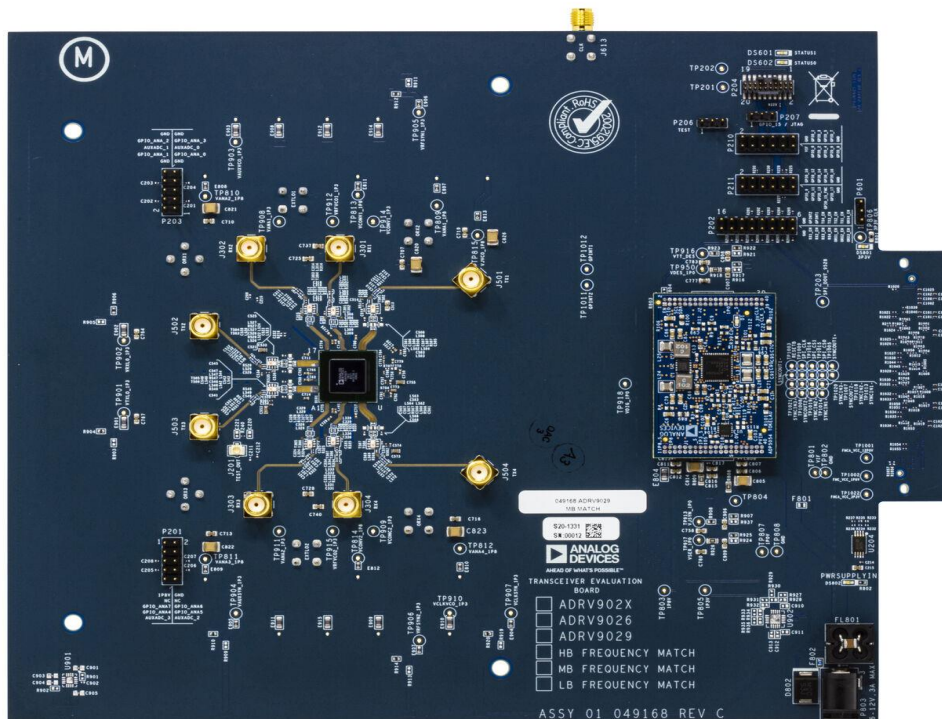




ADRV9029 DPD results with SKYWORKS PA

Part No: SKY66398-11



ADRV9029 Evaluation Board with on-chip Digital Predistortion Solution

Introduction:

In this report, we present DPD results using the ADRV9029 on-chip DPD using the following setup configuration:

User Case: 51C_non-LinkSharing

Sampling rate: 245.76Msps

JESD Lane rate: 16.22016Gbps

DFE (CFR ,DPD): Enabled

LOL correction: Enabled

Skyworks PA test conditions

Transceiver	ADRV9029
Power Amplifier	SKY66398-11
Driver-Amplifier	ZVA183-S+.
Application	M-MIMO
Output power	28 dBm (0.63W)
PA Type	mMIMO
Frequency Range	2496-2690 MHz
Gain	37dB
Drain Efficiency %	21%
Bandwidth Tested	8x20MHz 160MHz
ACLR	-44dbc
Supply Voltage	5V

