Open Access Scientific Reports

Scientific Reports

Research Article Open Acces

Keywords: Power measurement; Analog multiplication; Frequency doublers; Curve tting

Introduction

e requirement of the load power measurements is routine in the electrical engineering labs and installations. ere are equipments available that can be used to measurement these quantities. Accurate measurement of power and other AC quantities is extremely important at all levels of the electrical power system, and is of value for both for power distributors and power consumers.

e objective of this paper is to design and fabricated power measurement system of an electrical load. e loads considered in the present study are resistive load (bulb) and inductive load (single phase induction motor, 220V, 1 HP). e AD633 is a low cost multiplier comprising of a translinear core, a buried Zener reference, and a unity gain connected output ampli er with an accessible summing node. AD633 is a complete four-quadrant multiplier o ered in low cost 8-lead SOIC and PDIP packages. e result is a product that is cost e ective and easy to apply. No external components or expensive user calibration are required to apply this IC. Monolithic construction and laser calibration make the device stable and reliable. High (10 M) input resistances make signal source loading negligible. Power supply voltages can range from ±8 V to ±18 V. e internal scaling voltage is generated by a stable Zener diode; which gives multiplier accuracy supply insensitive [1-3].

Analog Multiplier Based Single Phase Power Measurement System Block Diagram and Schematic Diagram

is paper presents a power measurement technique of an electrical load. e proposed method is a low cost power measurement technique. e load taken into consideration is resistive load (such as bulb) and inductive load (like single phase induction motor, 220V, 1hp). is method employs analog circuit (AD633 IC) which does the analog multiplication of the two signals: one signal transducted via current transformer and the other one transducted through the voltage transformer. e AD633 nds various applications, such as power measurement, modulation and demodulation, automatic gain control,

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pass lter is proportional to the average load power consumed and displayed through cathode ray oscilloscope [4-6].

Experimental Results

First case: Power measurement of resistive load

e schematic diagram with the components ratings and electrical connection is depicted in the Figure 2. is diagram is drawn using the OrCAD.

R_1=.18K, R_2=.18K and C_1=10 µF

Table 1 shows the measured values at di erent points for the resistive load.

Second case: Power measurement of inductive load using phase shi er

In power measurement, it is necessary that the phase of secondary winding current shall be displaced by exactly 1800 from that of the primary winding current. It is seen that the phase di erence is di erent from 180° by an angle (phase error). us in power measurement, owing to use of CT, secondary winding current not being 180° out of phase with the primary winding current. us, the angle is compensated to make current out of phase by using a variable phase shi er prior to AD633 IC as shown in Figure 3. A resistor of 10 k is connected to convert current into voltage at the output of CT. With the help of a CRO the voltage signal across the secondary of the VT and across the secondary of the CT are compared. By changing the potentiometric probe of the phase shi er the phase di erence between the signals is made zero.

Subsequently, this set up is used for measurement of inductive load and following parameter is recorded as given below in Table 2.

Curve tting with Mathlab

Curve tting is a useful exercise for representing a data set in a linear or polynomial term. We are performing curve tting to establish relation between the output of lter and load. ere are two such function available in MATLAB which can be used for this purpose Poly t (Polynomial curve tting) and Polyval (Polynomial evaluation). e Poly t (input data, output data, order) is a function that approximates the inputs/outputs data sets in terms of polynomial of chosen order in the sense of minimum mean square error. "Polyval" evaluates a polynomial for a given set of x values. So, polyval actually generates a curve to t the data based on the coe cients found using poly t. Figure 4 and 5 shows the poly t for resistive load and inductive load using phase shi er.

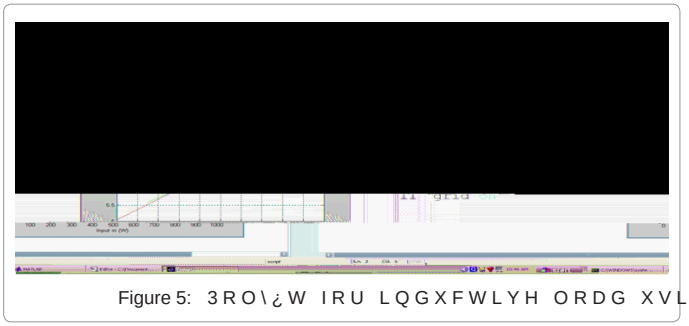

Figure 5: 3 R O \ ¿ W I R U L Q G X F W L Y H O R D G X V L Q J S K D V H V K L I W H U

Here x are the di erent load values and y is their corresponding output at low pass lter.

e blue line is original plot and the green line is the poly t plot

e equation of a line is y = mx + c