DOI

Modular Multilevel Converter Control Strategy Under Unbalanced Grid Condition

ABSTRACT:

0

KEY WORDS:

$$P_x = \frac{}{T}\int^T u_x i_x \; t = \frac{}{T}\int^T u_x \; i \;_x + i \;_x \;\; t$$

$$P \;_x = \frac{}{T}\int^T \frac{U}{} i \;_x \; t - \frac{}{T}\int^T \frac{U}{} i \;_x \; t =$$

$$\frac{}{T}\int^T U \; I \;_x \; t$$

$$P_x = -\frac{}{T}\int^T u \;_x i \;_x \; t = -\frac{}{T}\int^T \frac{U}{} I \;_x \; t$$

$$\frac{}{T}\int^T u_x i \;_x \; t$$

$$P_x = \frac{}{T}\int^T u \;_x i \;_x \; t = -\frac{}{T}\int^T \frac{U}{} I \;_x \; t$$

$$\frac{}{T}\int^T u_x i \;_x \; t$$

1.1

$$P_x = P_x \approx$$

$$P \;\; = P \;\; \Rightarrow \frac{}{T}\int^T u \;\; i \;\;\; t = \frac{}{T}\int^T U \;\; I \;\;\; t$$

$$P \;\; = P \;\; \Rightarrow \frac{}{T}\int^T u \;\; i \;\;\; t = \frac{}{T}\int^T U \;\; I \;\;\; t$$

$$P \;\; = P \;\; \Rightarrow \frac{}{T}\int^T u \;\; i \;\;\; t = \frac{}{T}\int^T U \;\; I \;\;\; t$$

$I \;\; = I \;\; = I \;\; = I$ $\qquad i \quad i \quad i$

$I \;\; = I \;\; = I$

$$P \;\; = P \;\; = P \;\; \Rightarrow P \;\; = P \;\; = P \;\; \Rightarrow$$

$$\frac{}{T}\int^T u \;\; i \;\;\; t = \frac{}{T}\int^T u \;\; i \;\;\; t = \frac{}{T}\int^T u \;\; i \;\;\; t$$

$u \quad u \quad u$

$i \quad i \quad i$

$i \quad i \quad i$

$I \;\; \neq I \;\; \neq I$

$i \quad i \quad i$

$u \quad u \quad u$

$$P \;\; \neq P \;\; \neq P \;\; \Rightarrow P \;\; \neq P \;\; \neq P \;\; \Rightarrow$$

$$\frac{}{T}\int^T U \;\; I \;\;\; t \neq \frac{}{T}\int^T U \;\; I \;\; dt \neq \frac{}{T}\int^T U \;\; I \;\;\; t \Rightarrow$$

$$I \;\; \neq I \;\; \neq I$$

$$P \;\; = P \;\; = P \;\; \Rightarrow P \;\; = P \;\; = P \;\; \Rightarrow$$

$$\frac{}{T}\int^T U \;\; I \;\;\; t = \frac{}{T}\int^T U \;\; I \;\;\; t = \frac{}{T}\int^T U \;\; I \;\;\; t \Rightarrow$$

$$I \;\; = I \;\; = I \;\; = I$$

1.2

U

I_x

$P \;_x \qquad i_x$

P_x

I_x

$i_x \quad i_x \qquad I_x \quad i_x \quad i_x$

Δi_x

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Tab. 1 Circuit and experimental parameters

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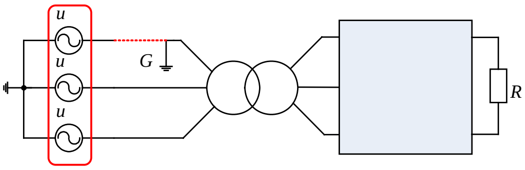
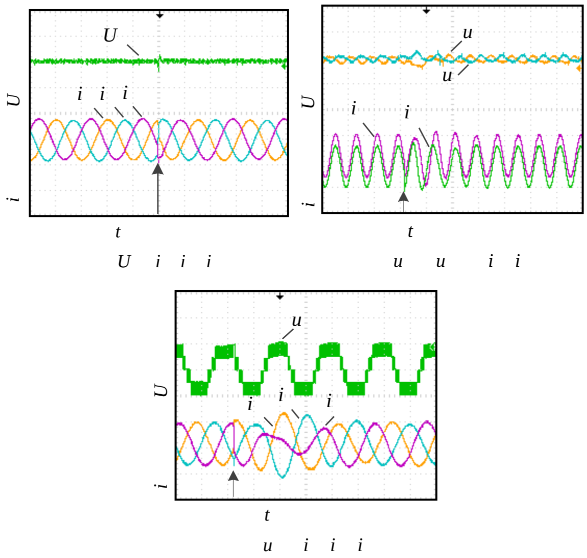
f
P



