A High Efficient Cross Connected H-bridge Style Multilevel Inverter with Lower Power Components

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Abstract

Compare to the classical inverters, the multilevel inverter finds remarkable advantages, which can be suitably implemented in green energy power generation. Here an asymmetric multilevel inverter with fewer components is proposed for renewable energy applications. The proposed inverter is a cross between two H bridge-style devices. To maximize the output voltage three different algorithms to fix the amplitude of the DC sources are proposed and the best among them is chosen for implementation. The recommended inverter can generate 19 levels of output voltages using three DC sources with reduced power components. The nearest level modulation is used as the control course for the inverter. Here MATLAB software is used to simulate the proposed inverter and the performance of the inverter is observed. The proposed inverter is constructed in real-time, and the performance of the inverter is studied by testing with fixed and variable reactive loads. A comparative study is made between the simulation model and real-time work results in-terms of efficiency and harmonics in the load wave-forms.

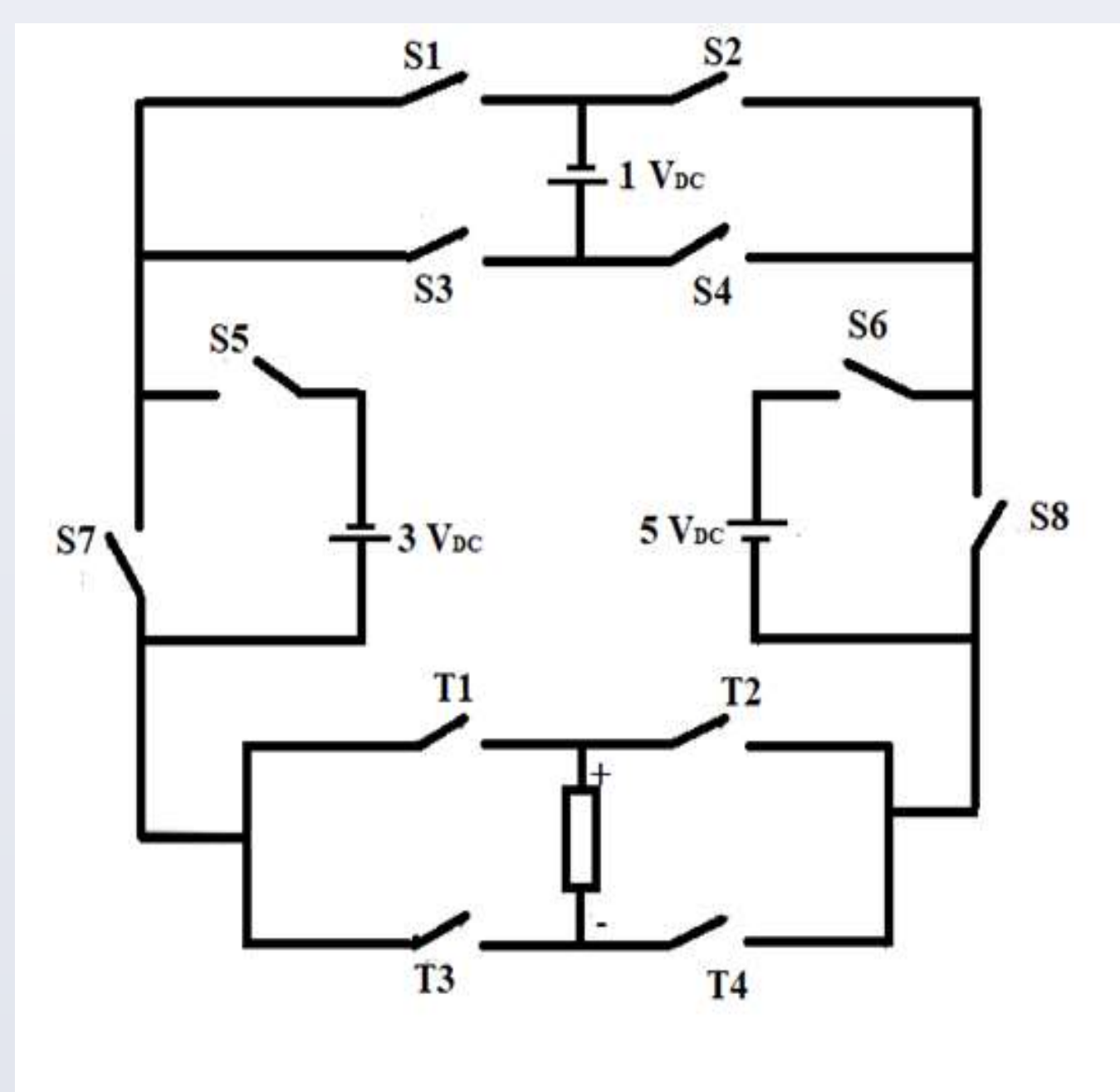## 1.Design of Proposed Ladder MLI to Generate 19-Level

