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A FAMILY OF ZERO CURRENT TANSITION TRANSFORMERS LESS PHOTO VOLTAIC GRID -CONNECTED SINGLE PHASE INVERTER WITH FUZZY CONTROLLER

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ABSTRACT:
The demand of electrical energy is increasing day by day .so there is is a need of increasing the efficient management of power generation ,transmission, distribution of electrical energy, due to the A renewable energy under push to reach grid parity without additional subsidies and favorable policies while cost and reliability are major cancers for both pv panels and pv inverters comparable or exceeded grid function an a power become competitive to conversion generation technologies in the goal of this paper to grow the industry and academic in new technology challenges in to smart pv inverters in addition to the "dolor per watts" to the overall system cost target .low leakage current and high efficiency are two key indexes for transformer less pv grid connected inverters. The transformer less inverter topologies Solar cells produce direct current electricity from sun light which can be used to power equipment or to recharge a battery. The first practical application of photovoltaic was to power orbiting satellites and other spacecraft, but todaythe majority of photovoltaic modules are used for grid connected power generation. In this case an inverter is required to convert the DC to AC. There is a smaller market for off-grid power for remote have superior efficiency thanks to saving transformer but there semiconductor devices still hardswitching stated present .A family of ZCT transformer less inverterwithsinusoidal PWM modulation is deduced by using fuzzy logic controller .

Key indexes: ***grid-connected inverter, resonant tank, transformer less, zero- current – transition, fuzzy controller.***

1.INTRODUCTION:

PV systems are used to supply The Generated electrical energy into grid .Renewable energy sources are key issues in the attemptto address energy problems among the all energy sources. Solar energy one of the most up to date techniques .however applications are limited by relatively high cost in comparison with traditional sources.today's word needs more energy due to skyrocketing population industries .hence renewable energy plays an important role to ensure a better future .solar energy has greatest role in present tend because free from pollution. and green. pv grid traditionalelectrical power systems the use of power electronics use of Power electronics increase in day by day such as inverters .

systems are two types they are usually embedded with low -or high efficiency transformer nevertheless the transformer requires few number of power stages .and thus , the design of highly efficientand low cost and small-size inverters .become difficult task .on other hand it is possible to remove transformer from the inverter in order to reduce the losses ,size and cost of those systems, namely transformer less pv systems .
All the transformer less pv systems are designed based on the condition when CMV is constant. Throughout the different switching states. In transformer less pvinverters, the main design criterion is to reduce the leakage current.
Flowing through capacitance through the ground. In recent years, grid connected systems have become more and more wide spread in private and commercial application.Non isolated inverters with decreased no of components .High efficiency are preferred choices for these applications where,power density, cost,weight and reliability are critical issue.Its efficiency can reach 97% with unipolar pulse width modulation method. However generates a common mode voltage with amplitude of half input voltage. At the switching frequency at the silicon gallium n types.

2. PVSYSTEMS:

PV photo voltaic the direct conversion of light into electricity at the atomic level, some materials exhibit a property know as photo electric effect that causes them to absorb photons of light and release electrons .when these free electrons are captured ,an electric current that can be used as electricity.

