

Build #6  
DOE11\_1 to DOE11\_5  
T9504A\_P13 (3,84 mm – 12x320 µm)

draft

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- restricted -

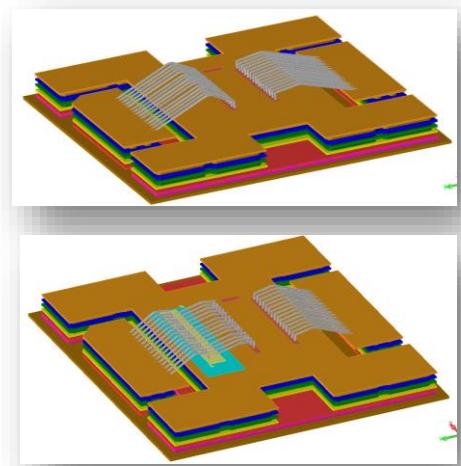
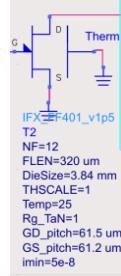
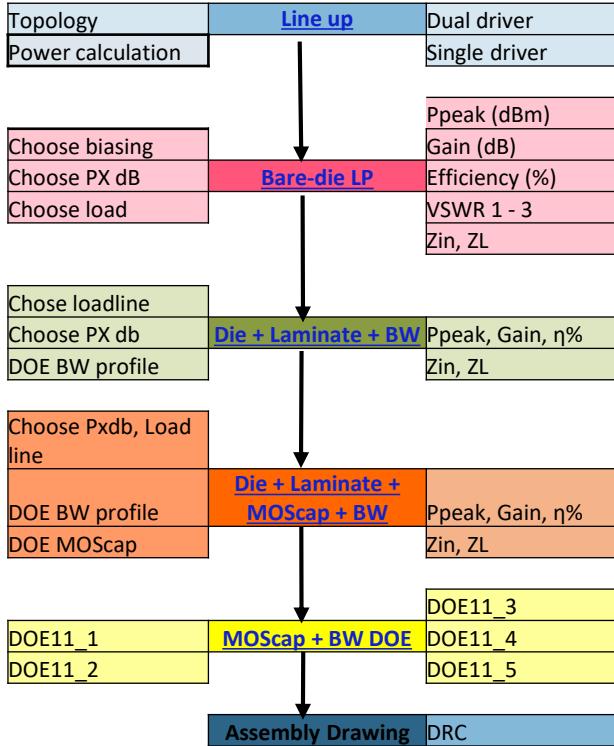
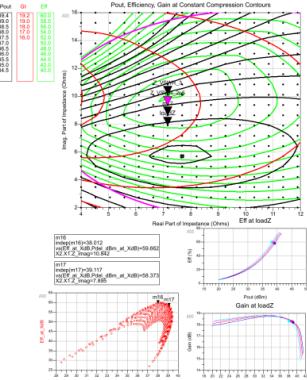


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# Design approach



# Build tracking: starting point

- Minipack build tracking



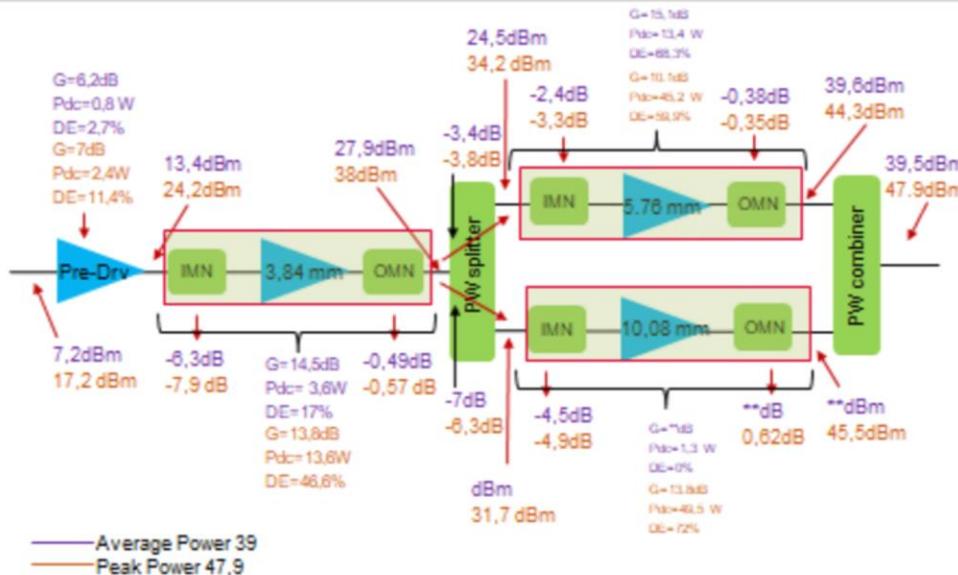
Assembly build order	Design Status (Theepak/Bhagath)	Drawing status (Antonio/Filippo)	ADS Library	ADS Cell Name	Oxide Thickness [nm]	Assembly build order	Variant (POE)	Laser Marking for Sample	RF GaN device geometry	RF GaN device name	RF GaN device wafer	RF GaN Die X (um)	RF GaN Die Y (um)	Wafer number (GaN)	Die Picking status
6			LAC3839.lib			6	DOE1_1	3.84 (12'320um) P13/T9504A	T9504A wf. 1		1060	736	RU149505.08 wfr#01	wafers available @Helmut	
6			LAC3839.lib			6	DOE1_2	3.84 (12'320um) P13/T9504A	T9504A wf. 1		1060	736	RU149505.08 wfr#01	wafers available @Helmut	
6			LAC3839.lib			6	DOE1_3	3.84 (12'320um) P13/T9504A	T9504A wf. 1		1060	736	RU149505.08 wfr#01	wafers available @Helmut	
6			LAC3839.lib			6	DOE1_4	3.84 (12'320um) P13/T9504A	T9504A wf. 1		1060	736	RU149505.08 wfr#01	wafers available @Helmut	
6			LAC3839.lib			6	DOE1_5	3.84 (12'320um) P13/T9504A	T9504A wf. 1		1060	736	RU149505.08 wfr#01	wafers available @Helmut	

## RFP\_tech\_product catalog -PL55 (Active GaN die)

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	X	Y	Z	AA	AB	AC	AD
sequence	Tech	basetype	Chip label	basetype_chip	short description (periphery_finger_length_pitch)	reticle kind	D9 released basetype	Die X (um)	Die Y (um)	die area	aspect ratio	Gate Periphery (mm)	# Gate tabs	Gate Tab Distance (um)	Gate Width / Finger Length (um)	Gate-source pitch (um)	Gate-drain pitch (um)	gate fingers	# Gate Pad Tubs	Gate Pad Size (PG opening in T slot pad)	Drain Pad Size (PG opening in T slot pad)	Thermal Resistance (K/mm/W)	# of gate sections activated	# of gate sections unactivated	Series Gate Resistor/finger [0mΩ]	comment	quantities per wafer/shot	pre T/T8 grade material amount ("old") w/ Rg
15	RFGaN-C1	T9504A	T9504A	T9504A_T9504A	3.84_320_61.45	mono	-	1060	736	0.78	1.44	3.84	4	80	320	61.2	61.5	12	2	80	38.72				based in R9505A P13	~ 16k		
41	RFGaN-C1	R9505A	P13	R9505A_P13	3.84_320_61.45	shared	-	1060	736	0.78	1.44	3.84	4	80	320	61.2	61.5	12	2	80	38.72					5	untested	

# Power calculation Doherty (Theepak Shoundrabalan)

Current Design(Top schematic) Freq=3.6GHz, Driver Power Requirement

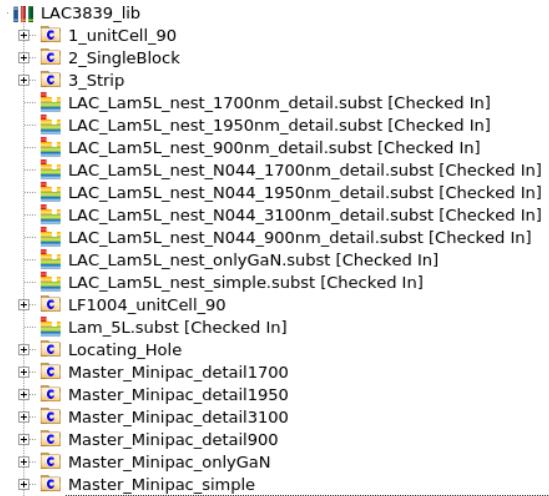


- › Single Driver stage
  - › Needs to deliver 38 – 40 dBm Pout including losses @ Full power.
  - › Needs to deliver 27.9 – 32 dBm Pout including losses @ back-off.



# Design on laminate DOE6

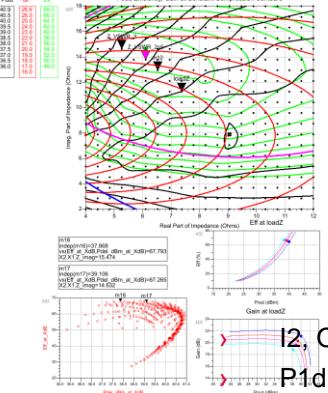
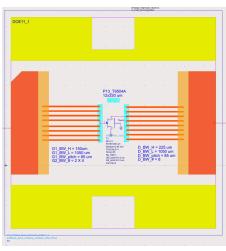
## › Laminate library:LAC3839\_lib



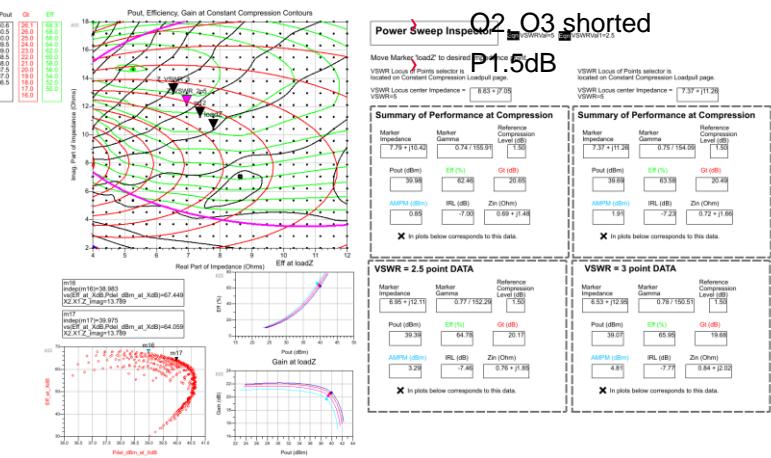
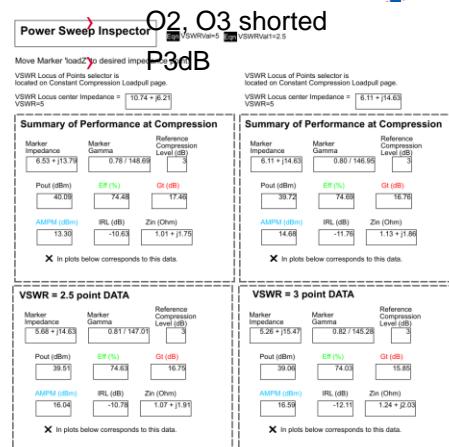
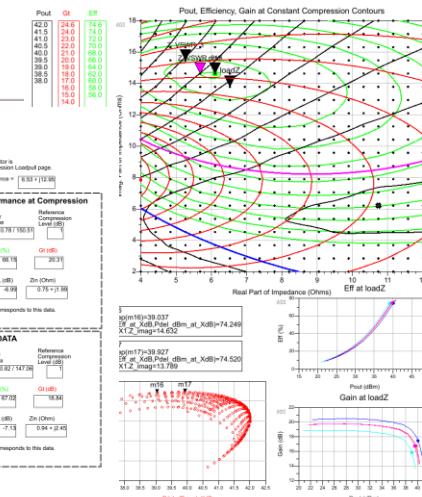
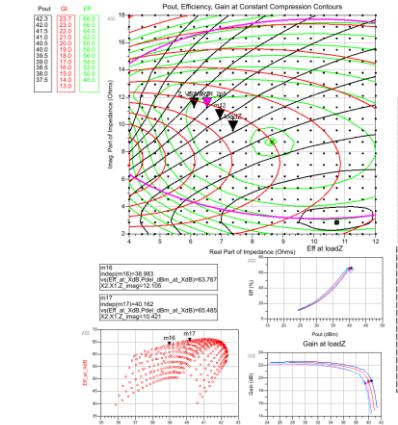
	GaN	MOSCap
Design	Die_GaN_v0_lib	IC_LD8C_lib
Assembly drawing		Central_v0_lib



# DOE\_11\_1 detail EM



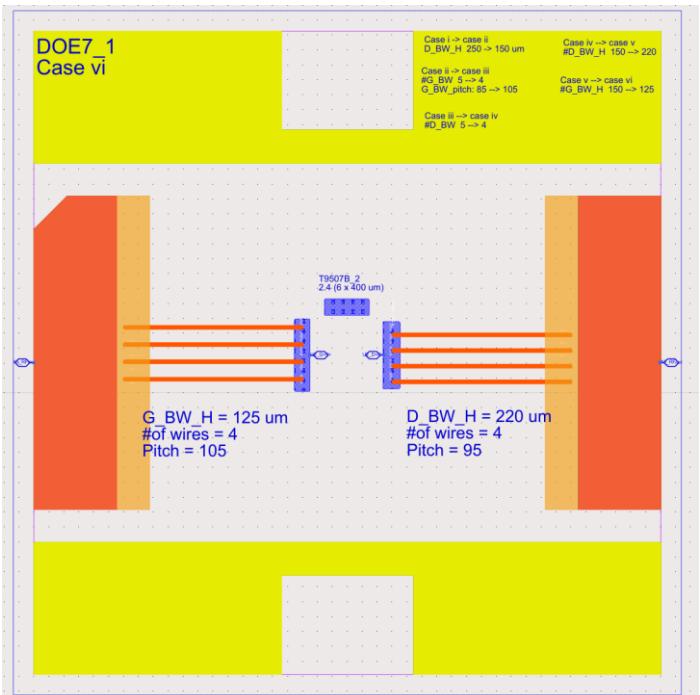
I2, O2,xO3 shorted  
P1dB



# DOE7\_1: Laminate, Bond Wire selection ( based on DOE7\_1, 2.4 mm die)

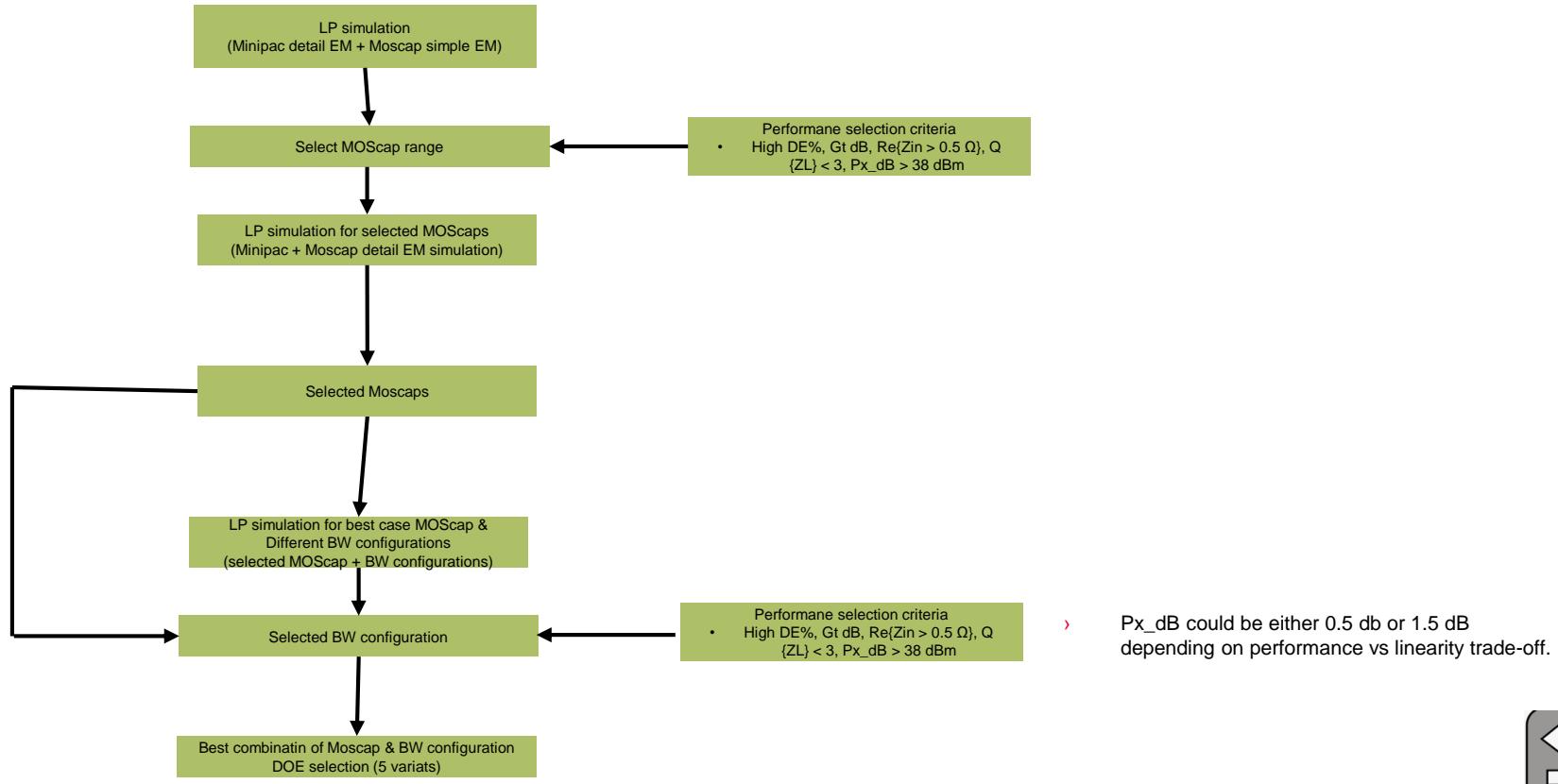
Simulation case/BW profile	G_BW_H (μm)	#G_BW	G_BW_pitch (μm)	G_BW_L (μm)	D_BW_H (μm)	#D_BW	D_BW_pitch (μm)	D_BW_L (μm)
Case i	150	5	85	1070	250	5	75	1070
Case ii	150	5	85	1070	150	5	75	1070
Case iii	150	4	105	1070	150	5	75	1070
Case iv	150	4	105	1070	150	4	95	1070
Case v	150	4	105	1070	220	4	95	1070
Case vi	125	4	105	1070	220	4	95	1070

P_0.5dB	Max. performance @ P1.5dB				@ MXE			
	Simulation case/BW_profile	MXP (dBm)	MXG (dB)	MXE (%)	Zin_Re (Ω)	Zin_L (Ω)	Pout (dBm)	Eff. (%)
Bare die		37,90	24,4	50,60	1,3 - j 9,7	24,4 + j 24	36,65	50,7
Case i		36,3	25,8	49	2,3 + j 1,9	13 + j 16,1	35,62	49,10
Case ii		36,40	23,0	50,00	2,1 + j 0,6	12,1 + j 16,1	35,74	50,00
Case iii		36,20	23,5	49,00	2,1 + j 0,9	12,1 + j 16,1	35,65	49,30
Case iv		36,20	23,6	49,40	2,1 + j 1,0	12,7 + j 17,3	35,52	49,40
Case v		36,20	24,6	49,00	2,5 + j 2,0	12,7 + j 17,3	35,40	49,10
DOE7_1 Case vi		36,20	24,6	49,00	2,5 + j 2,1	12,1 + j 17,3	36,39	49,00