Fig. 1. 19-level MLI

Table 1. Switching pattern of proposed MLI

V_{DC}	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12
0V	0	0	1	1	0	0	1	1	1	1	0	0
1V	1	0	0	1	0	0	1	1	1	1	0	0
.	.	.	.	.	.	.	.	.	.	.	.	.
9V	1	0	0	1	1	1	0	0	1	1	0	0
0V	0	0	1	1	0	0	1	1	1	1	0	0
-1V	1	0	0	1	0	0	1	1	0	0	1	1
.	.	.	.	.	.	.	.	.	.	.	.	.
-9V	1	0	0	1	1	1	0	0	0	0	1	1

2. Simulation and Experimentation of 19-Level MLI
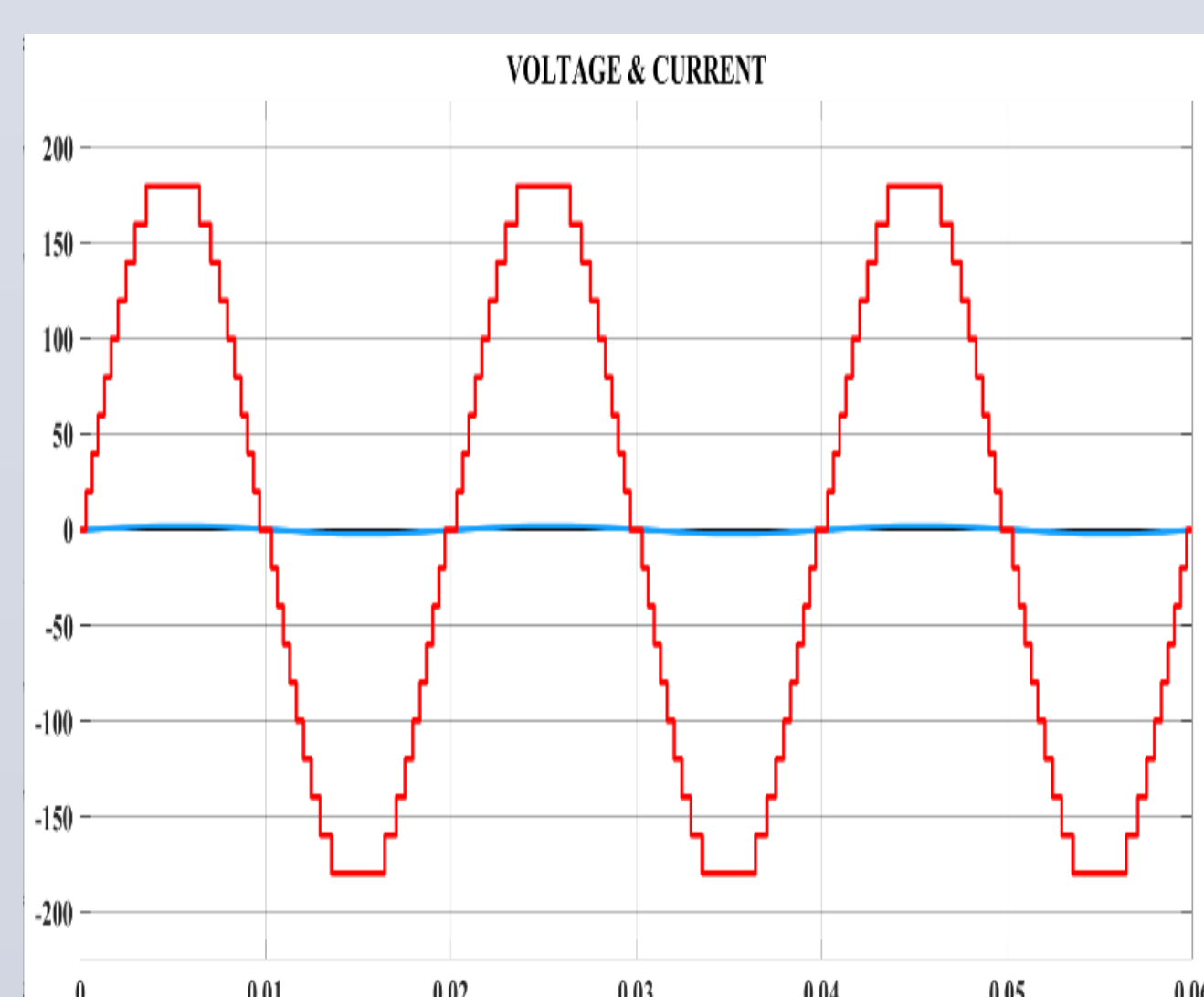

Fig. 2. Output voltage & current waveforms for RL load.
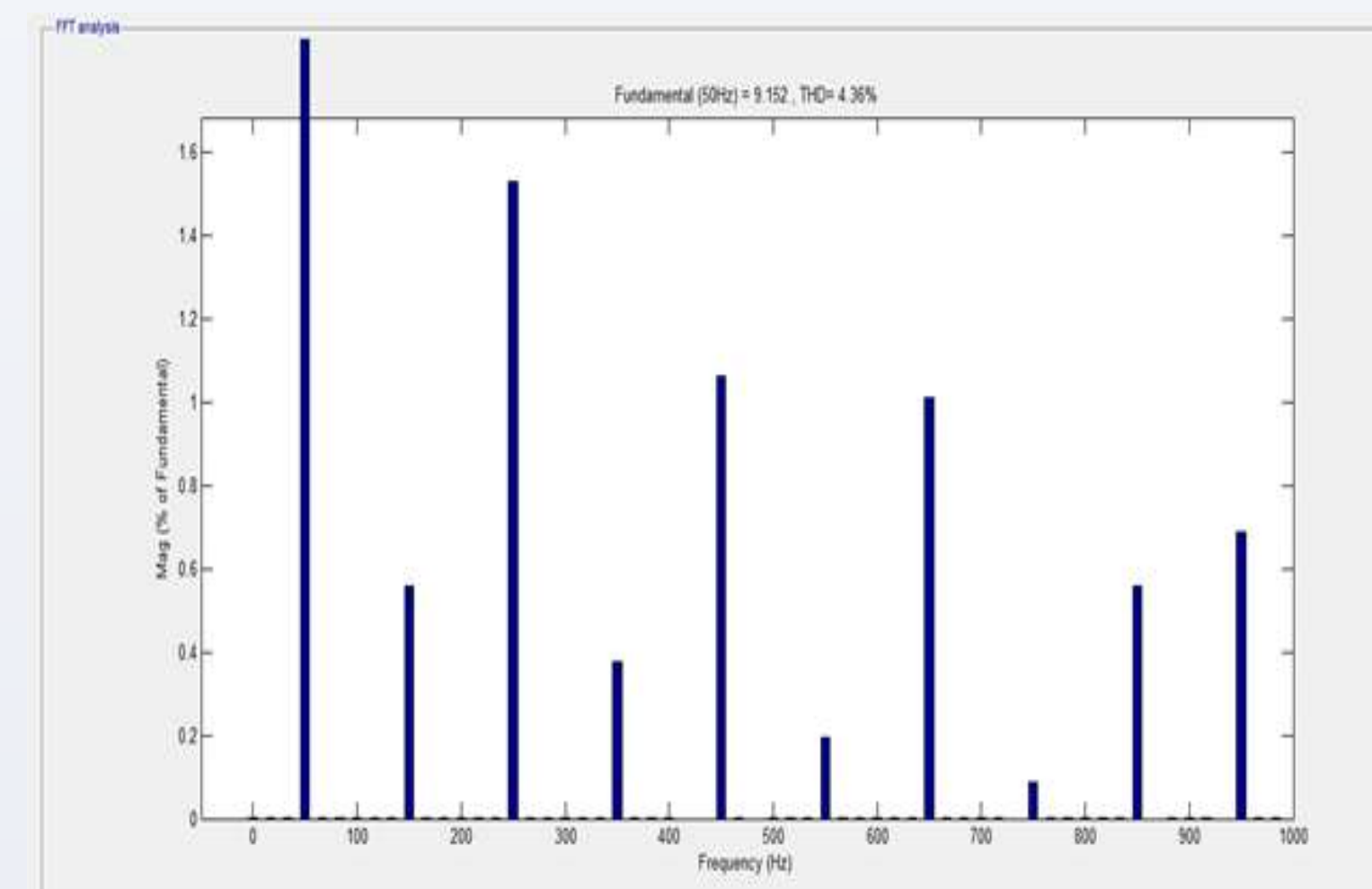

