



27th International Conference on
MAGNET TECHNOLOGY

November 15-19, 2021, Fukuoka, Japan

*Hybrid Conference:
On-site and On-line*

Analysis on Fault Current Limiting and Recovery Characteristics of Three-Phase Transformer Type SFCL using Two SMs between Secondary Windings

Sung-Hun Lim¹, Seok-Cheol Ko², Tae-Hee Han³

1: Department of Electrical Engineering, Soongsil University, Seoul, Republic of Korea

2 : Industry-University Cooperation Foundation, Kongju National University, Republic of Korea

3 : Department of Semiconductor Engineering, Jungwon University, Republic of Korea

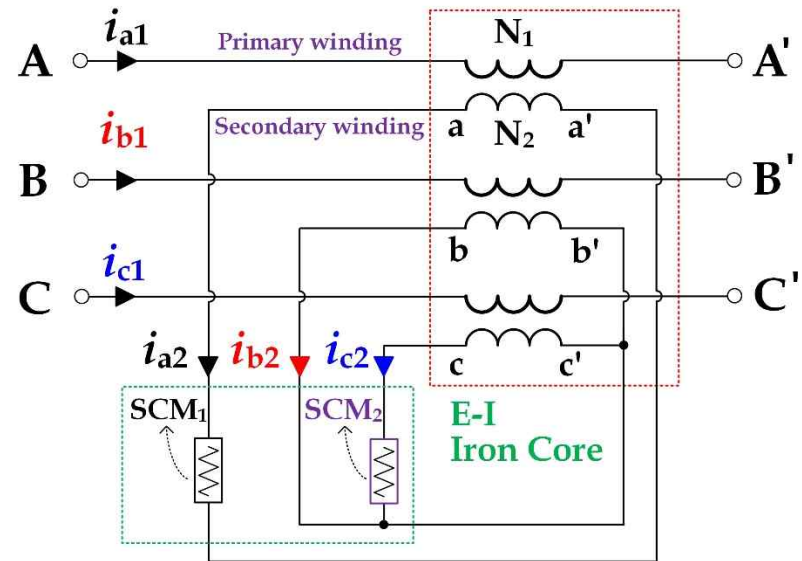
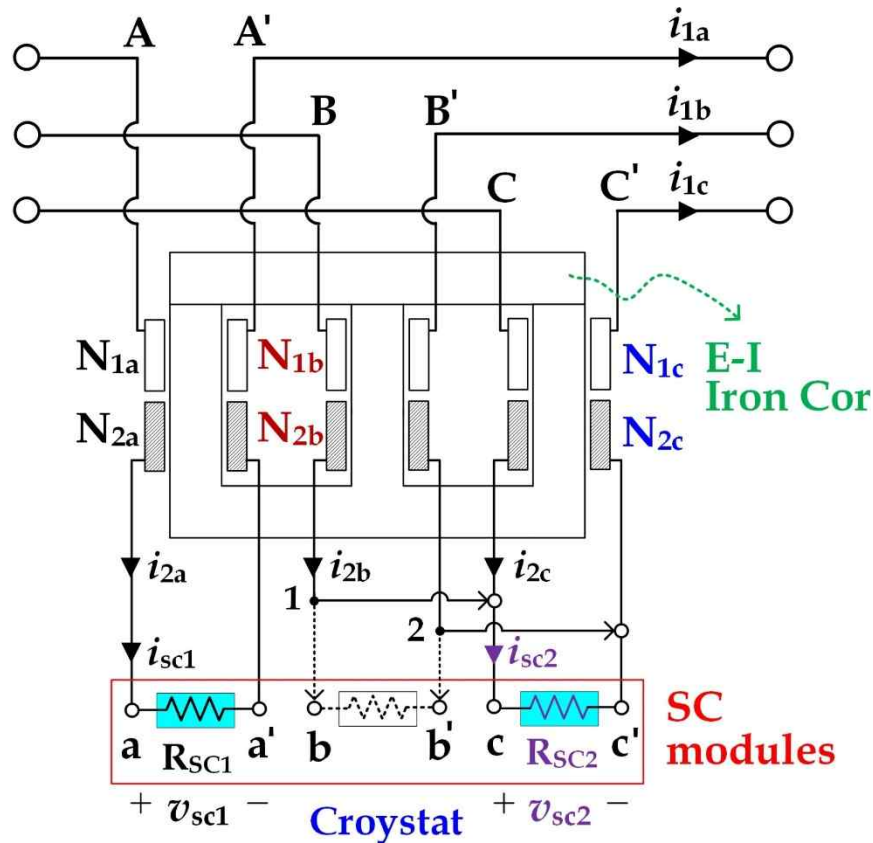
1. Introduction

