MAX2291 Is Ideal for EDGE PCS1900 Base-Station Pre-Driver Application

EDGE PCS1900 Basestation Pre-Driver Uses MAX2291 Performance measures are presented for the MAX2291 power amplifier with EDGE modulation in the PCS1900 band. Spectrum shape, EVM and "s" parameters are given. EVM ranges from 1.4% to 1.7% at +20 dBm output power. The schematic is shown along with layout details.

Introduction

Many GSM operators are beginning to roll out 2.G networks to support higher data rates to address the demands of today's mobile-phone users. EDGE, which stands for "Enhanced Dates for GSM Evolution," essentially triples the existing GSM data rate from 1 bit/symbol GMSK modulation to 3 bits/symbol 8PSK while operating in the same occupied channel bandwidth.

The newly adopted 8PSK modulation scheme requires a highly linear amplifier to minimize spectral regrowth and phase distortion. Power amplifiers for basestations impose even more stringent requirements for the pre-driver. The pre-driver must present a pristine signal with minimum non-linearity. As usual, the pre-driver must be electrically and thermally stable with good reliability for this application.

MAX2291 is an excellent low cost bipolar solution for GSM/EDGE base station down link pre-driver application, capable of delivering +20dBm rms power. Performance specifications are presented in this application note. Measured data on a MAX2291 evaluation kit indicates that MAX2291 meets or exceeds EDGE requirements with acceptable margin.

Test Conditions

- Testing conducted at +25 degree C.
- To power MAX2291 ON, set /SHDN jumper JU1 to "ON" state and power mode jumper JU2 to "High" state.
- Modulation Scheme: EDGE

Table 1. EDGE Pre-driver Specification and MAX2291 Measured Data:
All Measurements were conducted with EDGE Modulation

