

# HMCAD1520 IMD Measurements

## Product Application Note

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## Contents

<b>1</b>	<b>Introduction.....</b>	<b>3</b>
<b>2</b>	<b>HMCAD1520 IMD Measurement Data .....</b>	<b>Error! Bookmark not defined.</b>

## Figures

Figure 1	39.123 & 40.123 MHz input tones, Fs: 105 MSPS Precision Mode .....	4
Figure 2	iMD3, Fs: 105 MSPS, Fin 39.123 & 40.123 Precision Mode .....	5
Figure 3	39.123 & 40.123 MHz input tones, Fs: 125 MSPS Precision Mode	<b>Error! Bookmark not defined.</b>
Figure 4	iMD3, Fs: 125 MSPS, Fin 39.123 & 40.123 Precision Mode	<b>Error! Bookmark not defined.</b>

## Tables

Table 1	HMCAD1520 IMD Measurement Data .....	3
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## 1 Introduction

IMD, or Intermodulation Distortion, is one way to measure linearity in Analog to Digital Converters. The intermodulation between two frequency components will form additional signals at the sum and difference frequencies of the original tones and at multiples thereof. The second order products can typically be filtered out but third order ones, which occur at  $2f_2-f_1$  and  $2f_1-f_2$ , are close to the original signals. Aliased third harmonics can also present trouble. These IMD products can mask out small signals in the presence of larger ones, creating difficulty in multi-channel communication systems.

## 2 HMCAD1520 IMD Measurement Data

In this example, two tones are applied to a HMCAD1520, 1 MHz apart and at -7dBFS to avoid ADC clipping. The tones are applied at 39.123 and 40.123 MHz and also at 59.123 and 60.123 MHz, for two sampling rates, 105 MSPS and 125 MSPS.

The results are summarized in table below and in the plots which follow.

Fs	[MHz]	[dBFS]	[dBm]	[MHz]	[dBFS]	[dBm]	[dBFS]	[dBFS]
	Fi1	Ai1	Pi1	Fi2	Ai2	Pi2	iMD2	iMD3
105	39.123	-7.1	11.7	40.123	-7.1	11.6	-92.3	-91.6
105	59.123	-7.0	12.1	60.123	-7.0	11.9	-109.7	-82.1
125	39.123	-7.0	11.6	40.123	-7.1	11.4	-95.9	-91.4
125	59.123	-7.1	11.7	60.123	-7.1	11.1	-101.8	-89.4

Note 1: The iMD2 and iMD3 in the table is in [dBFS]. The [dBc] numbers are 7 dB higher.