› Used as reference only. This slide is from DOE7

# Build #6: DOE11 simulation strategy



# MOScap range selection (Minipac detail + MOScap Simple EM simulation)

Detailed_EM_P1 3_T9504A	P_1.5 dB	Moscap					Max. performance @ P2dB			Performance @_ 38.5 dBm						Performance @_ 40.5 dBm					
		BW_profile	Name	Mdf Index	RF top plate (X x Y)	Oxide thickness (nm)	Value (pF)	MXP (dBm)	MXG (dB)	MXE (%)	Zin (Ω)	Z_L (Ω)	Pout (dBm)	Eff. (%)	Gt (dB)	IRL (dB)	Zin (Ω)	Z_L (Ω)	Pout (dBm)	Eff. (%)	Gt (dB)
DOE 11	BW_3o_4o_5o	N9501B_V8	16	1466 x 207	3100	3.53	41.6	21.5	72.4	0.8+j 3.6	5.7+j 12.1	38.44	70.9	19.2	-9.1	0.5+j 3.0	7.0+j 8.3	40.69	69.5	19.2	-5.4
DOE 11	BW_3o_4o_5o	N9501B_V6	14	1466 x 233	3100	3.98	41.6	21.3	73.1	0.8+j 3.7	5.7+j 12.1	38.45	71.8	19.0	-9.3	0.5+j 3.1	7.0+j 8.3	40.71	70.2	19.0	-5.7
DOE 11	BW_3o_4o_5o	N9500B_V7	19	1010 x 253	1950	4.64	41.5	20.8	73.7	0.8+j 3.8	5.7+j 12.1	38.51	73.4	18.7	-9.6	0.6+j 3.3	6.5+j 9.0	40.29	70.9	19.0	-6.3
DOE 11	BW_3o_4o_5o	N9500B_V3	15	1010 x 292	1950	5.35	41.5	20.3	74.7	0.9+j 3.8	5.7+j 12.1	38.5	74.3	18.3	-10.0	0.6+j 3.4	6.5+j 9.0	40.33	72.0	18.6	-6.8
DOE 11	BW_3o_4o_5o	N9500B_V2	5	1010 x 295	1700	6.17	41.5	19.7	75.5	0.8+j 3.9	5.7+j 11.5	38.71	74.1	18.1	-9.3	0.6+j 3.6	6.5+j 9.0	40.37	73.1	18.2	-7.2
DOE 11	BW_3o_4o_5o	N9500B_Std	1	1010 x 337	1700	7.05	41.5	19.1	75.7	0.8+j 4.0	5.3+j 11.5	38.42	73.8	17.8	-9.0	0.7+j 3.6	6.5+j 9.0	40.33	73.5	17.7	-7.6
DOE 11	BW_3o_4o_5o	N9500B_V7	10	1010 x 253	900	9.55	41.6	17.3	70.8	0.8+j 3.9	5.3+j 10.2	38.96	68.2	16.6	-8.3	0.6+j 3.7	7.0+j 7.1	41.03	70.4	16.0	-6.7
DOE 11	BW_3o_4o_5o	N9500B_V5	8	1010 x 270	900	10.19	41.7	16.8	69.1	0.7+j 3.9	5.3+j 9.6	39.31	66.8	16.3	-7.4	0.6+j 3.8	6.5+j 7.7	40.54	69.2	15.8	-6.9

- Selected MOScap range 3.98 → 9.55 pF
  - Based on mdif file based Moscap model.
- Selection criteria
  - Compression selected as P\_1.5 dB as this die has more power. Estimated power needed 38.5 to 39.5 dBm
  - As high Gt as possible
  - As high DE as possible
  - Reasonable/ matchable Zin
  - As low Q as possible for ZL
  - Clean contours (as less wobbly as possible to favour stability)
  - Reasonable IRL indicating a reasonable input match.
- General observation
  - For lower Moscap < 4.64 pF
    - Contours are becoming wobbly indicating instability issue.
  - For Moscap > 9.55 pF
    - Contours are look more stable but gain is lower and the efficiency drops quickly over power



# MOScap selection detail EM simulation

Detailed_EM_P1 3 T9504A	P_1.5 dB	Moscap					Max. performance @ P1.5dB			Performance @ 38.5 dBm					Performance @ 40.0 dBm							
		BW profile	Name	Mdf Index	RF top plate (X x Y)	Oxide thickness (nm)	Value (pF)	MXP (dBm)	MXG (dB)	MXE (%)	Zin (Ω)	Z_L (Ω)	Pout (dBm)	Eff. (%)	Gt (dB)	IRL (dB)	Zin (Ω)	Z_L (Ω)	Pout (dBm)	Eff. (%)	Gt (dB)	IRL (dB)
DOE																						
DOE_11	BW_3o_4o_5o	N9501B_V8	16	1466 x 207	3100	3.53		41.5	20.4	70.3	1.0 + j 3.2	5.6 + j 13.1	38.12	69.2	18.3	-10.5	0.8 + j 2.8	6.6 + j 10.8	39.55	69.5	18.6	-8.3
DOE_11	BW_3o_4o_5o	N9501B_V6	14	1466 x 233	3100	3.98		41.5	20.2	70.8	1.0 + j 3.2	5.7 + j 13.1	38.22	69.9	18.1	-10.4	0.8 + j 2.9	6.5 + j 10.8	39.5	69.7	18.6	-8.1
DOE_11	BW_3o_4o_5o	N9500B_V7	19	1010 x 253	1950	4.64		41.5	19.9	71.5	0.9 + j 3.3	5.6 + j 12.3	38.45	70.7	18.3	-8.6	0.7 + j 3.0	6.6 + j 10.1	39.86	70.2	18.5	-7.2
DOE_11	BW_3o_4o_5o	N9500B_V3	15	1010 x 292	1950	5.35		41.5	19.8	71.8	0.8 + j 3.3	5.6 + j 13.1	38.16	71.0	18.0	-8.4	0.7 + j 3.1	6.6 + j 10.8	39.56	70.8	18.4	-6.8
DOE_11	BW_3o_4o_5o	N9500B_V2	5	1010 x 295	1700	6.17		41.5	19.5	72.1	0.7 + j 3.4	5.6 + j 12.3	38.42	71.4	18.1	-7.2	0.6 + j 3.1	6.6 + j 10.1	39.91	71.2	18.2	-6.0
DOE_11	BW_3o_4o_5o	N9500B_Std	1	1010 x 337	1700	7.05		41.5	19.0	72.6	0.7 + j 3.5	5.6 + j 12.3	38.37	71.5	17.8	-6.8	0.6 + j 3.2	6.6 + j 10.1	39.98	72.0	17.9	-5.7
DOE_11	BW_3o_4o_5o	N9500B_V7	10	1010 x 253	900	9.55		41.5	18.7	73.8	0.7 + j 3.7	5.6 + j 12.3	38.39	72.5	17.6	-8.5	0.6 + j 3.5	6.6 + j 10.1	40.0	72.8	17.5	-6.7
DOE_11	BW_3o_4o_5o	N9500B_V5	8	1010 x 270	900	10.19		41.3	19.0	72.9	0.7 + j 3.7	6.1 + j 12.3	38.41	71.5	17.8	-8.8	0.6 + j 3.5	7.7 + j 9.4	40.46	72.1	17.4	-6.7

› High Eff.%, reasonable Gt, better Zin, non linear region (P\_1.5)

› Favourable caps in the range 3.98 → 6.17

› Px\_db could be either 0.5 db or 1.5 dB depending on performance vs linearity trade-off.



Detailed_EM_P1 3 T9504A	P_0.5 dB	Moscap					Max. performance @ P0.5dB			Performance @ 38.0 dBm					Performance @ 39.0 dBm							
		BW profile	Name	Mdf Index	RF top plate (X x Y)	Oxide thickness (nm)	Value (pF)	MXP (dBm)	MXG (dB)	MXE (%)	Zin (Ω)	Z_L (Ω)	Pout (dBm)	Eff. (%)	Gt (dB)	IRL (dB)	Zin (Ω)	Z_L (Ω)	Pout (dBm)	Eff. (%)	Gt (dB)	IRL (dB)
DOE																						
DOE_11	BW_3o_4o_5o	N9501B_V8	16	1466 x 207	3100	3.53		39.0	22.6	54.8	0.8 + j 2.6	8.2 + j 9.4	38.22	54.7	19.8	-10.5	0.7 + j 2.3	8.2 + j 6.4	39.0	51.2	19.6	-7.3
DOE_11	BW_3o_4o_5o	N9501B_V6	14	1466 x 233	3100	3.98		39.0	22.3	54.9	0.8 + j 2.7	8.2 + j 9.4	38.2	54.9	19.7	-10.4	0.7 + j 2.5	8.2 + j 7.2	38.95	53.3	19.6	-8.0
DOE_11	BW_3o_4o_5o	N9500B_V7	19	1010 x 253	1950	4.64		39.1	21.9	55.2	0.8 + j 2.9	8.2 + j 9.4	38.17	55.2	19.6	-9.9	0.7 + j 2.6	8.2 + j 7.2	39.01	53.9	19.5	-8.1
DOE_11	BW_3o_4o_5o	N9500B_V3	15	1010 x 292	1950	5.35		39.2	21.9	55.9	0.6 + j 2.9	7.7 + j 9.4	38.16	55.8	19.8	-7.6	0.5 + j 2.7	7.7 + j 7.2	39.03	54.3	19.7	-6.1
DOE_11	BW_3o_4o_5o	N9500B_V2	5	1010 x 295	1700	6.17		39.2	21.4	56.1	0.6 + j 3.0	7.7 + j 9.4	38.14	56.1	19.6	-7.3	0.5 + j 2.8	7.7 + j 7.2	39.05	54.7	19.5	-6.0
DOE_11	BW_3o_4o_5o	N9500B_Std	1	1010 x 337	1700	7.05		39.3	20.8	57.0	0.6 + j 3.1	7.7 + j 9.4	38.17	56.6	19.3	-6.7	0.5 + j 3.0	7.7 + j 7.2	39.18	55.6	19.1	-5.7
DOE_11	BW_3o_4o_5o	N9500B_V7	10	1010 x 253	900	9.55		39.4	19.2	60.0	0.6 + j 3.5	7.2 + j 10.1	38.13	60.0	18.3	-5.5	0.5 + j 3.3	7.2 + j 7.9	39.09	58.4	18.2	-4.7
DOE_11	BW_3o_4o_5o	N9500B_V5	8	1010 x 270	900	10.19		39.5	19.0	60.5	0.6 + j 3.5	7.2 + j 10.1	38.19	60.6	18.1	-5.3	0.4 + j 3.4	7.2 + j 7.9	39.14	58.9	18.0	-4.4

› Lower Eff.%, higher Gt, reasonable Zin, better linear region (P\_0.5 dB)

› Favourable caps in the range 6.17 → 10.19

› Selected best case 7.05 pF

# BW configuration evaluation detail EM simulation

Detailed_EM_P1 3_T9504A	P_1.5 dB	Moscap				Max. performance @ P1.5dB			Performance @ 38.5 dBm					Performance @ 40.5 dBm						
		Mdif Index	RF top plate (X x Y)	Oxide thickness (nm)	Value (pF)	MXP (dBm)	MXG (dB)	MXE (%)	Zin (Ω)	Z_L (Ω)	Pout (dBm)	Eff. (%)	Gt (dB)	IRL (dB)	Zin (Ω)	Z_L (Ω)	Pout (dBm)	Eff. (%)	Gt (dB)	IRL (dB)
DOE	BW_profile																			
DOE_11	BW_3m_4m_5m	N9500B_Std	1	1010 x 337	1700	7.05	41.5	19.0	72.6	0.7+j3.5	5.6+j12.3	38.37	71.5	17.8	-6.8	0.6+j3.2	6.6+j10.1	39.98	72.0	17.9
DOE_11	BW_3m_4m_6m	N9500B_Std	1	1010 x 337	1700	7.05	41.2	20.1	70.5	0.8+j3.3	7.2+j12.3	38.94	69.3	18.1	-9.8	0.7+j3.1	8.2+j9.4	40.56	69.6	17.9
DOE_11	BW_3m_4m_7m	N9500B_Std	1	1010 x 337	1700	7.05	41.3	20.0	71.2	0.7+j3.3	6.6+j10.8	39.14	70.2	18.5	-7.7	0.6+j3.1	8.2+j8.6	40.6	70.2	18.0
DOE_11	BW_3m_4m_8m	N9500B_Std	1	1010 x 337	1700	7.05	41.2	20.0	70.8	0.7+j3.4	6.1+j11.6	38.9	70.2	18.7	-7.7	0.6+j3.1	7.7+j9.4	40.48	70.2	18.2
DOE_11	BW_3m_9m_5m	N9500B_Std	1	1010 x 337	1700	7.05	41.2	20.4	72.0	0.8+j3.4	6.6+j10.8	39.2	71.1	18.7	-9.9	0.7+j3.2	7.7+j8.6	40.57	70.7	18.3
DOE_11	BW_3m_9m_7m	N9500B_Std	1	1010 x 337	1700	7.05	41.3	20.4	71.9	0.8+j3.5	6.6+j10.8	39.03	71.2	18.7	-10.4	0.6+j3.2	7.2+j7.9	40.60	70.0	18.4

- › High Eff.%, reasonable Gt, better Zin, non linear region (P\_1.5)
  - › Favourable BW profile BW\_3m4m7m & BW\_3m9m7m
  - › Px\_dB could be either 0.5 db or 1.5 dB depending on performance vs linearity trade-off.

Detailed_EM_P1 3_T9504A	P_0.5 dB	Moscap				Max. performance @ P0.5dB			Performance @ 38.0 dBm					Performance @ 39.5 dBm						
		Mdif Index	RF top plate (X x Y)	Oxide thickness (nm)	Value (pF)	MXP (dBm)	MXG (dB)	MXE (%)	Zin (Ω)	Z_L (Ω)	Pout (dBm)	Eff. (%)	Gt (dB)	IRL (dB)	Zin (Ω)	Z_L (Ω)	Pout (dBm)	Eff. (%)	Gt (dB)	IRL (dB)
DOE	BW_profile																			
DOE_11	BW_3m_4m_5m	N9500B_Std	1	1010 x 337	1700	7.05	39.3	20.8	57.0	0.6+j3.1	7.7+j9.4	38.17	56.6	19.3	-6.7	0.5+j3.0	7.7+j7.2	39.18	55.6	19.1
DOE_11	BW_3m_4m_6m	N9500B_Std	1	1010 x 337	1700	7.05	39.0	20.8	54.9	0.5+j3.1	7.2+j8.6	38.37	54.7	19.4	-5.8	0.4+j2.9	7.2+j6.4	39.03	51.0	19.1
DOE_11	BW_3m_4m_7m	N9500B_Std	1	1010 x 337	1700	7.05	39.4	21.0	57.0	0.5+j3.1	7.2+j8.6	38.26	56.5	19.6	-6.2	0.4+j2.9	7.2+j6.4	39.32	55.2	19.4
DOE_11	BW_3m_4m_8m	N9500B_Std	1	1010 x 337	1700	7.05	39.1	20.8	55.5	0.5+j3.1	7.2+j9.4	38.01	55.2	19.4	-6.2	0.4+j2.9	7.2+j7.2	38.99	53.5	19.3
DOE_11	BW_3m_9m_5m	N9500B_Std	1	1010 x 337	1700	7.05	39.4	20.8	56.7	0.5+j3.3	6.6+j8.6	38.21	56.2	19.6	-5.9	0.4+j3.0	6.6+j6.4	39.34	54.6	19.3
DOE_11	BW_3m_9m_7m	N9500B_Std	1	1010 x 337	1700	7.05	39.5	20.9	56.7	0.6+j3.3	6.6+j8.6	37.99	56.0	19.7	-6.4	0.5+j3.0	7.2+j6.4	39.31	56.0	19.4

- › Lower Eff.%, higher Gt, reasonable Zin, better linear region (P\_0.5 dB)
  - › Favourable BW profile BW\_3m4m7m & BW\_3m9m7m



# Selected DOE\_11

Detailed_EM_P1 3 T9504A	P_1.5 dB	Moscap					Max. performance @ P1.5dB			Performance @ 39 dBm						Performance @ 40.5 dBm					
DOE	BW_profile	Name	Mdf Index	RF top plate (X x Y)	Oxide thickness (nm)	Value (pF)	MXP (dBm)	MXG (dB)	MXE (%)	Zin (Ω)	Z_L (Ω)	Pout (dBm)	Eff. (%)	Gt (dB)	IRL (dB)	Zin (Ω)	Z_L (Ω)	Pout (dBm)	Eff. (%)	Gt (dB)	IRL (dB)
DOE_11_1	BW_1m_2m	No Moscap, data @ P3dB with O2, O3 shorted					42	24.6	74.6	1.3+j 2.1	5.3+j 15.5	39.06	74	15.9	-12.1	1.0+j 1.8	6.5+j 13.8	40.09	74.5	17.5	-10.6
DOE_11_2	BW_3m_4m_7m	N9500B_V3	15	1010 x 292	1950	5.35	41.3	20.7	70.0	0.8+j 3.2	6.1+j 10.8	38.92	68.8	19.2	-8.8	0.5+j 2.9	6.1+j 8.6	39.95	67	19.3	-5.9
DOE_11_3	BW_3m_4m_7m	N9500B_Std	1	1010 x 337	1700	7.05	41.3	20.0	71.2	0.7+j 3.3	6.6+j 10.8	39.14	70.2	18.5	-7.7	0.6+j 3.1	8.2+j 8.6	40.6	70.2	18.0	-7.0
DOE_11_4	BW_3m_9m_7m	N9500B_Std	1	1010 x 337	1700	7.05	41.3	20.4	71.9	0.8+j 3.5	6.6+j 10.8	39.03	71.2	18.7	-10.4	0.6+j 3.2	7.2+j 7.9	40.60	70.0	18.4	-6.9
DOE_11_5	BW_3m_9m_7m	N9500B_V7	10	1010 x 253	900	9.55	41.3	19.2	73.5	0.8+j 3.7	6.1+j 10.8	38.79	71.7	18.1	-9.6	0.6+j 3.5	6.1+j 8.6	40.12	71.3	18.1	-6.6

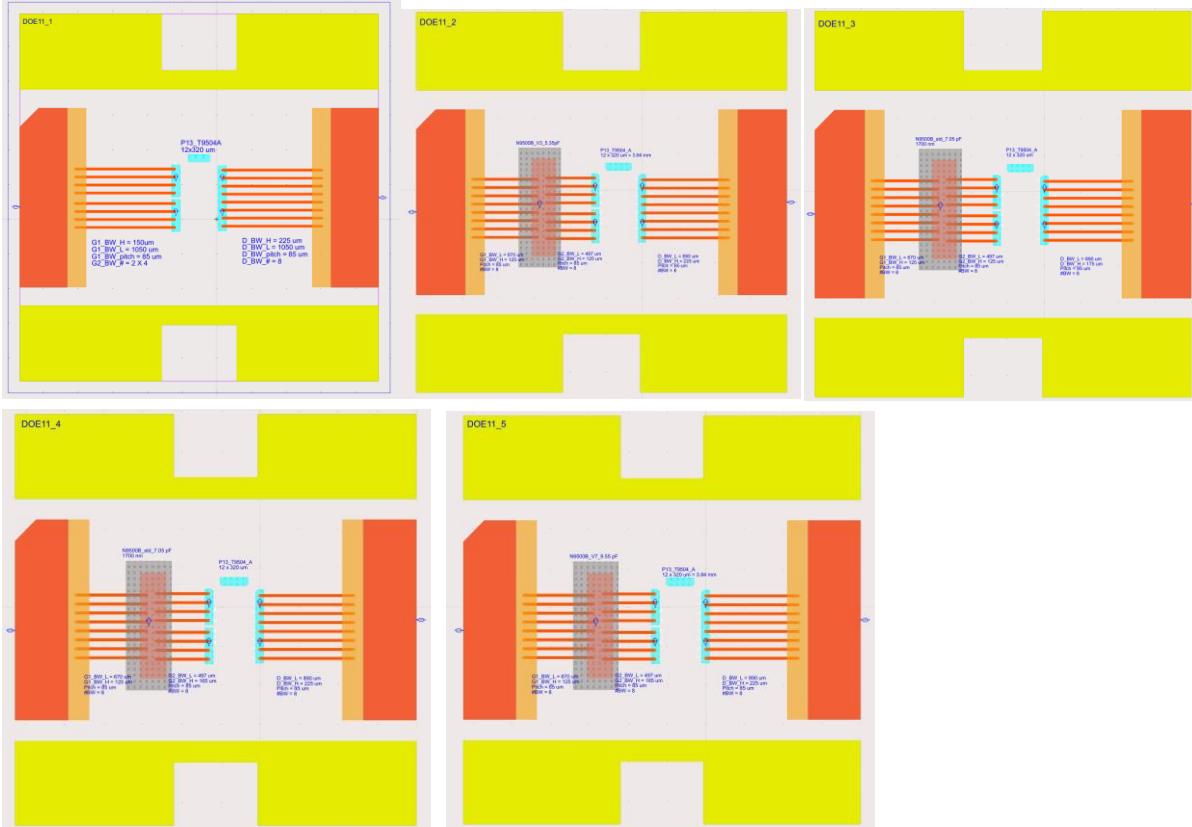
> Px\_dB could be either 0.5 dB or 1.5 dB or in between depending on performance vs linearity trade-off.