Parameter	Target Spec	Measured Data			Units	Reference/notes
		1930MHz	1960MHz	1990MHz		
Supply voltage	5.0	3.2	3.2	3.2	V	Absolute Maximum Voltage is +4.5V.
Idle Supply Current	-	312	312	312	mA	Vcc = +3.2V
Supply current	-	390	389	386	mA	Pout = +20.0dBm
Pout	+20.0	+20.0	+20.0	+20.0	dBm	RMS power in EDGE Mode
Gain	20	26.3	26.3	26.2	dB	
Spurious at 400kHz offset	-67	-66.4	-66.4	-66.4	dBc	Spurious level improves with reduced Pout.
Spurious at 600kHz offset	-80	-81.6	-81.6	-81.5	dBc	
EVM (average)	<5	1.6	1.4	1.7	%	
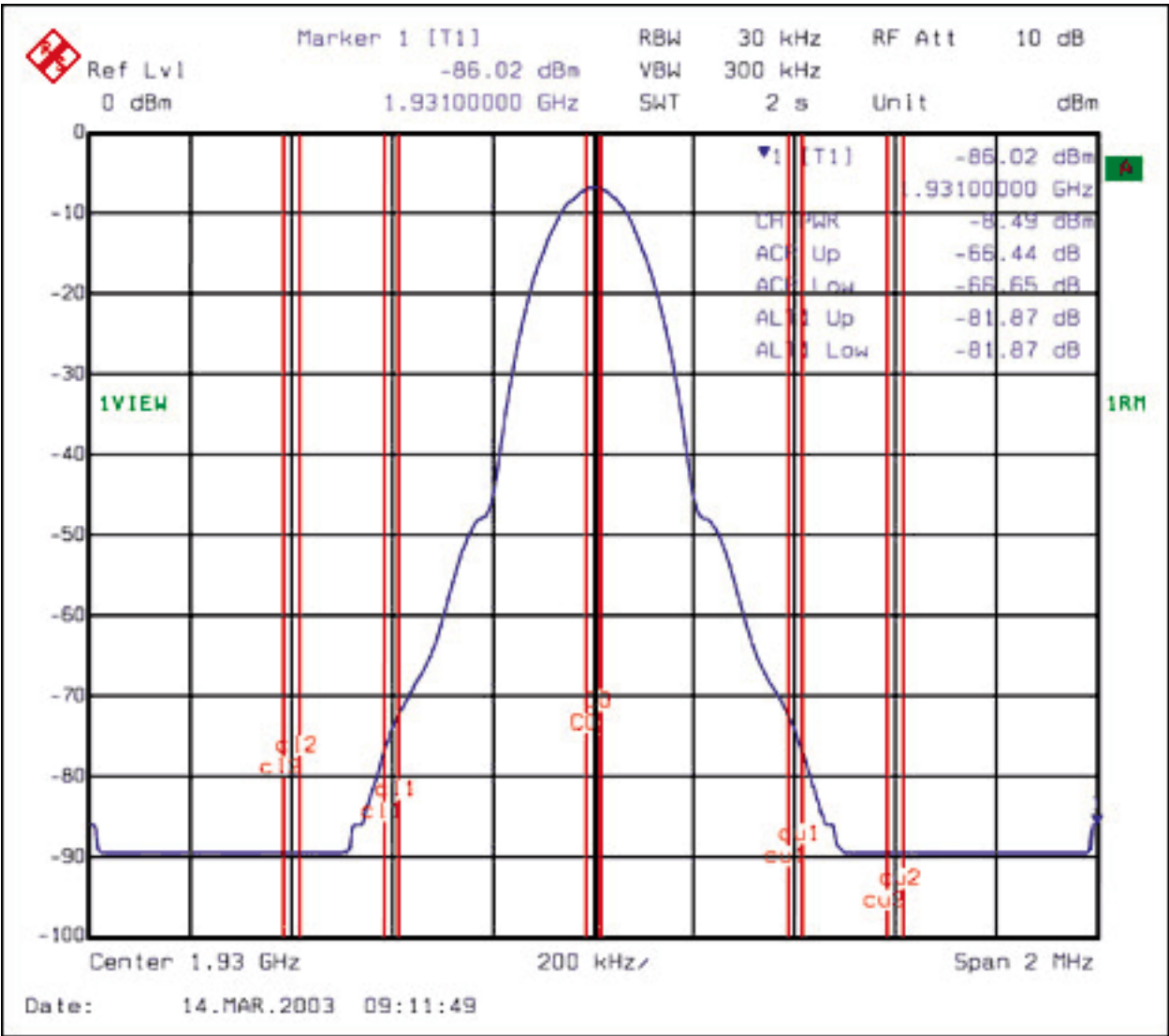
Figure 1. EDGE Modulation Spectrum Plot at 1930MHz and +20.0dBm Pout.
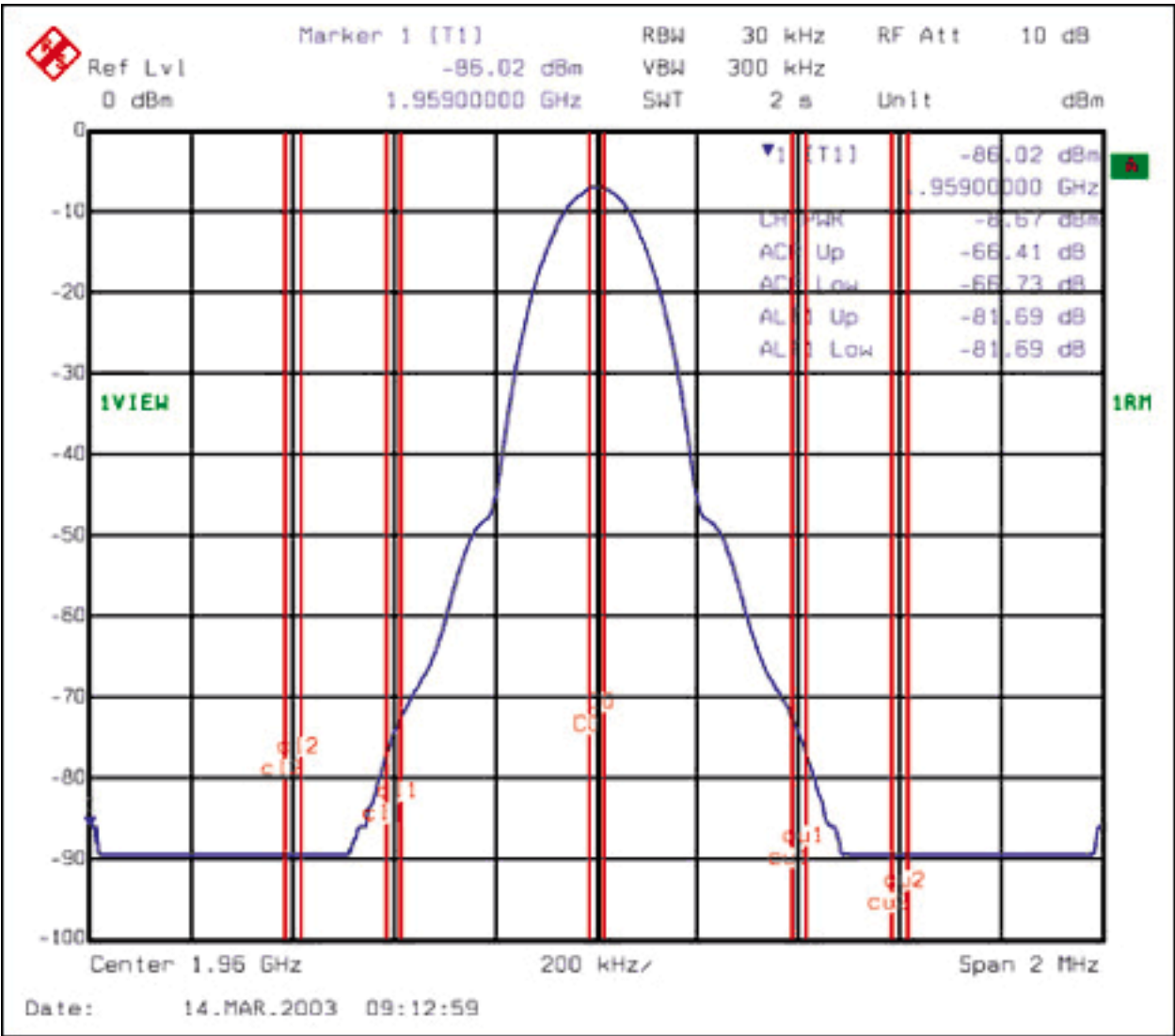
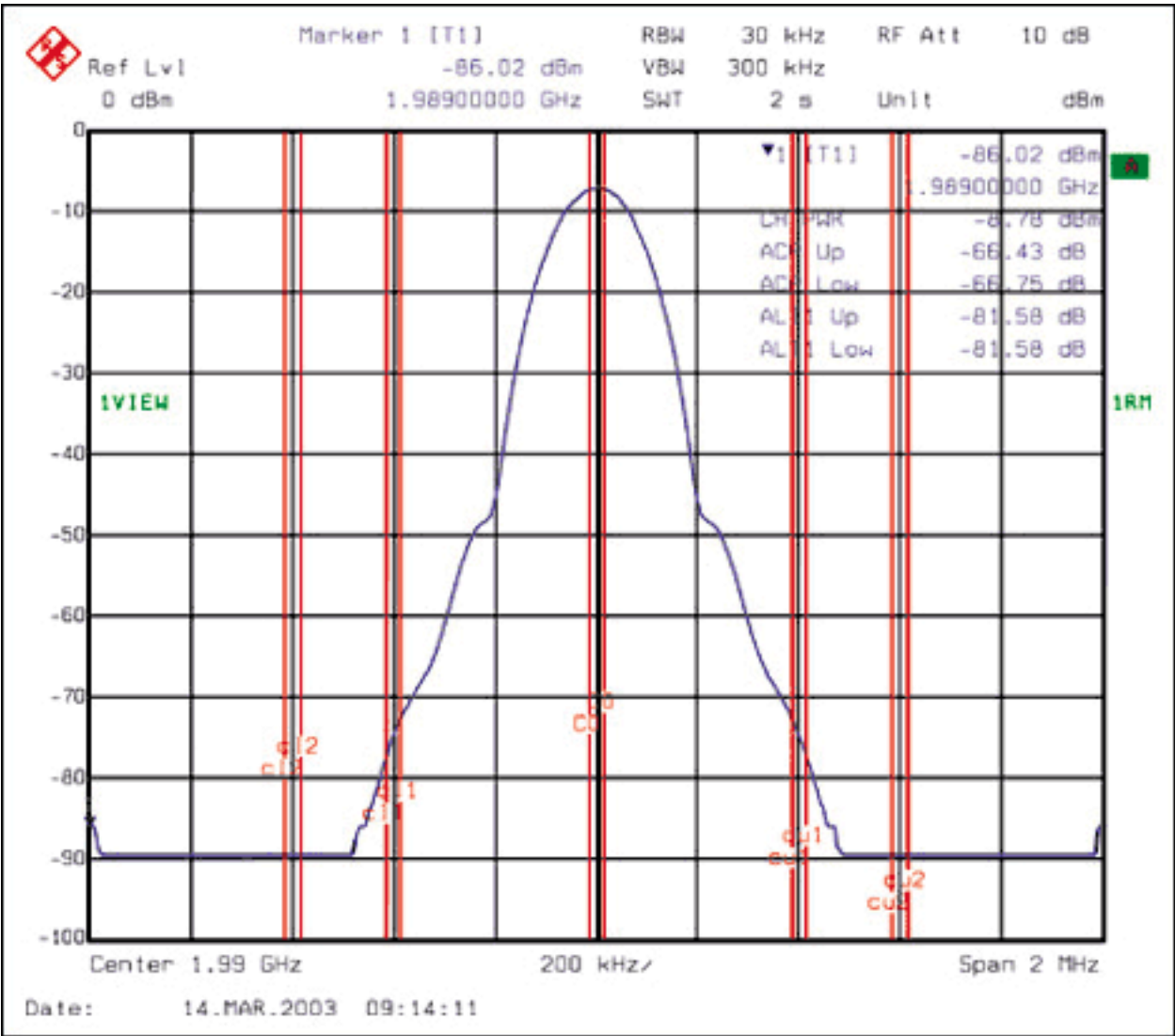*Figure 2. EDGE Modulation Spectrum Plot at 1960MHz and +20.0dBm Pout.*

