F1102 Extended Frequency Range

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- AT0225

- Rev 01: 2015-05-20 Added Noise Figure

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Introduction

- Customer is interested in the F1102 mixer but would like to use it in the Band 31(452 to 457 MHz) and high IF frequency (348 – 368 MHz). The LO is injection on the high side.

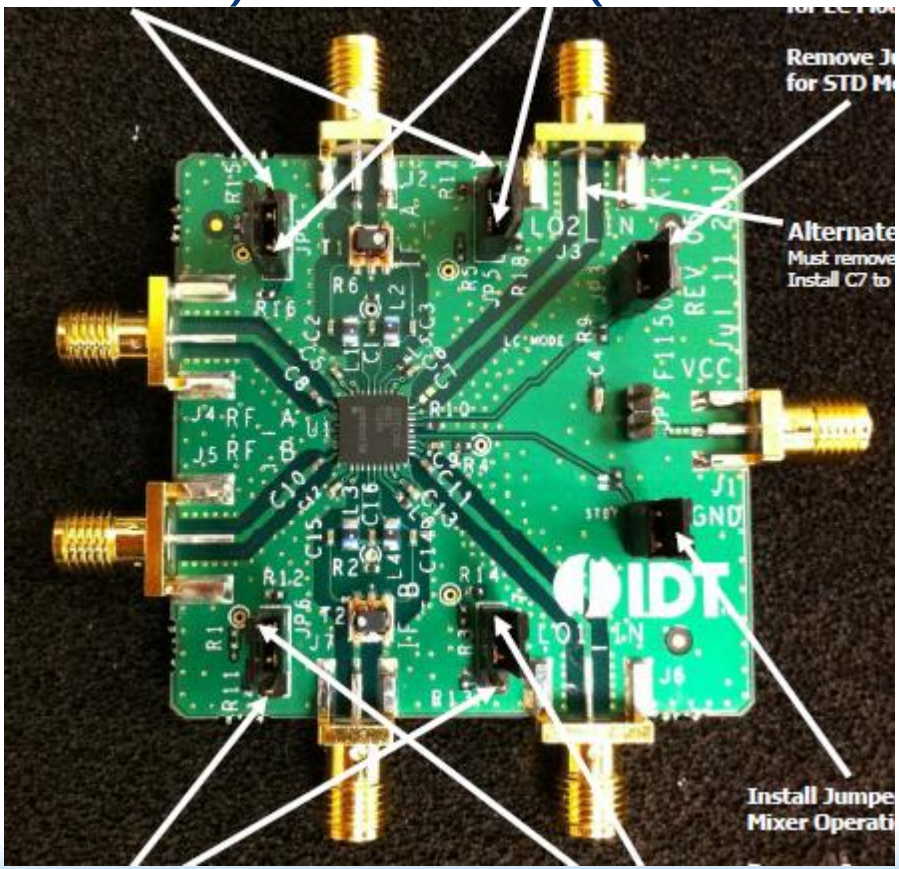
- The customer is curious about what parameters might change.

Testing

- Testing was only done at +25 C.
- Only the Low Current mode was used.
- Three configurations were tested.

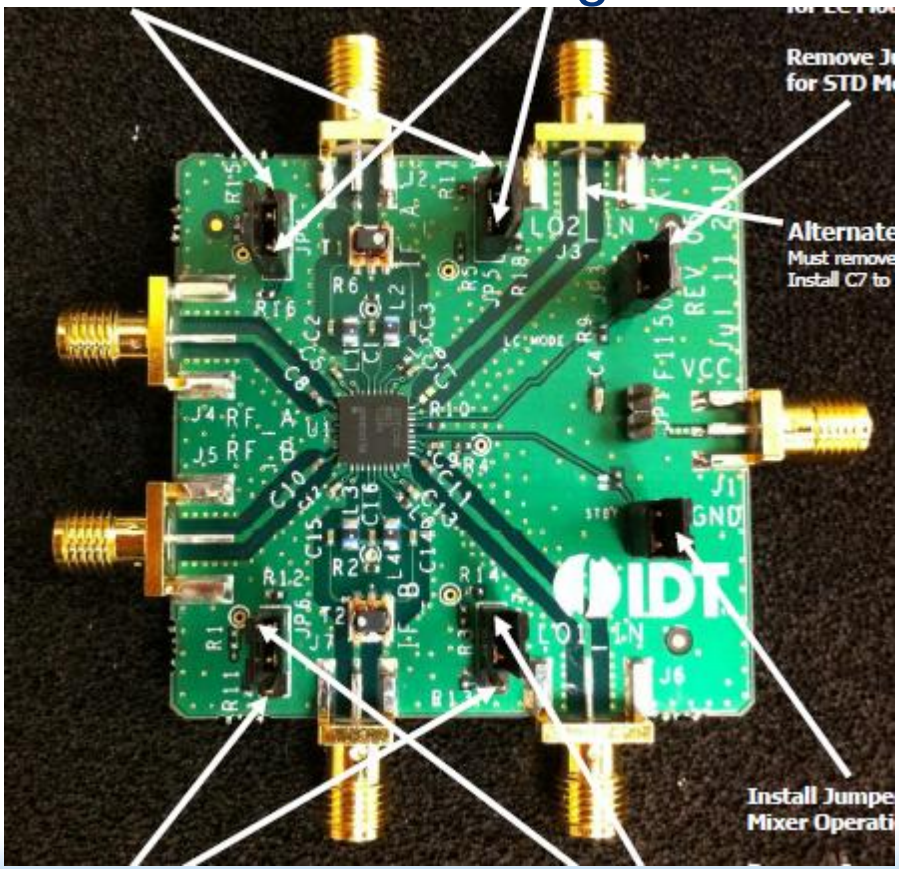
Configuration - Standard

- Standard Configuration (STD)
  - This is the evaluation board configuration for high frequency RF operation (900 MHz) and low IF (200 MHz).
- Key Components
  - RF Path
    - ✓C8=C10 = 150 pF
  - LO Path
    - ✓C11 = 150 pF
  - IF Path
    - ✓T1=T2 = TC4-1TG2+ (0.5-300 MHz)