Detailed_EM_P1 3 T9504A	P_0.5 dB	Moscap					Max. performance @ P0.5dB			Performance @ 38.0 dBm						Performance @ 39.5 dBm					
DOE	BW_profile	Name	Mdf Index	RF top plate (X x Y)	Oxide thickness (nm)	Value (pF)	MXP (dBm)	MXG (dB)	MXE (%)	Zin (Ω)	Z_L (Ω)	Pout (dBm)	Eff. (%)	Gt (dB)	IRL (dB)	Zin (Ω)	Z_L (Ω)	Pout (dBm)	Eff. (%)	Gt (dB)	IRL (dB)
DOE_11_1	BW_1m_2m	No Moscap, data @ P1dB with O2, O3 shorted					40.9	26.6	68.0	0.9+j 2.5	5.3+j 14.6	38.21	67.0	18.8	-7.1	0.6+j 1.6	7.4+j 11.3	40.0	64.4	21.1	-6.2
DOE_11_2	BW_3m_4m_7m	N9500B_V3	15	1010 x 292	1950	5.35	39.1	22.1	55.1	0.7+j 2.9	7.7+j 8.6	38.25	55.1	19.9	-9.4	0.6+j 2.6	7.7+j 6.4	39.08	53.4	19.7	-7.6
DOE_11_3	BW_3m_4m_7m	N9500B_Std	1	1010 x 337	1700	7.05	39.4	21.0	57.0	0.5+j 3.1	7.2+j 8.6	38.26	56.5	19.6	-6.2	0.4+j 2.9	7.2+j 6.4	39.32	55.2	19.4	-5.3
DOE_11_4	BW_3m_9m_7m	N9500B_Std	1	1010 x 337	1700	7.05	39.5	20.9	56.7	0.6+j 3.3	6.6+j 8.6	37.99	56.0	19.7	-6.4	0.5+j 3.0	7.2+j 6.4	39.31	56.0	19.4	-6.2
DOE_11_5	BW_3m_9m_7m	N9500B_V7	10	1010 x 253	900	9.55	39.6	19.3	60.5	0.6+j 3.5	6.6+j 8.6	38.56	60.5	18.5	-5.7	0.5+j 3.3	6.6+j 6.4	39.44	57.4	18.2	-4.9



# ADS cells & symbols

- P13\_T9504A\_Direct\_BW1m2m DOE11\_1
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    - layout [Checked In]
    - layout\_assy\_DOE\_11\_5 [Checked In]
    - schematic [Checked In]
    - symbol [Checked In]



# Acknowledgements

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- › [Theepak ShoundraBalan](#): Design related discussions, design review, troubleshooting and debugging
- › [Fillippo Panzalo](#): EM layouts of Moscaps, GaN dies, Assembly drawing generation and review.
- › [Jorge Texeira](#): Assembly design rule guidelines, drawing review, build planning, coordination and documentation.
- › [Shamsafar Alireza](#): Design review, design target discussions and guidelines.
- › [De Astis Giuseppe](#): Design follow up, design environment & logistic coordination.





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# Power calculation: Asymmetric Doherty

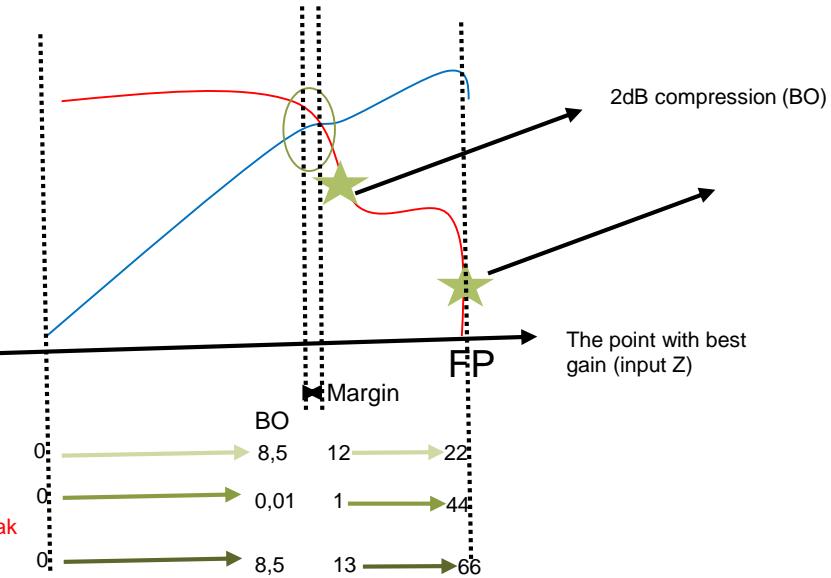
Specification				
Project	Frequency-Range [MHz]	P3dB (dBm)	P3dB (W)	PAR
PAM 2.0+	3400 - 3800	47,4	54,95	8,4
		Pavg (dBm)	Pavg (W)	
		39	7,94	

Doherty Topology	Remark	Ratio	Main (W)	Peak (W)
2-way asymmetric	To maximize efficiency	2	18,32	36,64

Estimation including loss								
	Required power (W)	Required power (dBm)	Loss (dBm)	Total required power (dBm)	Total required power (W)	Ratio	Total power (W)	Total power (dBm)
Main	18,32	42,63	0,8	43,43	22,02			
Peak	36,64	45,64	0,8	46,44	44,05		3,01	66,07

	Total output power (dBm)	PAR	Power @ MXE (dBm)	Margin (dB)	Power @ MXE (dBm)	Power @ MXE (W)	MXP (W)	MXP (dBm)
Main	48,2	8,4	39,8	1,00	40,80	12,02	22,02	43,43
Peak			Peak_start_ideal		Peak_start	0,01	44,05	46,44

Required power from peak



## Maximize Gain

- Main section gain as high as possible while maintaining Power @ MXE
- Peak section gain as high as possible while maintaining MXP



# Power calculation: Hybrid Symmetric Doherty

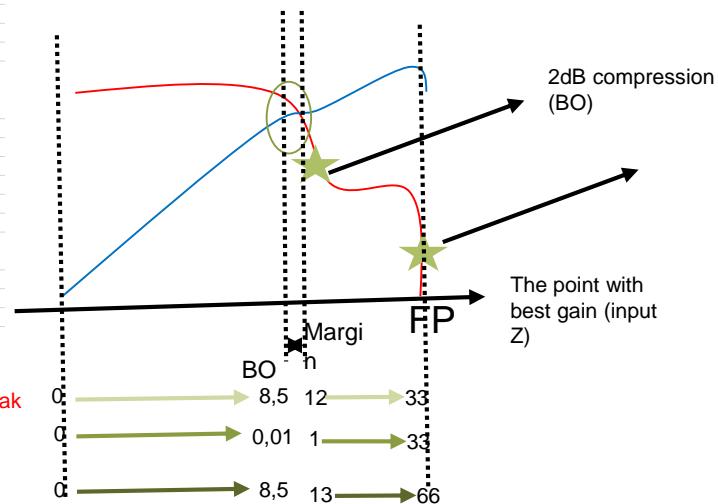
Doherty Topology	Remark	Ratio	Main (W)	Peak (W)
Symmetric	Maximize BW	1	27,48	27,48

## Estimation including loss

	Required power (W)	Required power (dBm)	Loss (dBm)	Total required power (dBm)	Total required power (W)	Ratio	Total power (W)	Total power (dBm)
Main	27,48	44,39	0,8	45,19	33,03		66,07	48,2
Peak	27,48	44,39	0,8	45,19	33,03			

	Total output power	PAR	Power @ MXE (dBm)	Margin (dB)	Power @ MXE (dBm)	Power @ MXE (W)	MXP (W)	MXP (dBm)
Main	48,2	8,4	39,8	1,00	40,80	12,02	33,03	45,19
Peak			Peak_start_ideal		Peak_start	0,01	33,03	45,19

Required power from peak



## Maximize Gain

- › Main section gain as high as possible while maintaining Power @ MXE
- › Peak section gain as high as possible while maintaining MXP

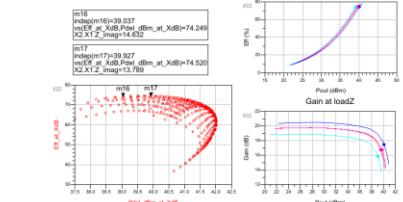
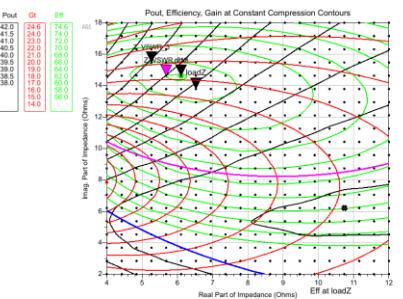
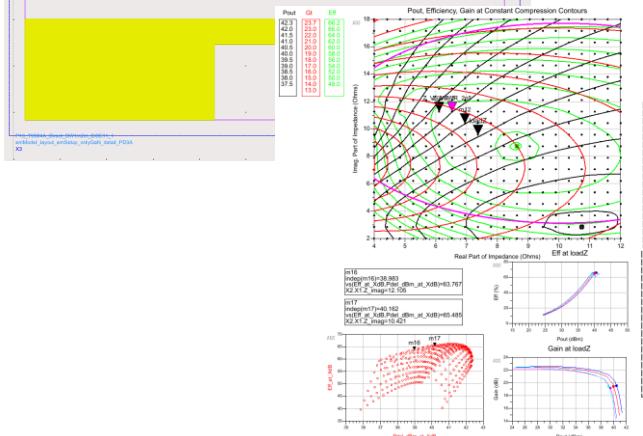
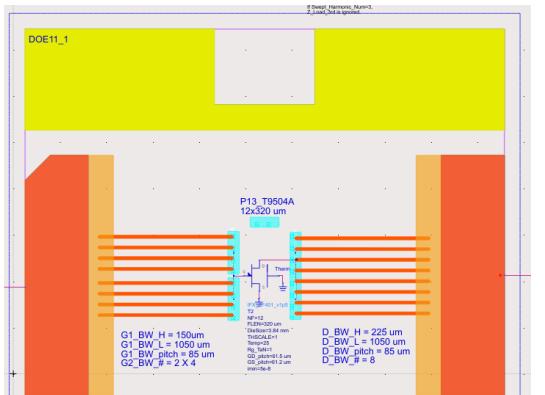


# Simulation Results



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# DOE\_11\_1 detail EM



## Power Sweep Inspector

Move Machine Readable to standard impedance point

Move Marker loadz to desired impedance point.

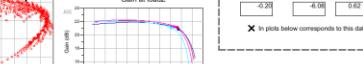
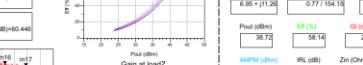
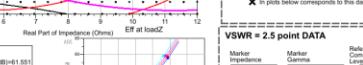
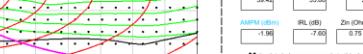
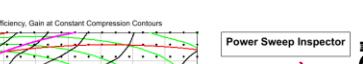
VSWR Locus of Points selector is located on Constant Compression Loadpull page.

VSWR | focus center impedance =

VSWR=5

**Summary of Performance at Completion**

#### **Summary of Performance at Compression**



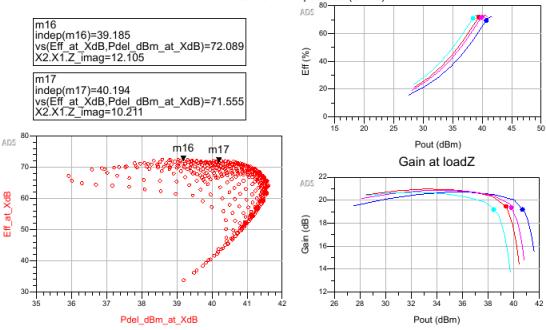
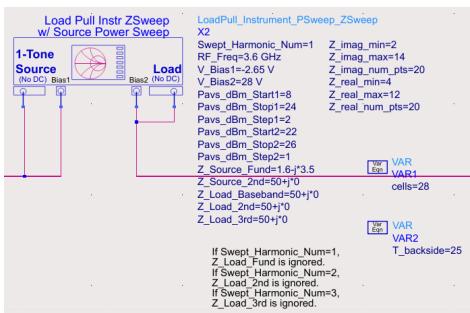
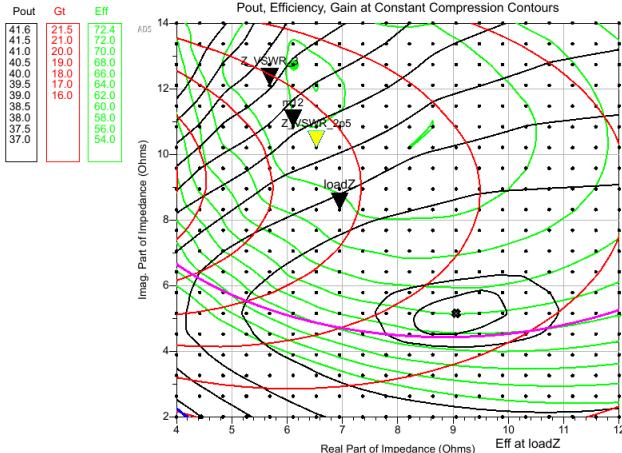
# MOScap evaluation Simple EM simulation

Detailed_EM_P1 3 T9504A	P_1.5 dB	Moscap					Max. performance @ P2dB			Performance @_ 38.5 dBm						Performance @_ 40.5 dBm					
		BW_profile	Name	Mdf Index	RF top plate (X x Y)	Oxide thickness (nm)	Value (pF)	MXP (dBm)	MXG (dB)	MXE (%)	Zin (Ω)	Z_L (Ω)	Pout (dBm)	Eff. (%)	Gt (dB)	IRL (dB)	Zin (Ω)	Z_L (Ω)	Pout (dBm)	Eff. (%)	Gt (dB)
DOE 11	BW_3o_4o_5o	N9501B_V8	16	1466 x 207	3100	3.53	41.6	21.5	72.4	0.8 + j 3.6	5.7 + j 12.1	38.44	70.9	19.2	-9.1	0.5 + j 3.0	7.0 + j 8.3	40.69	69.5	19.2	-5.4
DOE 11	BW_3o_4o_5o	N9501B_V6	14	1466 x 233	3100	3.98	41.6	21.3	73.1	0.8 + j 3.7	5.7 + j 12.1	38.45	71.8	19.0	-9.3	0.5 + j 3.1	7.0 + j 8.3	40.71	70.2	19.0	-5.7
DOE 11	BW_3o_4o_5o	N9500B_V7	19	1010 x 253	1950	4.64	41.5	20.8	73.7	0.8 + j 3.8	5.7 + j 12.1	38.51	73.4	18.7	-9.6	0.6 + j 3.3	6.5 + j 9.0	40.29	70.9	19.0	-6.3
DOE 11	BW_3o_4o_5o	N9500B_V3	15	1010 x 292	1950	5.35	41.5	20.3	74.7	0.9 + j 3.8	5.7 + j 12.1	38.5	74.3	18.3	-10.0	0.6 + j 3.4	6.5 + j 9.0	40.33	72.0	18.6	-6.8
DOE 11	BW_3o_4o_5o	N9500B_V2	5	1010 x 295	1700	6.17	41.5	19.7	75.5	0.8 + j 3.9	5.7 + j 11.5	38.71	74.1	18.1	-9.3	0.6 + j 3.6	6.5 + j 9.0	40.37	73.1	18.2	-7.2
DOE 11	BW_3o_4o_5o	N9500B_Std	1	1010 x 337	1700	7.05	41.5	19.1	75.7	0.8 + j 4.0	5.3 + j 11.5	38.42	73.8	17.8	-9.0	0.7 + j 3.6	6.5 + j 9.0	40.33	73.5	17.7	-7.6
DOE 11	BW_3o_4o_5o	N9500B_V7	10	1010 x 253	900	9.55	41.6	17.3	70.8	0.8 + j 3.9	5.3 + j 10.2	38.96	68.2	16.6	-8.3	0.6 + j 3.7	7.0 + j 7.1	41.03	70.4	16.0	-6.7
DOE 11	BW_3o_4o_5o	N9500B_V5	8	1010 x 270	900	10.19	41.7	16.8	69.1	0.7 + j 3.9	5.3 + j 9.6	39.31	66.8	16.3	-7.4	0.6 + j 3.8	6.5 + j 7.7	40.54	69.2	15.8	-6.9

- Selected MOScap range 3.98 → 9.55 pF
  - Based on mdif file based Moscap model.
- Selection criteria
  - Compression selected as P\_1.5 dB as this die has more power. Estimated power needed 38.5 to 39.5 dBm
  - As high Gt as possible
  - As high DE as possible
  - Reasonable/ matchable Zin
  - As low Q as possible for ZL
  - Clean contours (as less wobbly as possible to favour stability)
  - Reasonable IRL indicating a reasonable input match.
- General observation
  - For lower Moscap < 4.64 pF
    - Contours are becoming wobbly indicating instability issue.
  - For Moscap > 9.55 pF
    - Contours are look more stable but gain is lower and the efficiency drops quickly over power



# DOE\_11 Moscap simple 3,53 pF



## Power Sweep Inspector

Eqn VSWRVal=5 Eqn VSWRVal=2.5

Move Marker 'loadZ' to desired impedance point.

VSWR Locus of Points selector is located on Constant Compression Loadpull page.

VSWR Locus center Impedance =  $9.05 + j10.16$   
VSWR=5

VSWR Locus of Points selector is located on Constant Compression Loadpull page.

VSWR Locus center Impedance =  $6.11 + j10.84$   
VSWR=5

## Summary of Performance at Compression

Marker Impedance	Marker Gamma	Reference Compression Level (dB)
$6.95 + j8.32$	$0.76 / 160.76$	1.50
Pout (dBm)	Eff (%)	Gt (dB)
40.69	69.51	19.19
AMPM (dBm)	IRL (dB)	Zin (Ohm)
-14.88	-5.42	$0.53 + j3.02$

$\times$  In plots below corresponds to this data.

## Summary of Performance at Compression

Marker Impedance	Marker Gamma	Reference Compression Level (dB)
$6.11 + j10.84$	$0.79 / 155.19$	1.50
Pout (dBm)	Eff (%)	Gt (dB)
39.41	71.96	19.46
AMPM (dBm)	IRL (dB)	Zin (Ohm)
-16.53	-7.65	$0.66 + j3.44$

$\times$  In plots below corresponds to this data.

## VSWR = 2.5 point DATA

Marker Impedance	Marker Gamma	Reference Compression Level (dB)
$6.53 + j10.21$	$0.78 / 156.54$	1.50
Pout (dBm)	Eff (%)	Gt (dB)
39.82	71.44	19.36
AMPM (dBm)	IRL (dB)	Zin (Ohm)
-16.23	-7.29	$0.65 + j3.31$

$\times$  In plots below corresponds to this data.