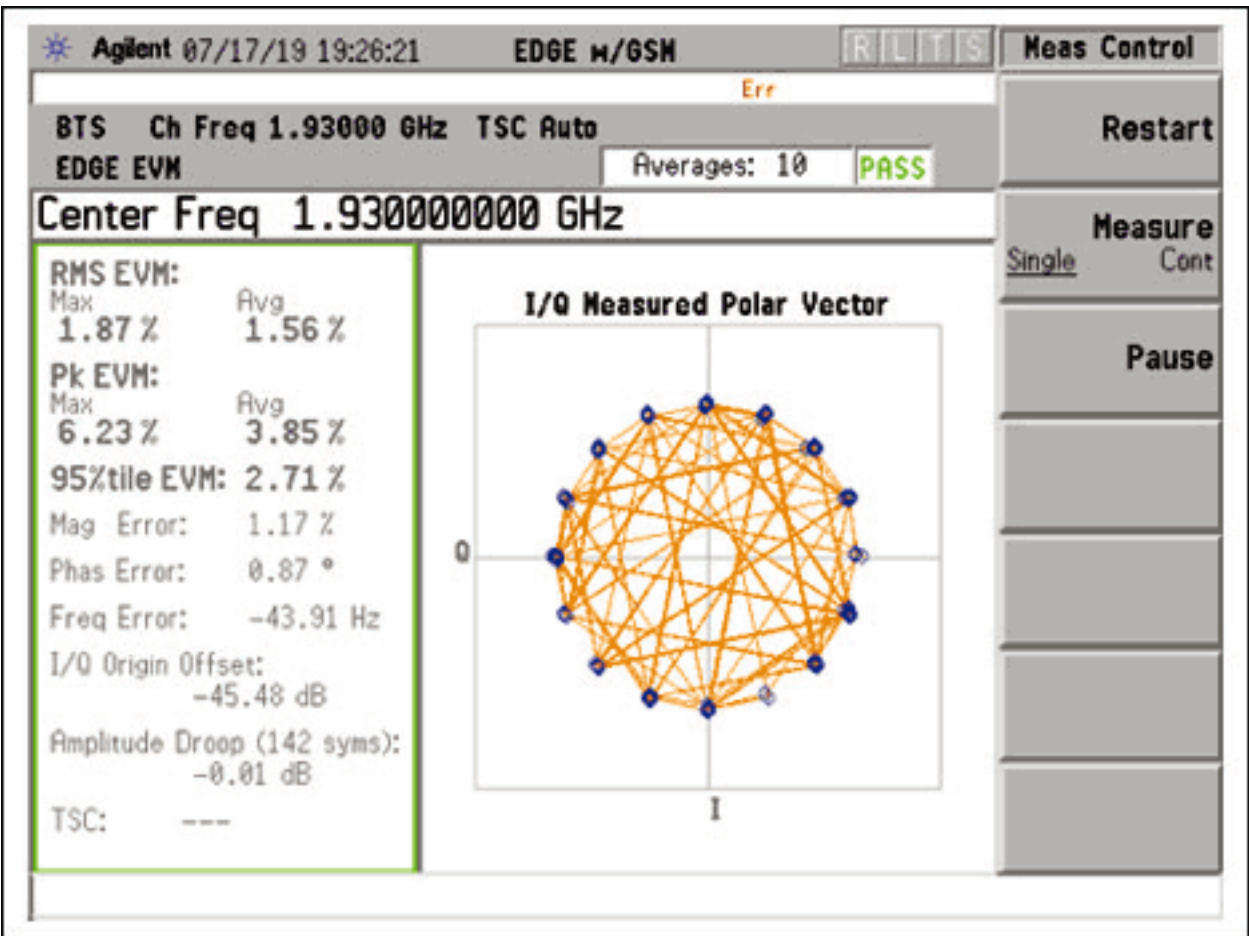*Figure 3. EDGE Modulation Spectrum Plot at 1990MHz and +20.0dBm Pout.*

