

1. RF MMIC Innovator

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[CLASSIFICATION] APPLICATION NOTE

[DATE] 2015.07

[REVISION NO.] REV.A

[MEASURING INSTRUMENTS]

- NA\_AGILENT 8753ES

- SA\_AGILENT E4440A

- SG\_AGILENT 4438C

- SG\_IFR 3416

## Wide Band Drive Amp BT09E

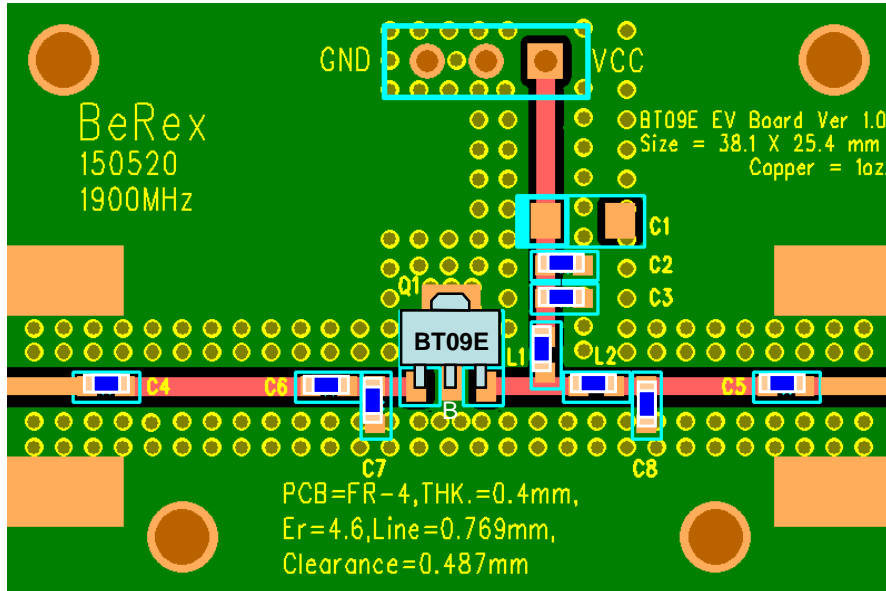
### Application Note (Tune for OIP3)



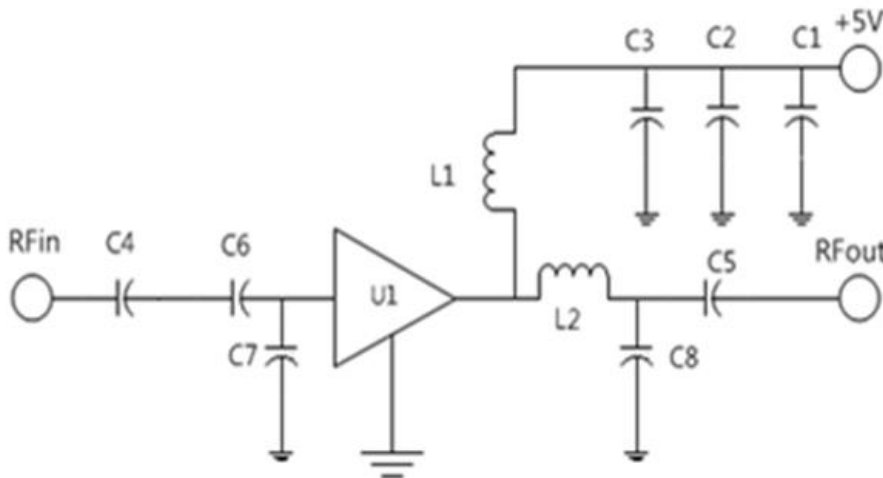
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1. BT09E\_1900MHz Application Note



Ref. Des.	Description/ Part Number	Values	Vendor
C1	3216 CAP	-	
C2	1608 CAP	1uF	Samsung
C3	1608 CAP	62pF	Samsung
C4	1608 CAP	0Ω	Samsung
C5	1608 CAP	100pF	Samsung
C6	1608 CAP	10pF	Samsung
C7	1608 CAP	2.7pF	Samsung
C8	1608 CAP	2.7pF	Samsung
L1	1608 IND	22nH	Taiyo Yuden
L2	1608 IND	1.8nH	Taiyo Yuden
U1	SOT89PKG	BT09E	BEREX



TITLE	
BT09E Evaluation Board	
(1900 MHz)	
Drawing Number	Rev.
Date	Drawn By
FILE NAME	SHEET

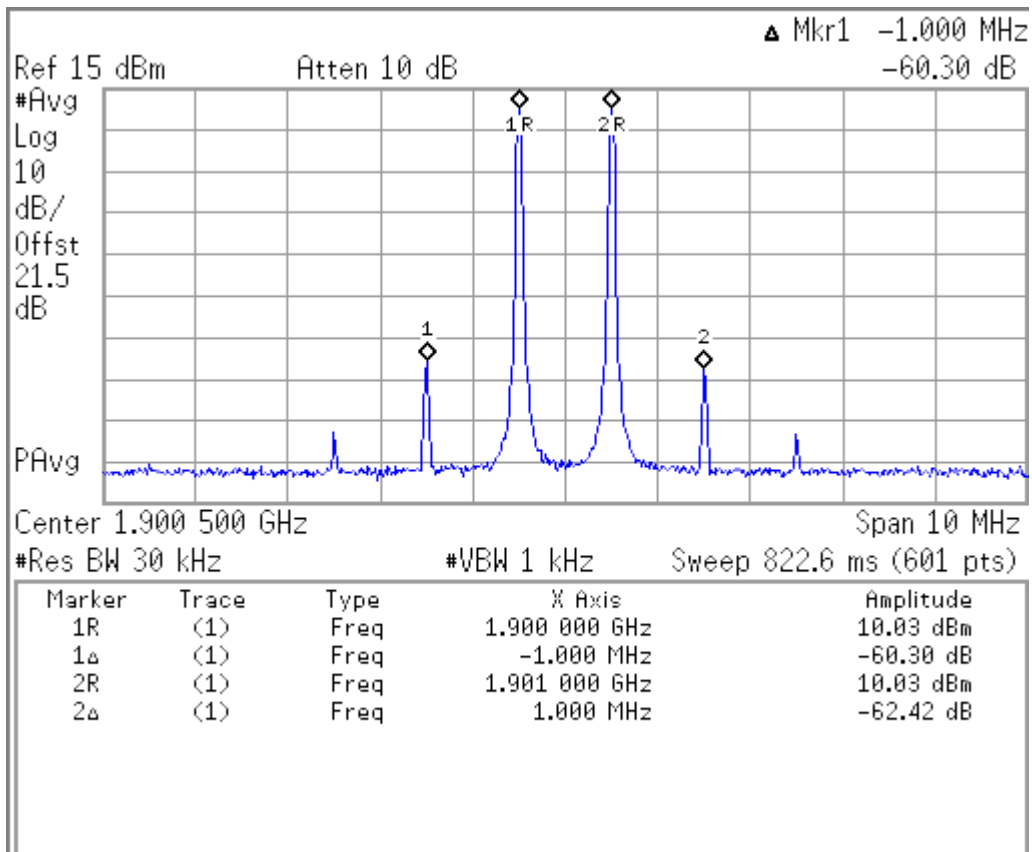
Note: \_PCB: 31mil thick FR4

1. The distance between the edge of the series cap(C6) and the Input Pin of BT09E is 2.4mm
2. The distance between the edge of the shunt cap(C7) and the Input Pin of BT09E is 1.2mm
3. The distance between the edge of the series ind(L2) and the Output Pin of BT09E is 3.5mm
4. The distance between the edge of the shunt cap(C8) and the Output Pin of BT09E is 5.6mm

