dB)
15
10
5
0
-5
-10
-15
-20
-25
-30
-35
100
150
200
250
300
350
Input [RF] Frequency (MHz)

Gain – Band 5


F1102 - Gain
LO = 1105 MHz, 0 dBm, +5 V, =25 C
Data Measured to connectors
Channel A
Channel B
Gain (dB)
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
50
100
150
200
250
300
350
Input [RF] Frequency (MHz)

Gain – Band 6


F1102 - Gain
LO = 1105 MHz, 0 dBm, +5 V, =25 C
Data Measured to connectors
Channel A
Channel B
Gain (dB)
15
10
5
0
-5
-10
-15
-20
-25
-30
-35
550
555
560
565
570
575
580
585
590
595
600
Input [RF] Frequency (MHz)

Comments

- The F1102 mixer does not work properly for most of the bands.

Band	Input [RF] (MHz)		LO (MHz)	Output [IF] (MHz)		Comment
1	150	680	806	956	1486	RF is out band, IF is out of band. This is a upconverter application.
2	863	866	806	1669	1672	IF is out of band. This is a upconverter application.
3	276	282	806	530	524	RF is out band but shows promise since the gain is 0 dB. Further RF tuning might increase the gain.
4	136	318	1105	969	787	RF is out band, IF is out of band. This is a upconverter application.
5	55	566	1105	1160	1671	RF is out band, IF is out of band. This is a upconverter application.
6	575	581	1105	530	524	RF is out band but shows promise since the gain is 5 dB. Further RF tuning might increase the gain.

Comments

- For the upcoverter applications our downconverters can not be expanded into these bands.
- IDT does building blocks for an upconverter and if you contact Sales we could investigate a design.