Figure 4. Edge Modulation Constellation at +20 dBm Pout, 1930MHz. EVM is 1.56 %.
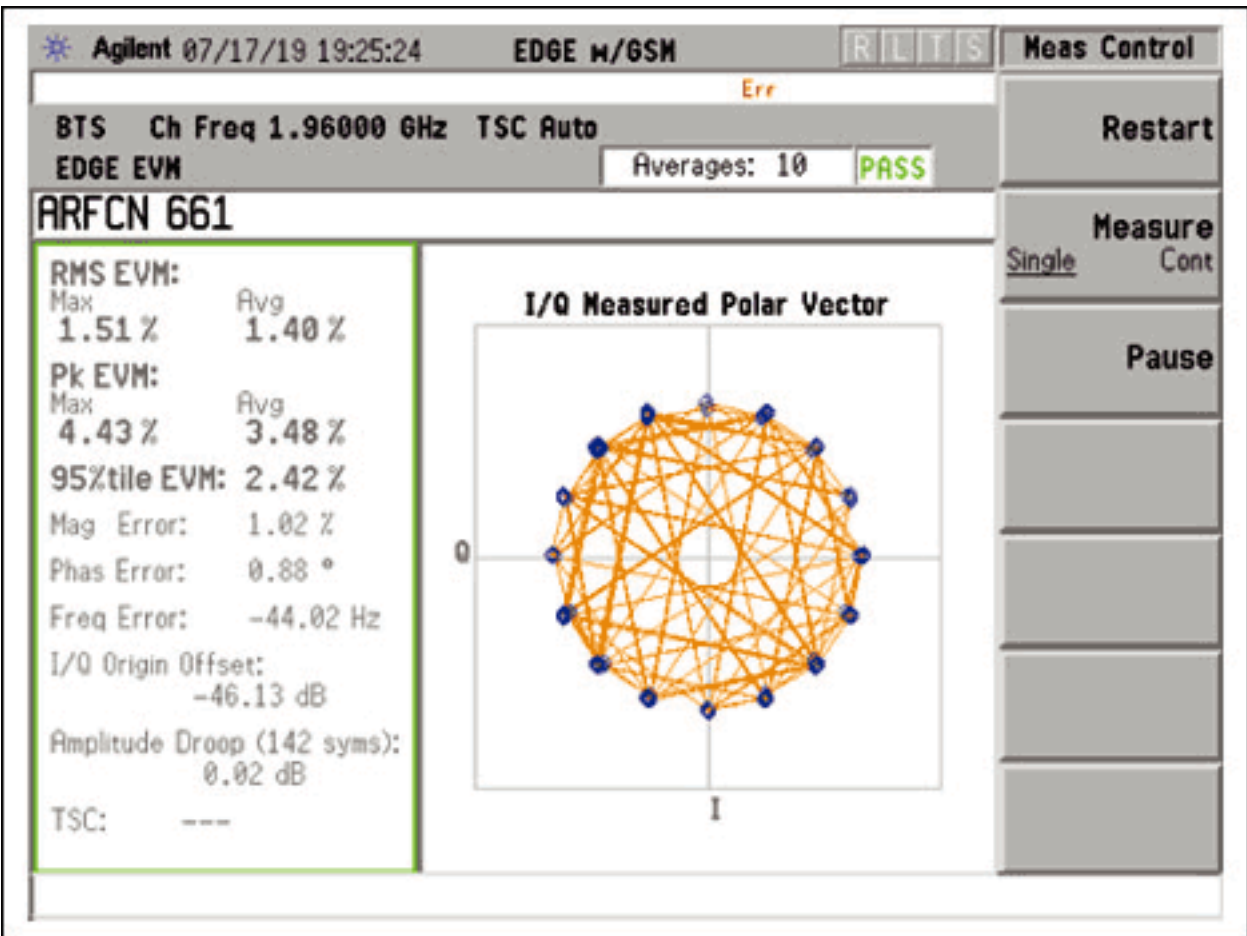
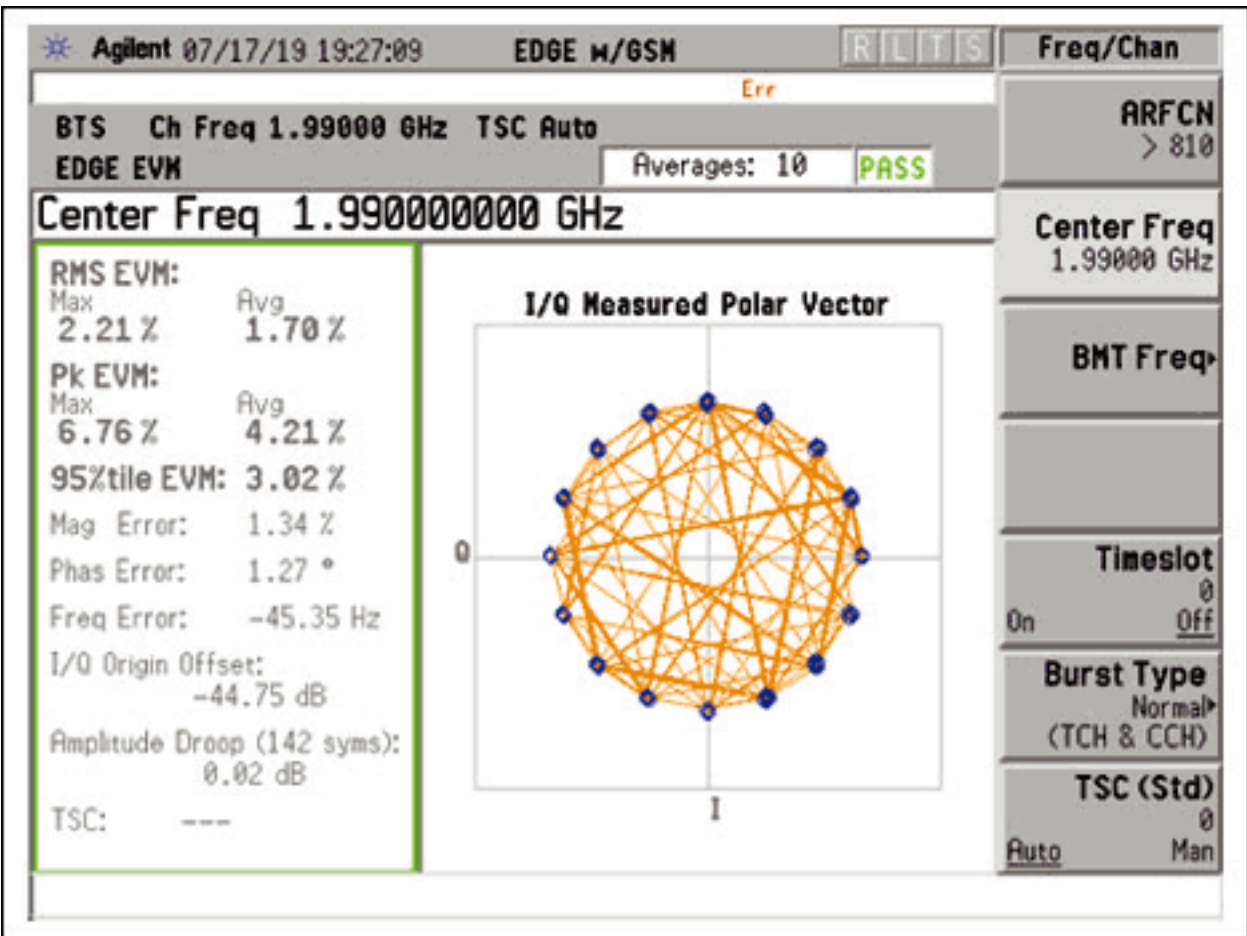*Figure 5. Edge Modulation Constellation at +20 dBm Pout, 1960MHz. EVM is 1.40 %.*