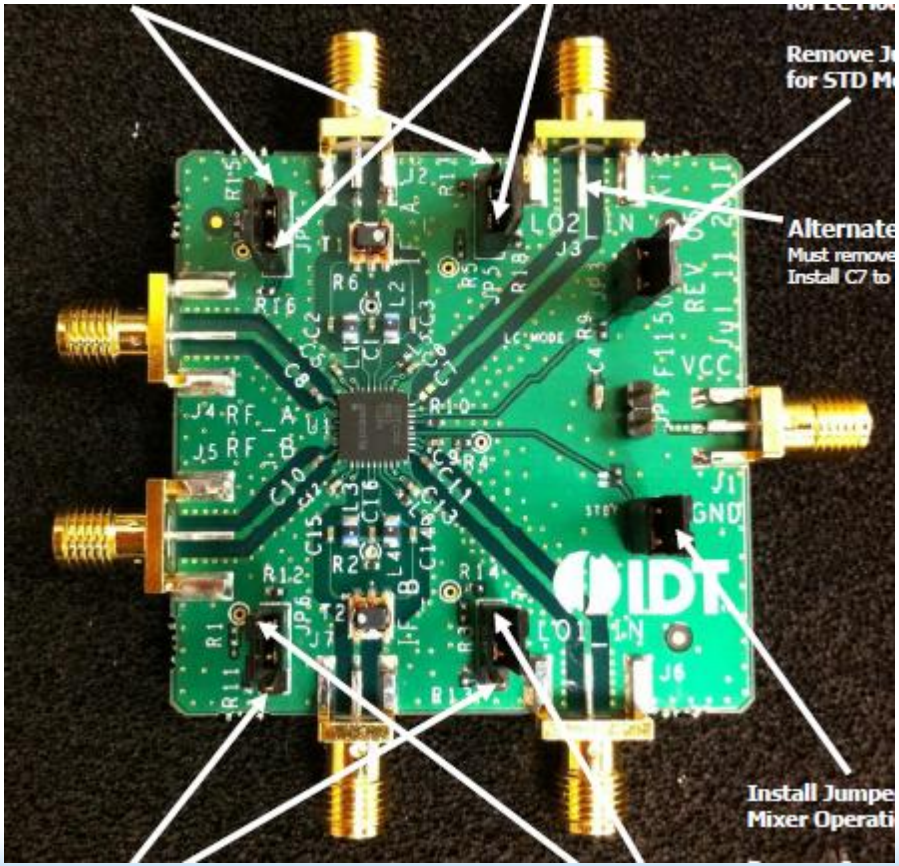
Configuration – RF Paths Tuned

- RF Tune
  - The evaluation board was modified for operation at 454 MHz which is similar to the 400 MHz configuration in the datasheet.
- Key Components
  - RF Path
    - ✓C8=C10 = 18 pF
    - ✓Added Shunt 3.0 pF
  - LO Path
    - ✓C11 = 6.8 pF
  - IF Path
    - ✓T1=T2 = TC4-1TG2+ (0.5-300 MHz)