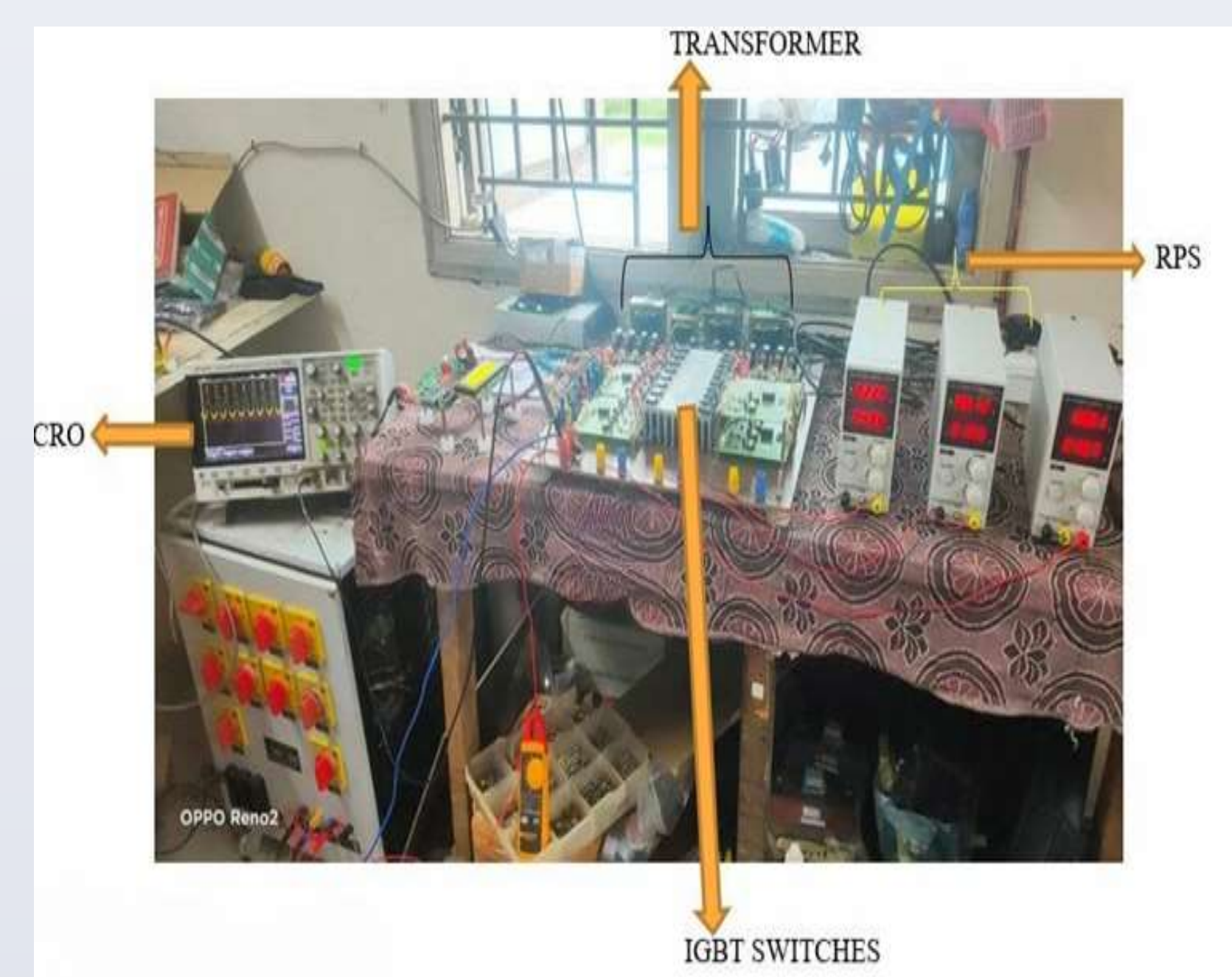Fig. 3. Output voltage & current waveforms for RL load.