Three-phase transformer type superconducting fault current limiter (SFCL) using two superconducting module (SM)s between secondary windings, which consisted of three-phase transformer windings wound on three legs of E-I iron core and two SMs connected between secondary windings, were suggested and its fault current limiting and recovery characteristics using double quench of two SMs were analyzed.

To verify the effective fault current limiting operation of three-phase transformer type SFCL using two SMs between secondary windings, the unsymmetrical ground and the symmetrical ground faults were applied into three-phase power simulated system with the suggested SFCL.

Through analysis on the test results, three-phase transformer type SFCL using two SMs between secondary windings was confirmed to have effective fault current limiting and recovery operations through double quench of two SMs.

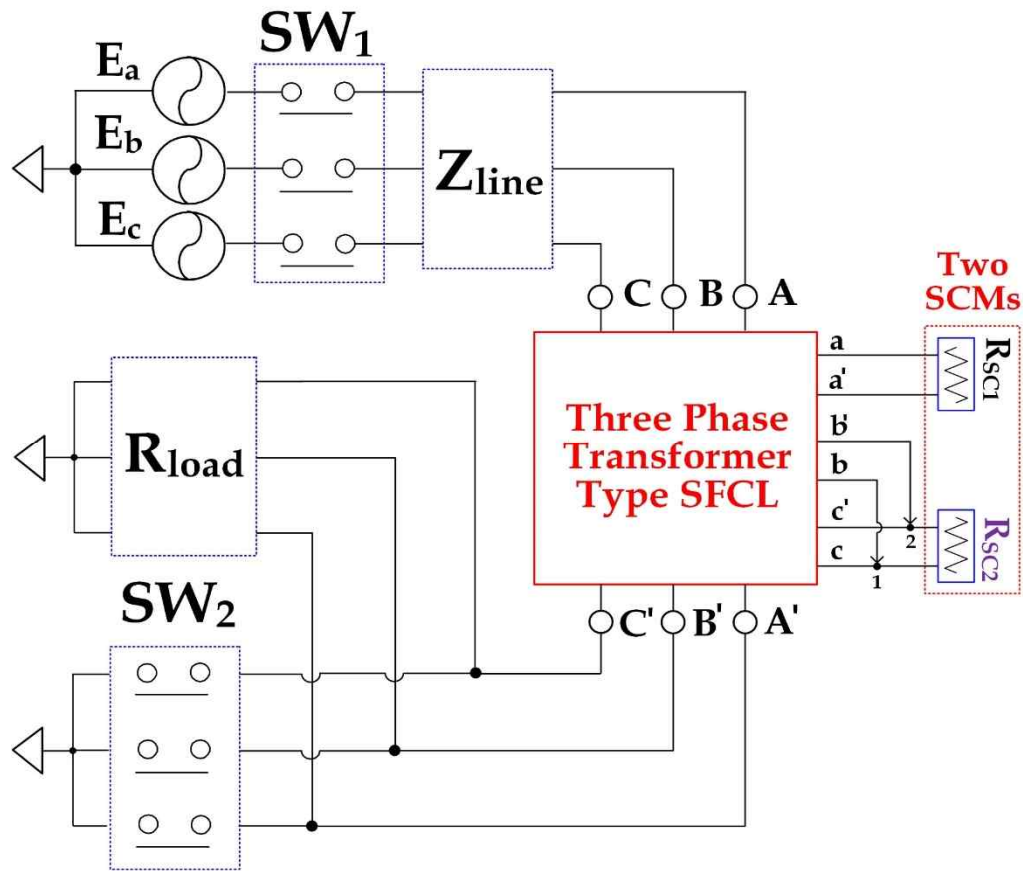
2. Configuration



Schematic configuration of Schematic structure of three-phase transformer type SFCL using two SCMs between secondary windings

Power System Protection
& Superconducting Power Application Lab.