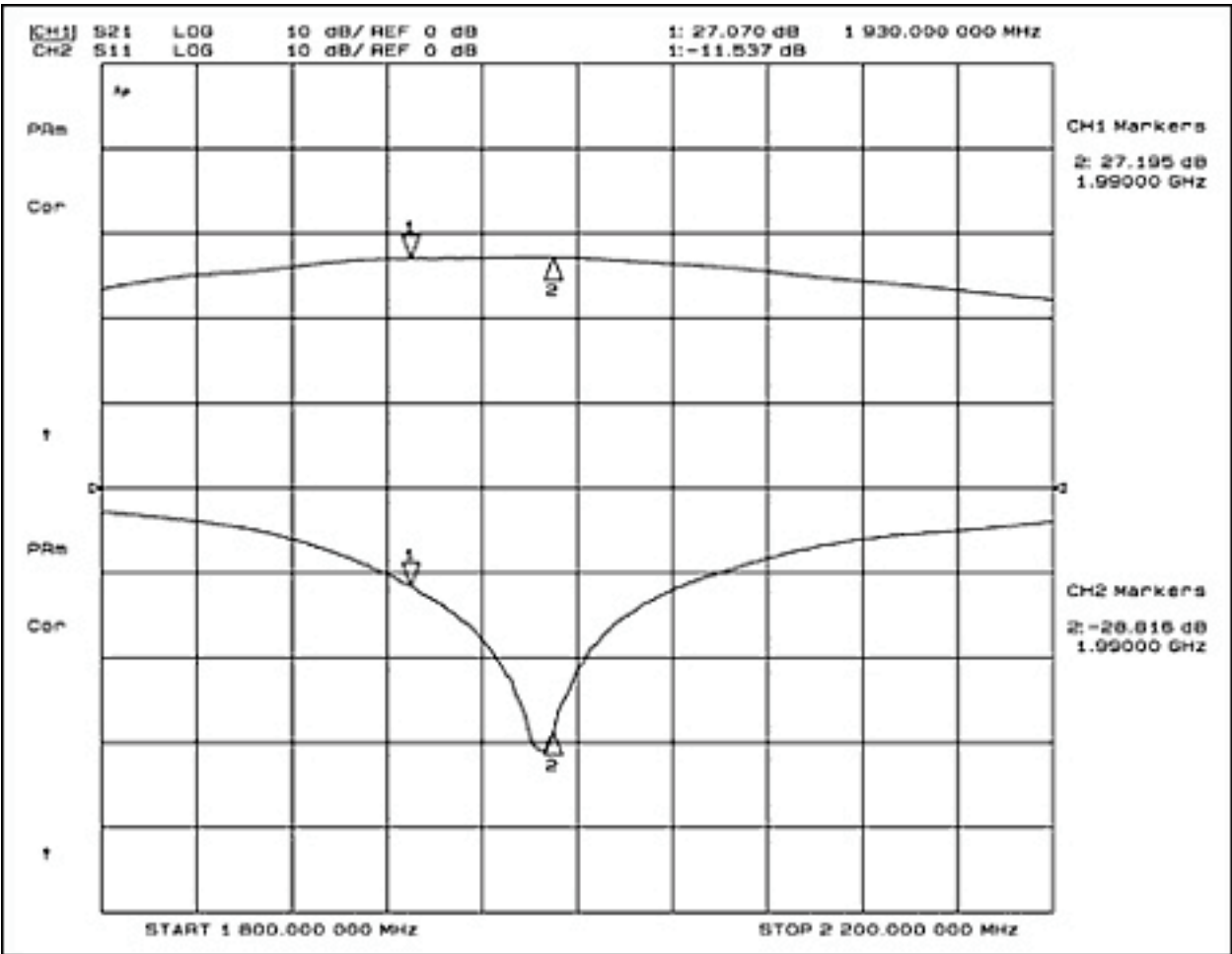*Figure 6. Edge Modulation Constellation at +20 dBm Pout, 1990MHz. EVM is 1.70 %.*
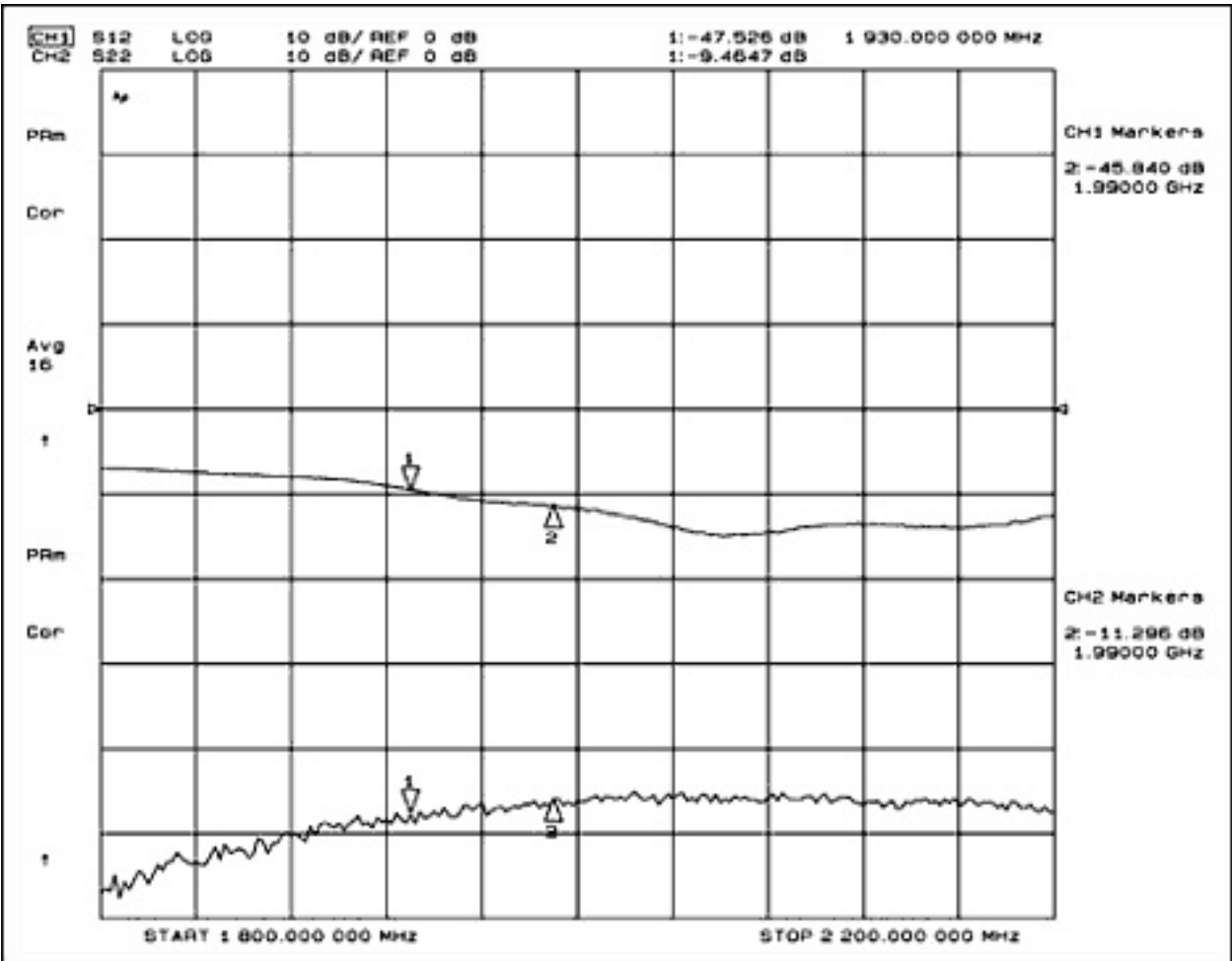
Figure 7. S21 and S11 Small Signal Plots.