10

Fig. 10 Grid fault scheme



U i i i

u u i i

u i i i

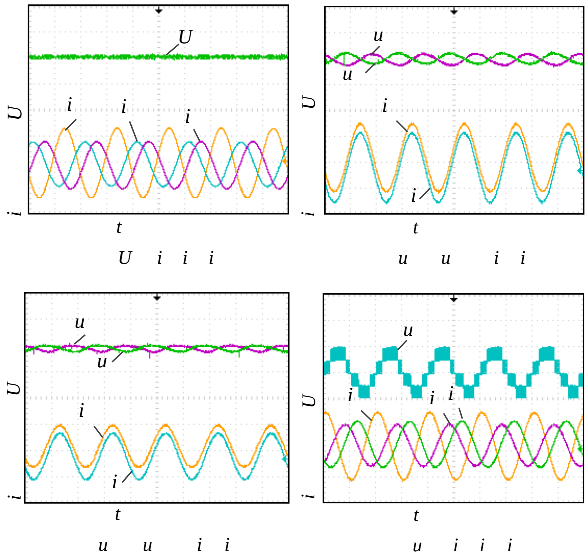
11 MMC

Fig. 11 Experimental results of MMC with dynamic reactive power

u u

i i

i



U i i i

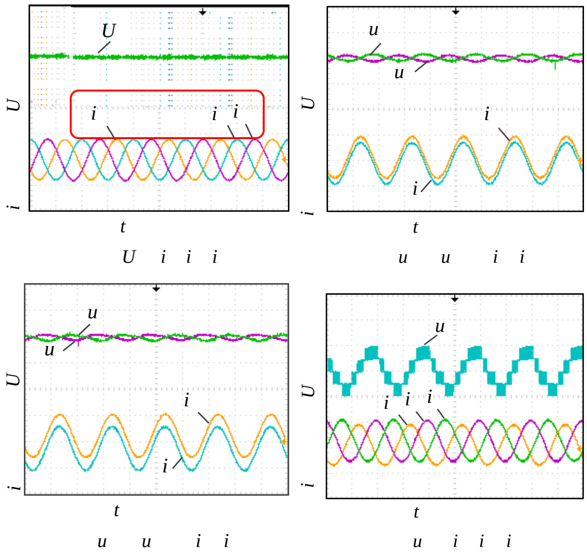
u u i i

u u i i

u i i i

12 [18]

Fig. 12 Experimental result with the control strategy proposed in [18] under unbalanced grid condition



U i i i

u u i i

u u i i

u i i i

13

Fig. 13 Experimental results with the control strategy proposed in this paper under unbalanced grid condition

4

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$$P \quad = P \quad \Rightarrow \frac{}{T}\int u \quad i \quad t = \frac{}{T}\int U \quad I \quad t$$

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$i \quad i \quad i$

$I \quad \neq I \quad \neq I$

$$P \quad \neq P \quad \neq P \quad \Rightarrow P \quad \neq P \quad \neq P \quad \Rightarrow$$

$$\frac{}{T}\int U \quad I \quad t \neq \frac{}{T}\int U \quad I \quad dt \neq \frac{}{T}\int U \quad I \quad t \Rightarrow$$

$$I \quad \neq I \quad \neq I$$

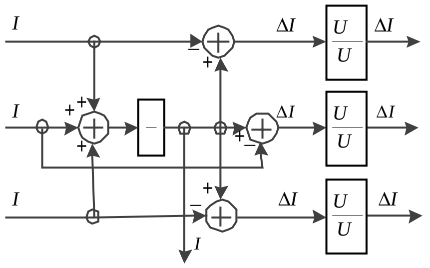

Fig. 1 AC-side current balancing control

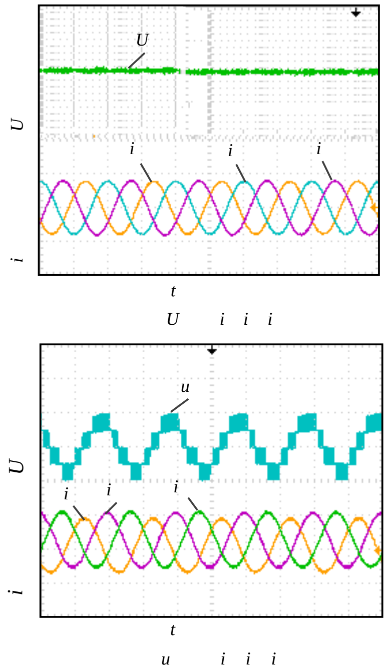

Fig. 2 Experimental results with the proposed control strategy under unbalanced grid condition