3. Experimental Circuit

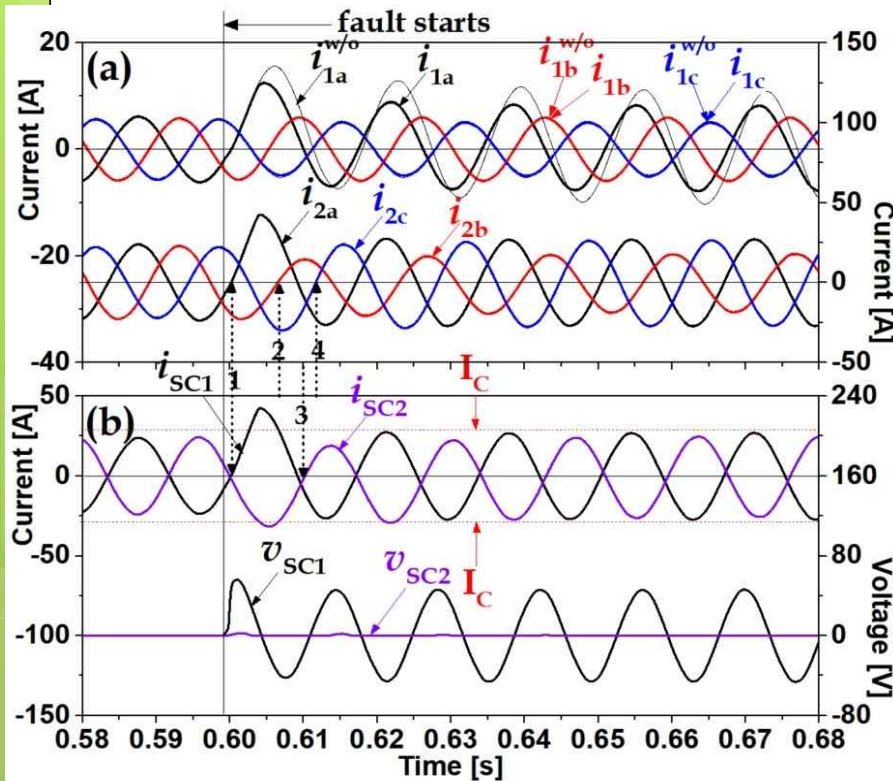


Experimental test circuit of three-phase transformer type SFCL using two SCMs between secondary windings.