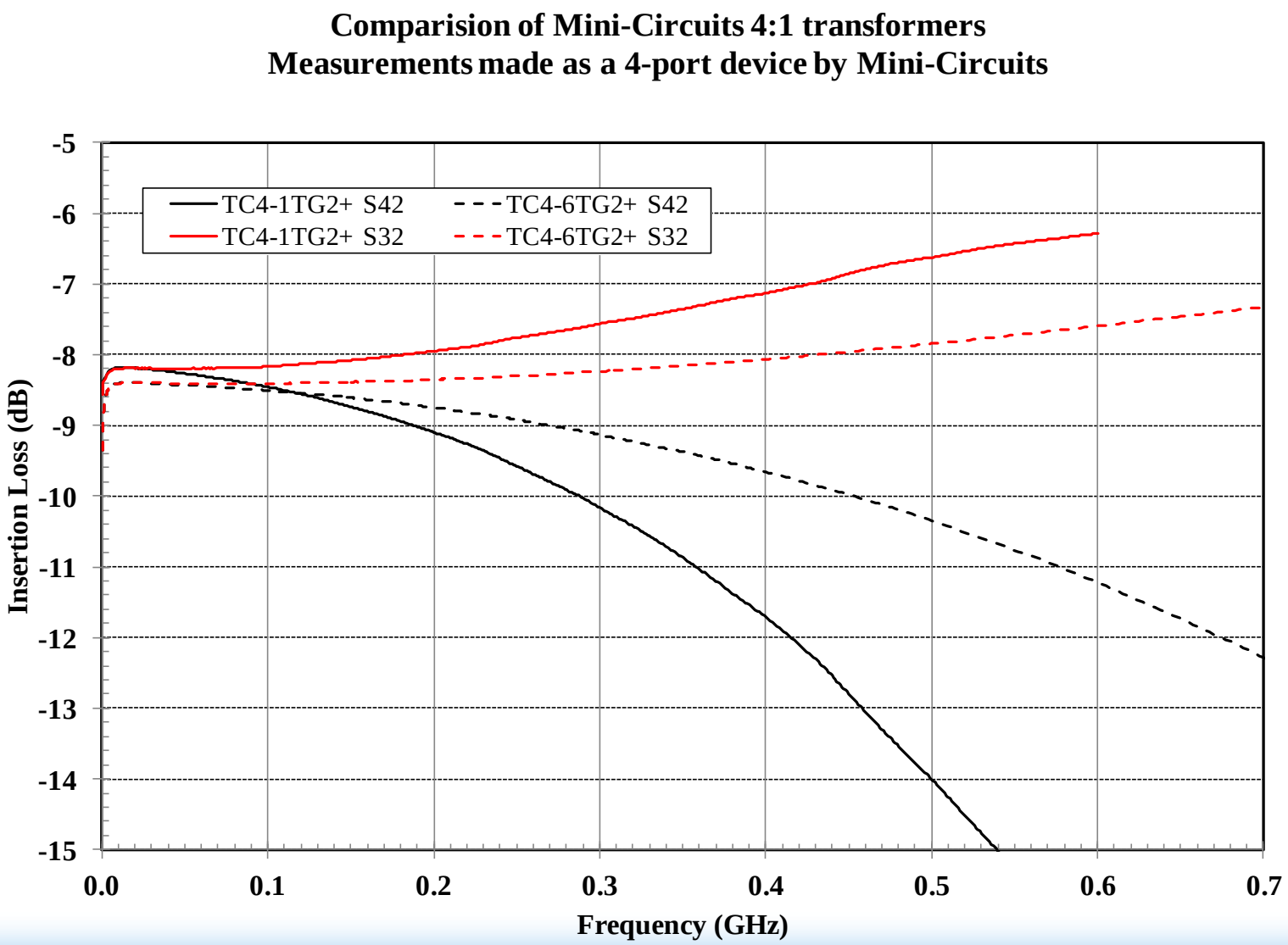


Configuration – Transformer Changed

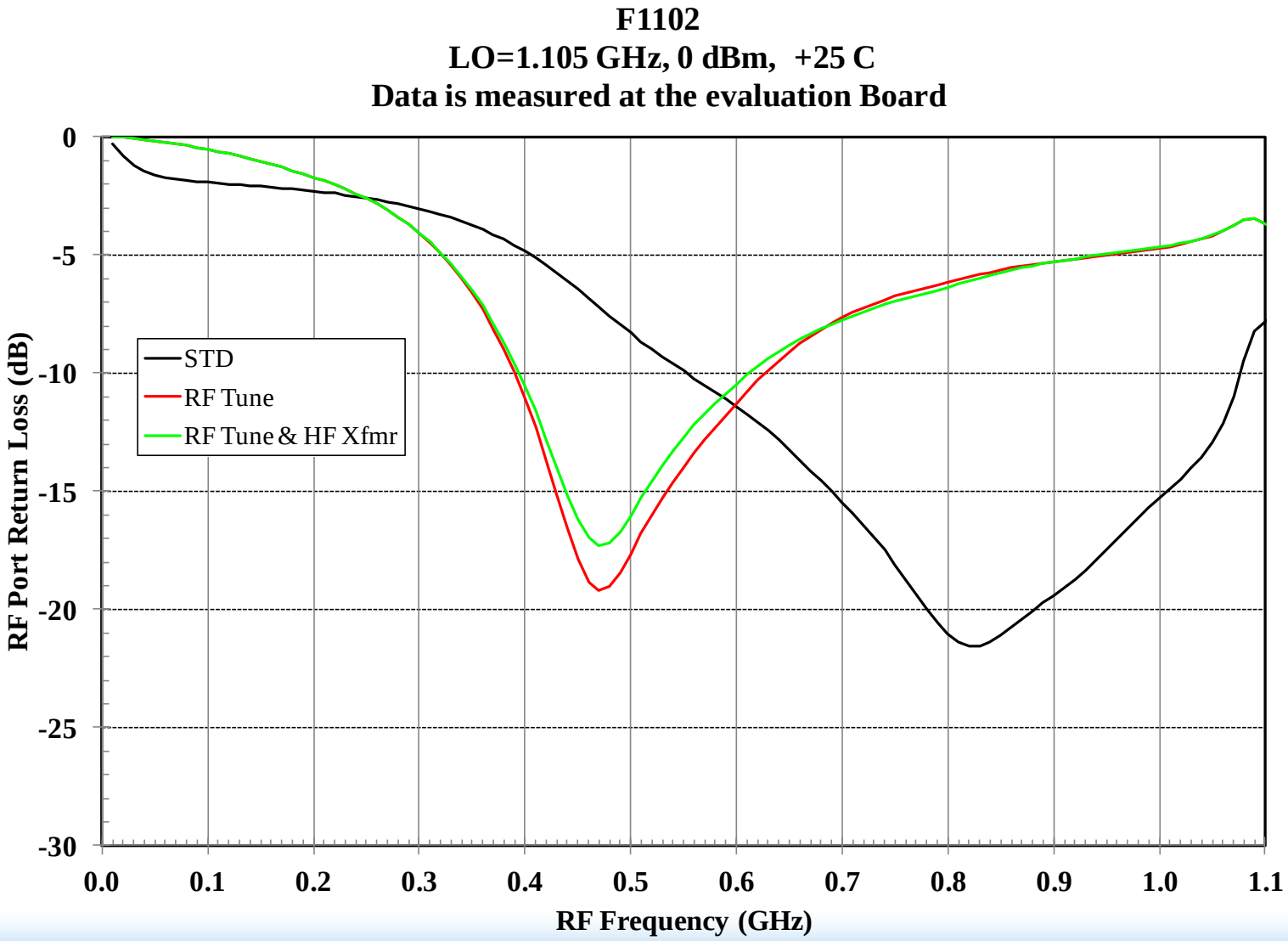
- RF Tune & HF Xfmr
  - Since the IF is above 300 MHz the IF transformer was change to a broader part,
- Key Components
  - RF Path
    - ✓C8=C10 = 18 pF
    - ✓Added Shunt 3.0 pF
  - LO Path
    - ✓C11 = 6.8 pF
  - IF Path
    - ✓T1=T2 = TC4-6TG2+ (1.5-600 MHz)