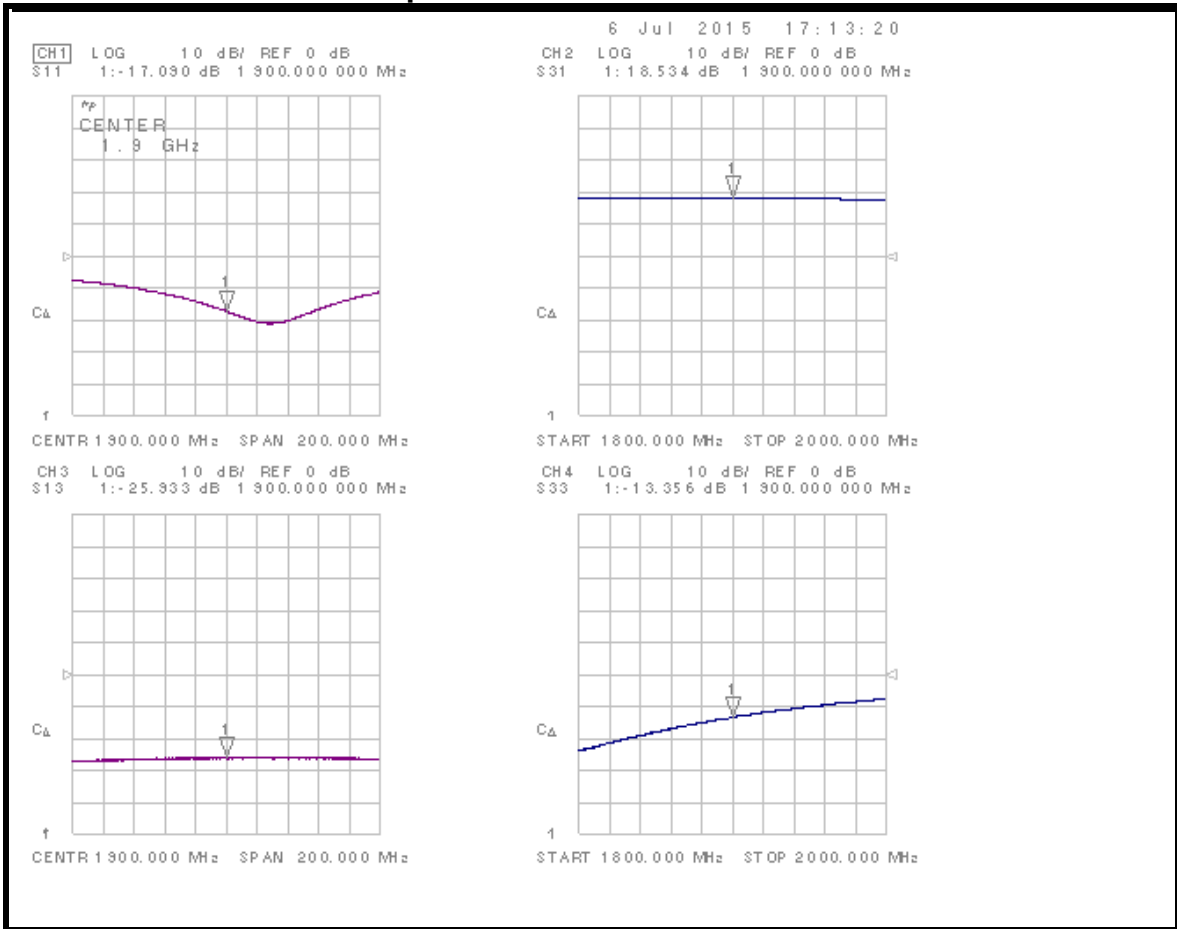
## 1.1 BT09E\_1900MHz Test Result

SN	Freq [MHz]	Vcc [V]	Icc [mA]	Gain [dB]	OIP3 [dBm] <sup>(1)</sup>	P1dB [dBm]	IRL [dB]	ORL [dB]	NF [dB]
	1900	5	82	18.5	40.1	23.4	-17	-13.3	4.4

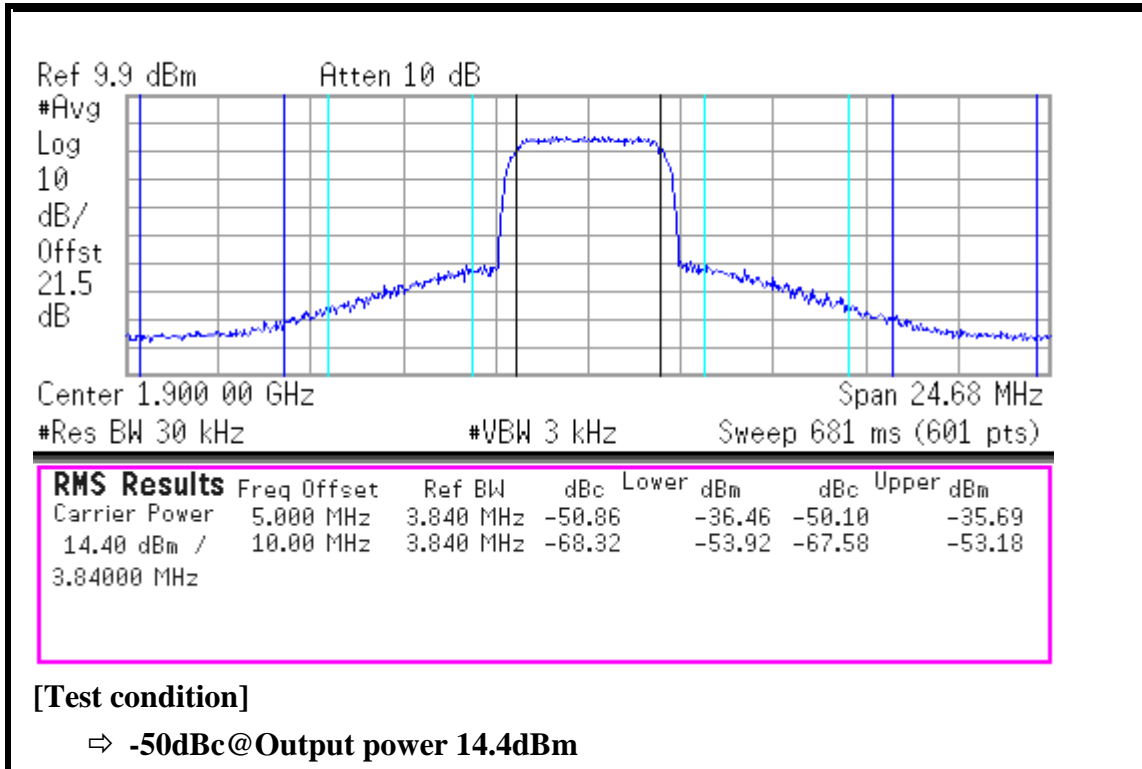
(1) OIP3 was tested @Pout=10dBm/tone 1MHz offset