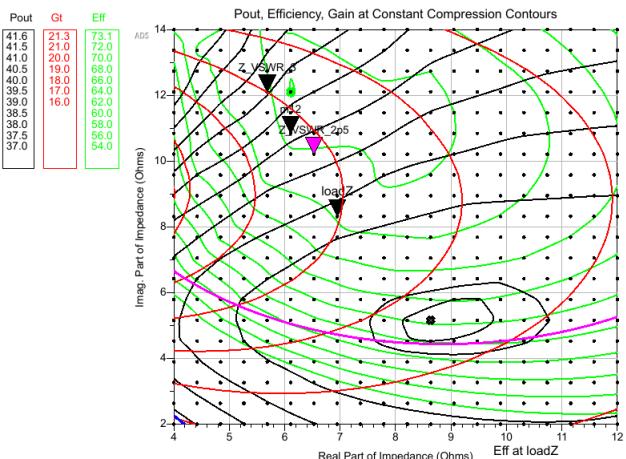
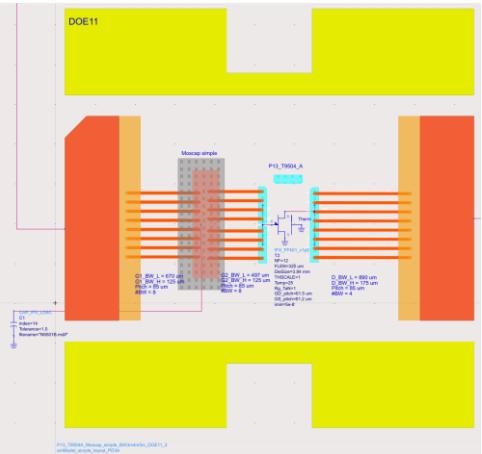
## VSWR = 3 point DATA

Marker Impedance	Marker Gamma	Reference Compression Level (dB)
$5.68 + j12.11$	$0.81 / 152.46$	1.50
Pout (dBm)	Eff (%)	Gt (dB)
38.44	70.94	19.19
AMPM (dBm)	IRL (dB)	Zin (Ohm)
-15.26	-9.11	$0.77 + j3.62$

$\times$  In plots below corresponds to this data.



# DOE\_11 Moscap simple 3.98 pF



## Power Sweep Inspector

Move Marker "loadZ" to desired impedance point.

VSWR Locus of Points selector is located on Constant Compression Loadpull page.

VSWR Locus center Impedance =  $6.63 + j5.16$   
VSWR=5

VSWR Locus of Points selector is located on Constant Compression Loadpull page.

VSWR Locus center Impedance =  $6.11 + j10.84$   
VSWR=5

## Summary of Performance at Compression

Marker Impedance	Marker Gamma	Reference Compression Level (dB)
$6.95 + j8.32$	$0.76 / 160.76$	1.50
Pout (dBm)	Eff (%)	Gl (dB)
40.71	70.16	19.03
AMPM (dBm)	IRL (dB)	Zin (Ohm)
-14.59	-5.70	$0.54 + j3.11$

✗ In plots below corresponds to this data.

## Summary of Performance at Compression

Marker Impedance	Marker Gamma	Reference Compression Level (dB)
$6.11 + j10.84$	$0.79 / 155.19$	1.50
Pout (dBm)	Eff (%)	Gl (dB)
39.40	72.54	19.27
AMPM (dBm)	IRL (dB)	Zin (Ohm)
-16.31	-7.84	$0.68 + j3.50$

✗ In plots below corresponds to this data.

## VSWR = 2.5 point DATA

Marker Impedance	Marker Gamma	Reference Compression Level (dB)
$6.53 + j10.21$	$0.78 / 156.54$	1.50
Pout (dBm)	Eff (%)	Gl (dB)
39.79	71.86	19.19
AMPM (dBm)	IRL (dB)	Zin (Ohm)
-15.99	-7.53	$0.66 + j3.38$

✗ In plots below corresponds to this data.

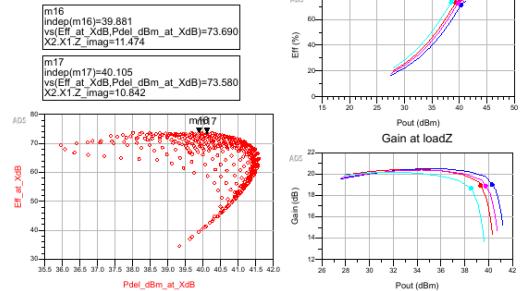
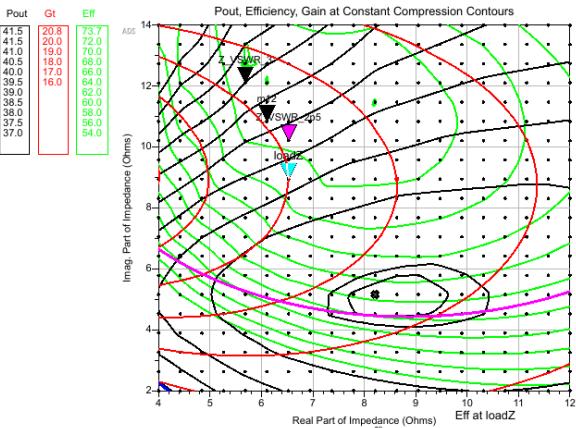
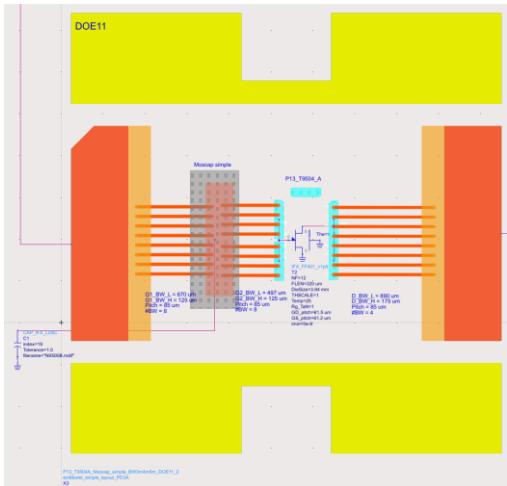
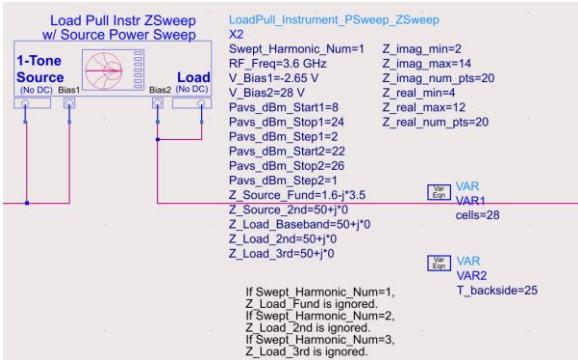
## VSWR = 3 point DATA

Marker Impedance	Marker Gamma	Reference Compression Level (dB)
$5.68 + j12.11$	$0.81 / 152.46$	1.50
Pout (dBm)	Eff (%)	Gl (dB)
38.45	71.77	18.99
AMPM (dBm)	IRL (dB)	Zin (Ohm)
-15.21	-9.26	$0.79 + j3.68$

✗ In plots below corresponds to this data.



# DOE\_11 Moscap simple 4.64 pF



## Power Sweep Inspector

Eqn VSWRVal5 Eqn VSWRVal1=2.5

Move Marker 'loadZ' to desired impedance point.

VSWR Locus of Points selector is located on Constant Compression Loadpull page.

VSWR center Impedance =  $8.21 + j5.16$   
 VSWR=5

VSWR Locus of Points selector is located on Constant Compression Loadpull page.

VSWR center Impedance =  $6.11 + j10.84$   
 VSWR=5

## Summary of Performance at Compression

Marker Impedance	Marker Gamma	Reference Compression Level (dB)
$6.53 + j8.95$	0.78 / 159.38	1.50

Pout (dBm)	Eff (%)	Gt (dB)
40.29	70.90	19.00
AMPM (dBm)	IRL (dB)	Zin (Ohm)
-15.59	-6.34	$0.57 + j3.34$

✗ In plots below corresponds to this data.

## Summary of Performance at Compression

Marker Impedance	Marker Gamma	Reference Compression Level (dB)
$6.11 + j10.84$	0.79 / 155.19	1.50

Pout (dBm)	Eff (%)	Gt (dB)
39.34	72.99	18.93
AMPM (dBm)	IRL (dB)	Zin (Ohm)
-16.06	-8.22	$0.71 + j3.59$

✗ In plots below corresponds to this data.

## VSWR = 2.5 point DATA

Marker Impedance	Marker Gamma	Reference Compression Level (dB)
$6.53 + j10.21$	0.78 / 156.54	1.50

Pout (dBm)	Eff (%)	Gt (dB)
39.75	72.39	18.88
AMPM (dBm)	IRL (dB)	Zin (Ohm)
-15.73	-7.93	$0.68 + j3.48$

✗ In plots below corresponds to this data.

## VSWR = 3 point DATA

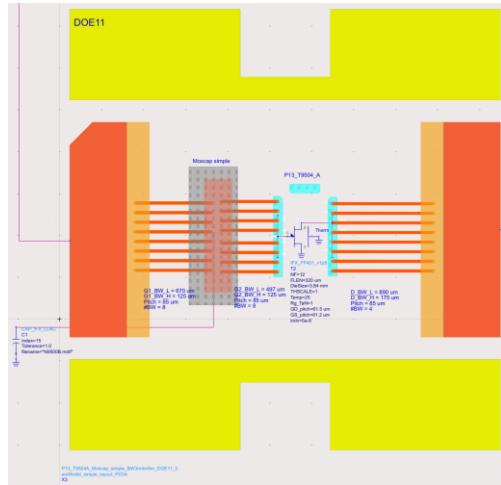
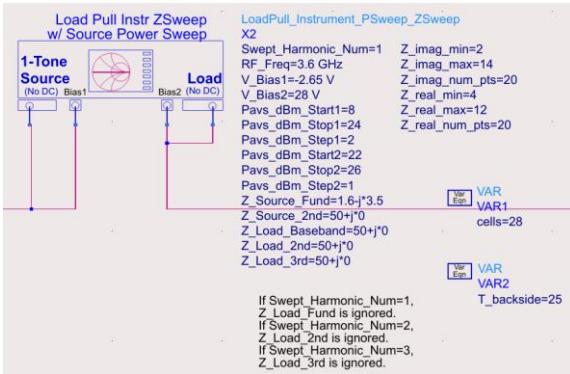
Marker Impedance	Marker Gamma	Reference Compression Level (dB)
$5.68 + j12.11$	0.81 / 152.46	1.50

Pout (dBm)	Eff (%)	Gt (dB)
38.51	73.38	18.67
AMPM (dBm)	IRL (dB)	Zin (Ohm)
-15.29	-9.62	$0.83 + j3.76$

✗ In plots below corresponds to this data.



# DOE\_11 Moscap simple 5.35 pF

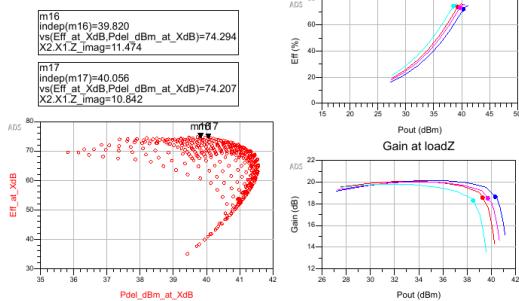
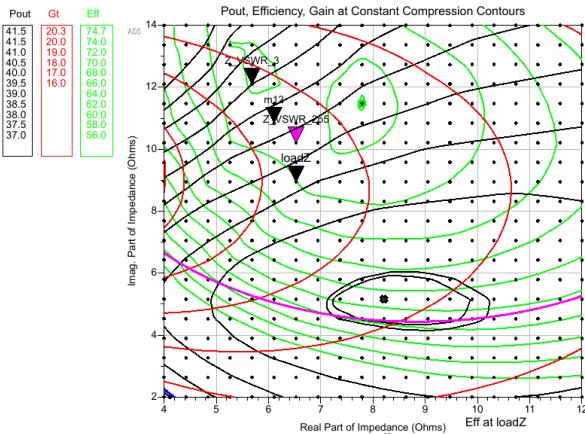


```

LoadPull_Instrument_PSweep_Zsweep

Swept_Harmonic_Num=1 Z_imag_min=2
RF_Freq=3.6 GHz Z_imag_max=14
V_Bias_1=-2.65 V Z_imag_num_pts=20
V_Bias_2=28 V Z_real_min=4
Pav_dBm_Start1=8 Z_real_max=12
Pav_dBm_Stop1=24 Z_real_num_pts=20
Pav_dBm_Start2=1 Z_real_min=4
Pav_dBm_Stop2=26 Z_real_max=12
Pav_dBm_Start3=1 Z_real_min=4
Z_Source_Fund=1+J3.5 VAR
Z_Source_2nd=50+J0 VAR1
Z_Load_Baseband=50+J0 cells=28
Z_Load_2nd=50+J0
Z_Load_3rd=50+J0

```



Pout	Gt	Eff
41.5	20.3	74.7
41.5	20.0	74.0
41.0	19.0	72.0
40.5	18.0	70.0
40.0	17.0	68.0
39.5	16.0	66.0
39.0		64.0
38.5		62.0
38.0		60.0
37.5		58.0
37.0		56.0

## Power Sweep Inspector

Move Marker 'loadZ' to desired impedance point.

VSWR Locus of Points selector is located on Constant Compression Loadpull page

VSWR Locus center Impedance =

Marker Impedance	Marker Gamma	Reference Compression Level (dB)
6.53 + j8.95	0.78 / 159.38	1.50

Point (IPm)      **EF (%)**      **CI (IP)**

**X** In plots below corresponds to this data

**VSWR = 2.5 point DATA**

Marker Impedance	Marker Gamma	Reference Compression Level (dB)
6.53 + j10.21	0.78 / 156.54	1.50

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39.71	73.00	18.52
AMPM (dBm)	IRL (dB)	Zin (Ohm)
-15.53	-8.35	0.72 + j3.57

11

VSWR Locus of Points selector is located on Constant Compression Loadpull page.

VSWR Locus center Impedance = **6.11 + j10.84**  
VSWR=5

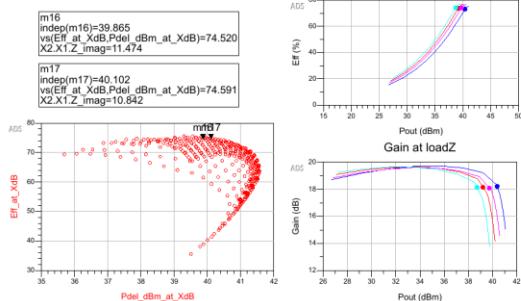
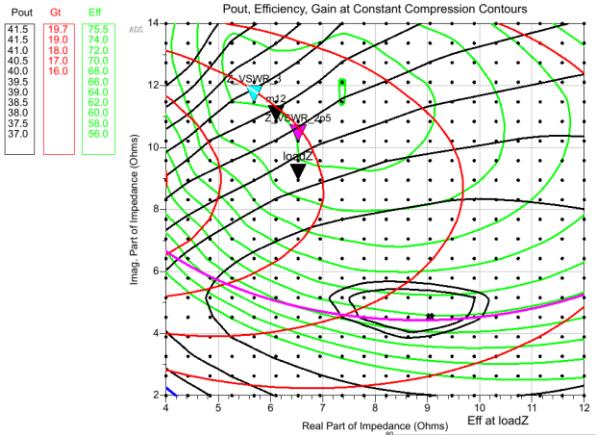
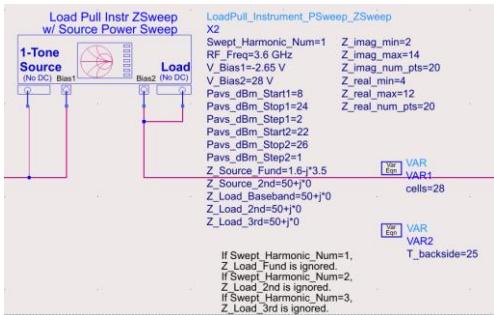
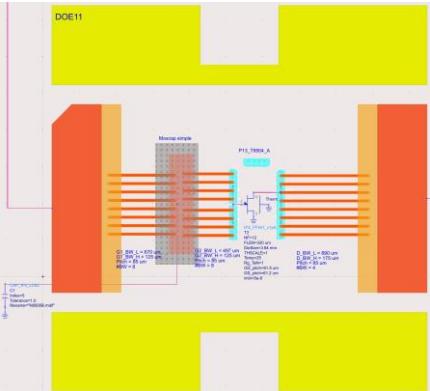
FORM 3

Summary of Performance at Compression		
Marker Impedance	Marker Gamma	Reference Compression Level (dB)
6.11 + j10.84	0.79 / 155.19	1.50
Pout (dBm)	Eff (%)	GI (dB)
39.27	73.34	18.58
AMPP (dBm)	IRL (dB)	Zin (Ohm)
-15.87	-6.60	0.74 + j3.67

• 2000 • 100 • 100



# DOE\_11 Moscap simple 6.17 pF



## Power Sweep Inspector

Move Marker 'loadZ' to desired impedance point.

VSWR Locus of Points selector is located on Constant Compression Leadfull page.

VSWR Locus center Impedance =

Summary of Performance at Comp		
Marker Impedance	Marker Gamma	Reflected Compression Level (%)
6.53 + j8.95	0.78 / 159.38	1
Pout (dBm)	Eff (%)	Gt (dB)
40.37	73.11	18
AMPM (dBm)	IRL (dB)	Zin (Ohm)
-15.13	-7.21	0.63 + j0.01

**X** In plots below corresponds to this data.

VSWR = 2.5 point DATA		
Marker Impedance	Marker Gamma	Reference Compress Level (dB)
6.53 + j10.21	0.78 / 156.54	1.
Pout (dBm)	Eff (%)	GI (dB)
39.73	74.05	18.
AMPM (dBm)	IRL (dB)	Zin (Ohm)
-15.48	-8.79	0.76 + j

✗ In plots below corresponds to this data.

**X** In plots below corresponds to this data.

VSWR Locus center Impedance = 6.11 + i10.84

Summary of Performance at Comp		
Marker Impedance	Marker Gamma	Reflected Comp Level
6.11 + j10.84	0.79 / 155.19	1
Pout (dBm)	Eff (%)	Gt (dB)
39.20	73.76	18
AMPM (dBm)	IRL (dB)	Zin (Ohm)
-15.84	-9.03	0.79 + j1.19

**X** In plots below corresponds to this data.

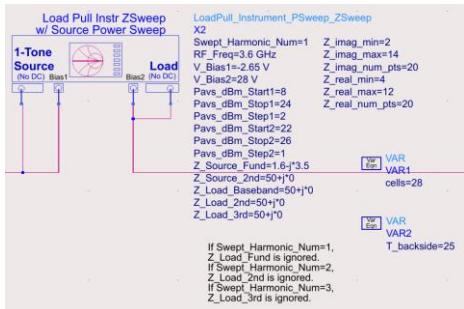
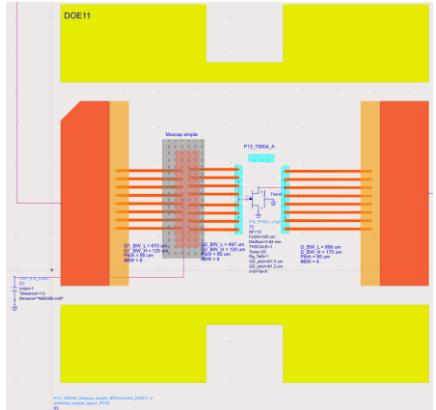
VSWR = 3 point DATA		
Marker Impedance	Marker Gamma	Reflected Power Level (dB)
5.68 + j11.47	0.81 / 153.84	-1.
Pout (dBm)	Eff (%)	Gl (dB)
38.71	74.08	18.
AMPM (dBm)	IRL (dB)	Zin (Ohm)
-15.92	-9.29	0.83 + j

✗ In plots below corresponds to this data.