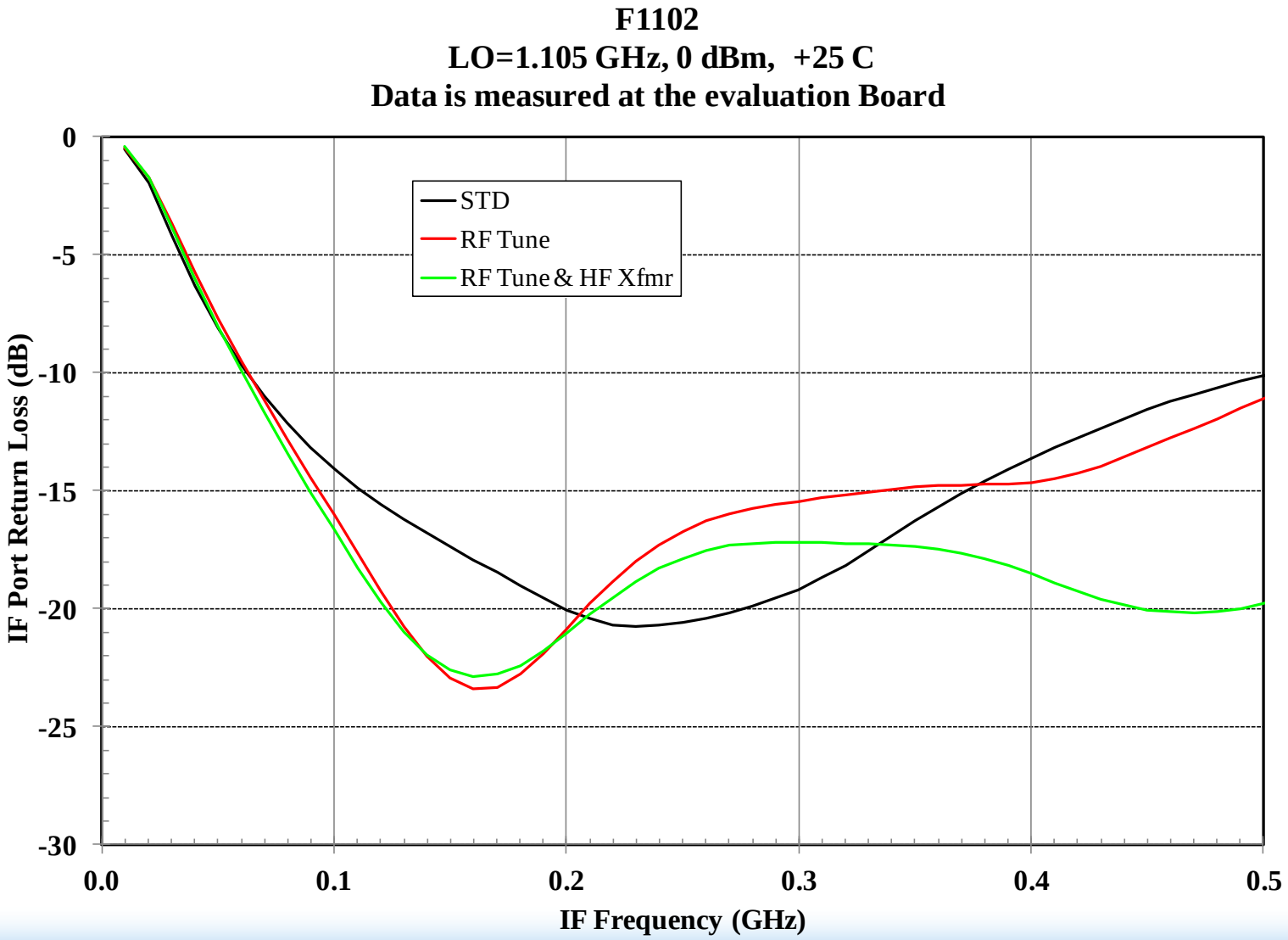
Mini-Circuits Transformers comparision



RF Port Return Loss

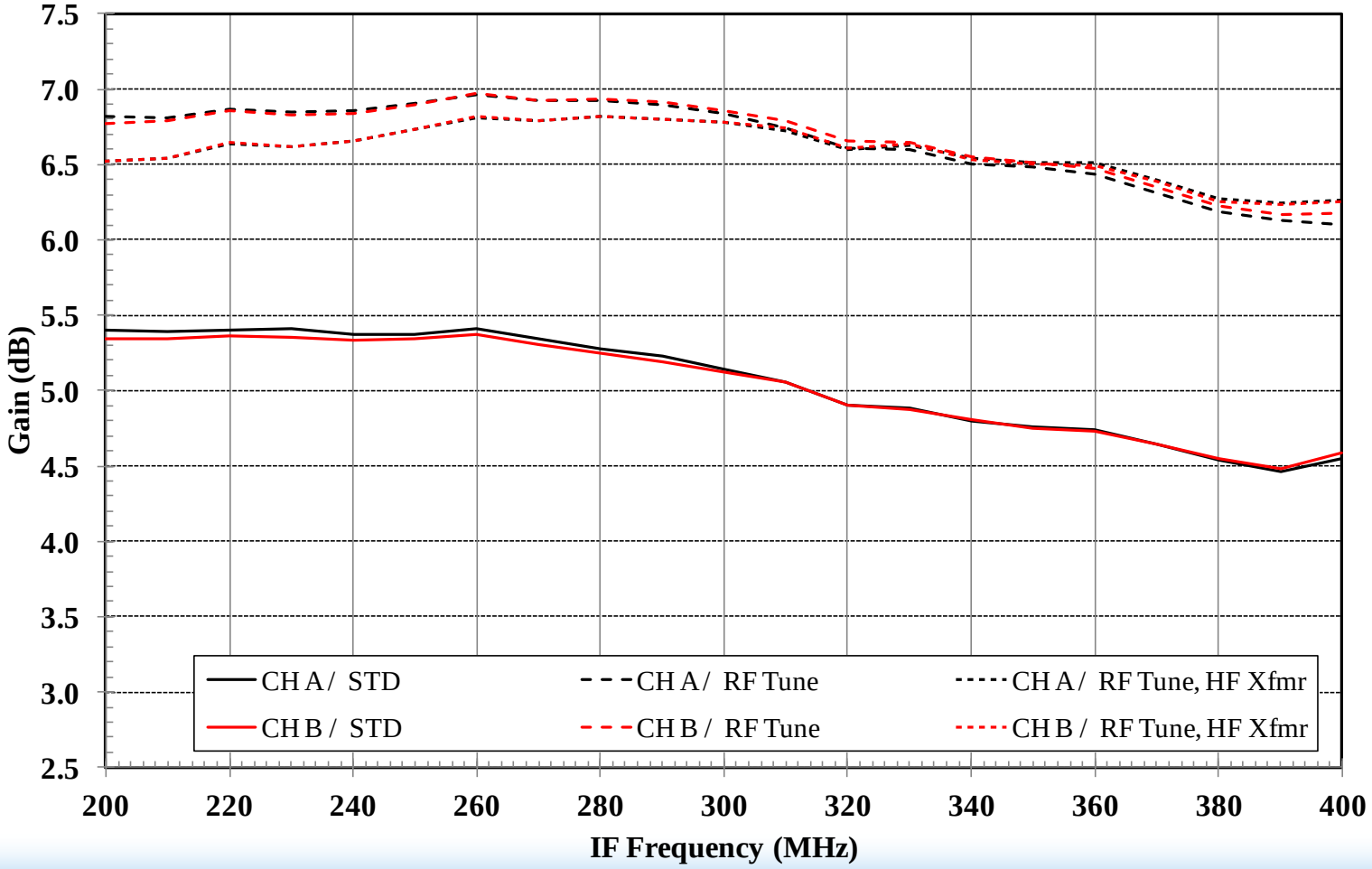


IF Port Return Loss