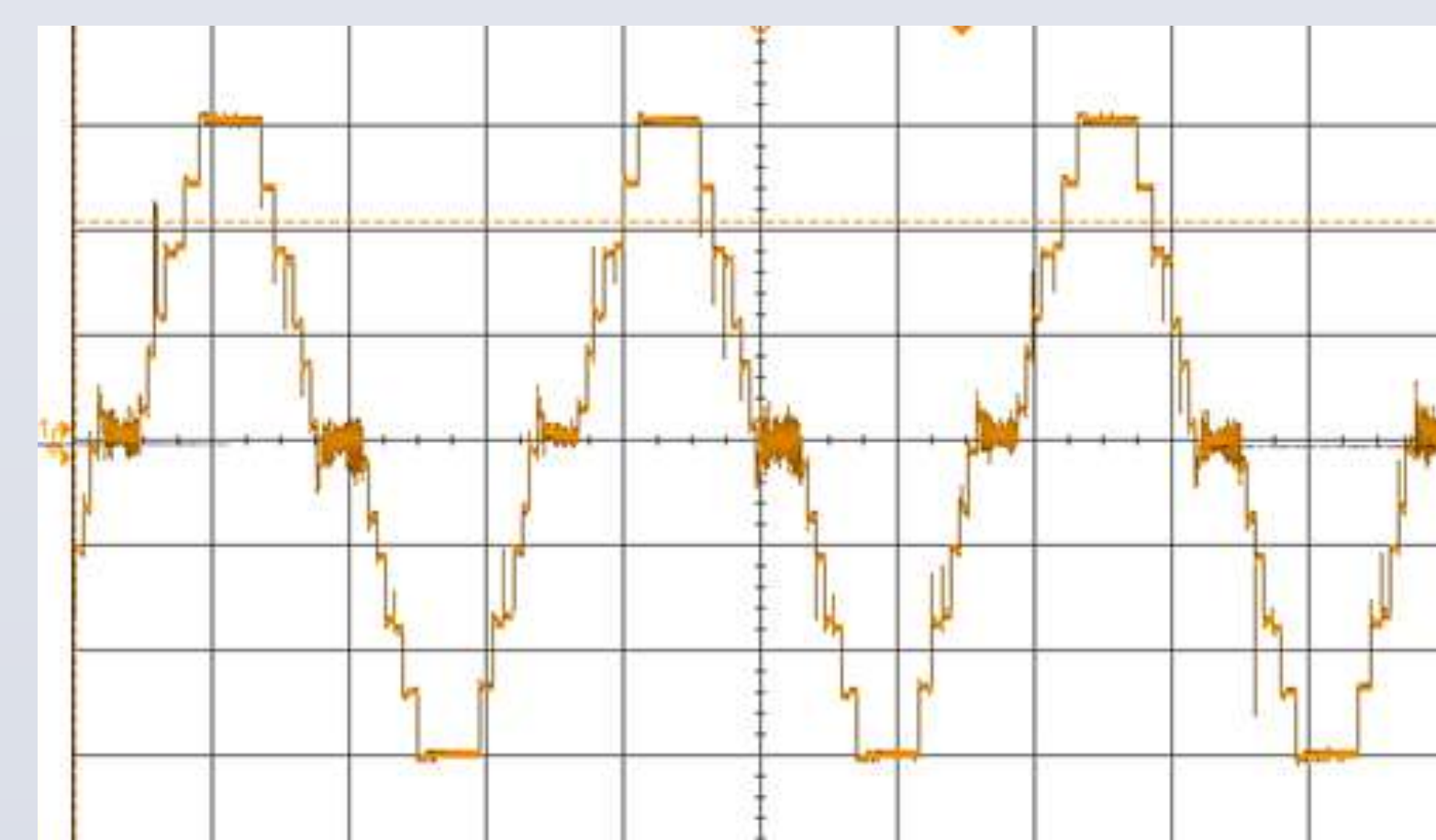Fig. 4. Hardware Model Of 19 Level MLI

Fig. 5. Experimental load waveform for RL load.

Table 2. Performance Parameters- of 19-level MLI

Load	V_o	I_o	P_o	%eff	THD
R	180	2	360	95.16	4.30
RL	180	2	360	94.34	4.26

Conclusion

This paper presents the asymmetric multilevel inverter with the reduced number of DC sources and switches count. The proposed inverter produces the 19 levels of output voltage and controlled using Nearest Level Modulation technique. The inverter voltage sources are set as V1 = VDC, V2 = 3VDC, V3 = 5 VDC. The inverter is simulated using Matlab software which produces lower THD = 4.26% which is minimum compared to standard IEEE formats. The is also tested in real time for fixed R and RL loads. Because of the variable DC supply the configured inverter is more suitable for renewable energy systems.