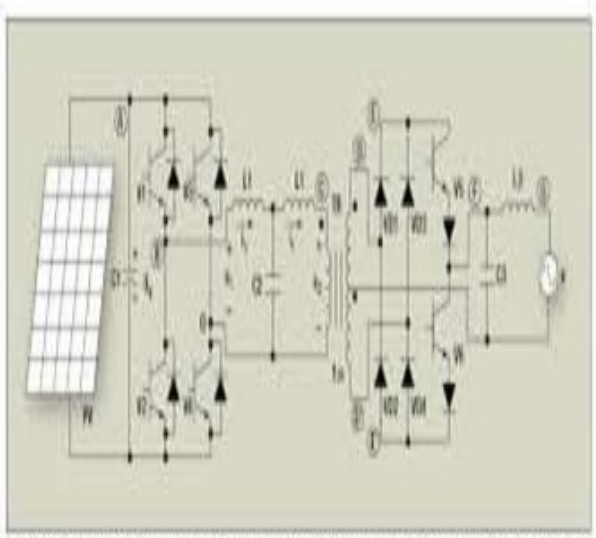
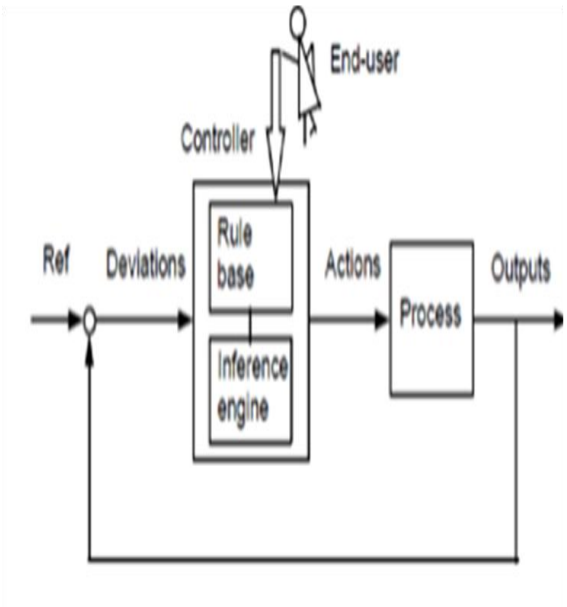


Fig. 1. System topology of the proposed single phase current source grid connected inverter that consists of a high frequency full-bridge inverter, immittance converter, center-tapped transformer, high-frequency bridge rectifier, power-frequency inverter and low-pass filter

3. Inverters:
At the very end of the 1800s American electrical pioneer Thomas Edison 1847-1931 went out of this way to demonstrate that direct current dc was better way to supply electrical power then alternating current AC inverters its converter. The only troubled is though many of our applications are design to work with AC, small scale power generator of an produce DC .that means if you want to something like anAC powered gadget from a DC car battery in a mobile home,you need a device that will converter DC toAC inverter.

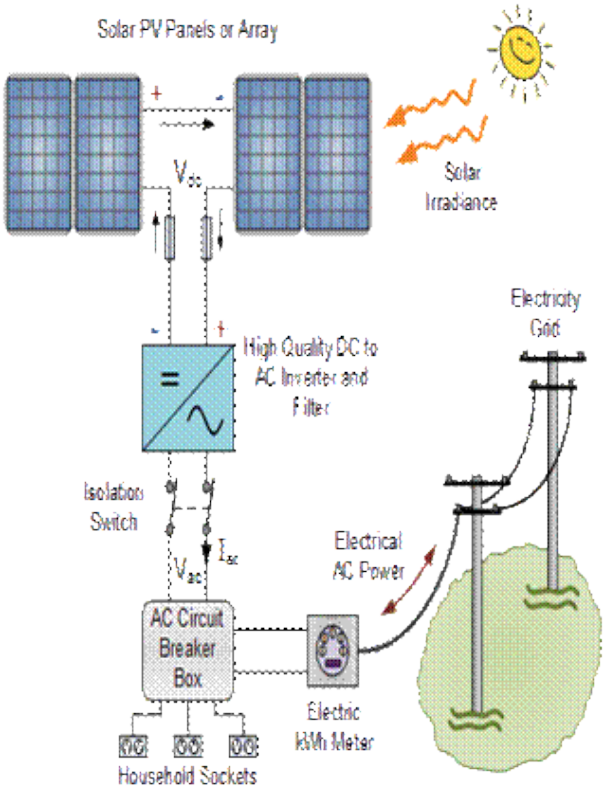
4. FUZZYCONTROLER:
Fuzzy controller are used for controlling consumes products such as washing machines video cameras and rice cookers as well as industrial processors such as cement kilns underground trains and robots fuzzy controller is a control method based on fuzzy logic just as fuzzy logic can be described simply as 'computing words rather than numbers' fuzzy control can be described simply as control with sentences rather than equations can include imperial rules and that is especially useful in operatators controlled plants .