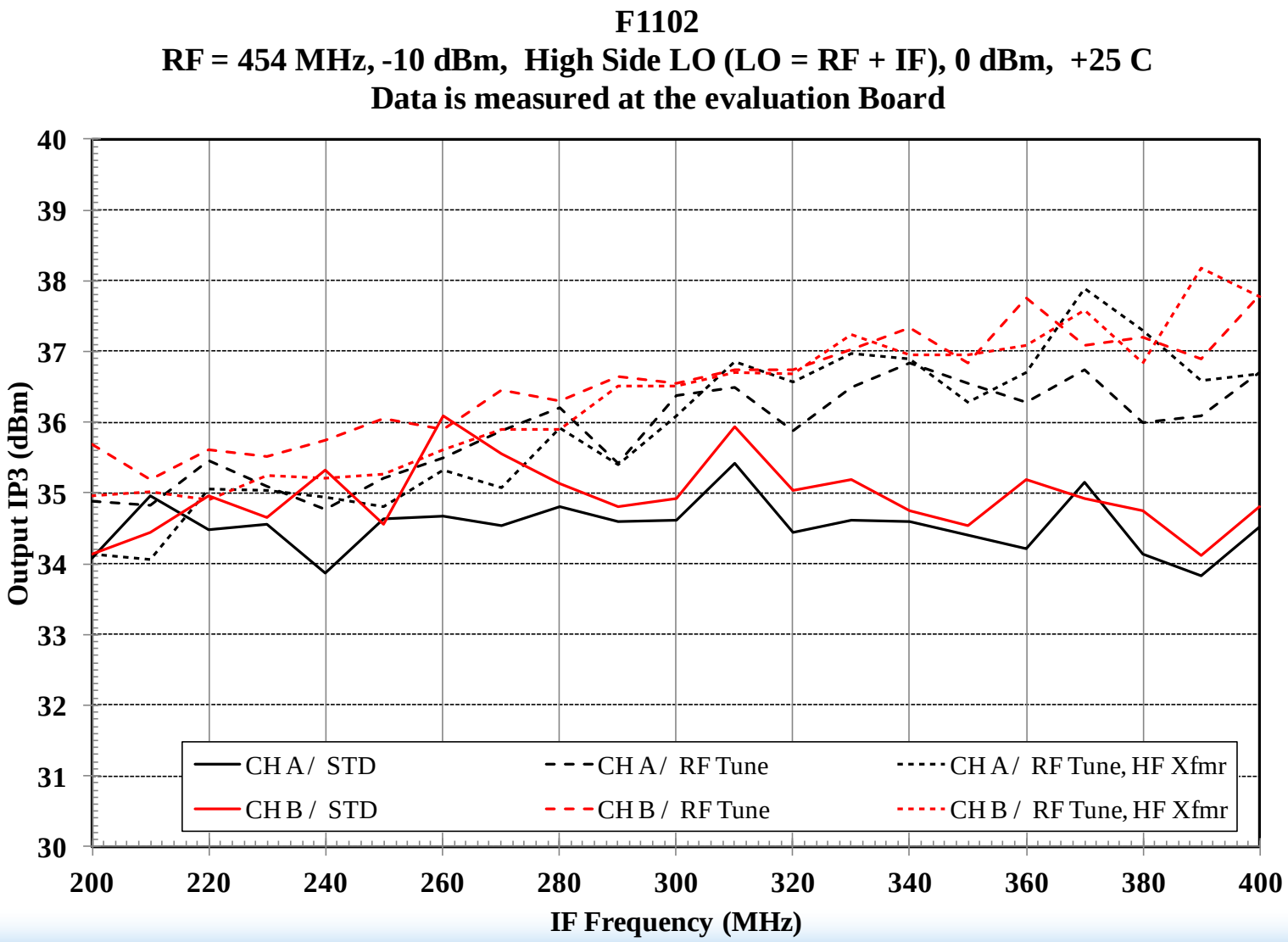


Gain, LC Mode

F1102
RF = 454 MHz, -10 dBm, High Side LO (LO = RF + IF), 0 dBm, +25 C
Data is measured at the evaluation Board