Test setup

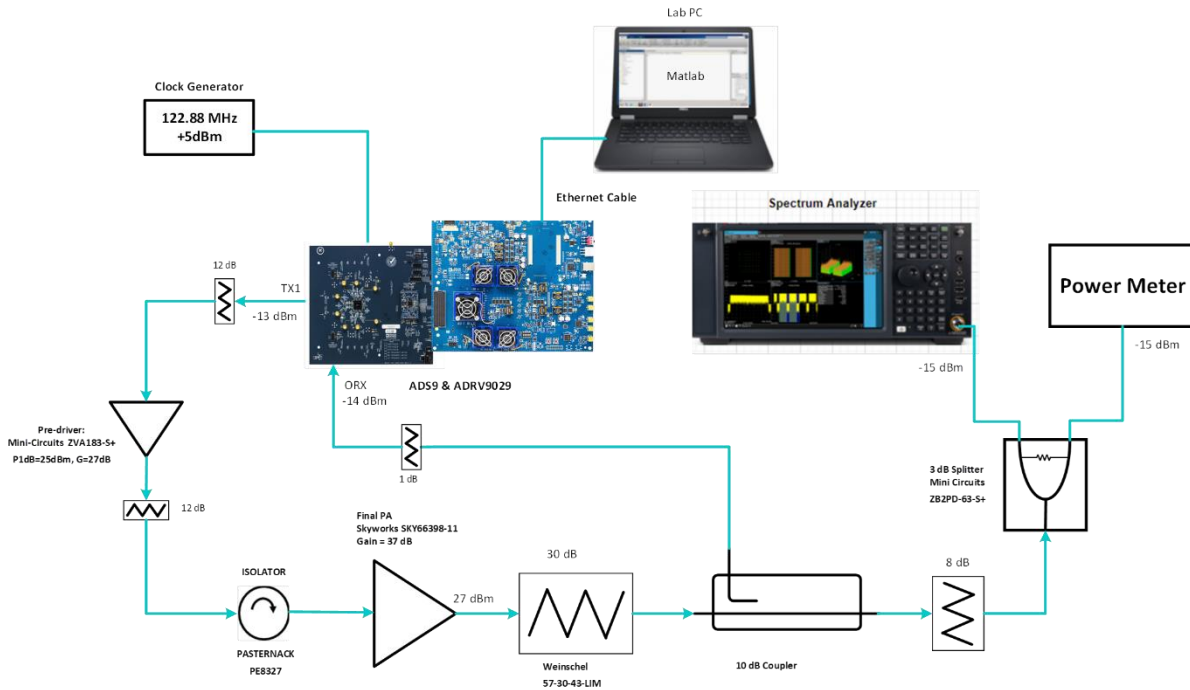


Fig. 1 ADI DPD Test Set up.

Note: The reports published are measurements done on single PA using ADI test environment. that there can be slight DPD performance difference due to part-to-part variations. PA vendors might release other versions of this same EVB with enhanced efficiency and linearity performance. Also, using a custom PA design based on this PA part number may results in different DPD performance.

The Driver amplifier used in Fig. 1 is ZVA183-S+. Customers may use different components in their DPD setups. However, careful component selection needs to be performed to be able to reproduce the DPD results published in this report.

We encourage our customers to evaluate the ADRV9029 DPD performance using evaluation board using the test conditions in this report. It is important to start by testing the evaluation board provided by the PA vendor with the recommended bias values and duplicate the DPD results in this report before proceeding with the custom PA design.

Summary

SKY66398-11 test conditions are:

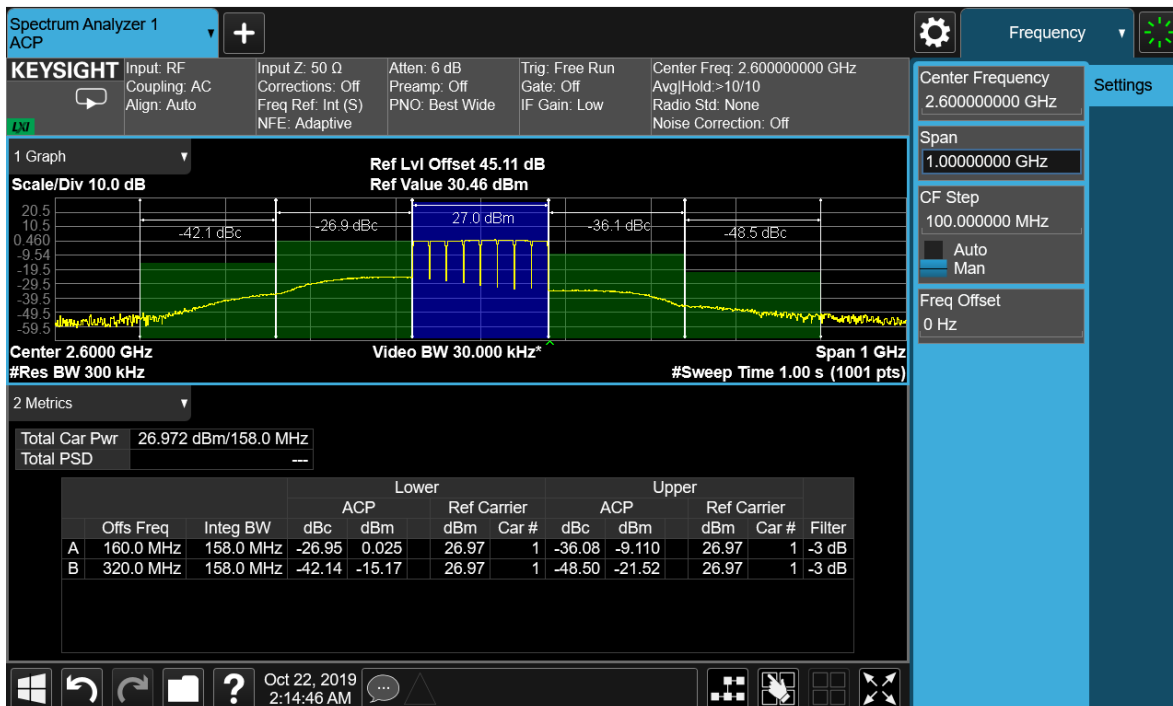
- Center Frequency: 2600 MHz
- Efficiency: 21%
- Average Output Power: 27dBm
- Test signal: 8x20MHz 160MHz
- Bias conditions : Vdd=5V, Idq=539mA , Vdd=5V, Idq=464mA , Vdd=5V, Idq=466mA