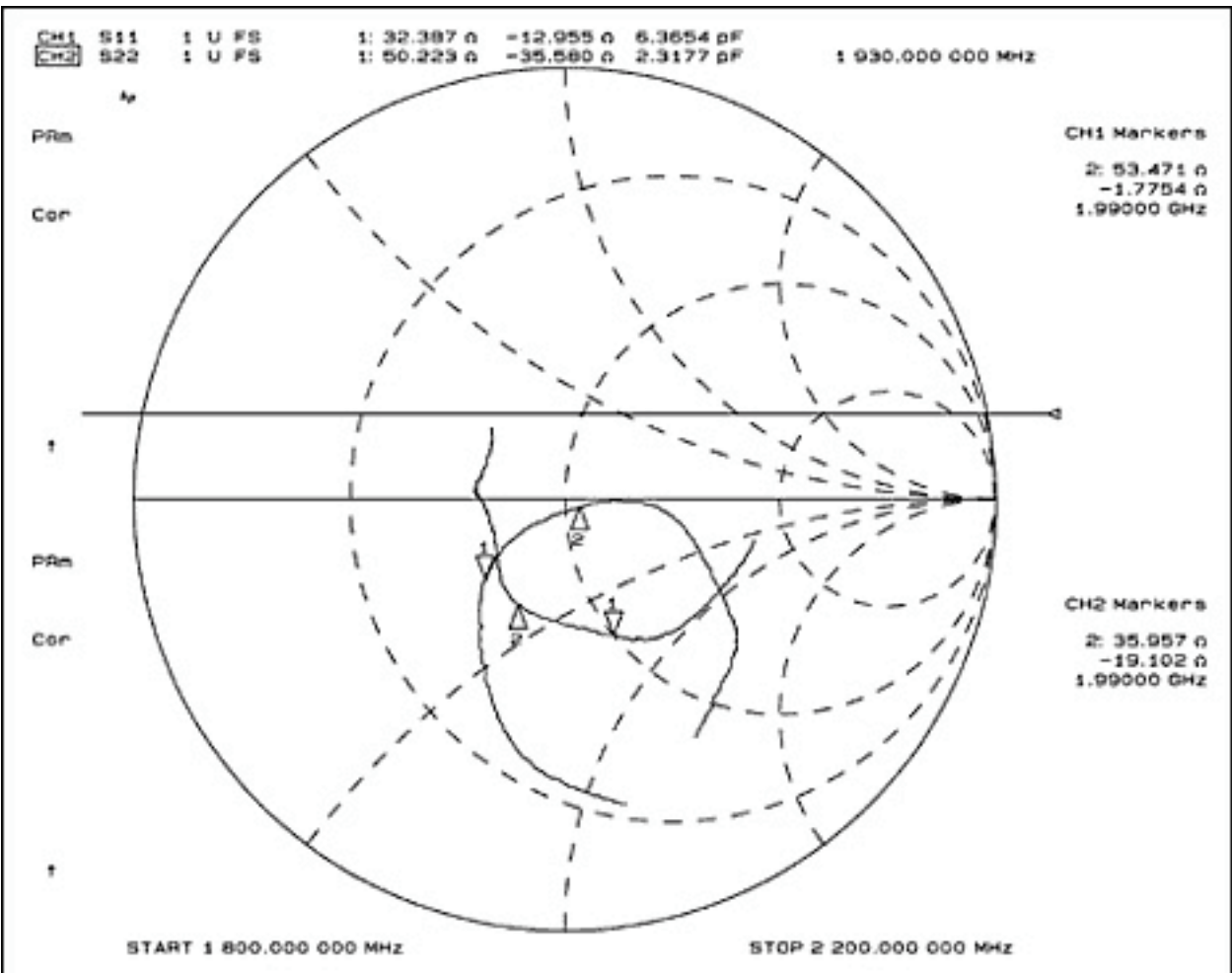*Figure 8. S12 and S22 Small Signal Plots.*

