B.S. Abdur Rahman Crescent Institute of Science & Technology
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ECC2203- COMMUNICATION THEORY AND SYSTEMS

PROJECT BASED LEARNING

PROJECT TITLE:

AM TRANSMITTER

TEAM MEMBERS:

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REPORT CONTENTS:

1. OBJECTIVE

To make one of the simplest AM TRANSMITTER circuits and deliver to larger distances without any changes in frequency of the audio signal.

2.INTRODUCTION:

Transmitters that transmit AM signals are known as AM transmitters. These transmitters are used in medium wave (MW) and short wave (SW) frequency bands for AM broadcast. The MW band has frequencies between 550 KHz and 1650 KHz, and the SW band has frequencies ranging from 3 MHz to 30 MHz The two types of AM transmitters that are used based on their transmitting powers are:

- High Level
- Low Level

High level transmitters use high level modulation, and low-level transmitters use low level modulation. The choice between the two modulation schemes depends on the transmitting power of the AM transmitter. In broadcast transmitters, where the transmitting power may be of the order of kilowatts, high level modulation is employed. In low power transmitters, where only a few watts of transmitting power are required, low level modulation is used.

High-Level and Low-Level Transmitters Below figure's show the block diagram of high-level and low-level transmitters. The basic difference between the two transmitters is the power amplification of the carrier and modulating signals.

Figure (a) shows the block diagram of high-level AM transmitter. Figure (a) is drawn for audio transmission. In high-level transmission, the powers of the carrier and modulating signals are amplified before applying them to the modulator stage, as shown in figure (a). In low-level modulation, the powers of

the two input signals of the modulator stage are not amplified. The required transmitting power is obtained from the last stage of the transmitter, the class C power amplifier.