Test Results

Case 1: Test Signal: 8x20MHz 160MHz (PAR = 8.5dB), Output Power: 26.9 dBm, Frequency : 2600MHz
Vdd=5V, Idq=464mA

In-Direct DPD (95 Coefficients), Model 96 (from 100MHz Sweep)

Pre DPD results:



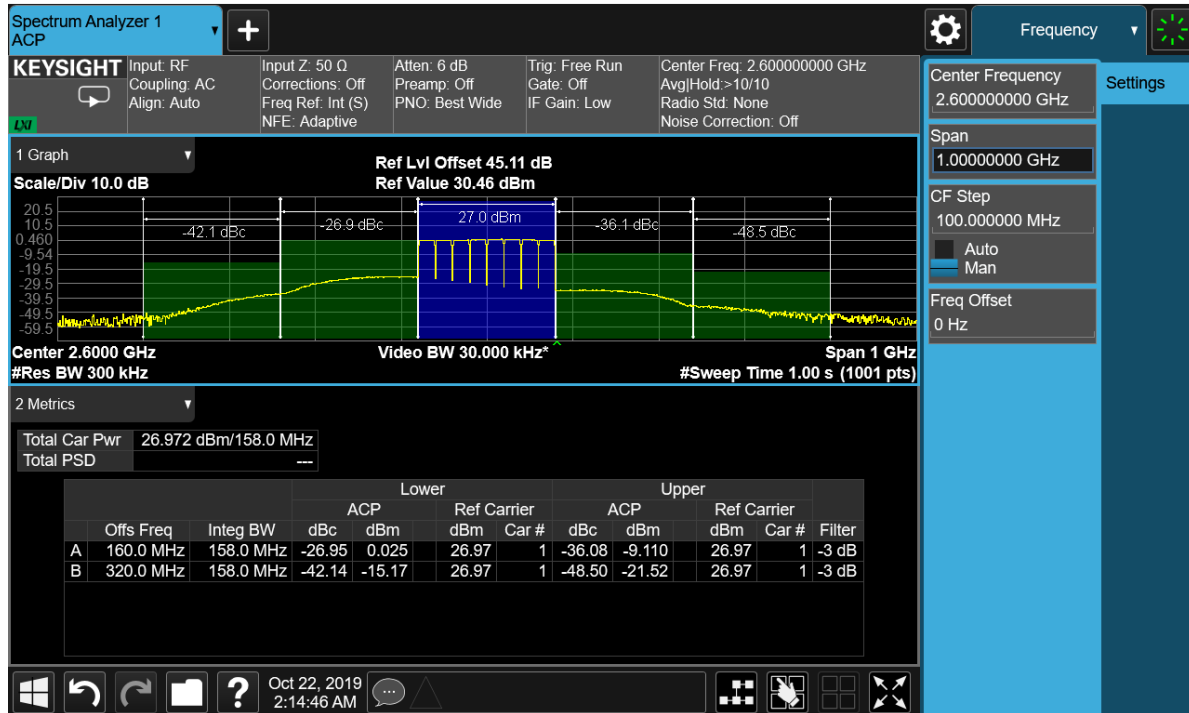
8x20MHz 160MHz -PAR 8.5dB					Open Loop [Pre-DPD]				Closed Loop [Post-DPD]			
Freq: MHz	Pout [dBm]	DE [%]	VDD [V]	Idq [A]	ACP_Lo [dBc]	ACP_Hi [dBc]	ALT1_lo [dBc]	ALT1_hi [dBc]	ACP_LO [dBc]	ACP_HI [dBc]	ALT1_lo [dBc]	ALT1_hi [dBc]
2600	26.9	21.11	5	0.464	-26.9	-36.1	-42.1	-48.1	-48.2	-49.1	-43.8	-49.4