5. FUZZY LOGIC PROCESS;
usually used for engineering application which is controlled by a fuzzy system .types of single phase A single phase grid connected inverter is grid connected inverters .have been investigated a common topology of this inverter is full bridge three level inverter can satisfy specificationthrough its very high switchinglosses, acoustic noise and level of interference EMI generated by the inverter switching operation.



FUZZY LOGIC PROCESS;

6.GRID CONNECTED PV SYSTEM;
The grid connected solar panels or solar array to the local power grid enables you to engage in one of the most advantageous parts of generating own electricity ;if during a sunny day more electricity is produced by your solar PV system then you use or consume ,this excess solar power is delivered back to the utility grid .the local power company for the amounts of produced by your grid connected PV system ."net amount' of electricity generated which may be either reduction in your monthly electrical bill or positive payment.



OVERVIEW OF GRID CONNECTED PV SYSTEM;

inverters high lets advantageous .transformer less pvThis chapter state that the transform less inverters compared to those with galvanic isolation .the summary of transformer less pv several inverter topologies presented followed, discussion about the parasitic capacitance ,of the PV array ,emphasizing safetyissues and ground leakage current due to varying voltage .
Voltage over this capacitance.the PV systems low voltage grid have an important role distributed generation system.pv systems have following characteristics.

- Low cost
- Small weight and size due to residential installations.
- High reliability to match with PV panels.
- Be safe human interaction.

7. TRANSFORMER LESS PV INVERTERS:

These inverters are depending on the electrical isolation between the PV panels and utility grid, the inverters can be isolated are non isolated these galvanic is usually realized by the means of a transformer which as major influence on a grid connected PV system (DC to AC efficiency).The presence of galvanic isolation in grid connected PV systems depends on the local country regulations. Depending on the power rating of the inverter, the price of inverter bellow 10 KW varies between 0,2 TO 1.2 Europe kw excluding vat. Here one can finds many small- scale building integrated systems that are connected to the grid. In order to cost –to-efficiency ratio of PV Systems, new inverter designs have been developed .A general classification of PV Inverters is as follows.

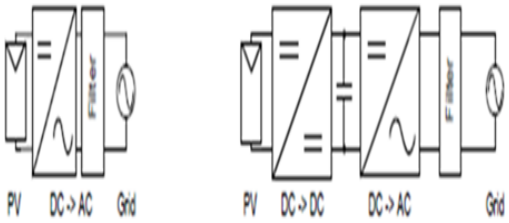
1. Central inverters
2. String inverters
3. Module integrated inverters
4. Multi-3

7.a) FULL BRIDGE INVERTERS:

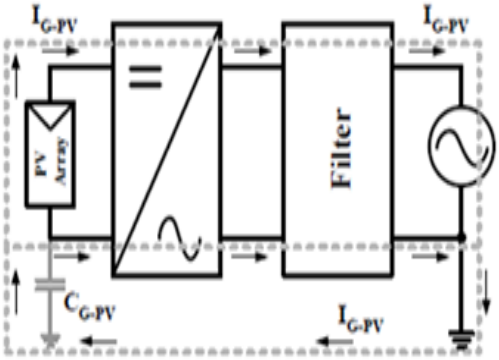
The full bridge inverters is the can be modulated with either unit polar or bi polar modulation techniques. in unipolar modulation both leg a(s1,s2)and legB(S3,S4)Switched with highefficiency with mi rroaredsinusoidal reference and two zero output voltage states' are possible: S1,S3=On and S2,S4=On with this modulation technique .The implementation is more feasible. High CMV amperes and leads to high leakage current between the grid and the pv system, the galvanic connection between them.