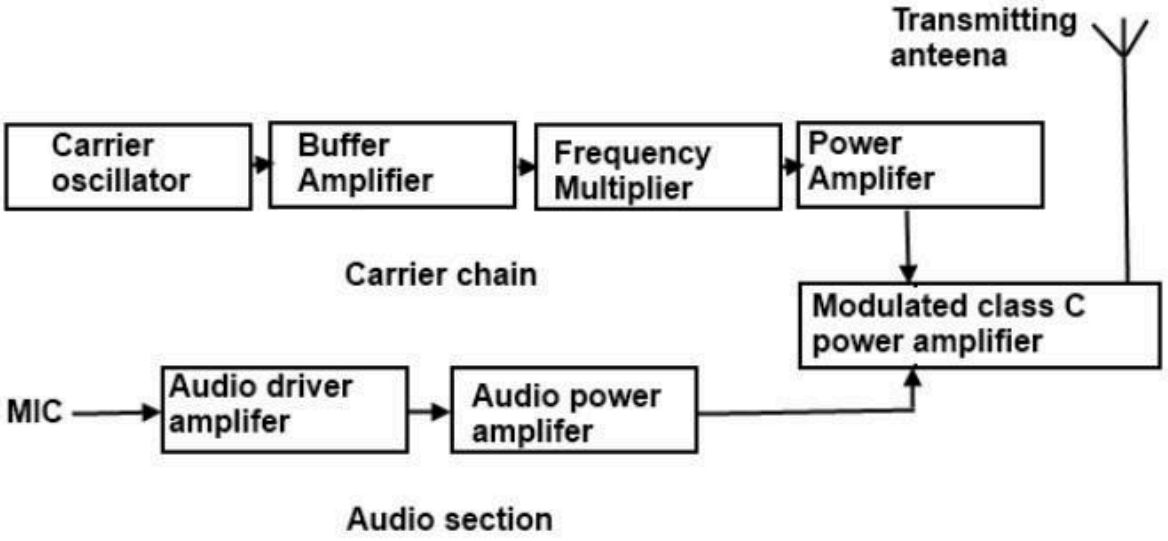
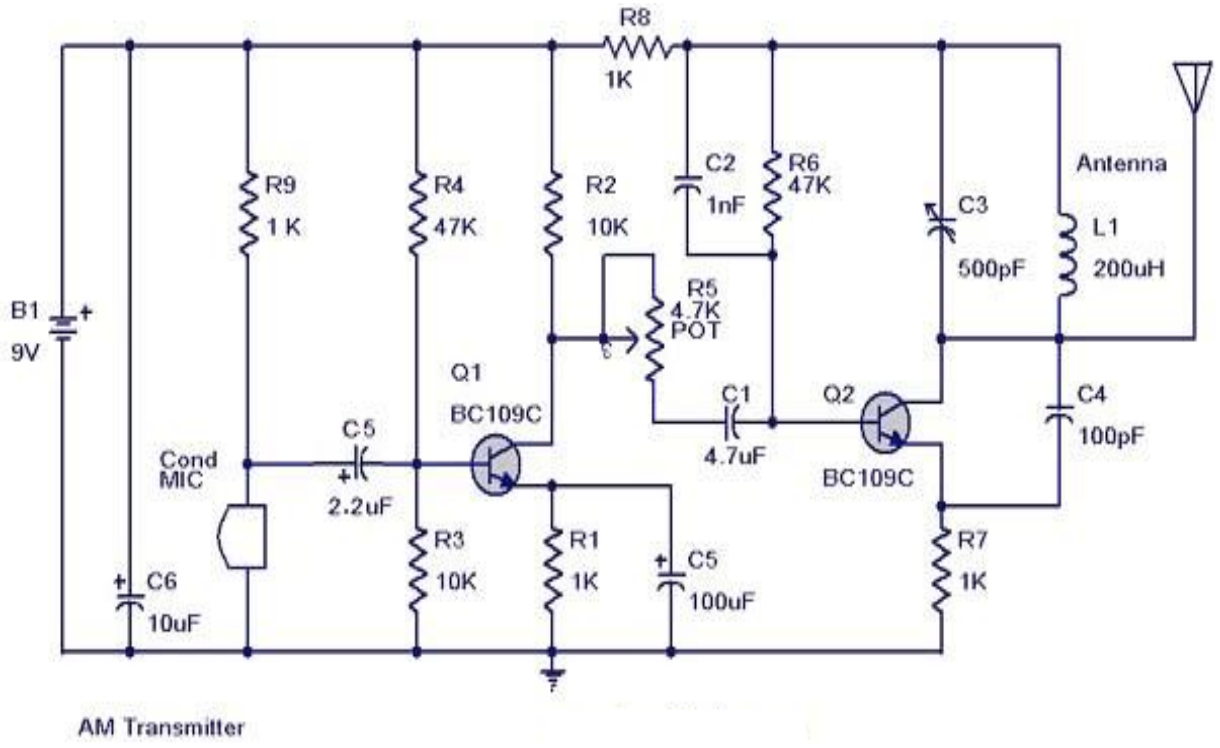


Figure (a) Block diagram of high level AM transmitter

CIRCUIT DIAGRAM:



COMPONENTS REQUIRED:

I. Battery/DC Supply 9V.

II. Resistors: 1K,47K,10K.

III. Potentiometer: 4.7K

IV. Inductor: 200uh.

V. Capacitors: 100uf,100pf,10uf,2.2uf,1nf,500pf.

VI. Transistors: BC 109C.

VII. Microphone.

VIII. Antenna.

IX. Connecting wires.

3.CIRCUIT DIAGRAM EXPLANATION:

- The AM transmitter circuit comprises two main sections: an audio amplifier and a radio frequency oscillator. The oscillator, consisting of

components such as Q1 (BC109), forms the core of the circuit. The tunable tank circuit, composed of inductance L1 and capacitance VC1, enables frequency adjustment within the range of 500kHz to 1600KHz. These components can be easily salvaged from an old medium wave radio. Q1 receives regenerative feedback by connecting its base and collector to opposite ends of the tank circuit.