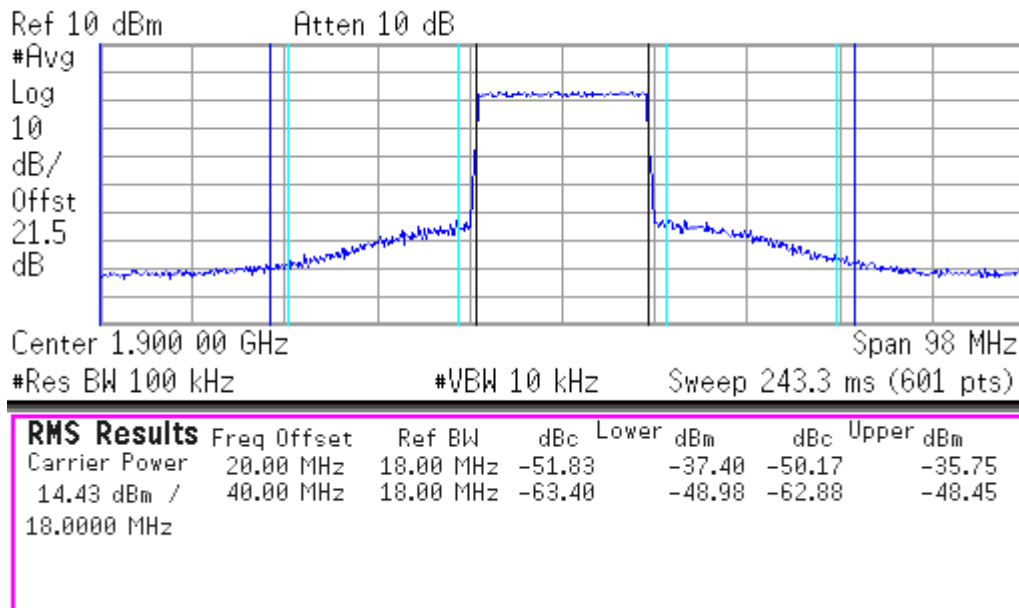
### 1.2 BT09E\_1900MHz S-parameter



## 1.3 BT09E\_ 1900MHz WCDMA 1FA ACLR



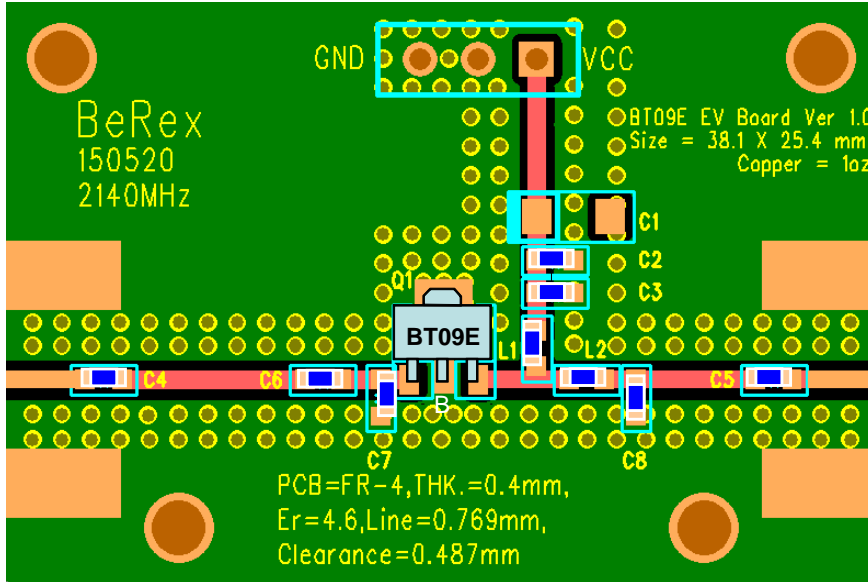
## 1.4 BT09E\_ 1900MHz LTE 20MHz ACLR



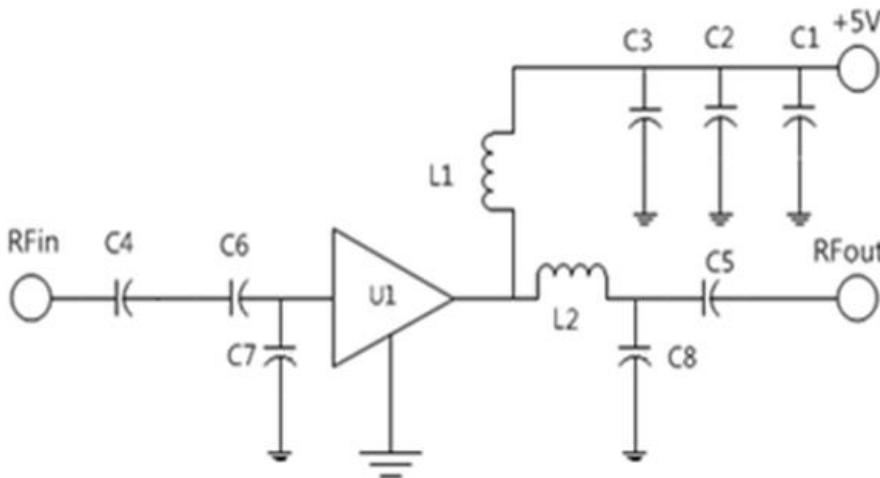
[Test condition]

⇒ -50dBc@Output power 14.4dBm

2. BT09E\_2140MHz Application Note



Ref. Des.	Description/ Part Number	Values	Vendor
C1	3216 CAP	-	
C2	1608 CAP	1uF	Samsung
C3	1608 CAP	62pF	Samsung
C4	1608 CAP	0Ω	Samsung
C5	1608 CAP	22pF	Samsung
C6	1608 CAP	1pF	Samsung
C7	1608 CAP	1.8pF	Samsung
C8	1608 CAP	1.2pF	Samsung
L1	1608 IND	10nH	Taiyo Yuden
L2	1608 IND	1.8nH	Taiyo Yuden
U1	SOT89 PKG	BT09E	BEREX



TITLE	
BT09E Evaluation Board	
(2140 MHz)	
Drawing Number	Rev.
Date	Drawn By
FILE NAME	SHEET

Note: \_PCB: 31mil thick FR4

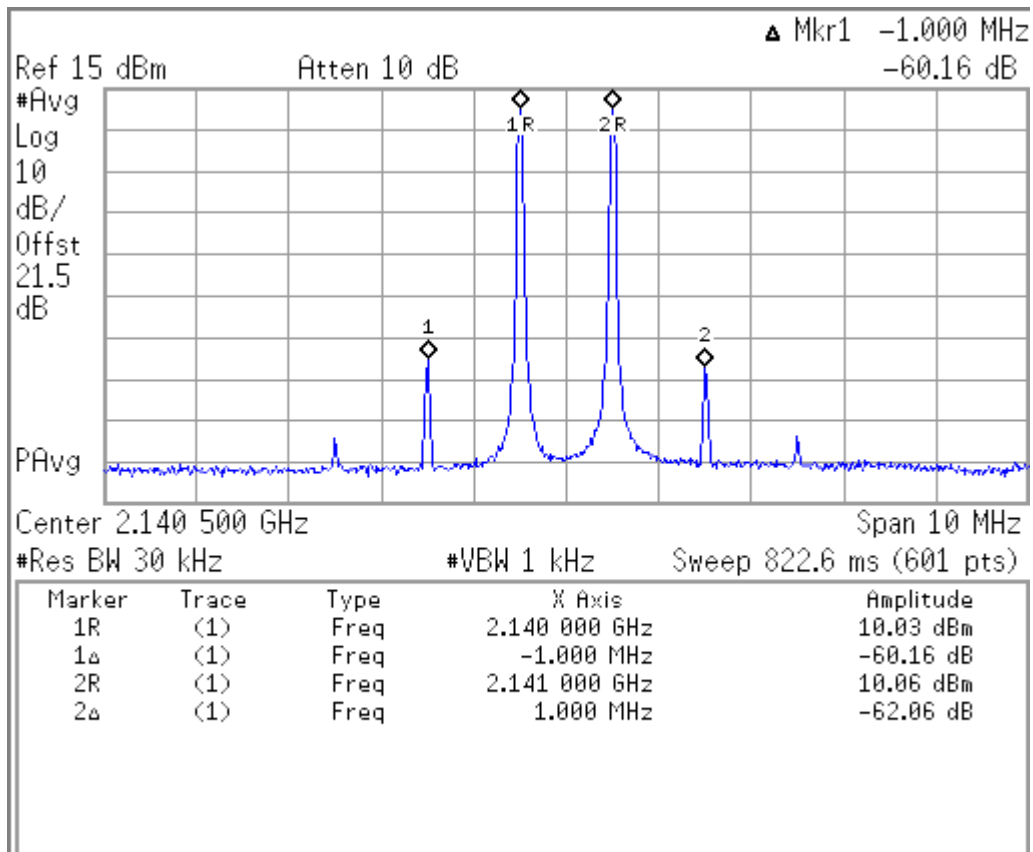
1. The distance between the edge of the series cap(C6) and the Input Pin of BT09E is 2.4mm
2. The distance between the edge of the shunt cap(C7) and the Input Pin of BT09E is 0.5mm
3. The distance between the edge of the series ind(L2) and the Output Pin of BT09E is 3.5mm
4. The distance between the edge of the shunt cap(C8) and the Output Pin of BT09E is 5.6mm