8. LESS PV INVERTER TOPOLOGIES;

Inverters according to the levels or power conversion. Can have one or more stages .a single and double stage topolology for a single phase grid connection is presented in fig.1



GRID CONNECTED PV SYSTEM;



The transformer less PV system showing the parasitic capacitance between the PV and the grounded frame of the array and the path of the alternating ground leakage current.

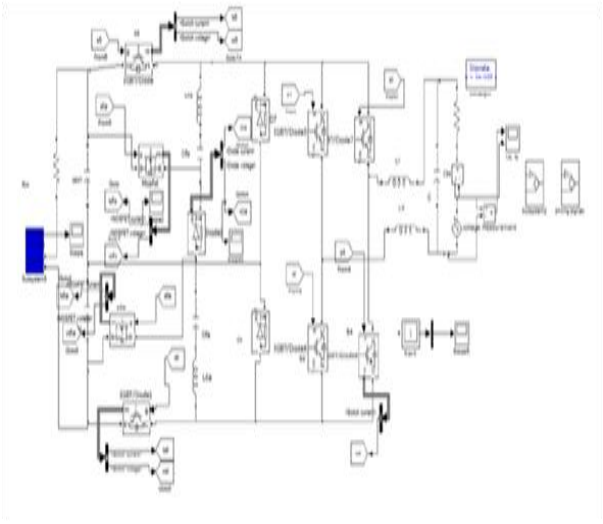
CIRCUI STRUCTURE AND OPERRATION PRINCIPLE;

In order to realize the soft switching operation for the high frequency main switch S5 and S6 in HS-H6-1 topology , The resonant components C5a,C6a,the auxiliary switches s5a,S6a, including their antiparallel diodes or, body diodes D5a,D6a,andone auxiliarydiode D are introduced from two resonant tanks ,as show in figure.L5a=L6a=LR, and C5a=C6a=Cr the line switching frequency full bridge inverter consists of switches Sr1,S2,S3and S4;the inductorL1,L2,capacitorsC! Make up filter connected to the grid; D7and D8are couple clamping diodes in the freewheeling period. The modulation pattern of the ZCT h6-1 topology same as h5-h6-1topology .this section focuses on the operation.
Vcm-AB= VAN+VBN (1) 2 VAN = Vdm-AB + Vcm-AB (3) 2 VBN = - Vdm-AB + Vcm-AB (4) 2 icm= i1+i2 (5)
In order to realize the soft-switching operation for the high-frequency main switches S5 and S6 in the HS-H6-I topology, the resonant components C5a, L5a, C6a, L6a, the auxiliary switches S5a, S6a (including their ant parallel diodes or, body diodes D5a and D6a), and one auxiliary diode D are introduced to form two resonant tanks, as shown in Fig. 1(a), L5a= L6a=Lr, and C5a = C6a= Cr. The line-frequency full-bridge inverter consists of the switches Sr1, S2, S3, and S4; the inductors L1,L2, and capacitor C1 make up the filter connected to the grid; D7 and D8 are a couple of clamping diodes in the freewheeling period. The modulation pattern of the ZCT-H6-I is the same with the HS-H6-I topology. This section focuses on the operation principle analysis of the ZCT resonant tank.

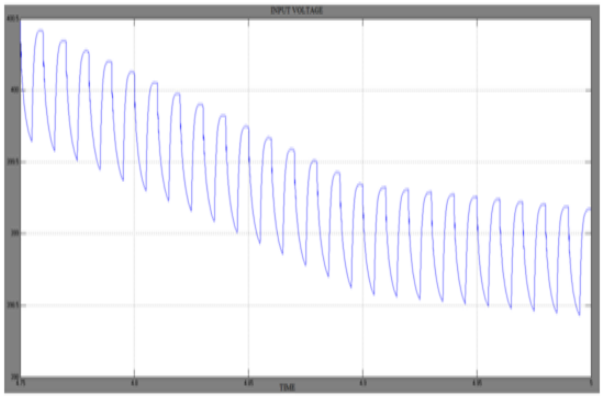
OPERATIONAL PRINCPLE ANALASYS;