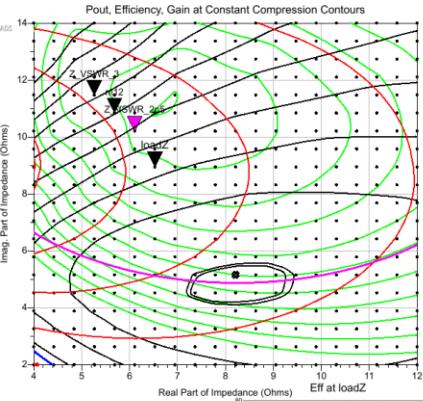
 In plots below corresponds to this data.



# DOE\_11 Moscap simple 7,05 pF



Pout	Gt	Eff
41.5	19.0	74.0
41.0	18.0	72.0
41.0	17.0	70.0
40.5	16.0	68.0
40.0	15.0	66.0
39.5	15.0	64.0
39.0	14.0	62.0
38.5	13.0	60.0
38.0	12.0	58.0
37.5	11.0	56.0
37.0	10.0	54.0



## Power Sweep Inspector

Egn VSWRval=5 Egn VSWRval1=2.5

Move Marker 'loadZ' to desired impedance point.

VSWR Locus of Points selector is located on Constant Compression Loadpull page.

VSWR Locus center Impedance =  $8.21 + j5.16$

## Summary of Performance at Compression

Marker Impedance:  $6.53 + j8.95$  Marker Gamma:  $0.78 / 159.38$  Reference Compression Level (dB): 1.50

Pout (dBm): 40.33 Eff (%): 73.50 Gt (dB): 17.74

AMPM (dBm): -15.10 IRL (dB): -7.61 Zin (Ohm):  $0.87 + j3.64$

X in plots below corresponds to this data.

VSWR Locus of Points selector is located on Constant Compression Loadpull page.

VSWR Locus center Impedance =  $5.68 + j10.84$

## Summary of Performance at Compression

Marker Impedance:  $5.68 + j10.84$  Marker Gamma:  $0.80 / 155.23$  Reference Compression Level (dB): 1.50

Pout (dBm): 38.97 Eff (%): 73.78 Gt (dB): 17.85

AMPM (dBm): -16.61 IRL (dB): -8.76 Zin (Ohm):  $0.79 + j3.86$

X in plots below corresponds to this data.

## VSWR = 2.5 point DATA

Marker Impedance:  $6.11 + j10.21$  Marker Gamma:  $0.79 / 156.59$  Reference Compression Level (dB): 1.50

Pout (dBm): 39.58 Eff (%): 74.49 Gt (dB): 17.80

AMPM (dBm): -16.28 IRL (dB): -8.61 Zin (Ohm):  $0.76 + j3.77$

X in plots below corresponds to this data.

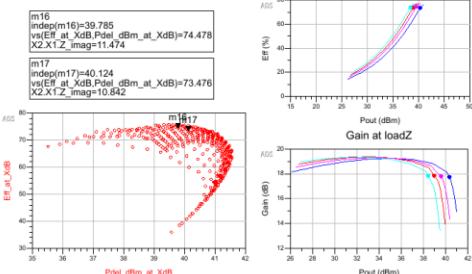
## VSWR = 3 point DATA

Marker Impedance:  $5.26 + j11.47$  Marker Gamma:  $0.82 / 153.89$  Reference Compression Level (dB): 1.50

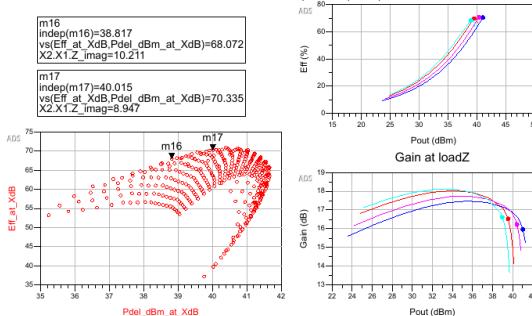
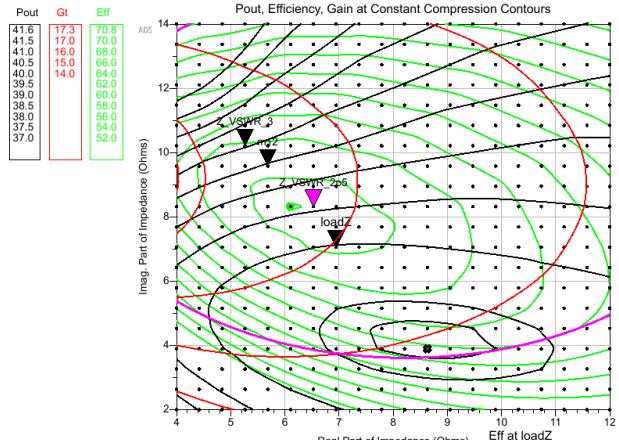
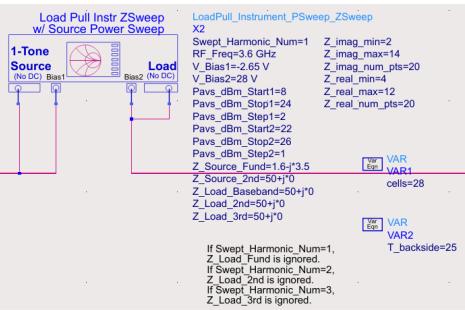
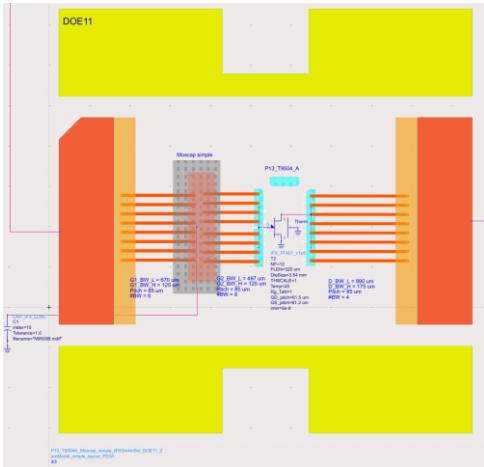
Pout (dBm): 38.42 Eff (%): 73.78 Gt (dB): 17.84

AMPM (dBm): -16.63 IRL (dB): -8.98 Zin (Ohm):  $0.84 + j3.95$

X in plots below corresponds to this data.



## DOE\_11 Moscap simple 9,55 pF



## Power Sweep Inspector

**Eqn** VSWRVal=5 **Eqn** VSWRVal1=2

Move Marker 'loadZ' to desired impedance point

VSWR Locus of Points selector is located on Constant Compression Loadpull page

VSWR Locus center Impedance =  $8.63 + j3.8$   
VSWR=5

Summary of Performance at Compression		
Marker Impedance	Marker Gamma	Reference Compression Level (dB)
$6.95 + j7.05$	$0.76 / 163.64$	1.50
Pout (dBm)	Eeff (%)	Gt (dB)
41.03	70.41	15.97
AMPM (dBm)	iRL (dB)	Zin (Ohm)
-12.71	-6.70	$0.60 + j3.69$

**X** In plots below corresponds to this data

VSWR Locus center Impedance =

VSWR Locus center Impedance = 5.68  
VSWR=5

Summary of Performance at Compression		
Marker Impedance	Marker Gamma	Reference Compression Level (dB)
5.68 + j9.58	0.80 / 158.04	1.50
Pout (dBm)	Eff (%)	GI (dB)
39.56	69.76	16.52
AMPM (dBm)	IRL (dB)	Zin (Ohm)
-18.21	-8.02	0.74 + j3.87

**X** In plots below corresponds to this da

VSWR = 2.5 point DATA

Marker Impedance	Marker Gamma	Reference Compress Level (dB)
6.53 + j8.32	0.77 / 160.80	1.50
Pout (dBm)	Eff (%)	Gl (dB)
40.43	70.80	16.22
AMPM (dBm)	IRL (dB)	Zin (Ohm)
-15.56	-7.53	0.67 + j3.77

**X** in plots below corresponds to this data.

**X** In plots below corresponds to this data

VSWR = 3 point DATA

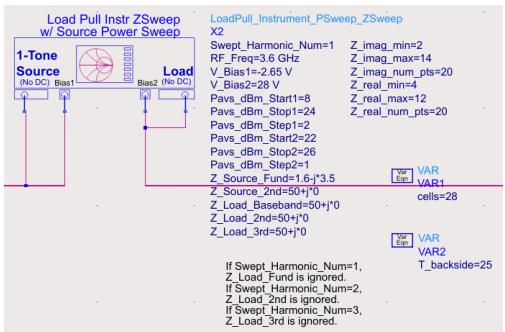
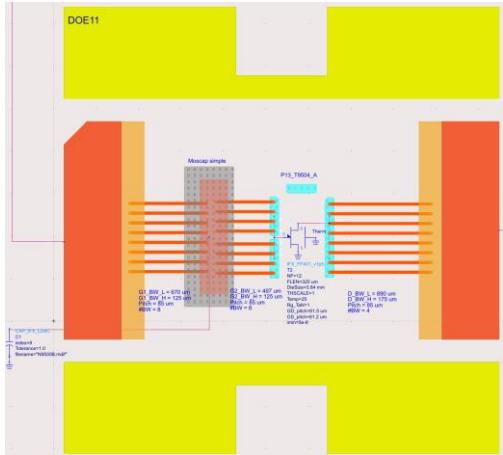
Marker Impedance	Marker Gamma	Reference Compression Level (dB)
5.26 + j10.21	0.82 / 156.68	1.50
Pout (dBm)	Eff (%)	Gt (dB)
38.96	68.18	16.61
AMPPM (dBm)	IRL (dB)	Zin (Ohm)
-19.06	-8.23	0.77 + j3.93

X In plots below corresponds to this data.

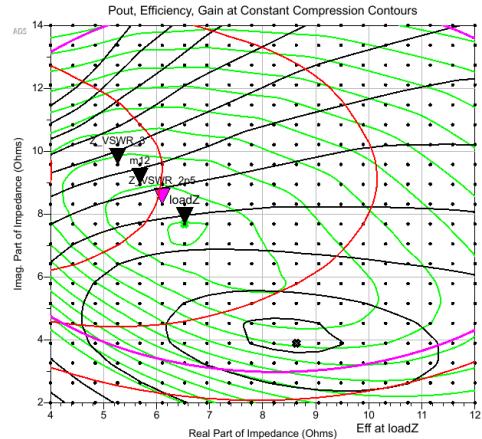
**X** In plots below corresponds to this date



# DOE\_11 Moscap simple 10,19 pF



Pout	Gt	Eff
41.7	16.8	69.1
41.5	15.0	66.0
41.0	14.0	64.0
40.5		62.0
40.0		60.0
39.5		58.0
39.0		56.0
38.5		54.0
38.0		52.0
37.5		50.0
37.0		48.0



## Power Sweep Inspector

Eqn VSWRVal=5 Eqn VSWRVal=2.5

Move Marker 'loadZ' to desired impedance point.

VSWR Locus of Points selector is located on Constant Compression Loadpull page.

VSWR Locus center Impedance =  $8.63 + j3.89$   
VSWR=5

VSWR Locus of Points selector is located on Constant Compression Loadpull page.

VSWR Locus center Impedance =  $5.68 + j6.95$   
VSWR=5

## Summary of Performance at Compression

Marker Impedance	Marker Gamma	Reference Compression Level (dB)
$6.53 + j7.68$	$0.77 / 162.23$	1.50
Pout (dBm)	Eff (%)	Gt (dB)
40.64	69.15	15.79
AMPM (dBm)	IRL (dB)	Zin (Ohm)
-15.04	-6.85	$0.62 + j3.78$

$\times$  In plots below corresponds to this data.

## Summary of Performance at Compression

Marker Impedance	Marker Gamma	Reference Compression Level (dB)
$5.68 + j8.95$	$0.80 / 159.46$	1.50
Pout (dBm)	Eff (%)	Gt (dB)
39.82	67.84	16.13
AMPM (dBm)	IRL (dB)	Zin (Ohm)
-18.30	-7.26	$0.67 + j3.87$

$\times$  In plots below corresponds to this data.

## VSWR = 2.5 point DATA

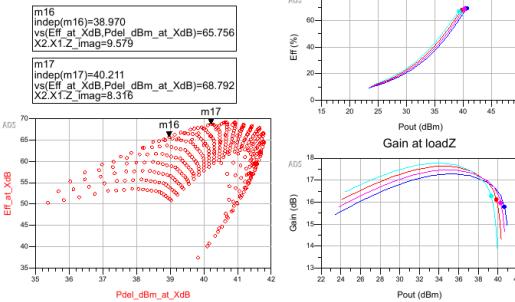
Marker Impedance	Marker Gamma	Reference Compression Level (dB)
$6.11 + j8.32$	$0.79 / 160.84$	1.50
Pout (dBm)	Eff (%)	Gt (dB)
40.27	68.70	15.97
AMPM (dBm)	IRL (dB)	Zin (Ohm)
-16.75	-7.06	$0.65 + j3.82$

$\times$  In plots below corresponds to this data.

## VSWR = 3 point DATA

Marker Impedance	Marker Gamma	Reference Compression Level (dB)
$5.26 + j9.58$	$0.82 / 158.08$	1.50
Pout (dBm)	Eff (%)	Gt (dB)
39.31	66.75	16.28
AMPM (dBm)	IRL (dB)	Zin (Ohm)
-19.54	-7.44	$0.70 + j3.93$

$\times$  In plots below corresponds to this data.





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# MOScap evaluation detail EM simulation

Detailed_EM_P1 3 T9504A	P_1.5 dB	Moscap					Max. performance @ P2dB			Performance @ 38.5 dBm						Performance @ 40.5 dBm					
		BW_profile	Name	Mdf Index	RF top plate (X x Y)	Oxide thickness (nm)	Value (pF)	MXP (dBm)	MXG (dB)	MXE (%)	Zin (Ω)	Z_L (Ω)	Pout (dBm)	Eff. (%)	Gt (dB)	IRL (dB)	Zin (Ω)	Z_L (Ω)	Pout (dBm)	Eff. (%)	Gt (dB)
DOE	BW_3o_4o_5o	N9501B_V8	16	1466 x 207	3100	3.53	41.5	20.4	70.3	1.0+j 3.2	5.6+j 13.1	38.12	69.2	18.3	-10.5	0.8+j 2.8	6.6+j 10.8	39.55	69.5	18.6	-8.3
DOE	BW_3o_4o_5o	N9501B_V6	14	1466 x 233	3100	3.98	41.5	20.2	70.8	1.0+j 3.2	5.7+j 13.1	38.22	69.9	18.1	-10.4	0.8+j 2.9	6.5+j 10.8	39.5	69.7	18.6	-8.1
DOE	BW_3o_4o_5o	N9500B_V7	19	1010 x 253	1950	4.64	41.5	19.9	71.5	0.9+j 3.3	5.6+j 12.3	38.45	70.7	18.3	-8.6	0.7+j 3.0	6.6+j 10.1	39.86	70.2	18.5	-7.2
DOE	BW_3o_4o_5o	N9500B_V3	15	1010 x 292	1950	5.35	41.5	19.8	71.8	0.8+j 3.3	5.6+j 13.1	38.16	71.0	18.0	-8.4	0.7+j 3.1	6.6+j 10.8	39.56	70.8	18.4	-6.8
DOE	BW_3o_4o_5o	N9500B_V2	5	1010 x 295	1700	6.17	41.5	19.5	72.1	0.7+j 3.4	5.6+j 12.3	38.42	71.4	18.1	-7.2	0.6+j 3.1	6.6+j 10.1	39.91	71.2	18.2	-6.0
DOE	BW_3o_4o_5o	N9500B_Std	1	1010 x 337	1700	7.05	41.5	19.0	72.6	0.7+j 3.5	5.6+j 12.3	38.37	71.5	17.8	-6.8	0.6+j 3.2	6.6+j 10.1	39.98	72.0	17.9	-5.7
DOE	BW_3o_4o_5o	N9500B_V7	10	1010 x 253	900	9.55	41.5	18.7	73.8	0.7+j 3.7	5.6+j 12.3	38.39	72.5	17.6	-8.5	0.6+j 3.5	6.6+j 10.1	40.0	72.8	17.5	-6.7
DOE	BW_3o_4o_5o	N9500B_V5	8	1010 x 270	900	10.19	41.3	19.0	72.9	0.7+j 3.7	6.1+j 12.3	38.41	71.5	17.8	-8.8	0.6+j 3.5	7.7+j 9.4	40.46	72.1	17.4	-6.7

› High Eff.%, reasonable Gt, better Zin, non linear region (P\_1.5)

› Favourable caps in the range 3.98 → 6.17

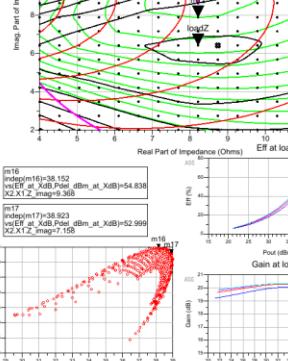
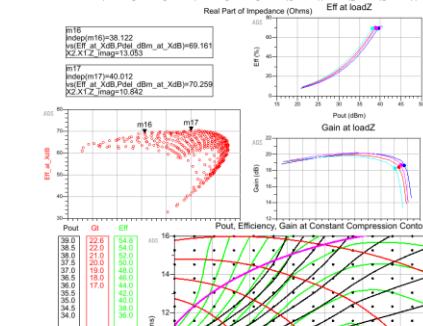
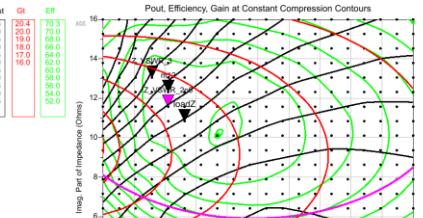
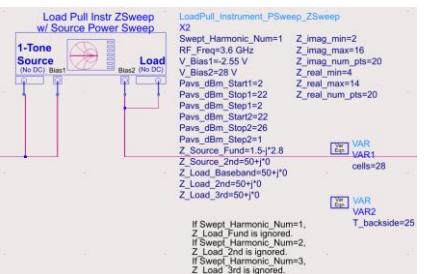
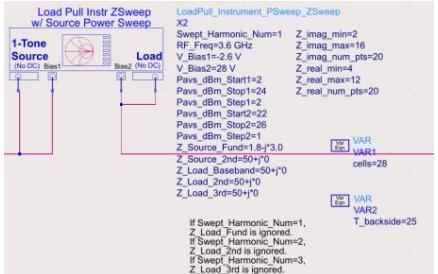
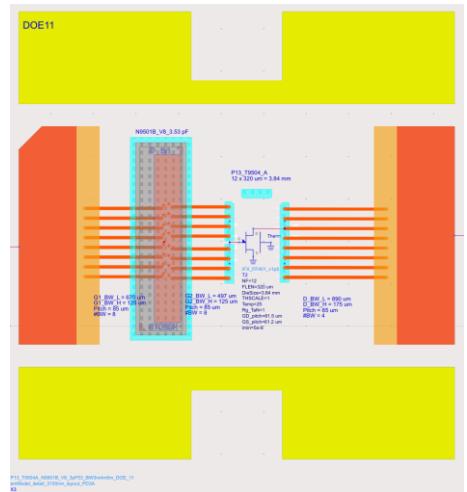
Detailed_EM_P1 3 T9504A	P_0.5 dB	Moscap					Max. performance @ P2dB			Performance @ 38.0 dBm						Performance @ 39.5 dBm					
		BW_profile	Name	Mdf Index	RF top plate (X x Y)	Oxide thickness (nm)	Value (pF)	MXP (dBm)	MXG (dB)	MXE (%)	Zin (Ω)	Z_L (Ω)	Pout (dBm)	Eff. (%)	Gt (dB)	IRL (dB)	Zin (Ω)	Z_L (Ω)	Pout (dBm)	Eff. (%)	Gt (dB)
DOE	BW_3o_4o_5o	N9501B_V8	16	1466 x 207	3100	3.53	39.0	22.6	54.8	0.8+j 2.6	8.2+j 9.4	38.22	54.7	19.8	-10.5	0.7+j 2.3	8.2+j 6.4	39.0	51.2	19.6	-7.3
DOE	BW_3o_4o_5o	N9501B_V6	14	1466 x 233	3100	3.98	39.0	22.3	54.9	0.8+j 2.7	8.2+j 9.4	38.2	54.9	19.7	-10.4	0.7+j 2.5	8.2+j 7.2	38.95	53.3	19.6	-8.0
DOE	BW_3o_4o_5o	N9500B_V7	19	1010 x 253	1950	4.64	39.1	21.9	55.2	0.8+j 2.9	8.2+j 9.4	38.17	55.2	19.6	-9.9	0.7+j 2.6	8.2+j 7.2	39.01	53.9	19.5	-8.1
DOE	BW_3o_4o_5o	N9500B_V3	15	1010 x 292	1950	5.35	39.2	21.9	55.9	0.6+j 2.9	7.7+j 9.4	38.16	55.8	19.8	-7.6	0.5+j 2.7	7.7+j 7.2	39.03	54.3	19.7	-6.1
DOE	BW_3o_4o_5o	N9500B_V2	5	1010 x 295	1700	6.17	39.2	21.4	56.1	0.6+j 3.0	7.7+j 9.4	38.14	56.1	19.6	-7.3	0.5+j 2.8	7.7+j 7.2	39.05	54.7	19.5	-6.0
DOE	BW_3o_4o_5o	N9500B_Std	1	1010 x 337	1700	7.05	39.3	20.8	57.0	0.6+j 3.1	7.7+j 9.4	38.17	56.6	19.3	-6.7	0.5+j 3.0	7.7+j 7.2	39.18	55.6	19.1	-5.7
DOE	BW_3o_4o_5o	N9500B_V7	10	1010 x 253	900	9.55	39.4	19.2	60.0	0.6+j 3.5	7.2+j 10.1	38.13	60.0	18.3	-5.5	0.5+j 3.3	7.2+j 7.9	39.09	58.4	18.2	-4.7
DOE	BW_3o_4o_5o	N9500B_V5	8	1010 x 270	900	10.19	39.5	19.0	60.5	0.6+j 3.5	7.2+j 10.1	38.19	60.6	18.1	-5.3	0.4+j 3.4	7.2+j 7.9	39.14	58.9	18.0	-4.4

› Lower Eff.%, higher Gt, reasonable Zin, linear region (P\_0.5 dB)

› Favourable caps in the range 6.17 → 10.19



DOE\_11 Moscap detail EM 3.53 pF



Move Marker "loadZ" to desired impedance point

#### **ASWID Loss of Pulse protocols**

VSMR Locus of Points selector is located on Constant Compression Loadpull page.