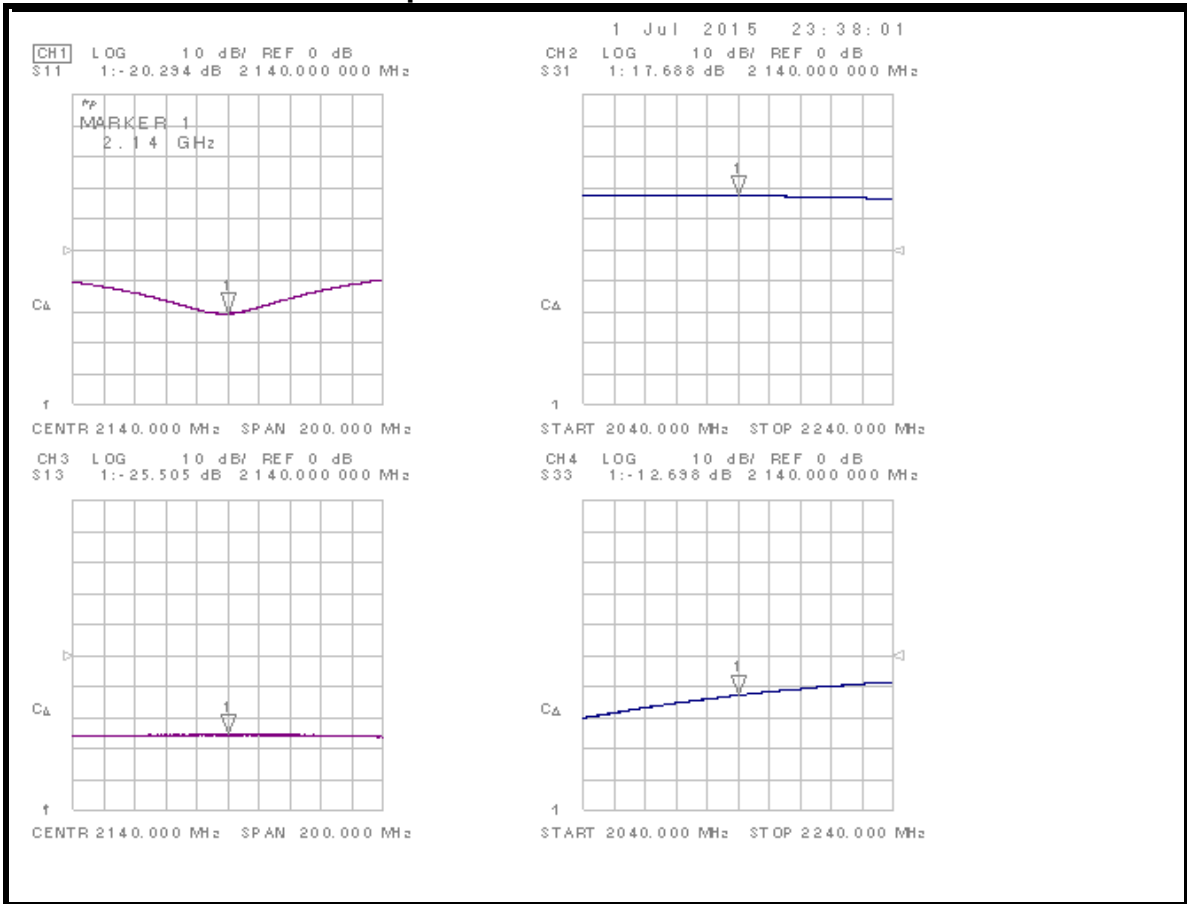
## 2.1 BT09E\_2140MHz Test Result

SN	Freq [MHz]	Vcc [V]	Icc [mA]	Gain [dB]	OIP3 [dBm] <sup>(1)</sup>	P1dB [dBm]	IRL [dB]	ORL [dB]	NF [dB]
	2140	5	88	17.6	40	23.5	-20.2	-12.6	4.5

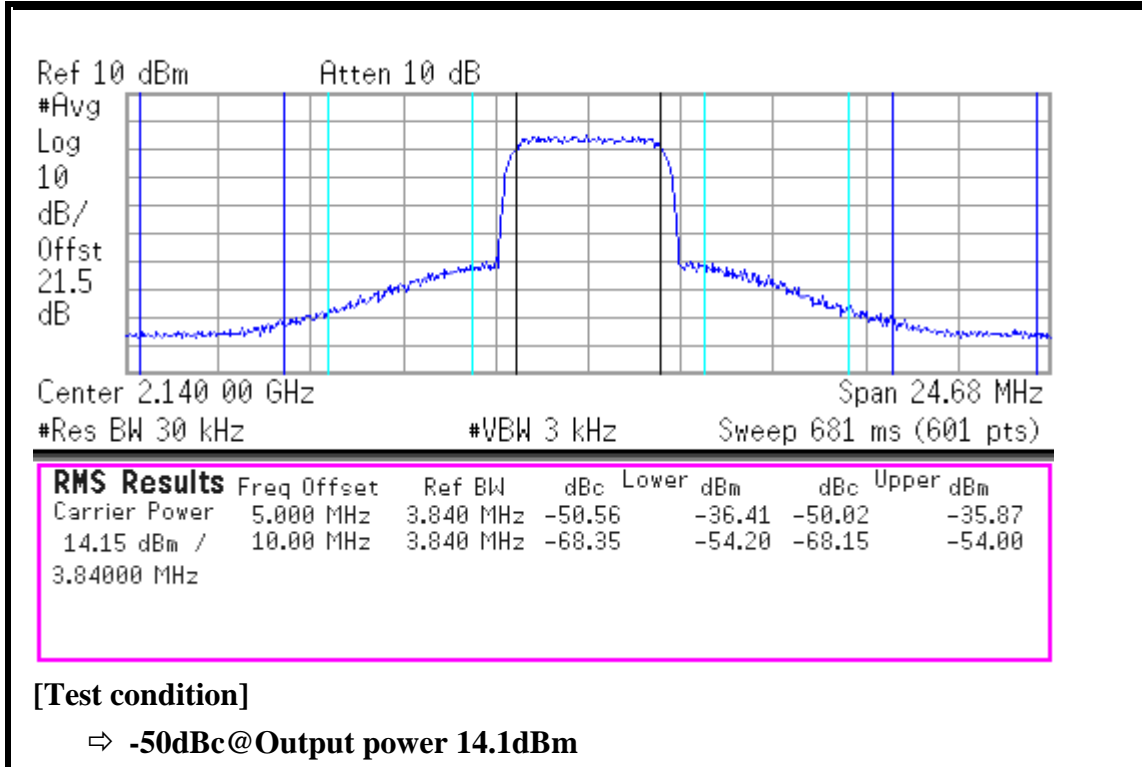
(1) OIP3 was tested @Pout=10dBm/tone 1MHz offset