ADRV9029- SKYWORKS PA test report

Case 2: Test Signal: 8x20MHz 160MHz (PAR = 8.5dB), Output Power: 27 dBm, Frequency : 2600MHz, Vdd=5V, Idq=466mA

Direct DPD (95 Coefficients), Model 96 (Chosen from 100MHz DPD Sweep)

Pre DPD results:



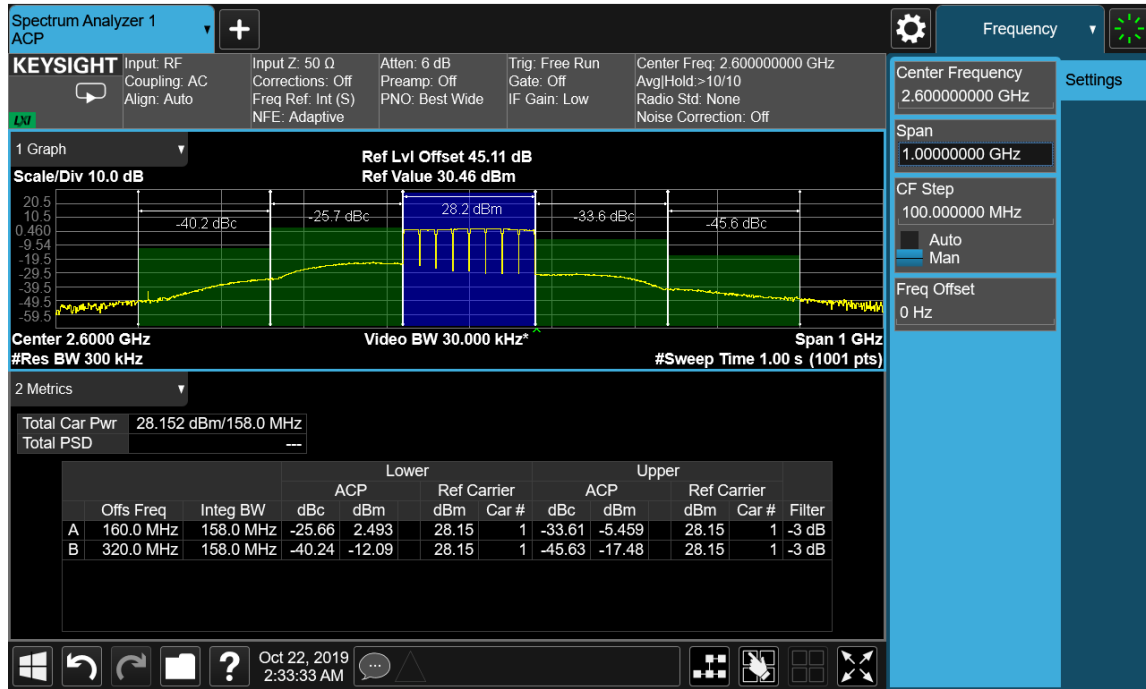
8x20MHz 160MHz -PAR 8.5dB					Open Loop [Pre-DPD]				Closed Loop [Post-DPD]			
Freq:	Pout	DE	VDD	Idd_PK	ACP_Lo	ACP_Hi	ALT1_lo	ALT1_hi	ACP_LO	ACP_HI	ALT1_lo	ALT1_hi
MHz	[dBm]	[%]	[V]	[A]	[dBc]	[dBc]	[dBc]	[dBc]	[dBc]	[dBc]	[dBc]	[dBc]
2600	26.9	26.5	5	0.466	-26.9	-36.1	-42.1	-48.5	-49.4	-50.7	-44	-49.2