Note 2: Temperature: 23C Supply Voltage: 1.8v

**Table 1** HMC1520AD IMD Measurement Data

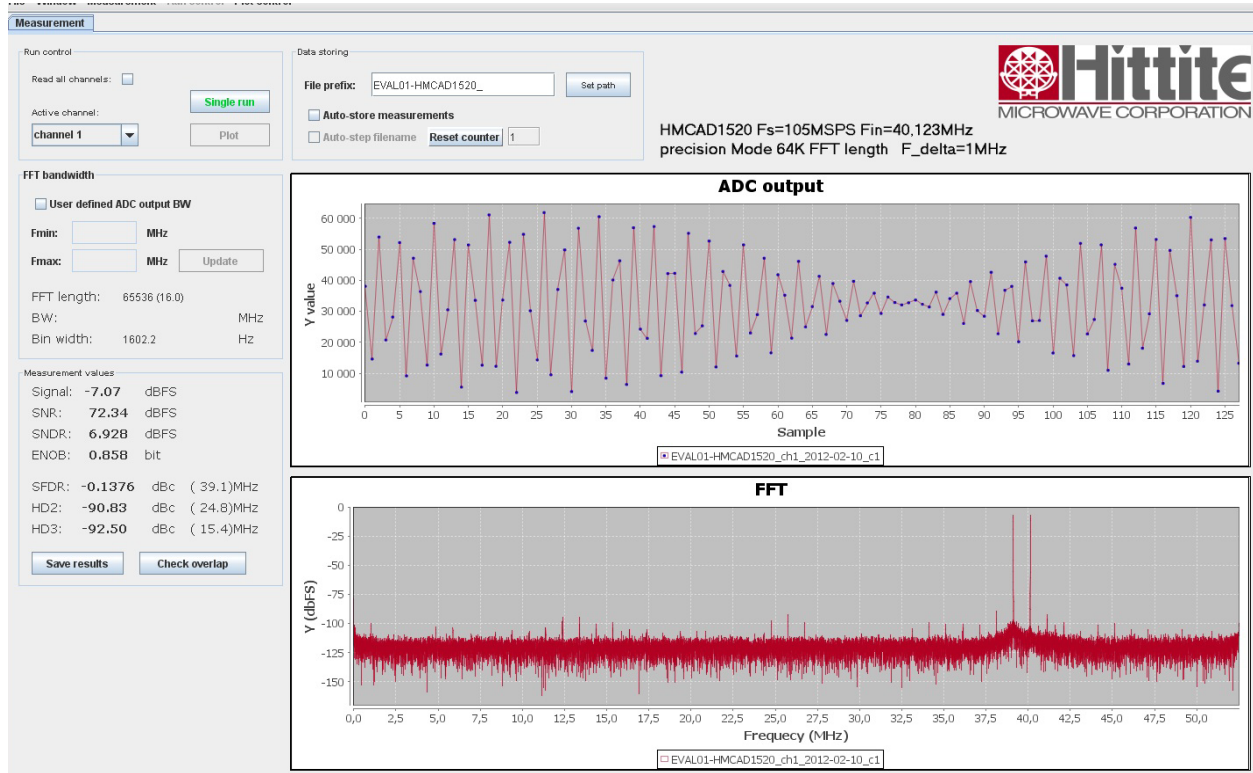


Figure 2 39.123 & 40.123 MHz input tones, Fs: 105 MSPS Precision Mode

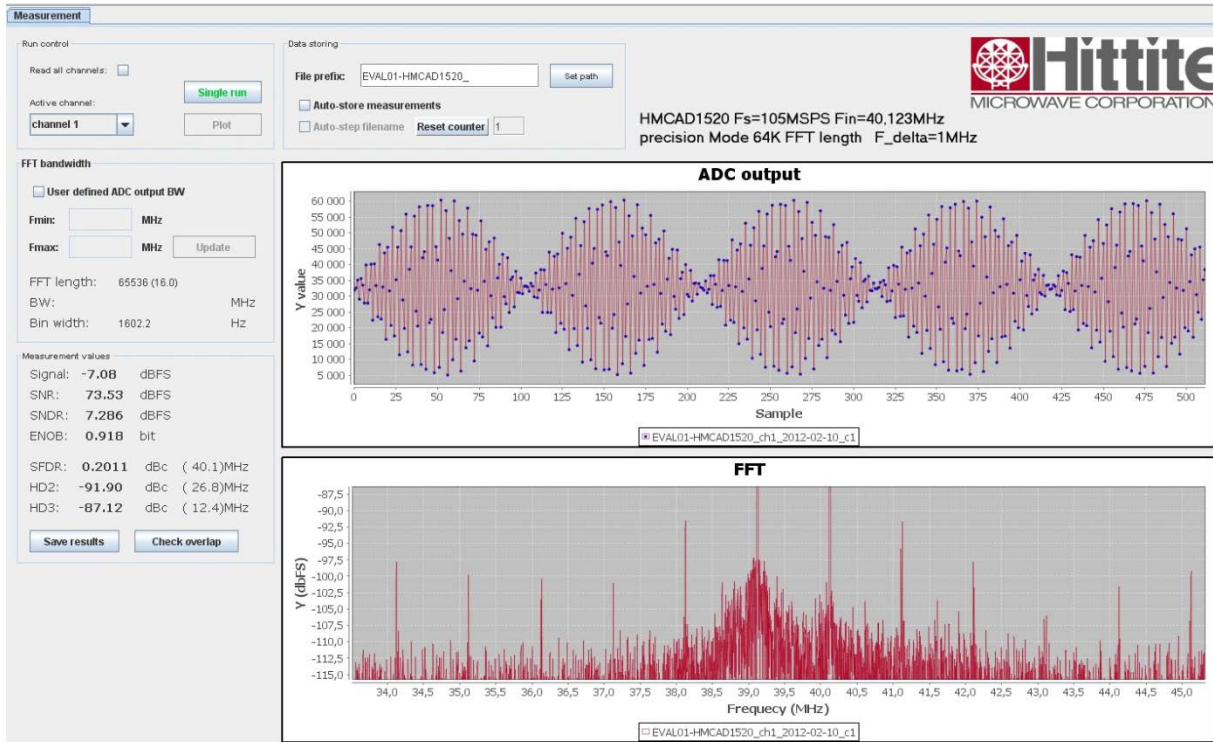
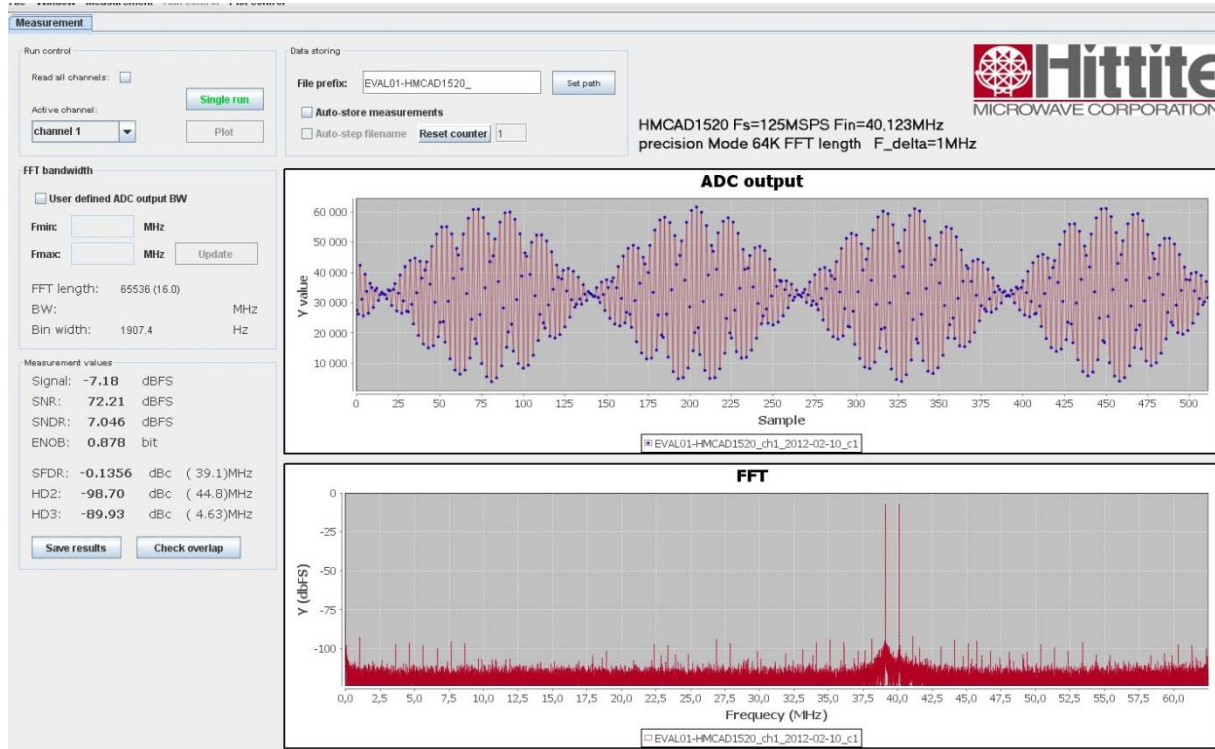