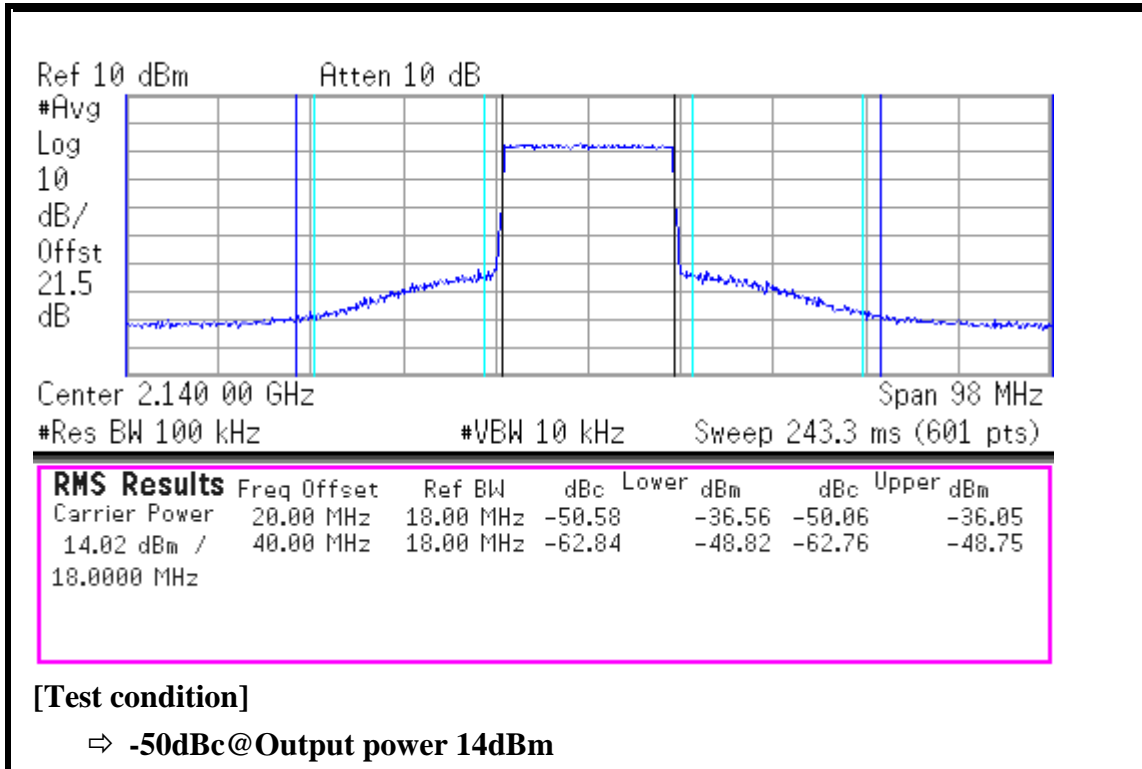
### 2.2 BT09E\_2140MHz S-parameter



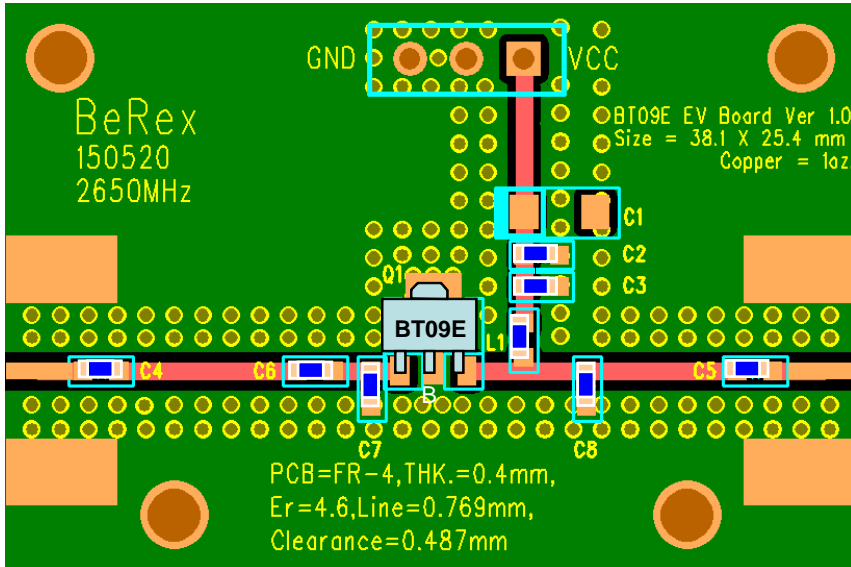
### 2.3 BT09E\_ 2140MHz WCDMA 1FA ACLR



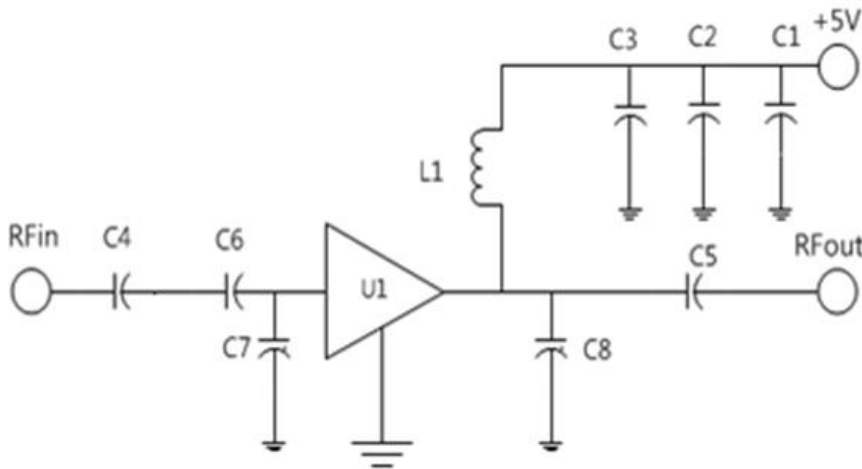
## 2.4 BT09E\_ 2140MHz LTE 20MHz ACLR



3. BT09E\_2650MHz Application Note



Ref. Des.	Description/ Part Number	Values	Vendor
C1	3216 CAP	-	
C2	1608 CAP	1uF	Samsung
C3	1608 CAP	22pF	Samsung
C4	1608 CAP	0 Ω	Samsung
C5	1608 CAP	22pF	Samsung
C6	1608 CAP	0.75pF	Samsung
C7	1608 CAP	1pF	Samsung
C8	1608 CAP	1.2pF	Samsung
L1	1608 IND	6.8nH	Taiyo Yuden
U1	SOT89 PKG	BT09E	BEREX



TITLE	
BT09E Evaluation Board	
(2650 MHz)	
Drawing Number	Rev.
Date	Drawn By
FILE NAME	SHEET

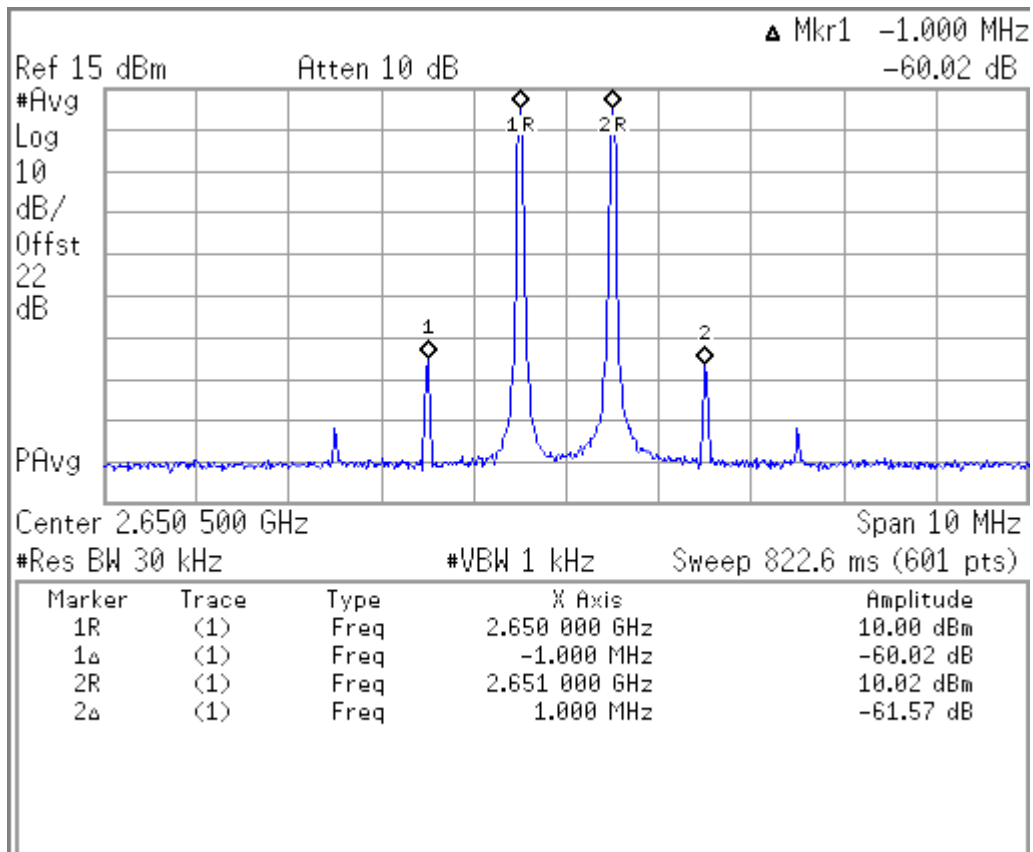
Note: \_PCB: 31mil thick FR4

1. The distance between the edge of the series cap(C6) and the Input Pin of BT09E is 2.4mm
2. The distance between the edge of the shunt cap(C7) and the Input Pin of BT09E is 0.5mm
3. The distance between the edge of the shunt cap(C7) and the Output Pin of BT09E is 5.6mm