Figure 9. S11 and S22 Impedance Plots.

MAX2291 Evkit Bill-of-Materials:

DESIGNATION	QTY	DESCRIPTION
C17, C46, C47, C50, L8, L12, D2, R2, IN2, JU3	10	Not Install
C48	1	Murata 470pF GRM36X7R471K050
C49	1	Murata 4.7pF ±0.1pF GRM36COG4R7B050
C52	1	Not Install
C56	1	Murata 10pF ±0.1pF GRM36COG100B050
C45, C54, C57, C64	4	Murata 0.01uF GRM36X7R103K016
C58	1	Not Install
C62	1	Murata 0.01uF GRM39X7R103J050
C65	1	10uF 6.3V 100mOhm Taiyo Yuden Ceramic, 1206 case size
C66	1	Murata 22pF GRM36COG220J050

C90	1	ATC 4.7pF ±0.1pF ATC100A4R7BW150XB (see special assembly instruction 2)
C92	1	Murata 1.1pF ±0.1pF GRM36COG1R1B050
L9, L15	2	0Ω 5% resistor (must be 0402)
L11	1	Coilcraft 0906-3, 2.55nH (see special assembly instruction 1)
L14	1	Murata 33nH LQP10A33NG00
R14	1	13kΩ 1% resistor (0402)
R16	1	24kΩ 5% resistor (0402)
R17	1	Not Install
R18	1	12kΩ 1% resistor (0402)
R19	1	Not Install
U1	1	MAX2291EBA 5x5 uCSP
VCC, GND	2	2-Pin Header (0.1" centers)
IN1, OUT	2	0.031" Edge Mount SMA EF Johnson 142-0701-881
JU1, JU2	2	3-Pin Header (0.1" centers)

Special Assembly Instructions

1.The top lead of the inductor L11 should be clipped to fit the upper pad. The bottom lead should be bent so that it reaches the output transmission line, where it will be soldered down.