Before the analysis, following assumptions are given:1)all semiconductor devices are ideal switches with anti parallel diodes , and the diodes are also ideal diodes without parasitic parameters (this assumption will ignore the reverse –recovery problem);2)the capacitance cdc1and cdc2of the dc filter are large enough to treated as a constant voltage sources and the inductance L1and L2of the filter are large enough to be treated as constant current at the switching frequency scale. by analyzing the operation principle of the ZCT-H6-1,the characteristics of the resonant tank can be concluded follows: during the switching transition , the shunt resonant network is activated to create a partial resonantto achieve zero current- turn off for the high frequency main switches; when the switching transition is over , the circuit simply reverts back to the familiar pulse width modulation operation mode in this wayachieve the soft switching preserving advantages of PWM style. the ZCT conceptZCT H6-1 in can alsobeextended to the other transformer less full bridge grid.

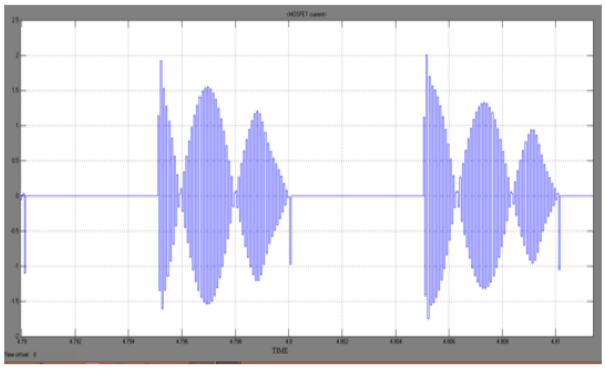
SIMULATION CIRCUIT:



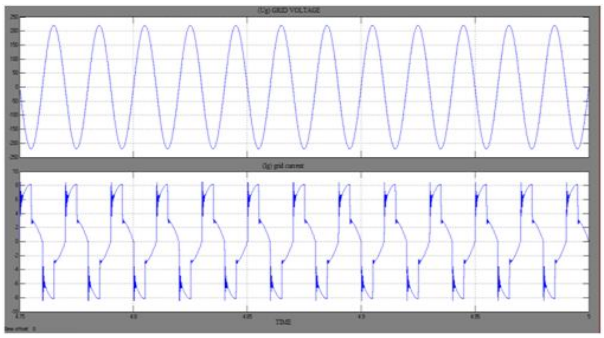
SIMULATION CIRCUIT OF SINGLE- PHASE ARRRAY ZCT CONVERTER.fig.1