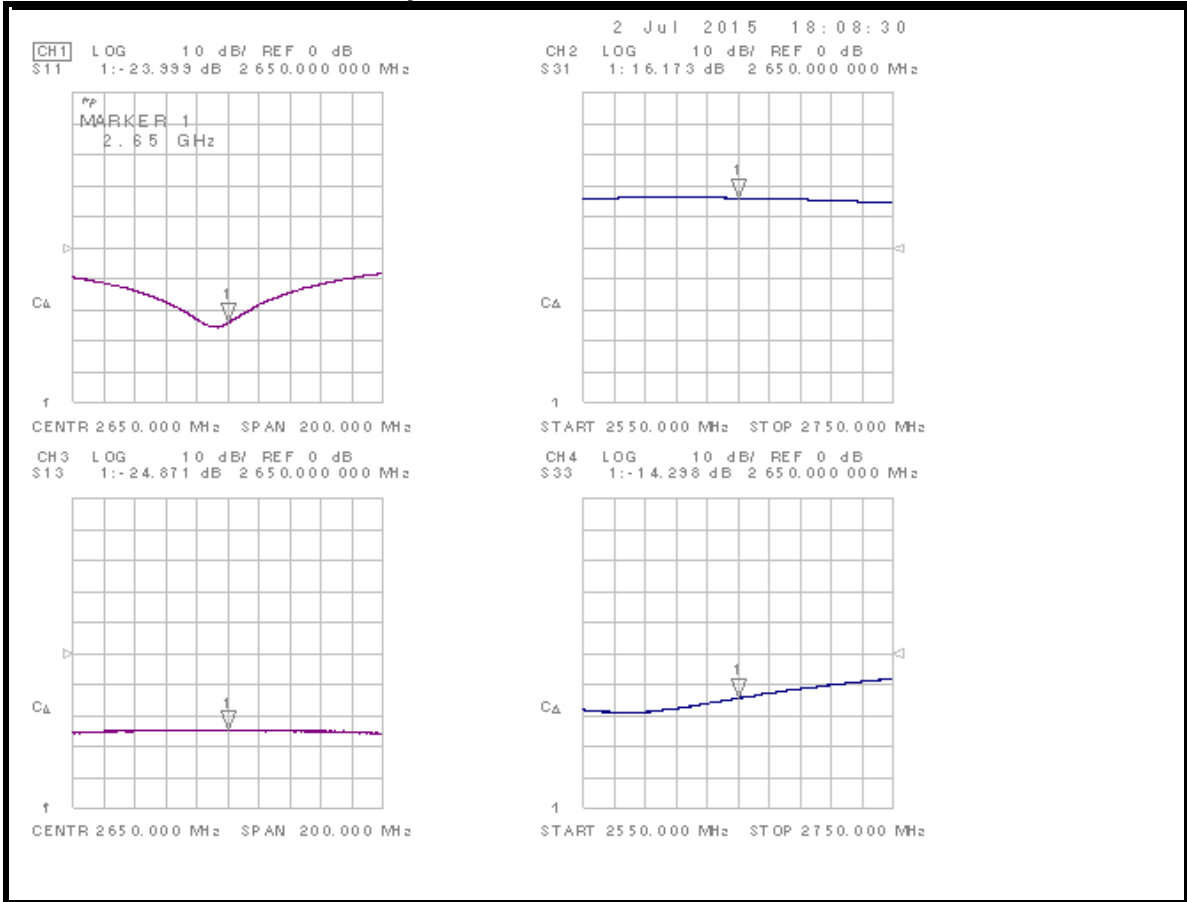
## 3.1 BT09E\_2650MHz Test Result

SN	Freq [MHz]	Vcc [V]	Icc [mA]	Gain [dB]	OIP3 [dBm] <sup>(1)</sup>	P1dB [dBm]	IRL [dB]	ORL [dB]	NF [dB]
	2650	5	91	16.1	40	23.2	-24	-14.2	4.7

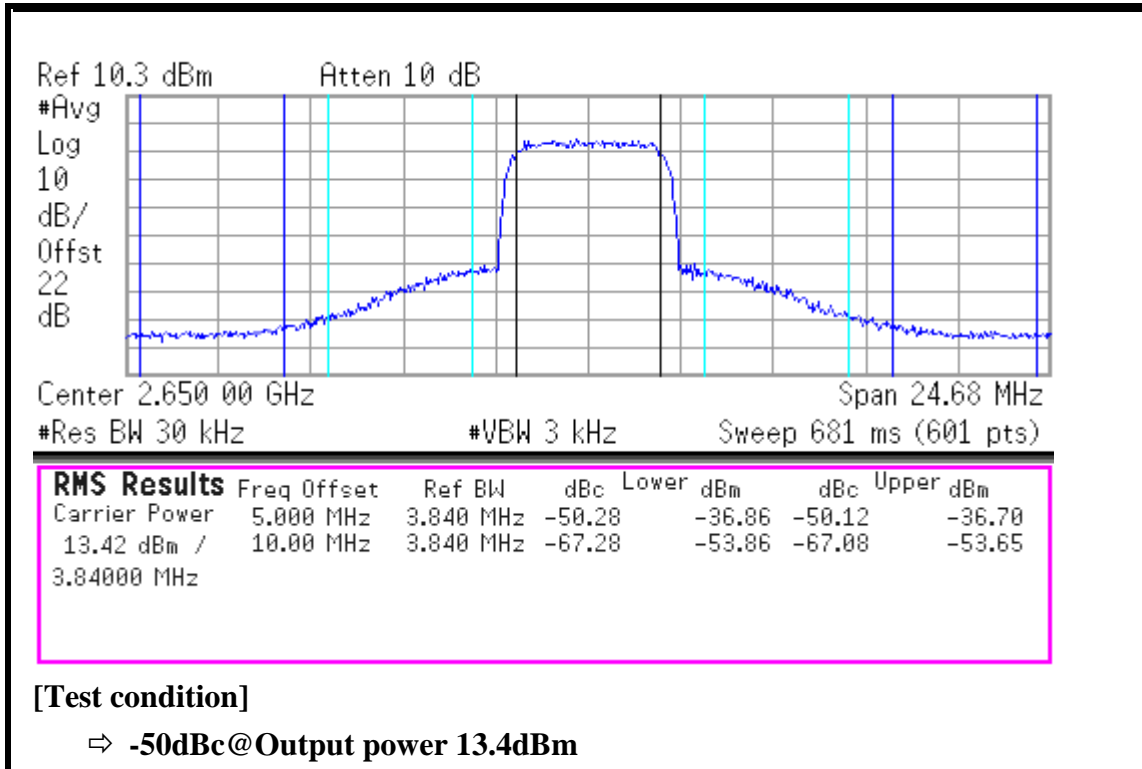
(1) OIP3 was tested @Pout=10dBm/tone 1MHz offset