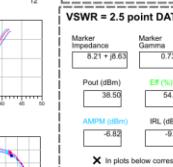
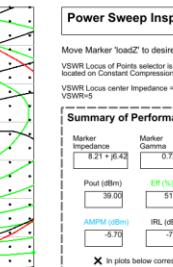
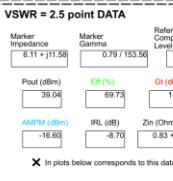
VSWR | Zocus center Impedance =

VSWR=5

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Summary of Performance at Con		
Marker Impedance	Marker Gamma	Reflec Comp Level
6.63 + j10.84	0.78 / 155.13	
Pout (dbm)	Eff (%)	Gt (d)
39.55	69.49	1

► To print before you can add to this data



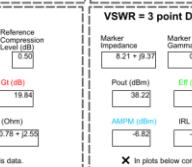
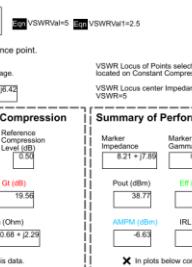
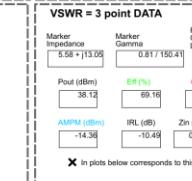
VSWR=5

Section 6: Performance Metrics

## Summary of Performance at Q3

Marker Impedance	Marker Gamma
$6.11 + j12.32$	$0.79 / 151.95$
Pout (dBm)	Eff (%)
38.74	69.70
AMPM (dBm)	IRL (dB)
Zin	

**X** To obtain better correspondence with

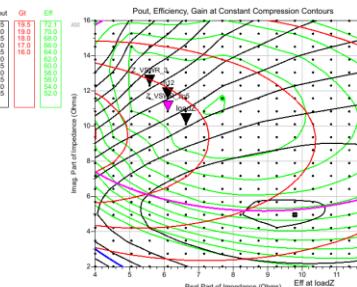
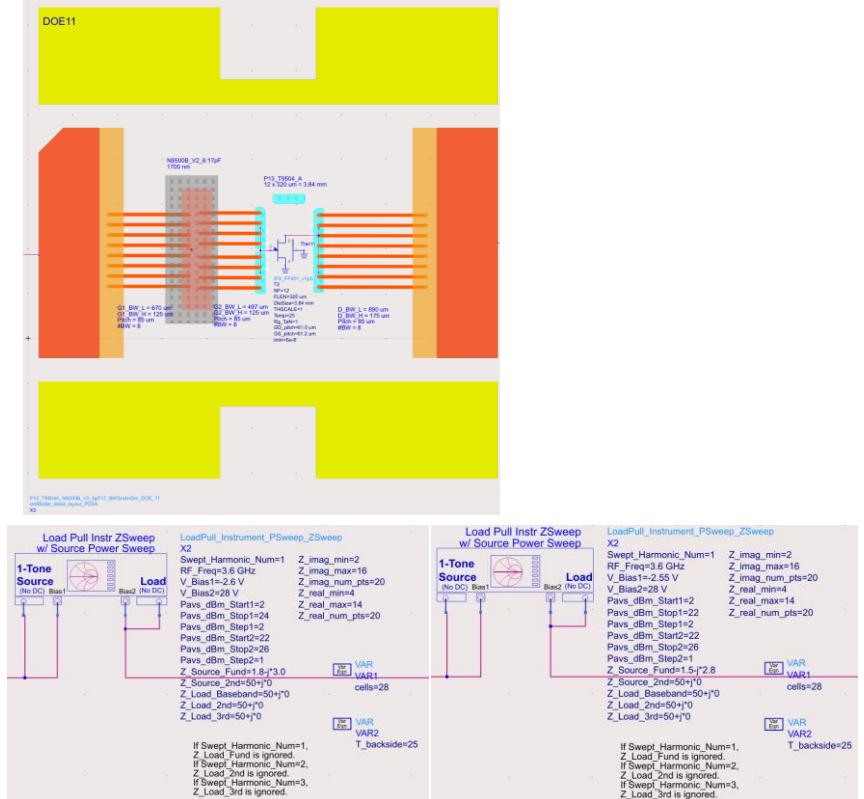




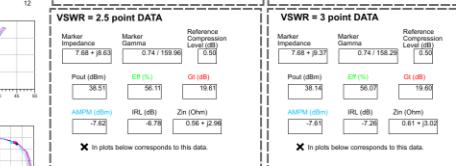
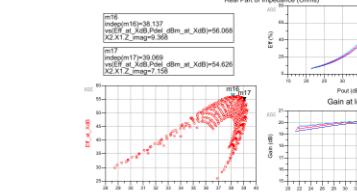
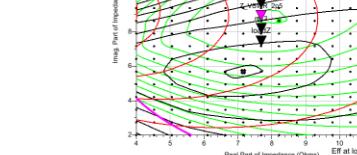
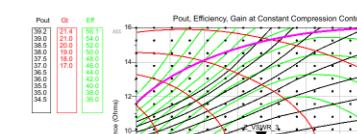
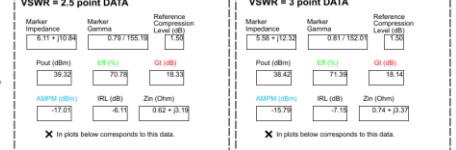
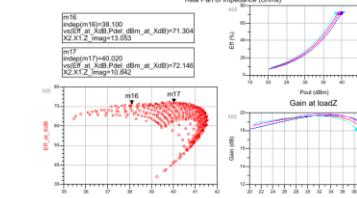




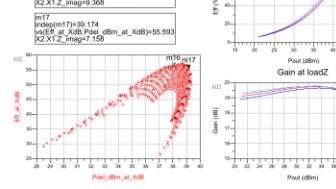
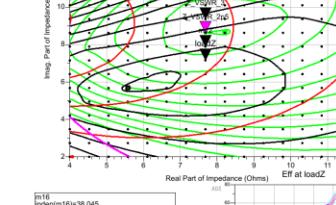
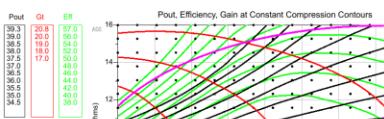
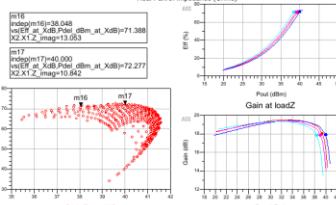
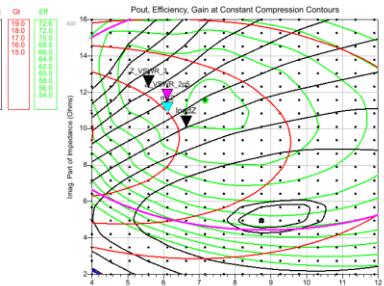
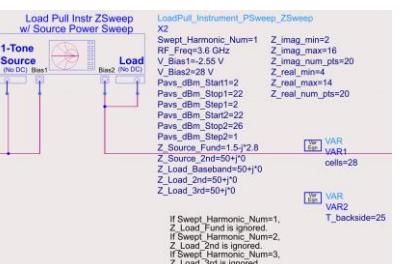
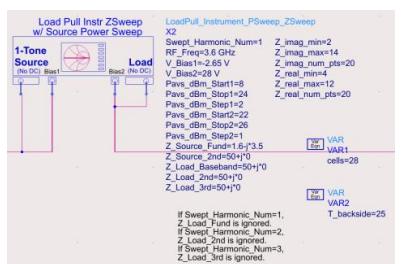
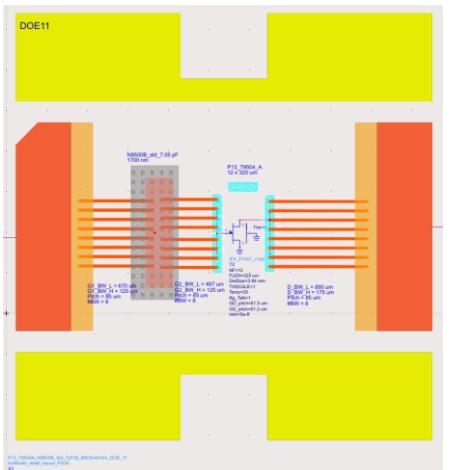
DOE\_11 Moscap detail EM 6.17 pF



Focus center Impedance =



DOE\_11 Moscap detail EM 7.05 pF



## Power Sweep Inspector

Move Marker "loadZ" to desired impedance point

SWR Locus of Points selector is located on Constant Compression Loadpull page.  
SWR Locus center Impedance =

VSWR Locus center impedance = 6.11 +

Summary of Performance at Compression		
Marker Impedance	Marker Gamma	Reference Compression Level (dBm)
6.11 + j10.84	0.79 / 155.19	1.56
Pout (dBm)	EIRP (dB)	G/T (dB)
39.31	71.12	18.03
AMPR (dBm)	IRL (dB)	Zin (Ohm)
-16.78	-5.85	0.60 + j3.29

X In plots below corresponds to this data.

Summary of Performance at Compression		
Marker Impedance	Marker Gamma	Reference Compensation Level (dB)
6.63 +j10.11	0.77 /+156.77	1.50
Pout (dBm)	EIRP (dB)	GL (dB)
39.98	71.98	17.91
AMPM (dBm)	RL  (dB)	Zin (Ohm)
-16.19	-3.74	0.56 +j3.19

X In plots below corresponds to this data.

VSWR = 2.5 point DATA		
Marker Impedance	Marker Gamma	Reference Compensation Level (dB)
6.11 + j11.58	0.79 / 153.59	1.50
Pout (dBm)	Erf (%)	GI (dB)
36.59	71.44	17.86
AMPM (dBm)	IRL (dB)	Zin (Ohm)
-15.84	-6.53	0.67 * j3.34

X In plots below corresponds to this data.

VSWR = 3 point DATA		
Marker Impedance	Marker Gamma	Reference Compression Level (dB)
5.58 +j12.32	0.81 / 152.01	1.50
Pout (dBm) 38.37	Eff (%) 71.43	Gt (dB) 17.84
AMP (dBm) -15.54	IRL (dB) -6.79	Zin (Ohm) 0.72 +j3.49

X In plots below corresponds to this data.

Power Sweep Inspector

Move Marker 'loadZ' to desired impedance point

VSWR Locus of Points selector is located on Constant Compression Loadpull page.

VSWR Locus center Impedance =	$5.56 + j6.68$
<b>Summary of Performance at Comp.</b>	
Marker Impedance	Marker Gamma
$7.68 + j7.16$	$0.74 / 163.33$
Pout (dBm)	Eff (%)
39.18	55.57
AMPM (GHz)	IRL (dB)
-7.01	-6.66
	Zin (Ohm)
	$0.48 + j2$

Summary of Performance at C	
Marker Impedance	Marker Impedance
7.68 + j7.83	0.74 + j161.64
Pout (dBm)	ER (dB)
39.94	56.59
AMPM (dBm)	IRL (dB)
-J.43	-5.97
	Zn (Ohm)
	6.51 + j3.43

**VSWR = 2.5 point DATA**

Marker Impedance      Marker Gamma

Marker	Marker	Reference
Impedance	Gamma	Compression Level (dB)

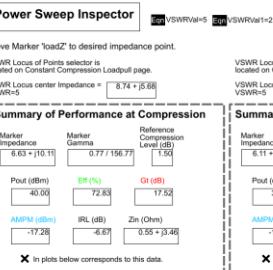
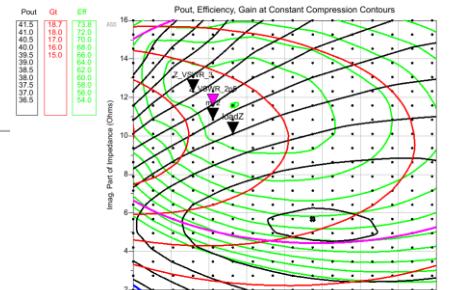
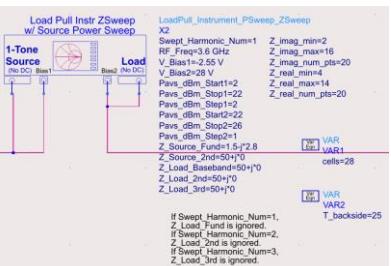
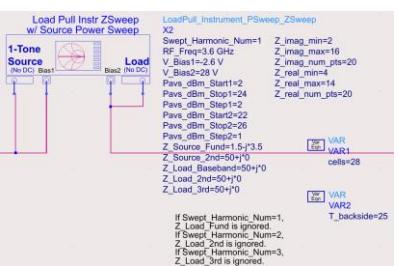
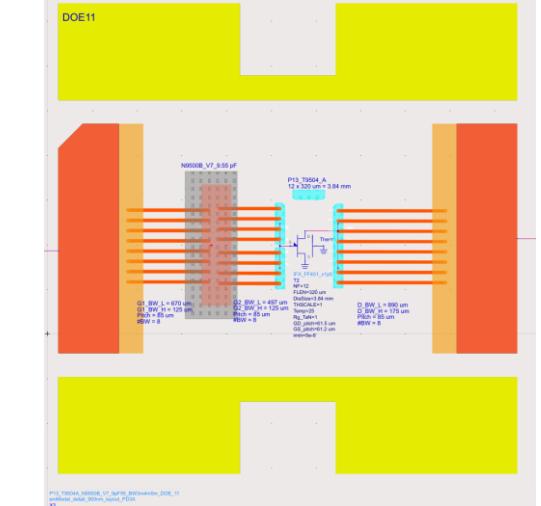
Pout (dBm)	Eff (%)	Gt (dB)
38.60	56.96	19.21
AMPM (dBm)	IRL (dB)	Zin (Ohm)
-7.64	-6.34	0.55 + j3.

✗ In plots below corresponds to this data.

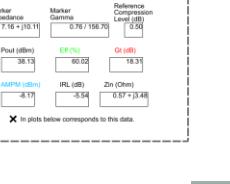
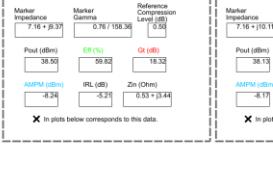
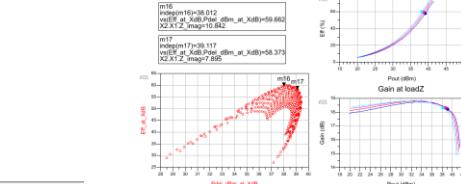
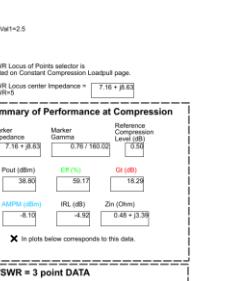
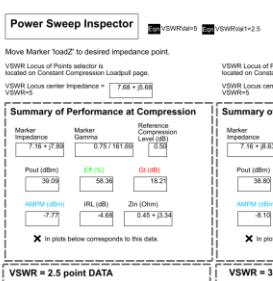
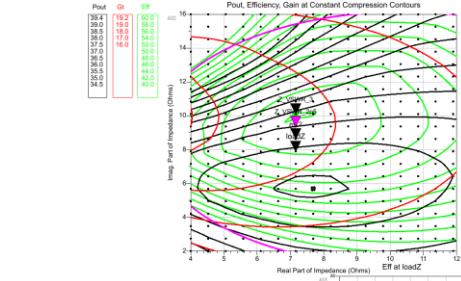
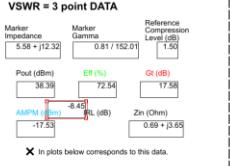
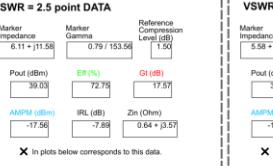
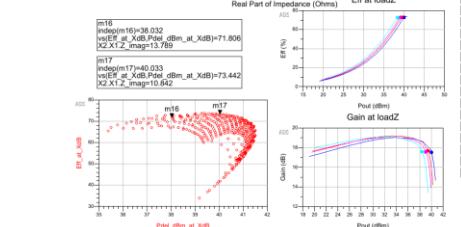
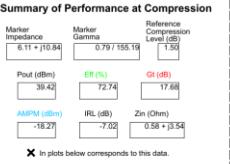
Port (dBm)	EIR (%)	Gt (dB)
38.17	56.63	19.26
AMPM (dBm)	IRL (dB)	Zin (Ohm)
-7.64	-6.74	0.59 + j3.1

X in plots below corresponds to this data.