ADRV9029- SKYWORKS PA test report



Case 3: Test Signal: 8x20MHz 160MHz (PAR = 8.5dB), Output Power: 28.2dBm, Frequency : 2600MHz, Vdd=5V Idq=542mA

Direct DPD (95 Coefficients)

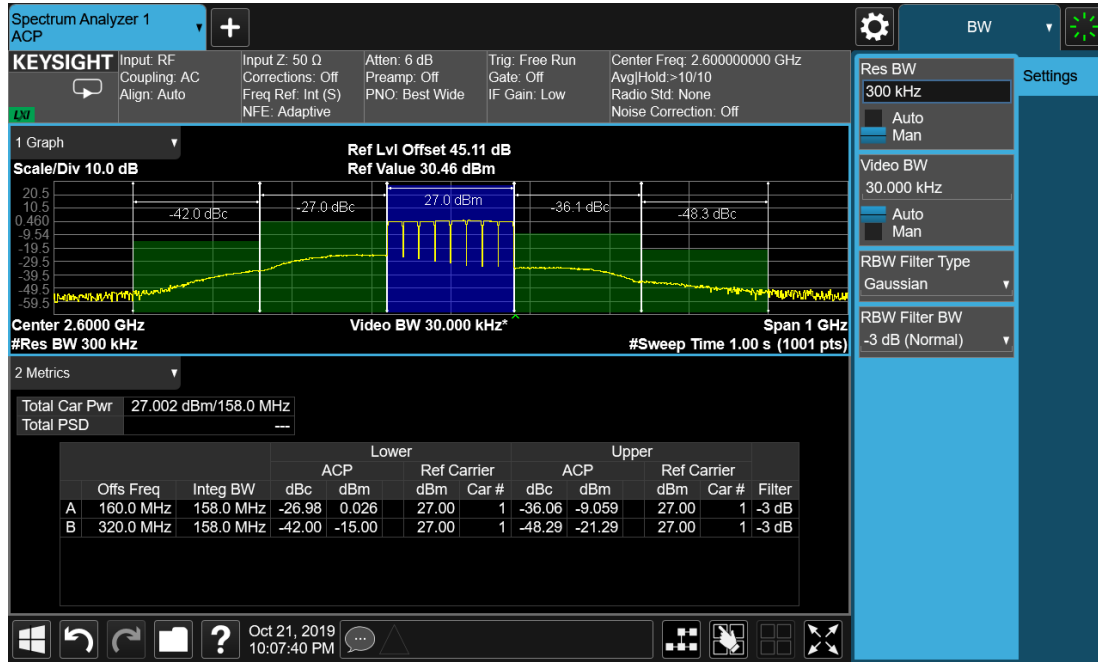


8x20MHz 160MHz -PAR 8.5dB					Open Loop [Pre-DPD]				Closed Loop [Post-DPD]			
Freq:	Pout	DE	VDD	Idd_PK	ACP_Lo	ACP_Hi	ALT1_lo	ALT1_hi	ACP_LO	ACP_HI	ALT1_lo	ALT1_hi
MHz	[dBm]	[%]	[V]	[A]	[dBc]	[dBc]	[dBc]	[dBc]	[dBc]	[dBc]	[dBc]	[dBc]
2600	28.2	23.82	5	0.542	-25.7	-33.6	-40.2	-45.6	-47	-48.9	-42.2	-45.4

ADRV9029- SKYWORKS PA test report

Case 4: Test Signal: 8x20MHz 160MHz (PAR = 8.5dB), Output Power: 28.2dBm, Frequency : 2600MHz, Vdd=5V Idq=464mA