### 3.2 BT09E\_2650MHz S-parameter

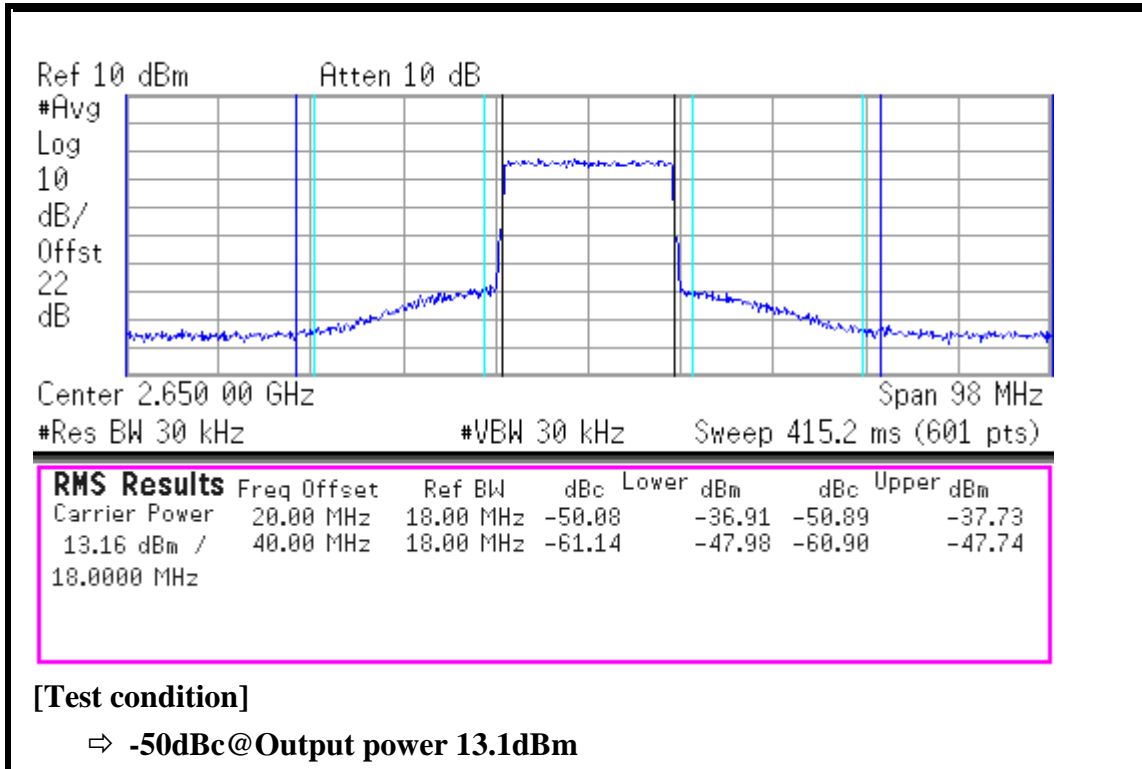


### 3.3 BT09E\_ 2650MHz WCDMA 1FA ACLR

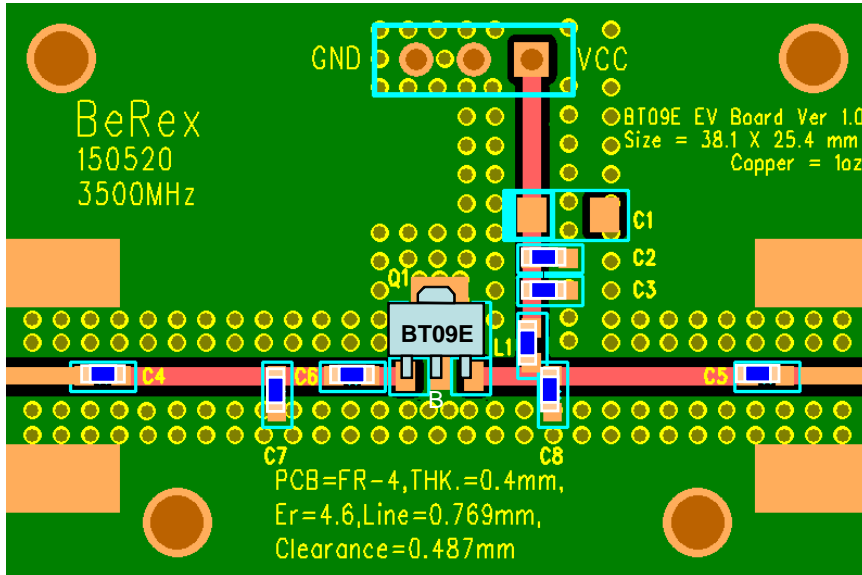




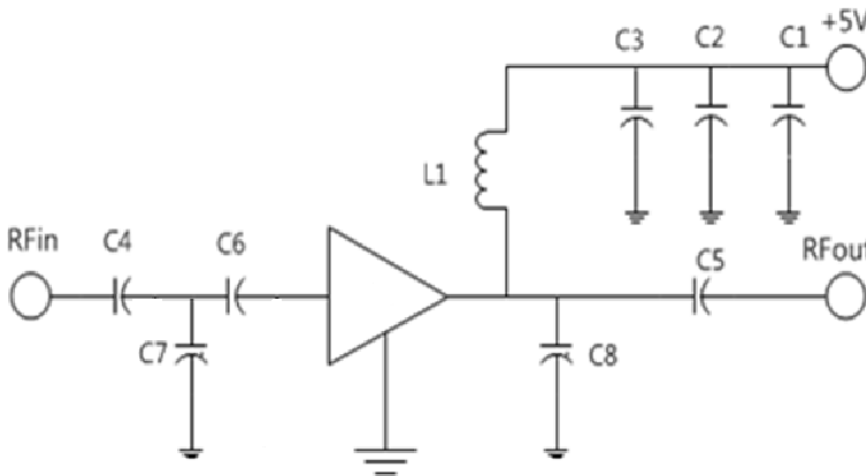
### 3.4 BT09E\_ 2650MHz LTE 20MHz ACLR



4. BT09E\_3500MHz Application Note



Ref. Des.	Description/ Part Number	Values	Vendor
C1	3216 CAP	-	
C2	1608 CAP	1uF	Samsung
C3	1608 CAP	22pF	Samsung
C4	1608 CAP	0 Ω	Samsung
C5	1608 CAP	22pF	Samsung
C6	1608 CAP	0.75pF	Samsung
C7	1608 CAP	1pF	Samsung
C8	1608 CAP	1pF	Samsung
L1	1608 IND	6.8nH	Taiyo Yuden
U1	SOT89 PKG	BT09E	BEREX



TITLE	
BT09E Evaluation Board	
(3500 MHz)	
Drawing Number	Rev.
Date	Drawn By
FILE NAME	SHEET

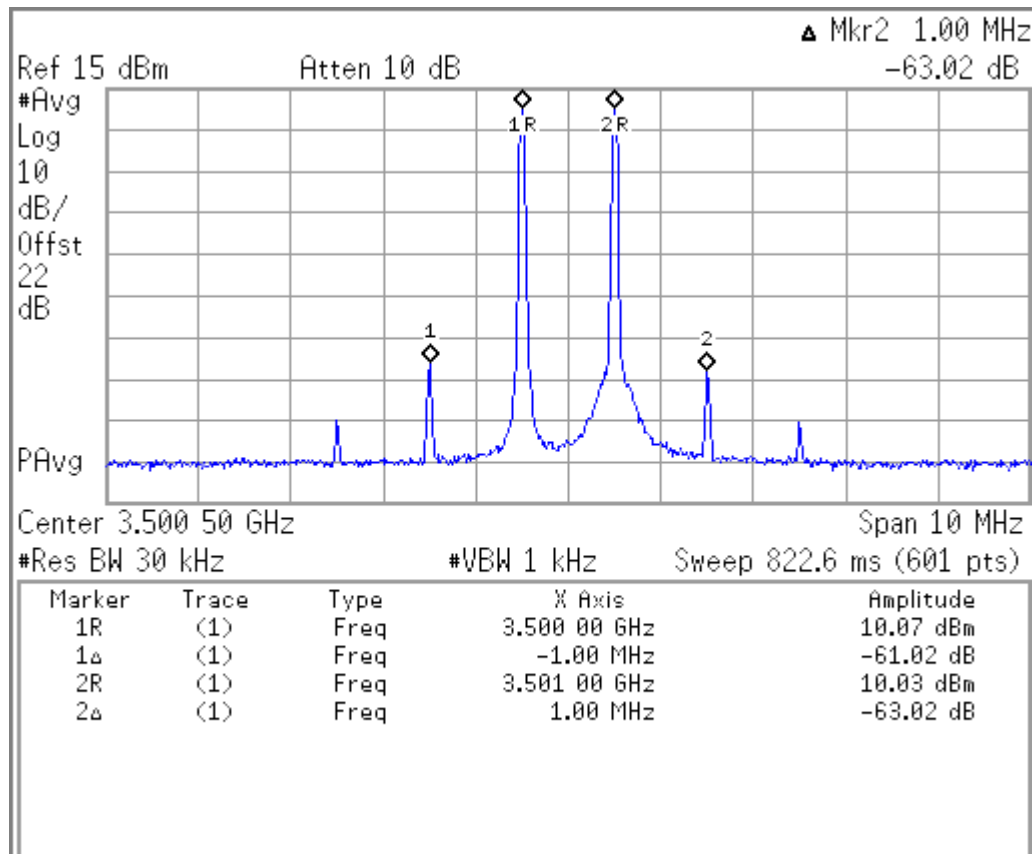
Note: \_PCB: 31mil thick FR4

1. The distance between the edge of the series cap(C6) and the Input Pin of BT09E is 1.2mm
2. The distance between the edge of the shunt cap(C7) and the Input Pin of BT09E is 3.6mm
3. The distance between the edge of the shunt cap(C7) and the Output Pin of BT09E is 1.7mm