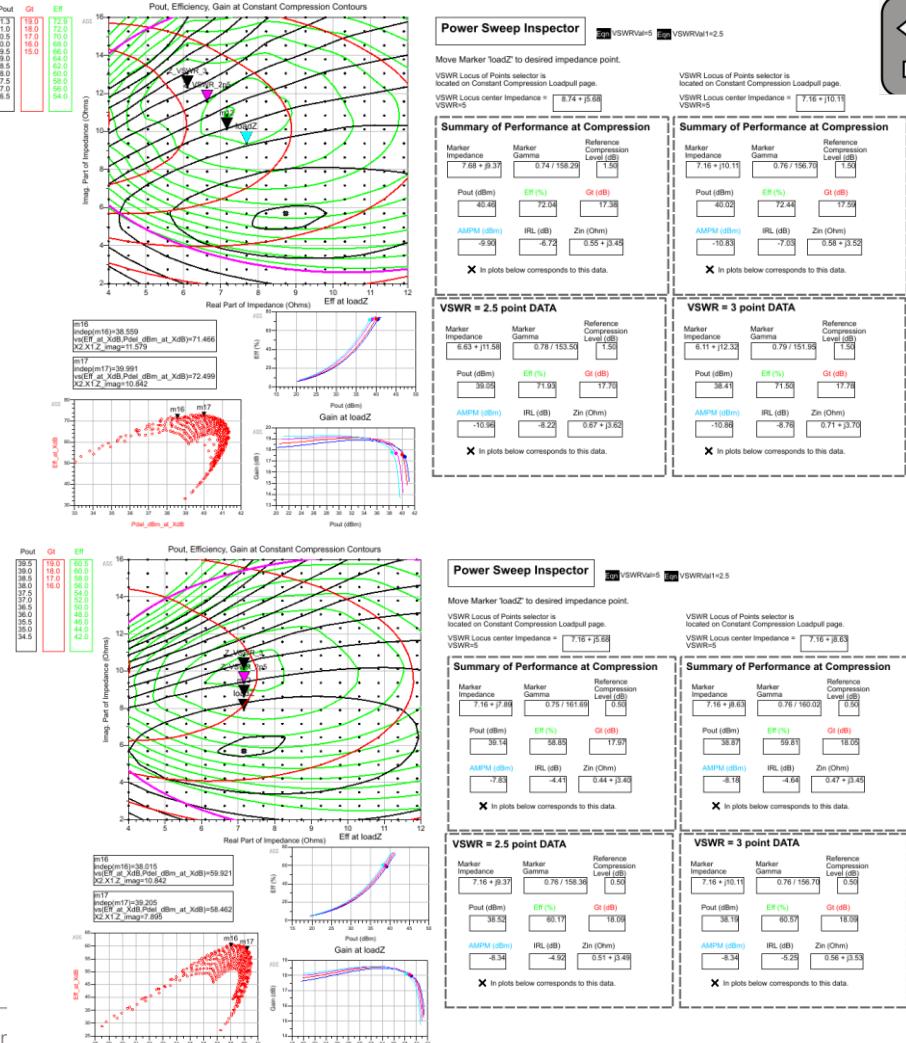
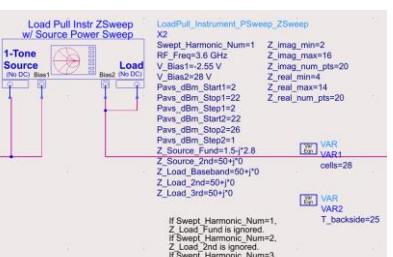
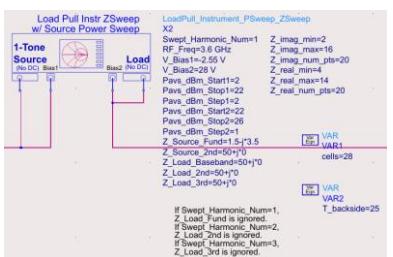
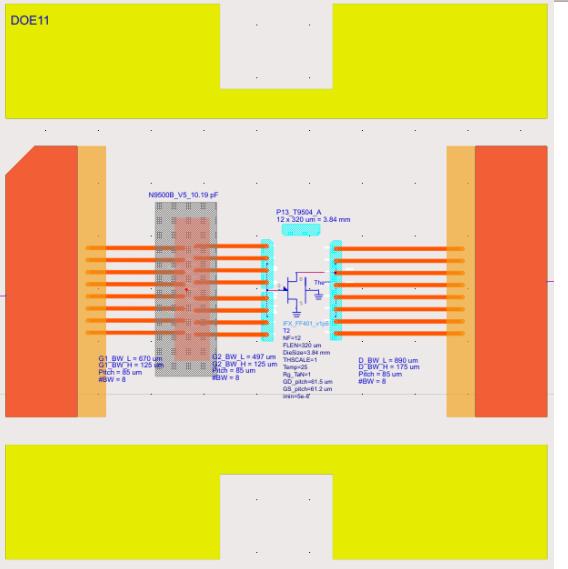
# DOE\_11 Moscap detail EM 9.55 pF



VSWR Locus of Points selector is located on Constant Compression Loadup page.  
VSWR Locus center Impedance = 6.11 + j10.54  
VSWR=5



# DOE\_11 Moscap detail EM 10.19 pF



# BW configuration evaluation detail EM simulation

Detailed_EM_P1 3 T9504A	P_1.5 dB	Moscap				Max. performance @ P2dB			Performance @ 38.5 dBm						Performance @ 40.5 dBm						
		Mdf Index	RF top plate (X x Y)	Oxide thickness (nm)	Value (pF)	MXP (dBm)	MXG (dB)	MXE (%)	Zin (Ω)	Z_L (Ω)	Pout (dBm)	Eff. (%)	Gt (dB)	IRL (dB)	Zin (Ω)	Z_L (Ω)	Pout (dBm)	Eff. (%)	Gt (dB)	IRL (dB)	
DOE	BW_profile																				
DOE_11	BW_3m_4m_5m	N9500B_Std	1	1010 x 337	1700	7.05	41.5	19.0	72.6	0.7+j3.5	5.6+j12.3	38.37	71.5	17.8	-6.8	0.6+j3.2	6.6+j10.1	39.98	72.0	17.9	-5.7
DOE_11	BW_3m_4m_6m	N9500B_Std	1	1010 x 337	1700	7.05	41.2	20.1	70.5	0.8+j3.3	7.2+j12.3	38.94	69.3	18.1	-9.8	0.7+j3.1	8.2+j9.4	40.56	69.6	17.9	-7.1
DOE_11	BW_3m_4m_7m	N9500B_Std	1	1010 x 337	1700	7.05	41.3	20.0	71.2	0.7+j3.3	6.6+j10.8	39.14	70.2	18.5	-7.7	0.6+j3.1	8.2+j8.6	40.6	70.2	18.0	-7.0
DOE_11	BW_3m_4m_8m	N9500B_Std	1	1010 x 337	1700	7.05	41.2	20.0	70.8	0.7+j3.4	6.1+j11.6	38.9	70.2	18.7	-7.7	0.6+j3.1	7.7+j9.4	40.48	70.2	18.2	-6.9
DOE_11	BW_3m_9m_5m	N9500B_Std	1	1010 x 337	1700	7.05	41.2	20.4	72.0	0.8+j3.4	6.6+j10.8	39.2	71.1	18.7	-9.9	0.7+j3.2	7.7+j8.6	40.57	70.7	18.3	-8.0
DOE_11	BW_3m_9m_7m	N9500B_Std	1	1010 x 337	1700	7.05	41.3	20.4	71.9	0.8+j3.5	6.6+j10.8	39.03	71.2	18.7	-10.4	0.6+j3.2	7.2+j7.9	40.60	70.0	18.4	-6.9

- › High Eff.%, reasonable Gt, better Zin, non linear region (P\_1.5)
- › Favourable BW profile BW\_3m4m7m & BW\_3m9m7m

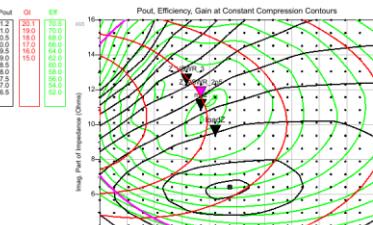
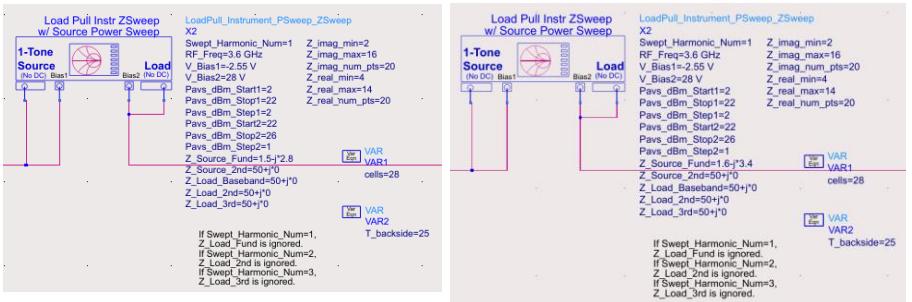
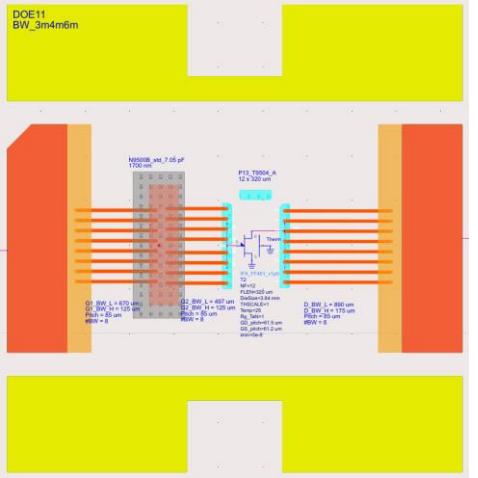
Detailed_EM_P1 3 T9504A	P_0.5 dB	Moscap				Max. performance @ P2dB			Performance @ 38.0 dBm						Performance @ 39.5 dBm						
		Mdf Index	RF top plate (X x Y)	Oxide thickness (nm)	Value (pF)	MXP (dBm)	MXG (dB)	MXE (%)	Zin (Ω)	Z_L (Ω)	Pout (dBm)	Eff. (%)	Gt (dB)	IRL (dB)	Zin (Ω)	Z_L (Ω)	Pout (dBm)	Eff. (%)	Gt (dB)	IRL (dB)	
DOE	BW_profile																				
DOE_11	BW_3m_4m_5m	N9500B_Std	1	1010 x 337	1700	7.05	39.3	20.8	57.0	0.6+j3.1	7.7+j9.4	38.17	56.6	19.3	-6.7	0.5+j3.0	7.7+j7.2	39.18	55.6	19.1	-5.7
DOE_11	BW_3m_4m_6m	N9500B_Std	1	1010 x 337	1700	7.05	39.0	20.8	54.9	0.5+j3.1	7.2+j8.6	38.37	54.7	19.4	-5.8	0.4+j2.9	7.2+j6.4	39.03	51.0	19.1	-5.0
DOE_11	BW_3m_4m_7m	N9500B_Std	1	1010 x 337	1700	7.05	39.4	21.0	57.0	0.5+j3.1	7.2+j8.6	38.26	56.5	19.6	-6.2	0.4+j2.9	7.2+j6.4	39.32	55.2	19.4	-5.3
DOE_11	BW_3m_4m_8m	N9500B_Std	1	1010 x 337	1700	7.05	39.1	20.8	55.5	0.5+j3.1	7.2+j9.4	38.01	55.2	19.4	-6.2	0.4+j2.9	7.2+j7.2	38.99	53.5	19.3	-5.1
DOE_11	BW_3m_9m_5m	N9500B_Std	1	1010 x 337	1700	7.05	39.4	20.8	56.7	0.5+j3.3	6.6+j8.6	38.21	56.2	19.6	-5.9	0.4+j3.0	6.6+j6.4	39.34	54.6	19.3	-5.0
DOE_11	BW_3m_9m_7m	N9500B_Std	1	1010 x 337	1700	7.05	39.5	20.9	56.7	0.6+j3.3	6.6+j8.6	37.99	56.0	19.7	-6.4	0.5+j3.0	7.2+j6.4	39.31	56.0	19.4	-6.2

- › Lower Eff.%, higher Gt, reasonable Zin, linear region (P\_0.5 dB)
- › Favourable BW profile BW\_3m4m7m & BW\_3m9m7m





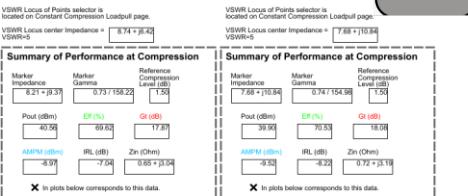
# BW\_3m4m6m



## Power Sweep Inspector

Move Marker 'loadZ' to desired impedance point.  
VSWR Locus of Points selector is located on Constant Compression Loadpage.

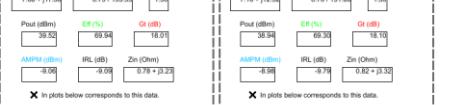
VSWR=4.5



## VSWR = 2.5 point DATA

Move Marker 'loadZ' to desired impedance point.  
VSWR Locus of Points selector is located on Constant Compression Loadpage.

VSWR=2.5



## Power Sweep Inspector

Move Marker 'loadZ' to desired impedance point.  
VSWR Locus of Points selector is located on Constant Compression Loadpage.

VSWR=5



## VSWR = 2.5 point DATA

Move Marker 'loadZ' to desired impedance point.  
VSWR Locus of Points selector is located on Constant Compression Loadpage.

VSWR=2.5



## VSWR = 3 point DATA

Move Marker 'loadZ' to desired impedance point.  
VSWR Locus of Points selector is located on Constant Compression Loadpage.

VSWR=3



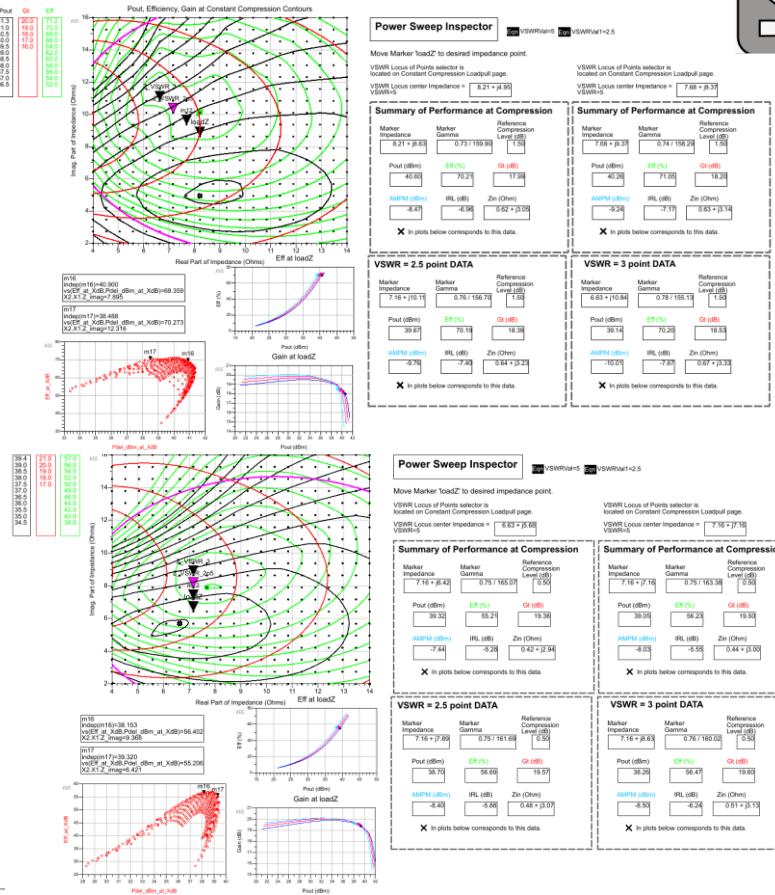
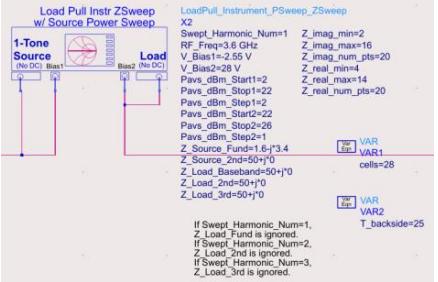
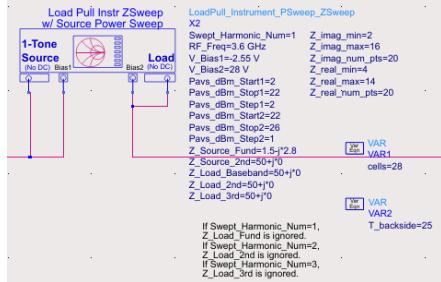
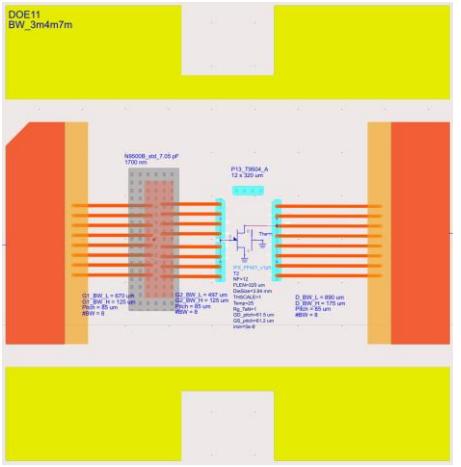
## VSWR = 3 point DATA

Move Marker 'loadZ' to desired impedance point.  
VSWR Locus of Points selector is located on Constant Compression Loadpage.

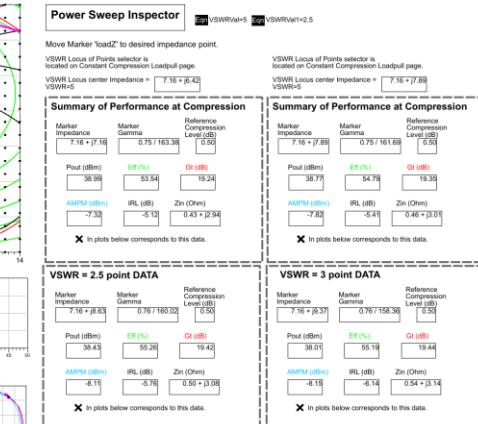
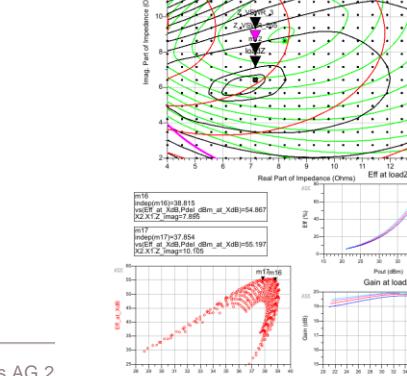
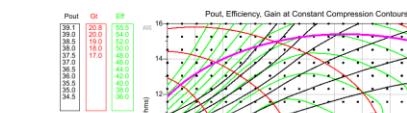
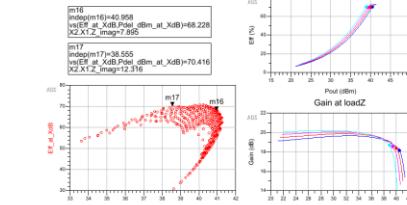
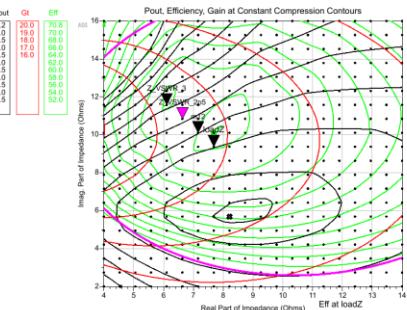
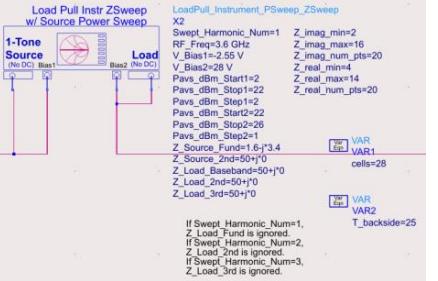
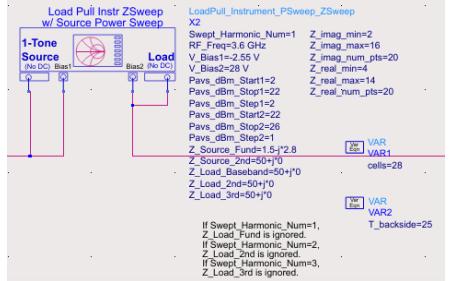
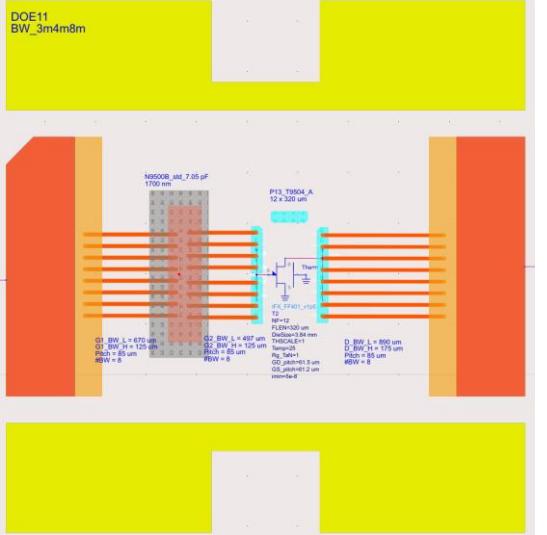
VSWR=3