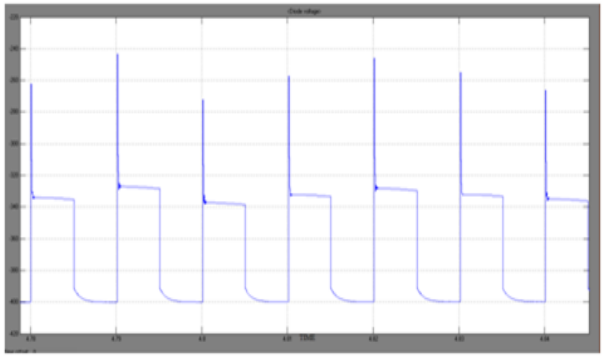
INPUT VOLTAGE OF ZCT-H6-1fig.2



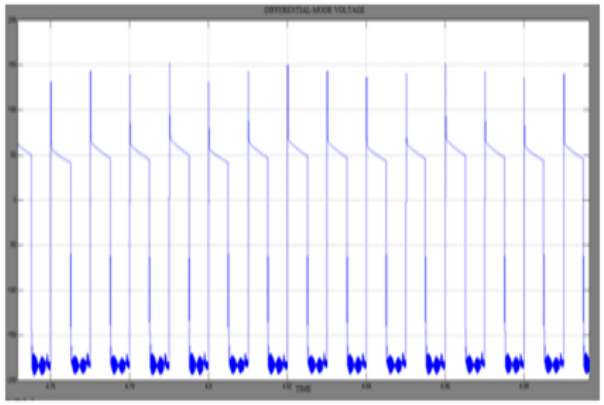
MOSFET CURRENT TO ZCT-H6-1fig.3



GRID VOLTAGE AND GRID CURRENT OF ZCT-H6-1fig.4



DIODE VOLTAGE OF ZCT –H6-1fig.5



DIFFERENT MODE VOLTAGE OF ZCTfig.6

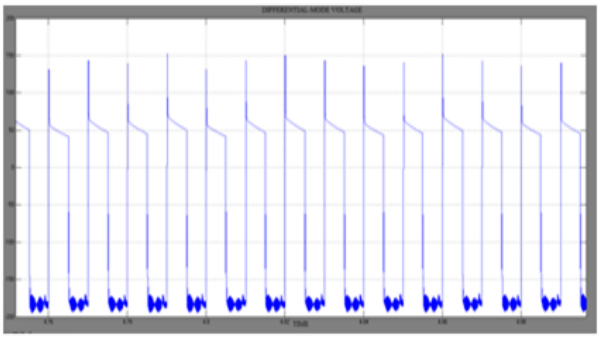


fig.7 DIFFERENTIAL MODE VOLTAGEOF ZCT-H6-1

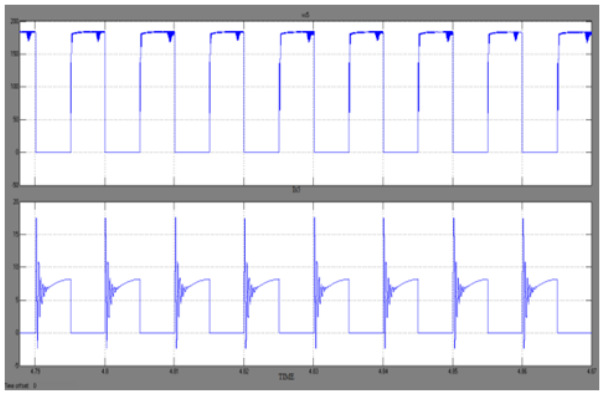


fig.8 SIMULATION WAVEFORM OF VS5,IS5

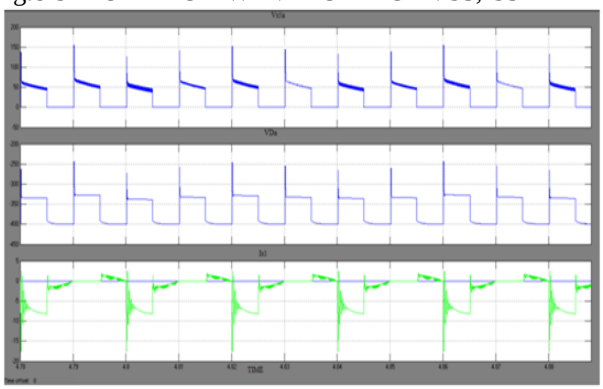


Fig.9 SIMULATION WAVFORM FOR VS5anaVDa, IS1.SIMULATION WAVEFORM FOR IS, and IS4, IS1.

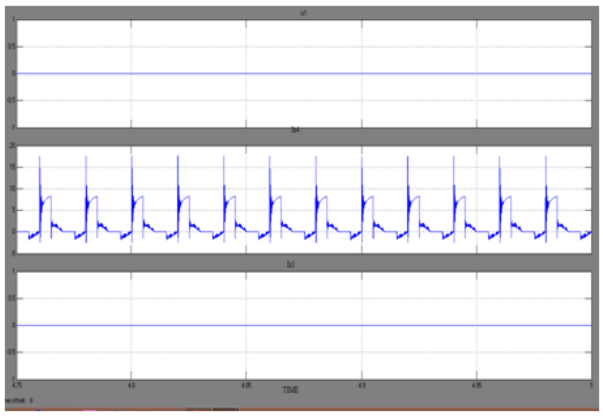


Fig.10 SWITCHING SIGNALS OF S1, S2, S3, S4, S5, AND S6.