- To facilitate signal transfer from the base to the top of L1, a 1nF capacitor (C2) is used. Additionally, a 100pF capacitor (C4) ensures oscillation propagation from the collector to the emitter, and through the internal base-emitter resistance of Q2 (BC109), back to the base. The inclusion of resistor R7 plays a crucial role in the circuit. It prevents oscillation from being shorted to ground through the extremely low internal emitter resistance (re) of Q1 (BC109). Moreover, it increases the input impedance to prevent the modulation signal from being grounded.
- Q2 is configured as a common emitter RF amplifier, and the emitter resistance is decoupled by capacitor C5 to unleash the full gain potential of this stage. The microphone utilized can be an electret condenser microphone, and the degree of AM modulation can be adjusted using the 4.7 K variable resistor (R5).

4. TRANSISTOR DETAILS:

Low Power Bipolar Transistors
BC109 Series

multicomp PRO

General Purpose Amplifier / Switches

RoHS Compliant

Pin Configuration
1. Emitter
2. Base
3. Collector

Feature

- NPN Silicon Planar Epitaxial Transistors

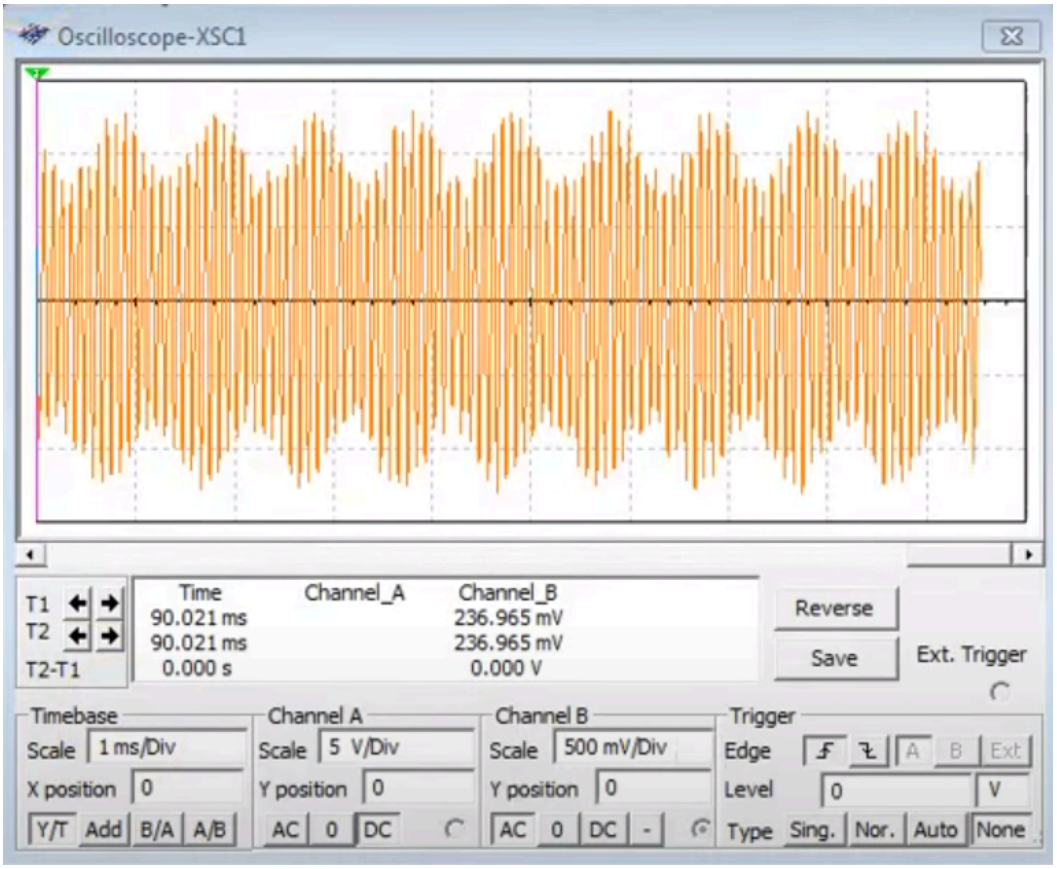
Absolute Maximum Ratings

Description	Symbol	Values	Unit
Collector-Emitter Voltage	V_{CEO}	25	V
Collector-Base Voltage	V_{CBO}	30	
Emitter-Base Voltage	V_{EBO}	5	
Collector Current Continuous	I_C	0.2	A
Power Dissipation at T_A = 25°C Derate Above 25°C	P_D	0.6 2.28	W mW / °C
Power Dissipation at Tc = 25°C Derate Above 25°C		1 6.67	
Operating and Storage Junction Temperature Range	T_J, T_{STG}	-65 to +200	°C
Thermal Resistance			
Junction to Case	$R_{th\ (j-c)}$	175	°C / W

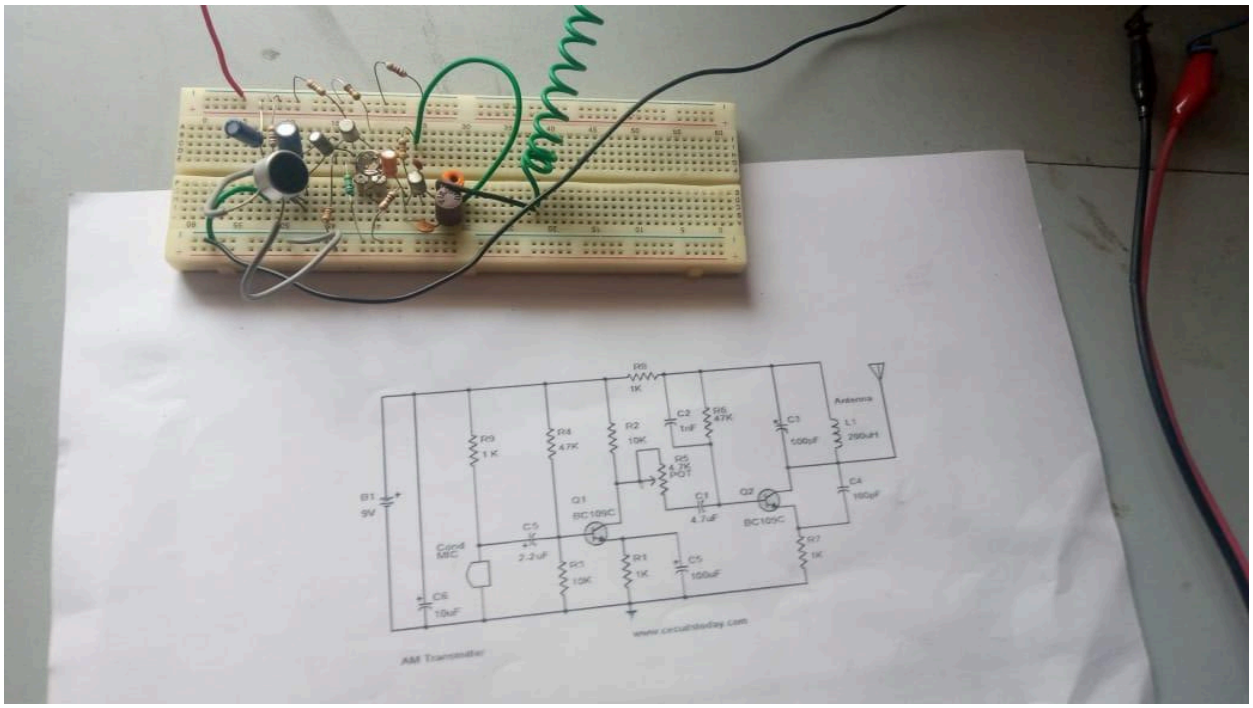
Electrical Characteristics (T_A = 25°C unless otherwise specified)