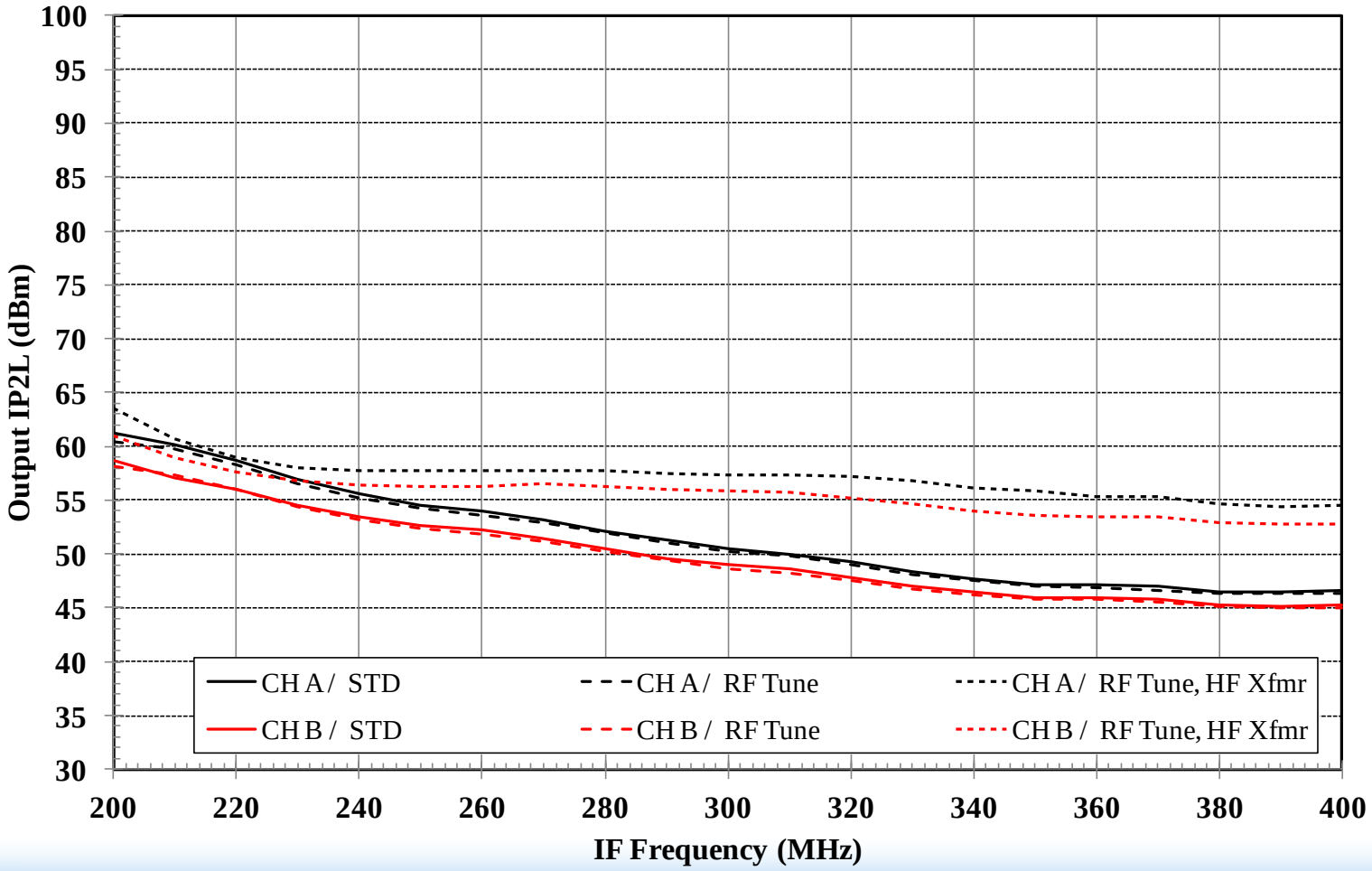


OIP3, LC Mode

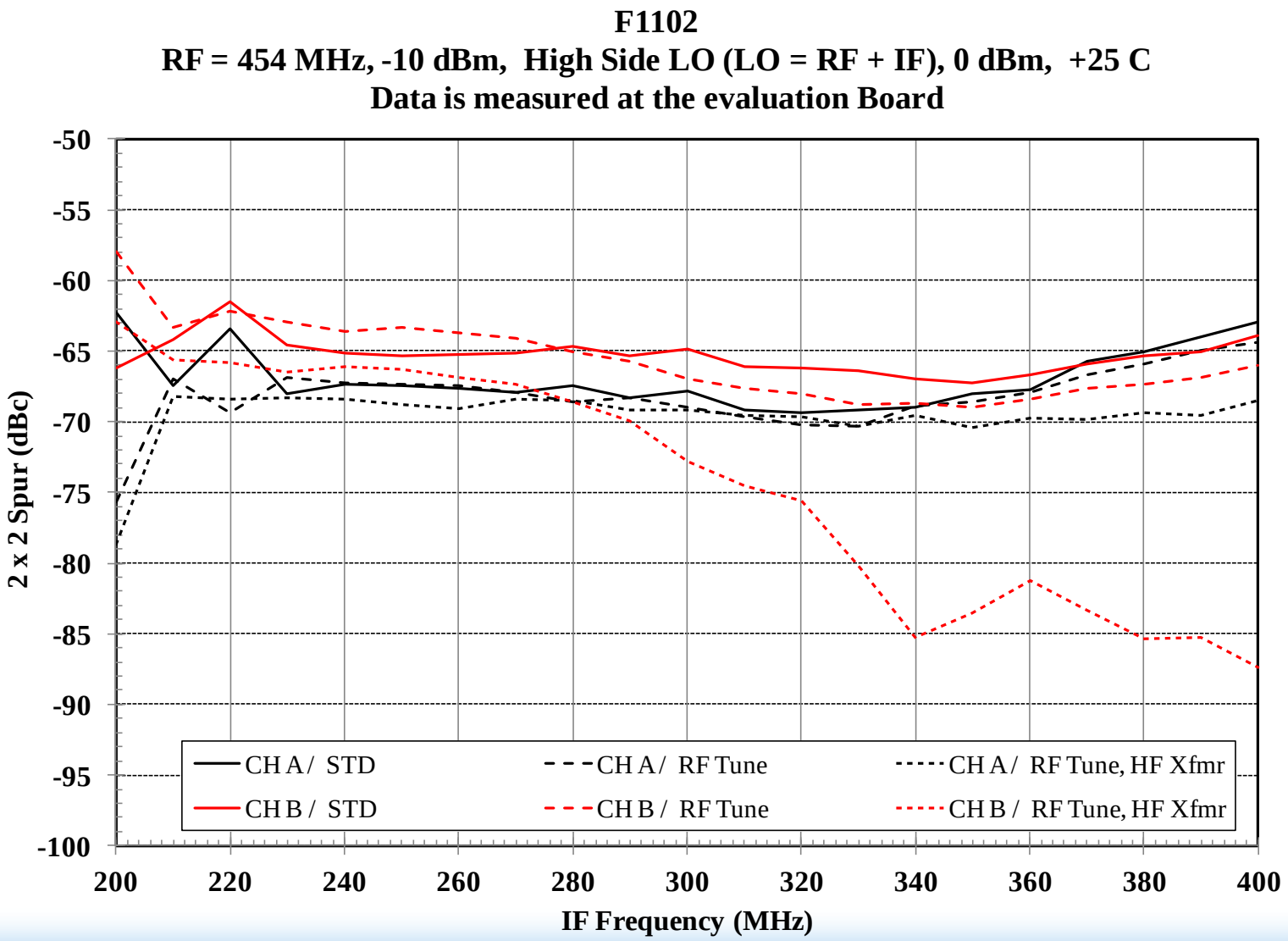

F1102
RF = 454 MHz, -10 dBm, High Side LO (LO = RF + IF), 0 dBm, +25 C
Data is measured at the evaluation Board
Output IP3 (dBm)
40
39
38
37
36
35
34
33
32
31
30
200
220
240
260
280
300
320
340
360
380
400
IF Frequency (MHz)
CH A / STD
CH A / RF Tune
CH A / RF Tune, HF Xfmr
CH B / STD
CH B / RF Tune
CH B / RF Tune, HF Xfmr