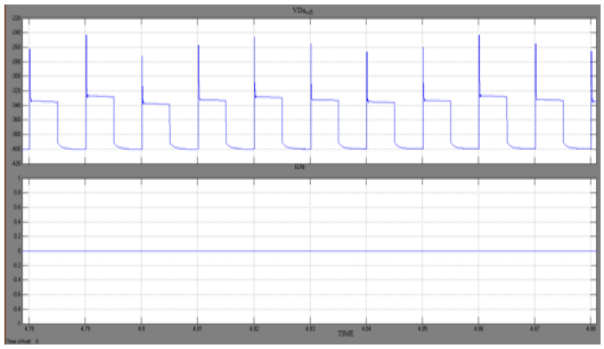


Fig11.SWITCHING SIGNAL FORVDaand IDa

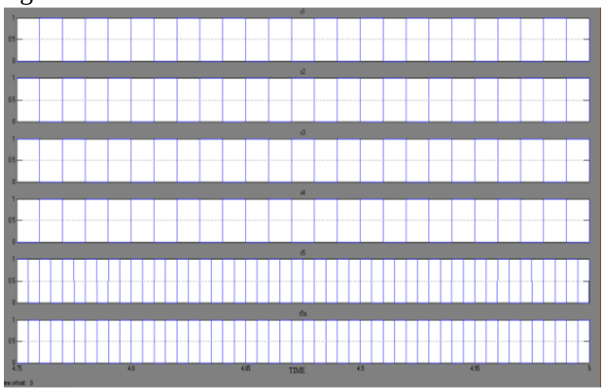
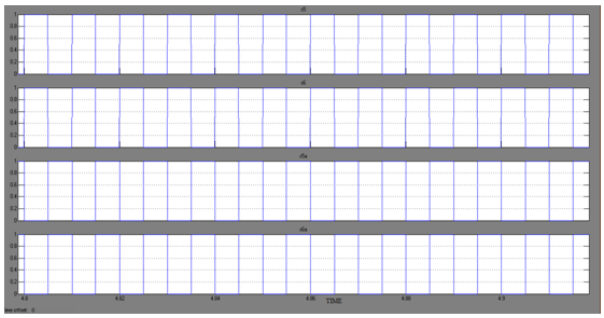


Fig.12SIMULATION WAVEFORMS FOR S5, S6, and S5a, S6a.



UNIQUE FEATURES OF FUZZY LOGIC;

The unique features of fuzzy logic that made it particularly good choice for many control problems are as follows ,it is inherent6ly robust since it does not require precise ,noise –free inputs and can be programmed to f ail safely is a feedback quits or destroye.the output is smooth control.Since the fuzzy logic controller process user defines rules governing the target of control system, it can be modify and tweak easily to improve or drastically alter system performance. New sensors can easily be incorporated's into the system by generating appropriate governing.

CONCLUSION;

The transformer less offer better efficiency, compared to those inverters that have a galvanic isolation. On the other hand ,in case the transformer is omitted ,the generating common mode behavior of the inverter topology greatly influences the ground leakage current through parasitic capacitance of pv bipolar PWM a constant commonmode voltage ,but the efficiency of the converter is low, due to the two level of output .using unipolar PWM modulation ,the output of the converter will have three levels , but in case the generated common-mode voltage will have high frequency components. that will lead to very high

ground leakage current. Bi directional switch, used to generate the zero voltage, the common mode voltageof the HB-ZVR topology and its high efficiency makes it makes it an attractive solution for transformer less PV applications.

Fuzzy logic controller to single phase inverters improves output wave forms and the lower THD .thispaper has presented a novel fuzzy PWM switchingsingle phase inverter. The reference signal generates the fuzzy controller .the behavior of the fuzzy controller single phase inverter was analyzed detail. By controlling the modulation index, the desired number of levels inverter'soutput can be achieved.

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