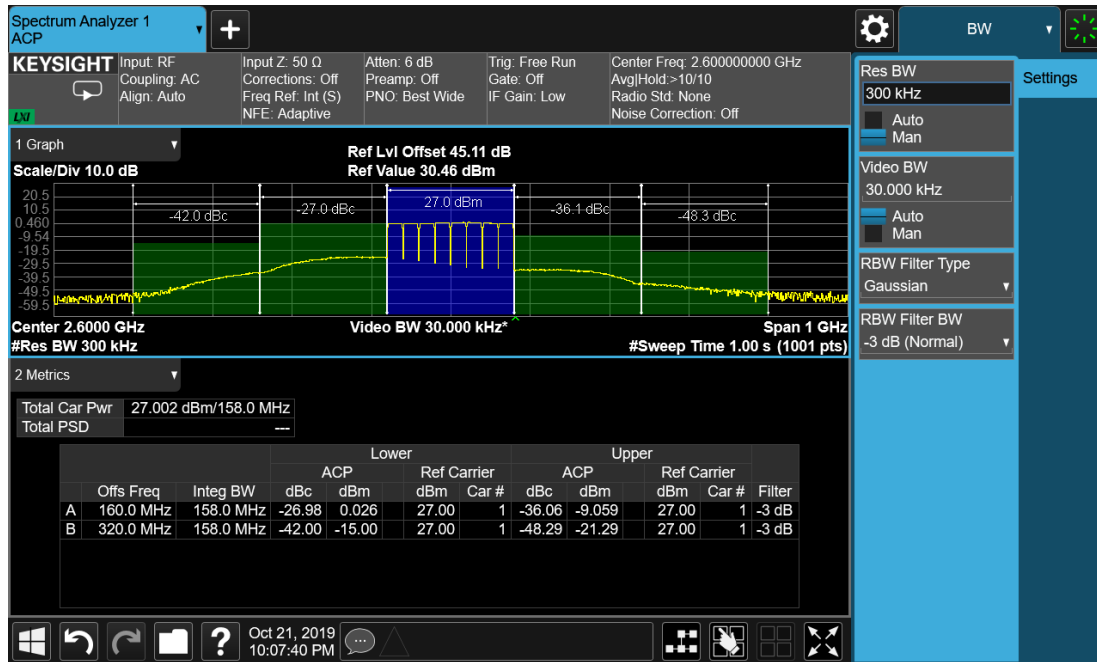
Indirect dpd (190 coefficients)



8x20MHz 160MHz -PAR 8.5dB					Open Loop [Pre-DPD]				Closed Loop [Post-DPD]			
Freq:	Pout	DE	VDD	Idd_Pk	ACP_Lo	ACP_Hi	ALT1_lo	ALT1_hi	ACP_LO	ACP_HI	ALT1_lo	ALT1_hi
MHz	[dBm]	[%]	[V]	[A]	[dBc]	[dBc]	[dBc]	[dBc]	[dBc]	[dBc]	[dBc]	[dBc]
2600	27	21.6	5	0.464	-27	-36.1	-42	-48.3	-48.7	-49.6	-43.9	-50

Case 5: Test Signal: 8x20MHz 160MHz (PAR = 8.5dB), Output Power: 27dBm, Frequency : 2600MHz, Vdd=5V Idq=466mA

Direct dpd (190 coefficients)



2x100MHz NR -PAR 8.5dB					Open Loop [Pre-DPD]				Closed Loop [Post-DPD]			
Freq: MHz	Pout [dBm]	DE [%]	VDD [V]	Idd_Pk [A]	ACP_Lo [dBc]	ACP_Hi [dBc]	ALT1_lo [dBc]	ALT1_hi [dBc]	ACP_LO [dBc]	ACP_HI [dBc]	ALT1_lo [dBc]	ALT1_hi [dBc]
2600	27	21.02	5	0.466	-27	-36.1	-42	-48.3	-49.2	-51	-43.9	-49.3

Conclusion

- The ADRV9029 on-chip, with DPD and CFR engines enabled, power consumption estimate is around 6.8 W in TDD mode. The power consumption can be reduced by lowering the sampling speed and saving JESD resources. Using the Zero IF architecture with an operating bandwidth of 200MHz, the ADRV2029 consumes lower power when compared to RFDAC transceiver architecture solutions.