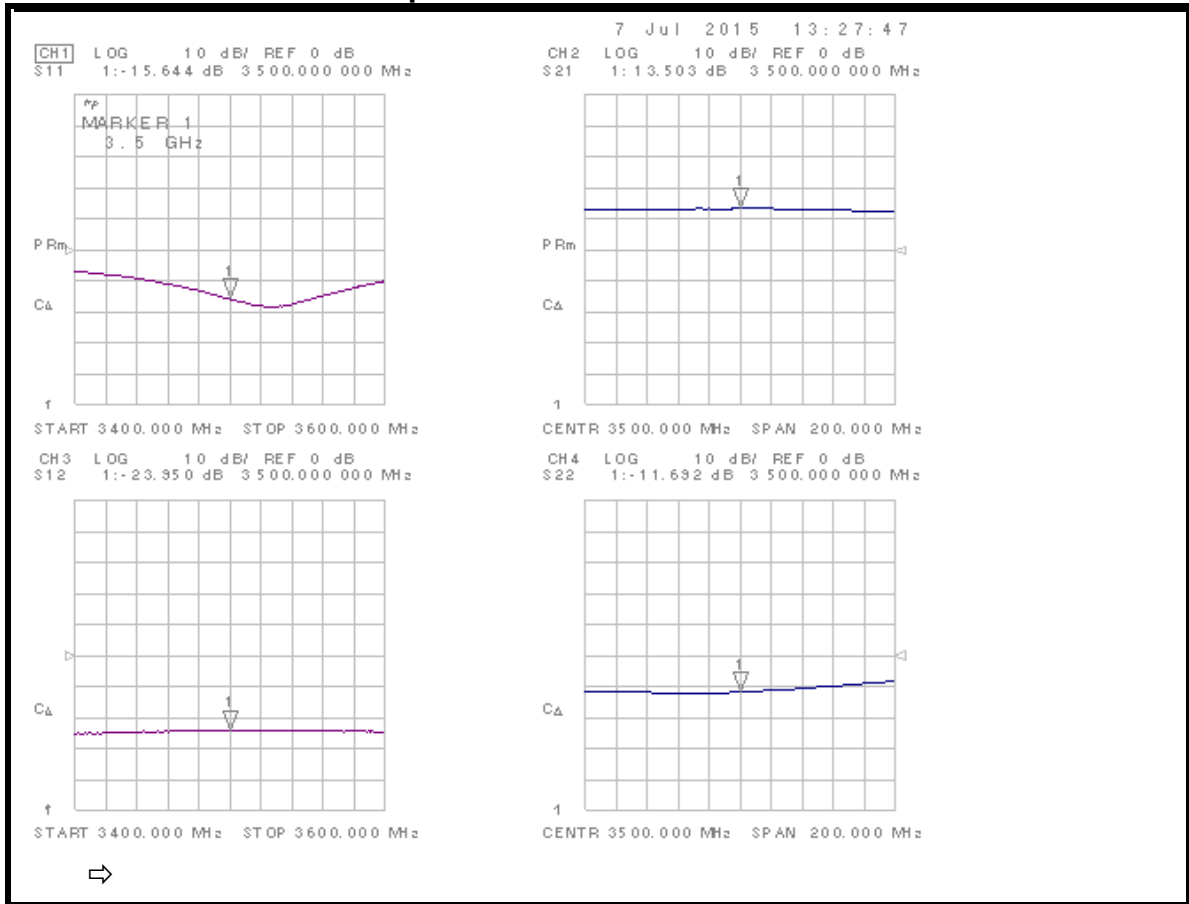
### 4.1 BT09E\_3500MHz Test Result

SN	Freq [MHz]	Vcc [V]	Icc [mA]	Gain [dB]	OIP3 [dBm] <sup>(1)</sup>	P1dB [dBm]	IRL [dB]	ORL [dB]	NF [dB]
	3500	5	81	13.5	40.5	23.1	-15.6	-11.6	5.1

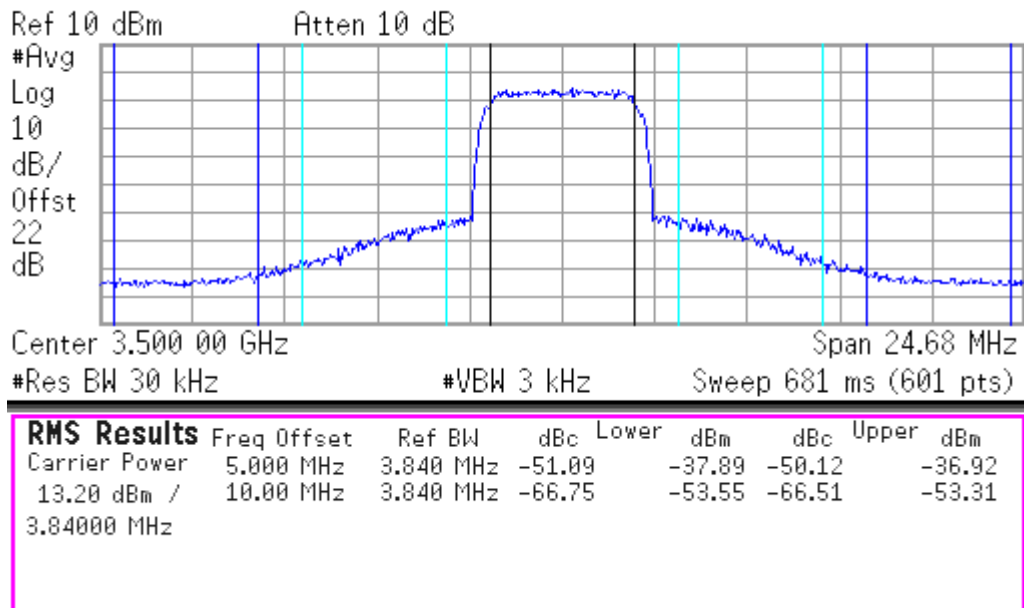
(1) OIP3 was tested @Pout=10dBm/tone 1MHz offset



### 4.2 BT09E\_3500MHz S-parameter



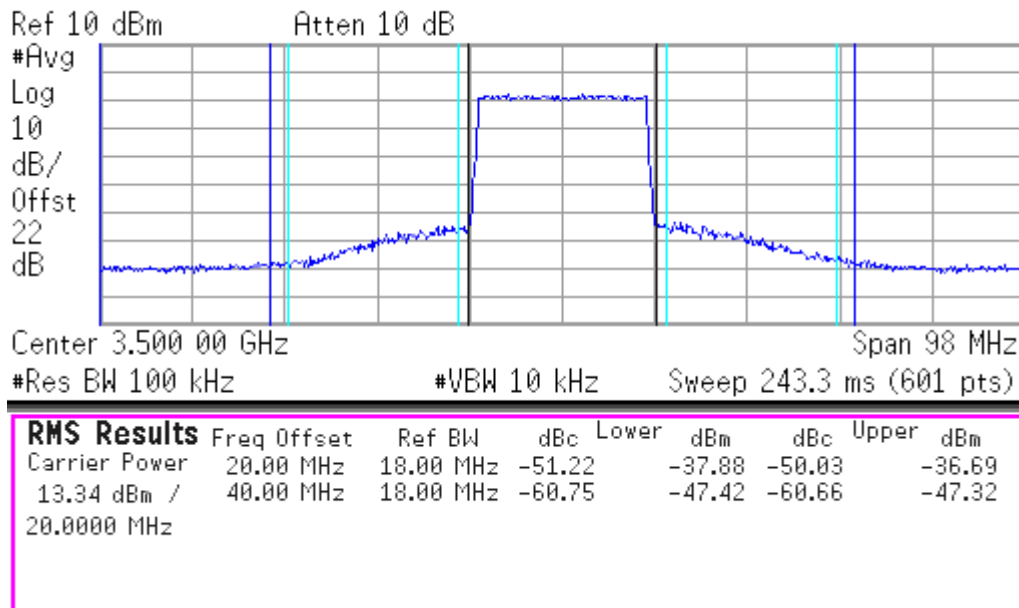
## 4.3 BT09E\_ 3500MHz WCDMA 1FA ACLR



[Test condition]

⇒ -50dBc@Output power 13.2dBm

## 4.4 BT09E\_ 3500MHz LTE 20MHz ACLR



[Test condition]

⇒ -50dBc@Output power 13.3dBm