OIP2, LC Mode

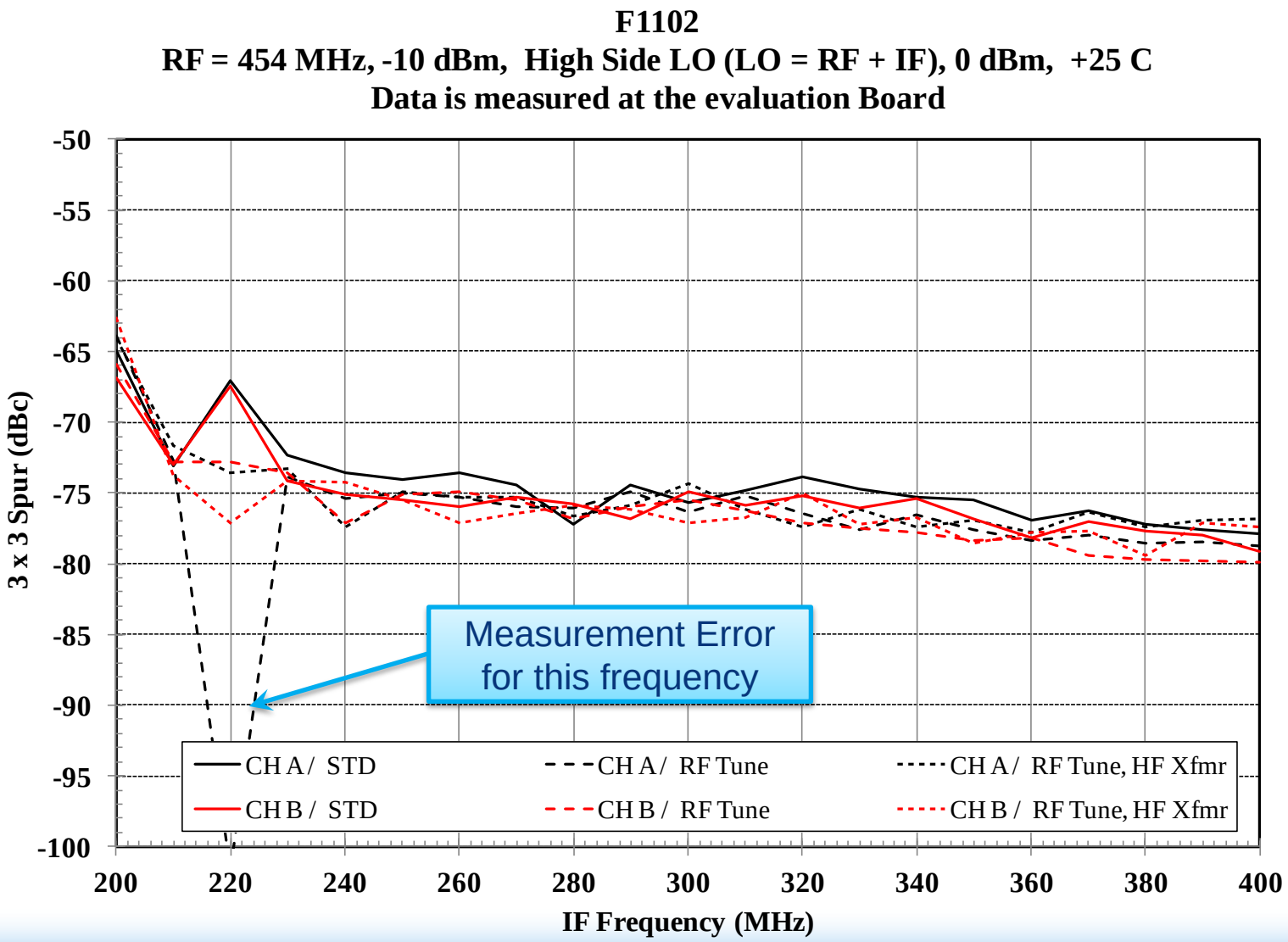
F1102
RF = 454 MHz, -10 dBm, High Side LO (LO = RF + IF), 0 dBm, +25 C
Data is measured at the evaluation Board