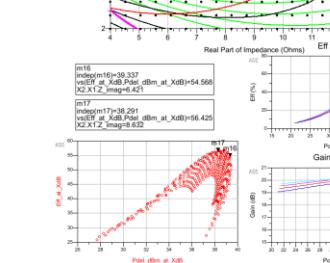
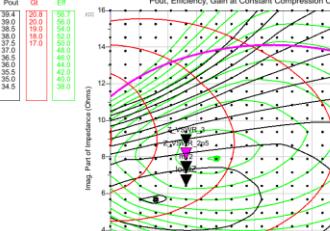
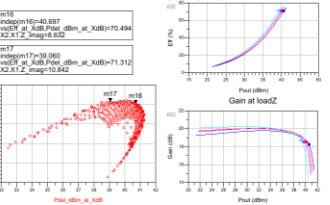
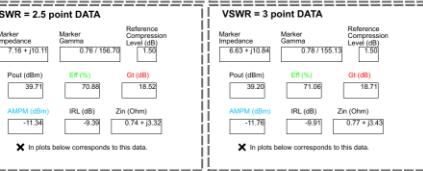
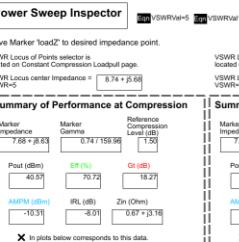
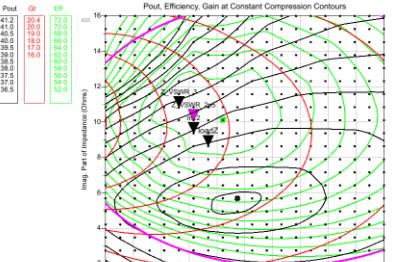
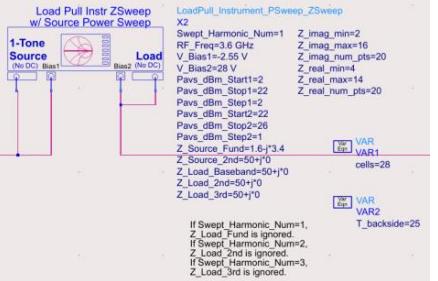
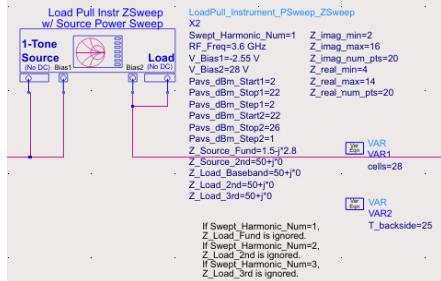
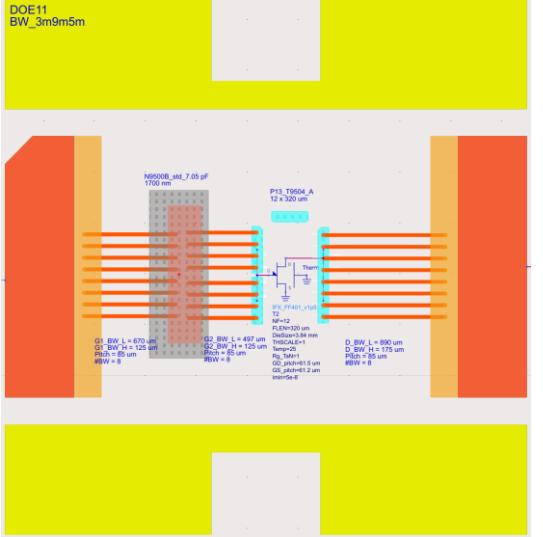
# BW\_3m4m7m



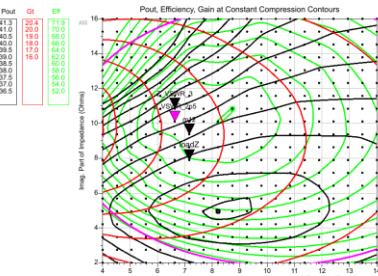
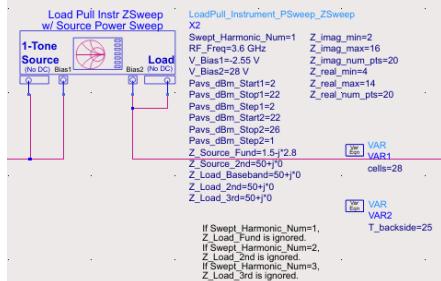
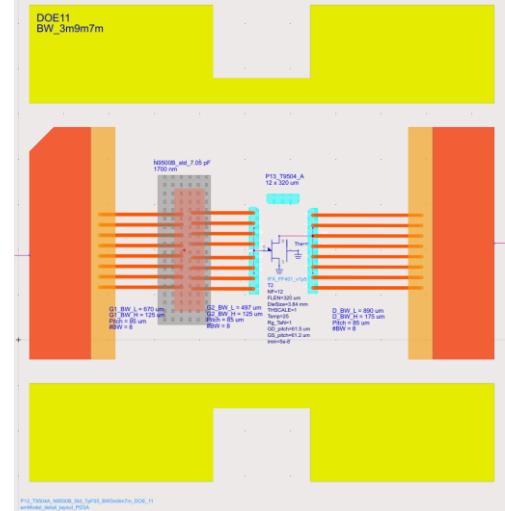
## BW\_3m4m8m



# BW\_3m9m5m



# BW\_3m9m7m



Power Sweep Inspector

VSWRval=5

VSWRval=2.5

Move Marker 'loadZ' to desired impedance point.

VSWR Locus of Points selector is located on Constant Compression Loadpull page.

VSWR Locus center Impedance = 7.16 + j(9.37)

VSWR Locus center Impedance = 7.16 + j(9.37)

VSWR Locus of Points selector is located on Constant Compression Loadpull page.

VSWR Locus center Impedance = 7.16 + j(9.37)

Summary of Performance at Compression

Summary of Performance at Compression

Marker Impedance = 7.16 + j(9.37)

Marker Gamma = 0.75 / 151.68

Reference Compression Level (dB) = 1.50

Eff (%) = 69.97

Marker Impedance = 7.16 + j(9.37)

Marker Gamma = 0.76 / 155.36

Reference Compression Level (dB) = 1.50

Eff (%) = 70.88

Marker Impedance = 7.16 + j(9.37)

Marker Gamma = 0.59 + j3.18

Reference Compression Level (dB) = 1.50

Eff (%) = 18.42

Marker Impedance = 7.16 + j(9.37)

Marker Gamma = -0.37

Reference Compression Level (dB) = 1.50

Eff (%) = 18.53

Marker Impedance = 7.16 + j(9.37)

Marker Gamma = 0.59 + j3.18

Reference Compression Level (dB) = 1.50

Eff (%) = 11.76

Marker Impedance = 7.16 + j(9.37)

Marker Gamma = 0.76 / 155.36

Reference Compression Level (dB) = 1.50

Eff (%) = 18.42

VSWR = 2.5 point DATA

VSWR = 3 point DATA

Marker Impedance = 6.63 + j(16.5)

Marker Gamma = 0.77 / 156.73

Reference Compression Level (dB) = 1.50

Eff (%) = 70.78

Marker Impedance = 6.63 + j(16.5)

Marker Gamma = 0.76 / 155.13

Reference Compression Level (dB) = 1.50

Eff (%) = 71.18

Marker Impedance = 6.63 + j(16.5)

Marker Gamma = 0.12 + j3.49

Reference Compression Level (dB) = 1.50

Eff (%) = 18.75

Marker Impedance = 6.63 + j(16.5)

Marker Gamma = 0.12 + j3.49

Reference Compression Level (dB) = 1.50

Eff (%) = 18.67

Post\_Efficiency\_Gain at Constant Compression Contours

Post\_Efficiency\_Gain at Constant Compression Contours

Marker loadZ = desired impedance point.

VSWR Locus of Points selector is located on Constant Compression Loadpull page.

VSWR Locus center Impedance = 5.05 + j(7.18)

VSWR Locus center Impedance = 5.05 + j(7.18)

VSWR Locus of Points selector is located on Constant Compression Loadpull page.

VSWR Locus center Impedance = 5.05 + j(7.18)

Summary of Performance at Compression

Summary of Performance at Compression

Marker Impedance = 7.16 + j(7.18)

Marker Gamma = 0.75 / 160.5

Reference Compression Level (dB) = 1.50

Eff (%) = 55.98

Marker Impedance = 7.16 + j(7.18)

Marker Gamma = 0.30 + j3.03

Reference Compression Level (dB) = 1.50

Eff (%) = 19.35

Marker Impedance = 7.16 + j(7.18)

Marker Gamma = 0.30 + j3.03

Reference Compression Level (dB) = 1.50

Eff (%) = 19.44

VSWR = 2.5 point DATA

VSWR = 3 point DATA

Marker Impedance = 6.63 + j(6.42)

Marker Gamma = 0.77 / 161.79

Reference Compression Level (dB) = 1.50

Eff (%) = 56.29

Marker Impedance = 6.63 + j(6.42)

Marker Gamma = 0.51 + j3.2

Reference Compression Level (dB) = 1.50

Eff (%) = 19.75

Marker Impedance = 6.63 + j(6.42)

Marker Gamma = 0.77 / 160.08

Reference Compression Level (dB) = 1.50

Eff (%) = 56.01

Marker Impedance = 6.63 + j(6.42)

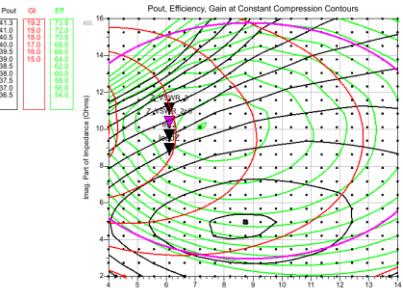
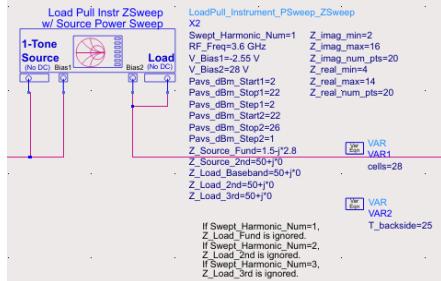
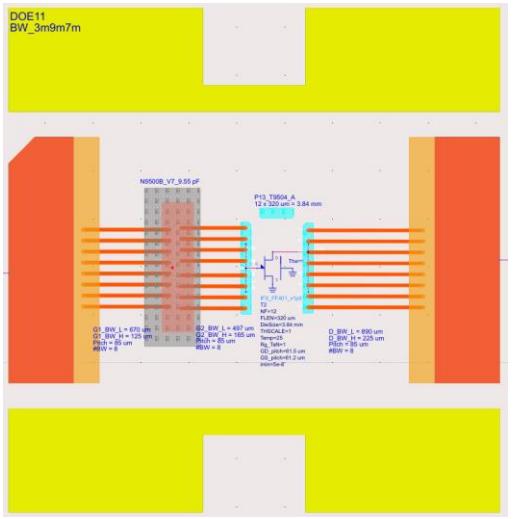
Marker Gamma = 0.56 / 3.28

Reference Compression Level (dB) = 1.50

Eff (%) = 19.72



# BW\_3m9m7m\_9.55 pF



## Power Sweep Inspector

vSWRVal=5 vSWRVal=2.5

Move Marker 'loadZ' to desired impedance point.

VSWR Locus of Points selector is located on Constant Compression Leadup page.

VSWR Locus center Impedance = 8.74 + j4.99

VSWR Locus of Points selector is located on Constant Compression Leadup page.

VSWR Locus center Impedance = 6.11 + j0.59

## Summary of Performance at Compression

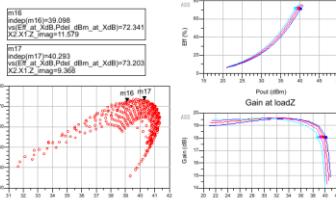
Marker Impedance	Marker Gamma	Reference Compression Level (dB)
6.11 + j0.59	0.79 / 160.13	1.56
45.12	71.21	18.04
AMP1 (dBm)	IRL (dB)	Zin (Ohm)
-14.10	-6.61	0.55 + j3.53

X in plots below corresponds to this data.

## Summary of Performance at Compression

Marker Impedance	Marker Gamma	Reference Compression Level (dB)
6.11 + j0.59	0.79 / 158.47	1.56
39.67	71.54	18.09
AMP1 (dBm)	IRL (dB)	Zin (Ohm)
-14.60	-7.49	0.61 + j3.59

X in plots below corresponds to this data.



## VSWR = 2.5 point DATA

Marker Impedance	Marker Gamma	Reference Compression Level (dB)
6.11 + j10.11	0.79 / 156.83	1.56
39.22	71.67	18.09
AMP1 (dBm)	IRL (dB)	Zin (Ohm)
-14.63	-4.46	0.69 + j3.54

X in plots below corresponds to this data.

## VSWR = 3 point DATA

Marker Impedance	Marker Gamma	Reference Compression Level (dB)
6.11 + j10.84	0.79 / 163.01	1.56
38.79	71.68	18.09
AMP1 (dBm)	IRL (dB)	Zin (Ohm)
-14.31	-9.62	0.77 + j3.56

X in plots below corresponds to this data.



## Power Sweep Inspector

vSWRVal=5 vSWRVal=2.5

Move Marker 'loadZ' to desired impedance point.

VSWR Locus of Points selector is located on Constant Compression Leadup page.

VSWR Locus center Impedance = 6.63 + j0.59

VSWR Locus of Points selector is located on Constant Compression Leadup page.

VSWR Locus center Impedance = 6.63 + j0.59

## Summary of Performance at Compression

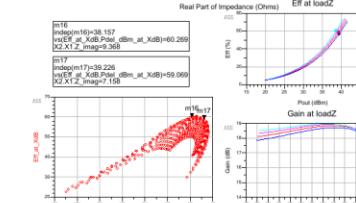
Marker Impedance	Marker Gamma	Reference Compression Level (dB)
6.63 + j0.42	0.77 / 165.75	1.56
39.44	57.31	18.23
AMP1 (dBm)	IRL (dB)	Zin (Ohm)
-14.51	-4.23	0.45 + j3.54

X in plots below corresponds to this data.

## Summary of Performance at Compression

Marker Impedance	Marker Gamma	Reference Compression Level (dB)
6.63 + j17.42	0.77 / 163.42	1.56
38.21	58.85	18.33
AMP1 (dBm)	IRL (dB)	Zin (Ohm)
-14.29	-5.13	0.48 + j3.52

X in plots below corresponds to this data.



## VSWR = 2.5 point DATA

Marker Impedance	Marker Gamma	Reference Compression Level (dB)
6.63 + j8.78	0.77 / 161.75	1.56
38.89	59.73	18.43
AMP1 (dBm)	IRL (dB)	Zin (Ohm)
-10.52	-5.37	0.53 + j3.49

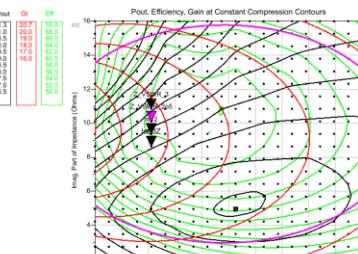
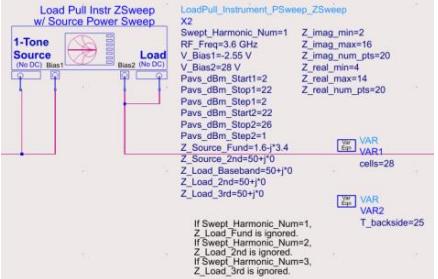
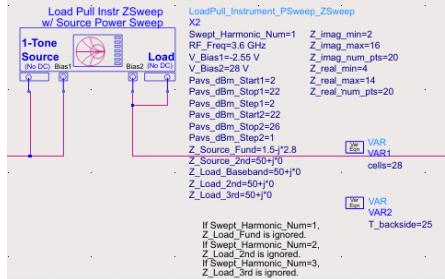
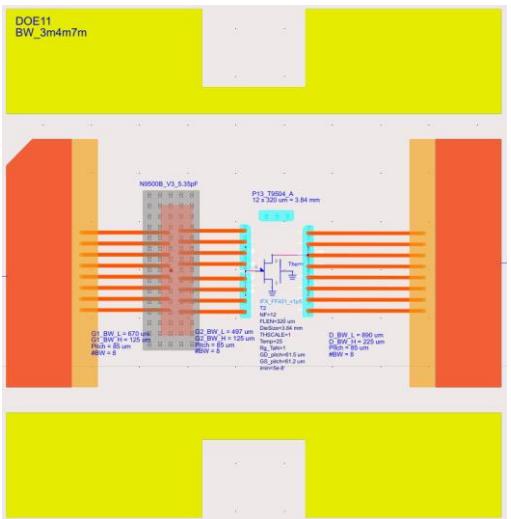
X in plots below corresponds to this data.

## VSWR = 3 point DATA

Marker Impedance	Marker Gamma	Reference Compression Level (dB)
6.63 + j8.68	0.77 / 161.08	1.56
38.52	60.52	18.41
AMP1 (dBm)	IRL (dB)	Zin (Ohm)
-10.37	-5.67	0.57 + j3.52

X in plots below corresponds to this data.

BW\_3m4m7m\_5.35 pF



## Power Sweep Inspector

Move Marker 'loadZ' to desired impedance point

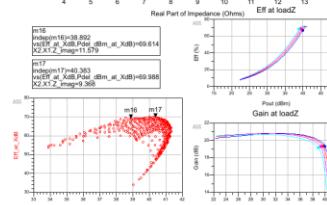
**VSWR Locus of Points selector is located on Constant Compensation | loadcell page.**

VSMR | Locus center impedance =

VSWR<1.50000 Impedance = 50.000 Ohm VSWR<1.50000 Impedance = 50.000 Ohm

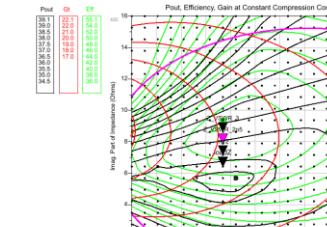
Summary of Performance at Compression			Summary of Performance at Decompression		
Marker Impedance	Marker Gamma	Reference Compression	Marker Impedance	Marker Gamma	Reference Decompression
Marker Impedance	Marker Gamma	Reference Compression	Marker Impedance	Marker Gamma	Reference Decompression

Imprecision	Gamma	UVRI (0)	Imprecision	Gamma
6.11 + [8.63]	0.79 / 160.13	1.50	6.11 + [9.37]	0.79 / 158.47



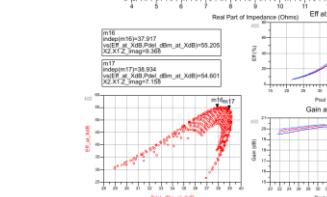
VSWR = 2.5 point DATA			VSWR = 3 point DATA		
Marker	Marker	Reference Distance	Marker	Marker	Marker

Impedance	Gamma	Compression Level (dB)	Impedance	Gamma
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### Power Sweep Inspector

Move Model 3000C to desired impedance point



Z	VSWR = 2.5 point DATA	VSWR = 3 point DATA
	Marker	Marker
	Marker	Marker
	Marker	Marker

RESISTANCE	IMPEDIMENTO	RESISTANCE	IMPEDIMENTO
1000	1000	1000	1000
1000	1000	1000	1000
1000	1000	1000	1000