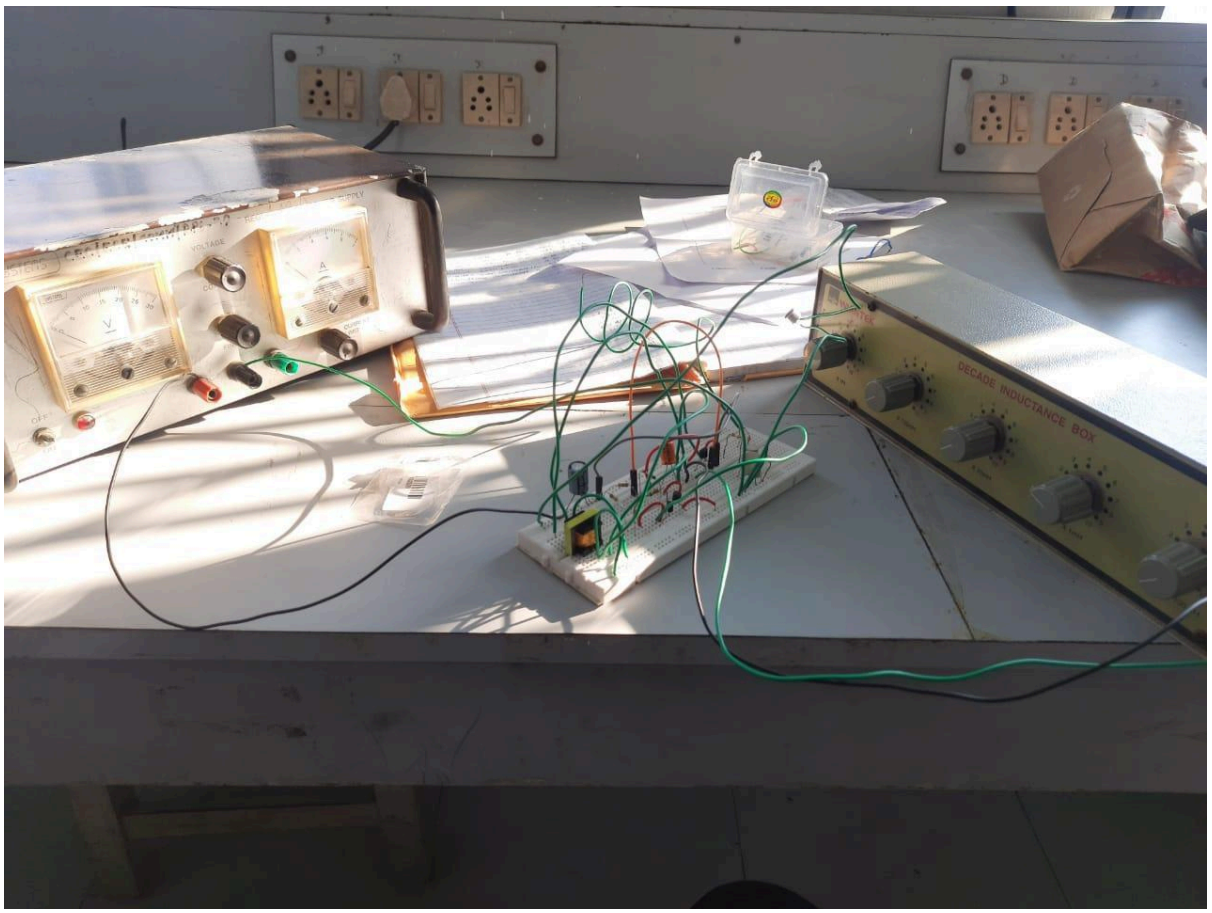
Description	Symbol	Test Condition	Minimum	Maximum	Unit
Collector-Emitter Voltage	V_{CEO}	I_C = 2 mA, I_B = 0	25	-	V
Collector-Base Voltage	V_{EBO}	I_E = 10μA, I_C = 0	5	-	
Collector-Cut off Current	I_{CBO}	V_{CB} = 25V, I_E = 0 Tamb = 125°C V_{CB} = 25 V, I_E = 0	-	15 4	nA μA
DC Current	h_{FE}	I_C = 10μA, V_{CE} = 5 V B Group C Group I_C = 2mA, V_{CE} = 5V B Group C Group	 40 100 200 420	- - - 800 800	-
Base Emitter Saturation Voltage	$V_{BE\ (sat)}$	I_C = 10mA, I_B = 0.5mA I_C = 100mA, I_B = 5mA	-	0.83 1.05	V
Collector Emitter Saturation Voltage	$V_{CE\ (sat)}$		-	0.25 0.6	