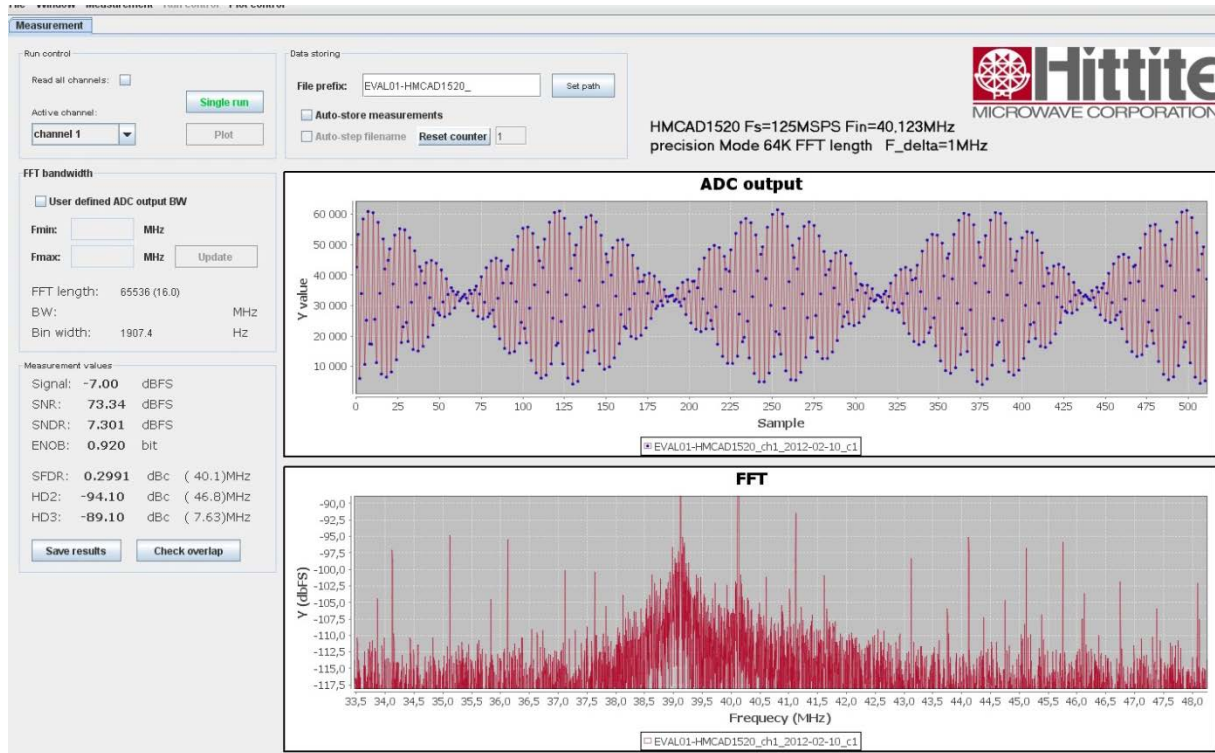


Figure 2 IMD3, Fs: 105 MSPS, Fin 39.123 & 40.123 MHz Precision Mode



**Figure 3** 39.123 & 40.123 MHz input tones,  $F_s$ : 125 MSPS Precision Mode



**Figure 4** IMD3,  $F_s$ : 125 MSPS,  $F_{in}$  39.123 & 40.123 MHz Precision Mode