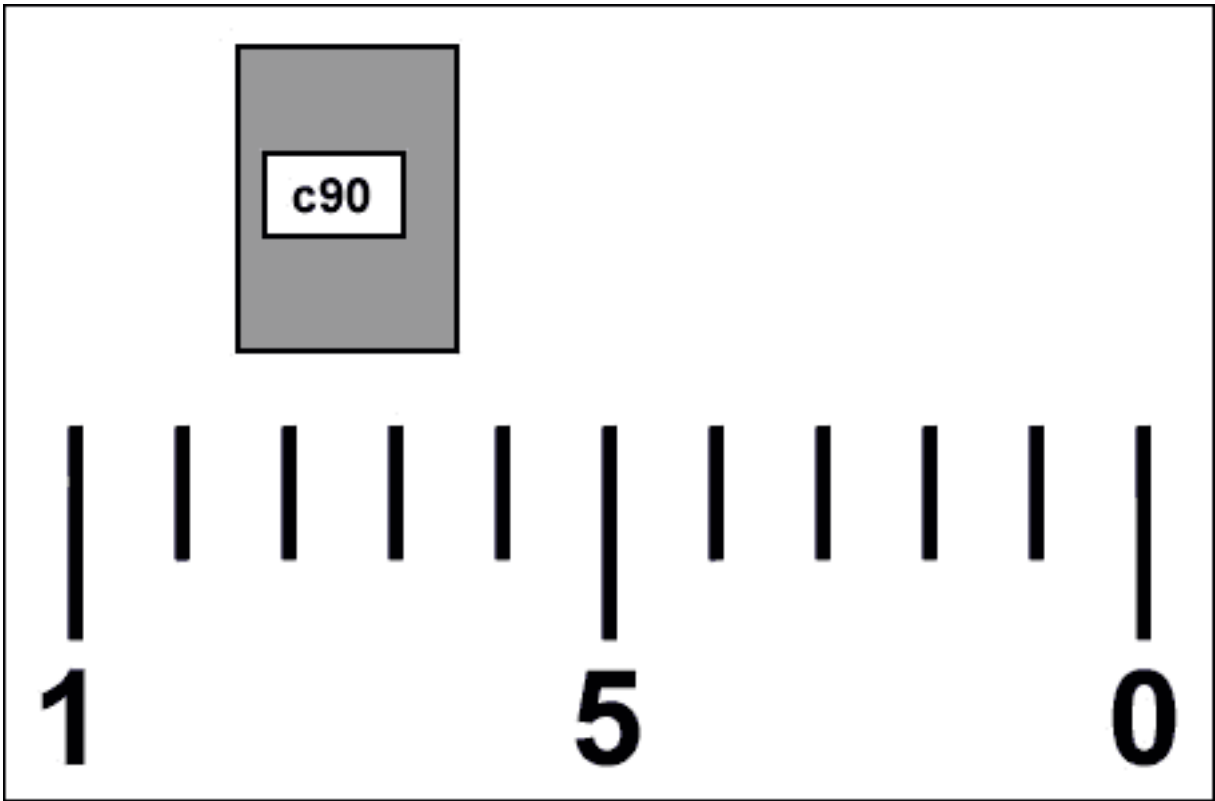2. C90 should be at left edge of tick mark #8.5 along output transmission line as shown below:

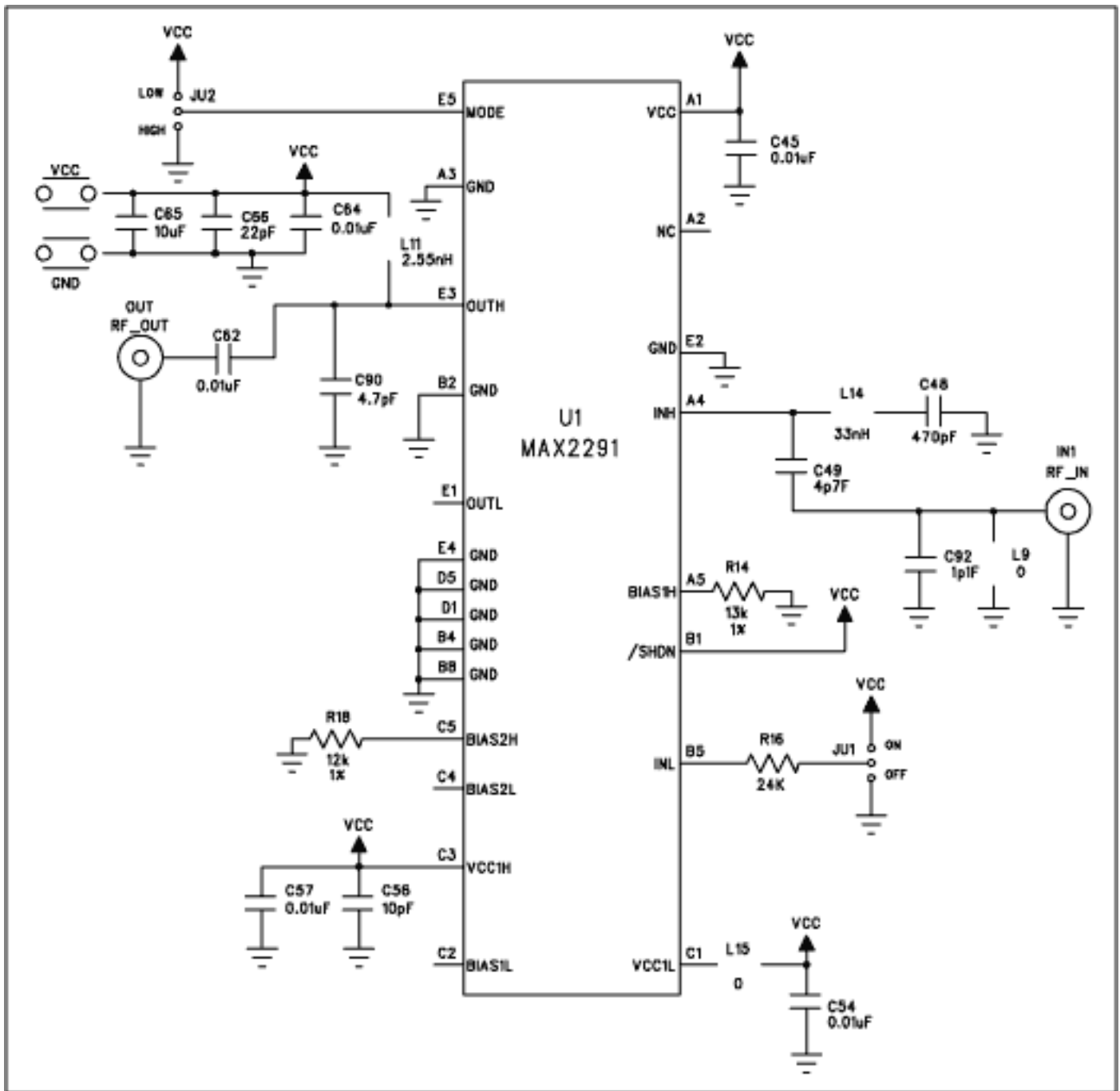*Figure 10. Location detail for C90 capacitor.*

Figure 11. MAX2291 EDGE Base Station Pre-driver Application Evaluation Kit Schematics.