SIMULATION RESULT:

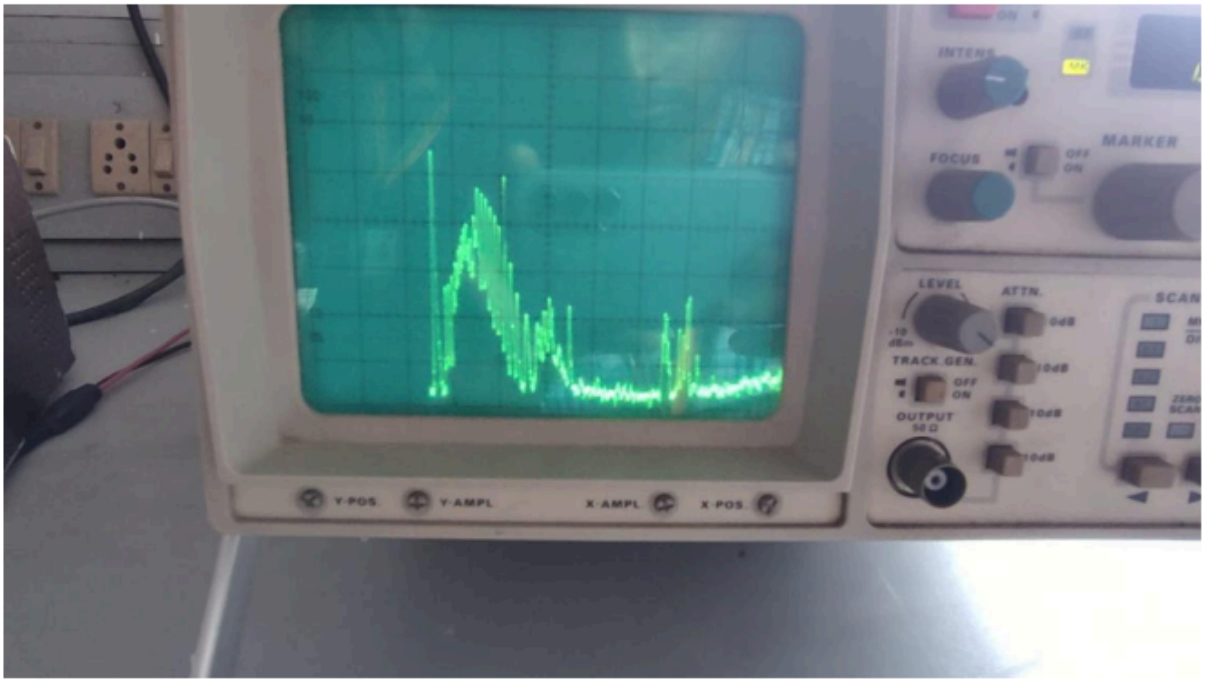


5. HARWARE PHOTOS:




DECADE INDUCTANCE BOX

OUTPUT:


Y-POS
Y-AMPL
X-AMPL
X-POS
FOCUS
MARKER
LEVEL
ATTN.
TRACK GEN.
OUTPUT

CONCLUSION:

The simulation and real time hardware implementation of AM Transmitter circuit has been executed and verified successfully.