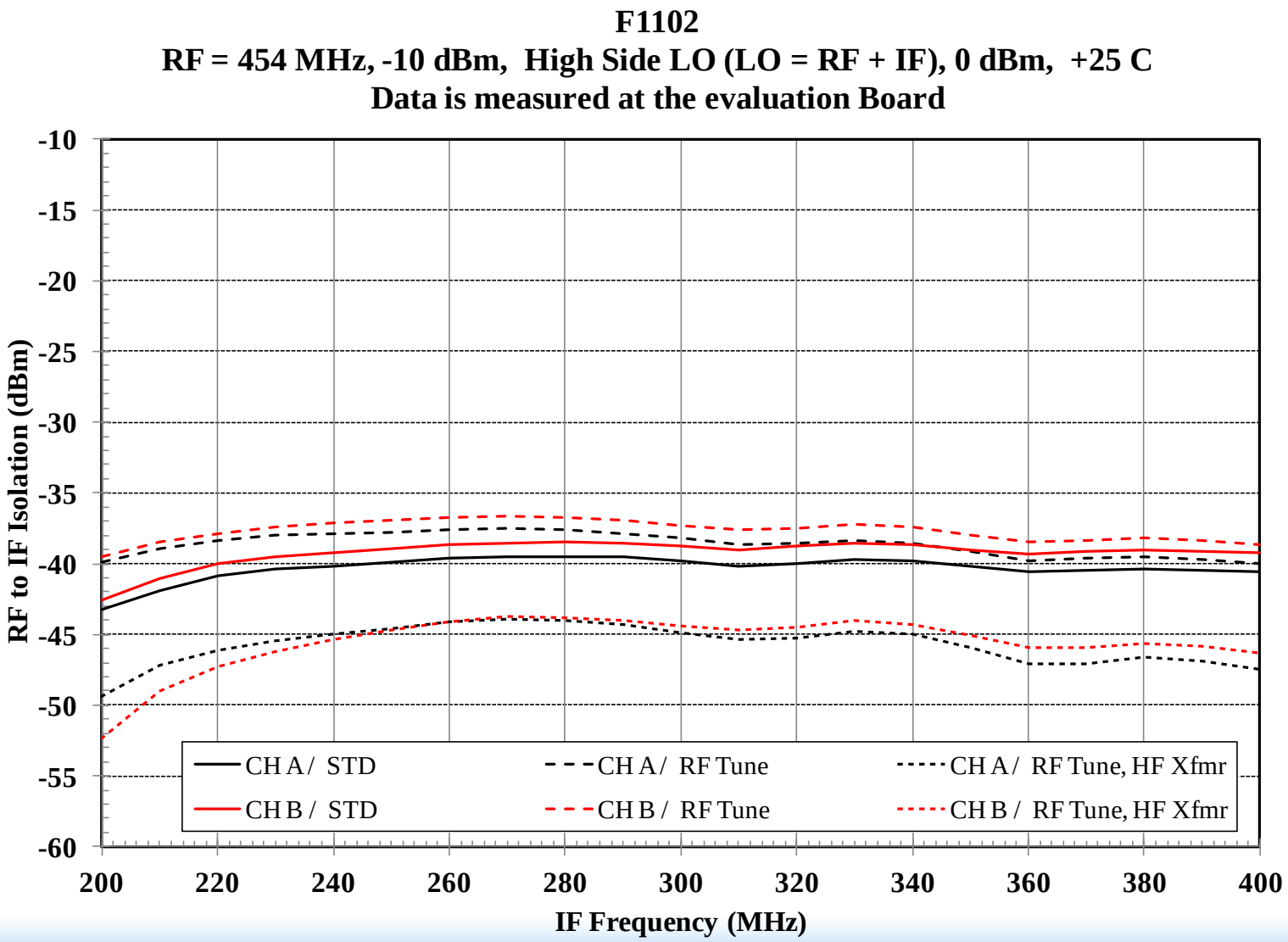
2x2 Spur, LC Mode



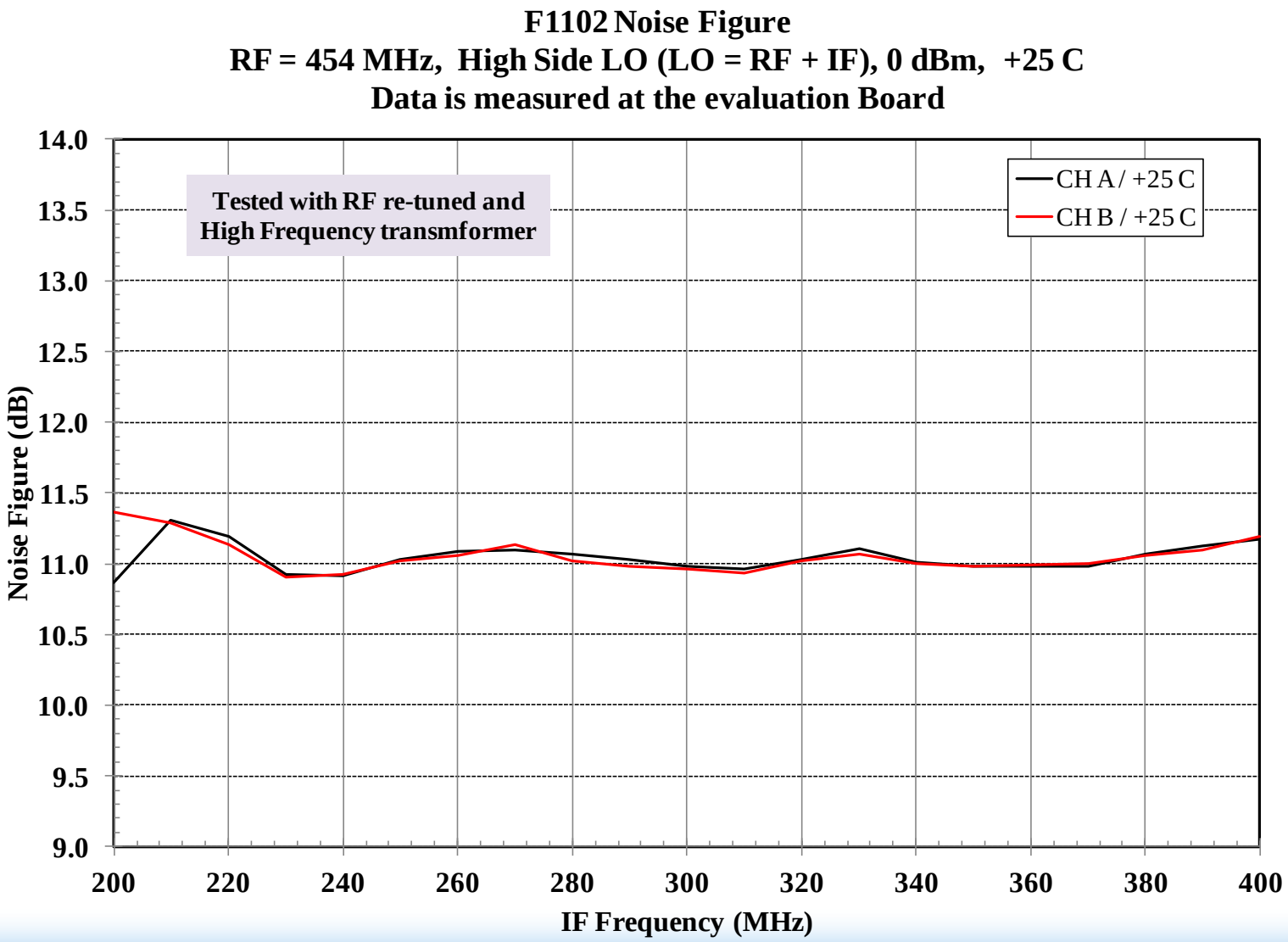
3x3 Spur, LC Mode



RF to IF Isolation, LC Mode



Noise Figure, LC Mode



Comments

- The gain is only 6.5 dB (datasheet has a typical gain of 8 dB), but the RF tuning helped to increase the gain from the standard configuration.
- The Output IP3 is approximately 37 dBm which is typical for the low current mode.
- The 3x3 Spur is approximately -75 dBc which is similar to the datasheet.
- The RF to IF isolation is about -45 dBm which better than the datasheet of -26 dBm.
- The noise figure is slightly worse,11 dB versus 9.5 dB.

- *The measured data has board losses that has not be de-embedded which at most will be 0.5 dB.*