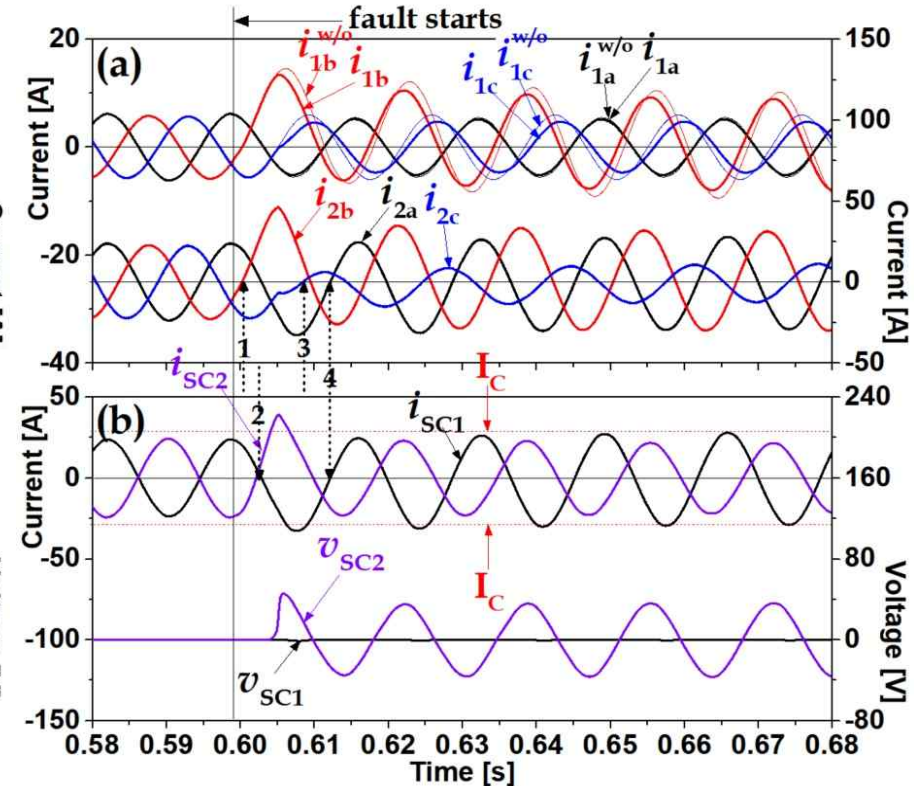
Power System Protection
& Superconducting Power Application Lab.

4. Experimental Results and Analysis

SLG in a phase



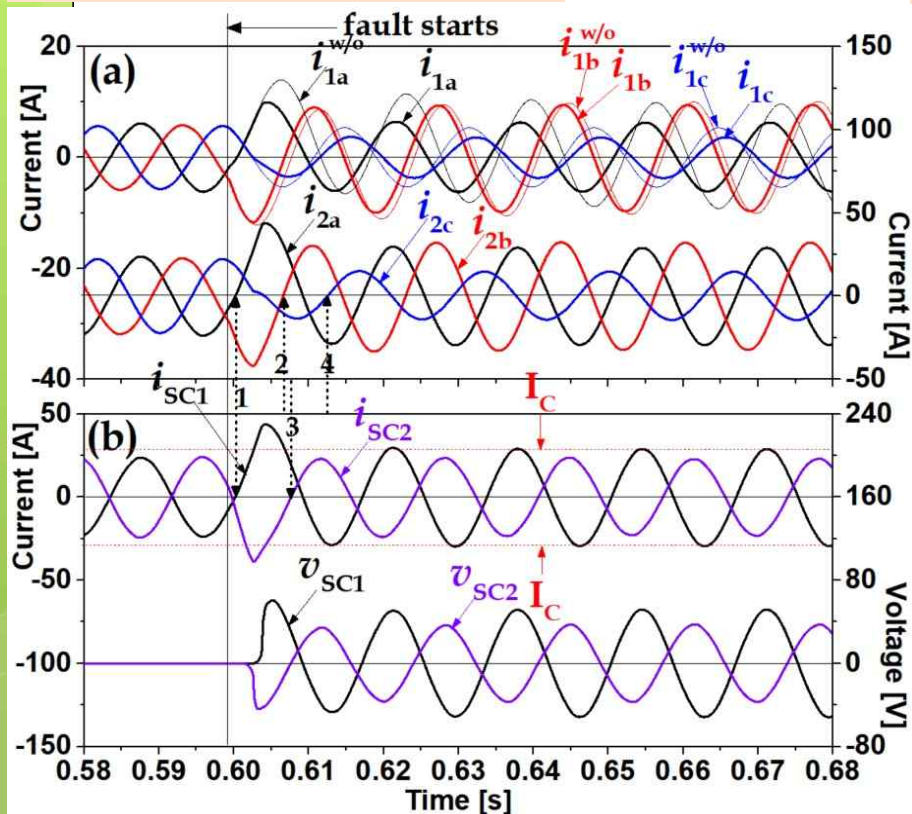
SLG in b phase



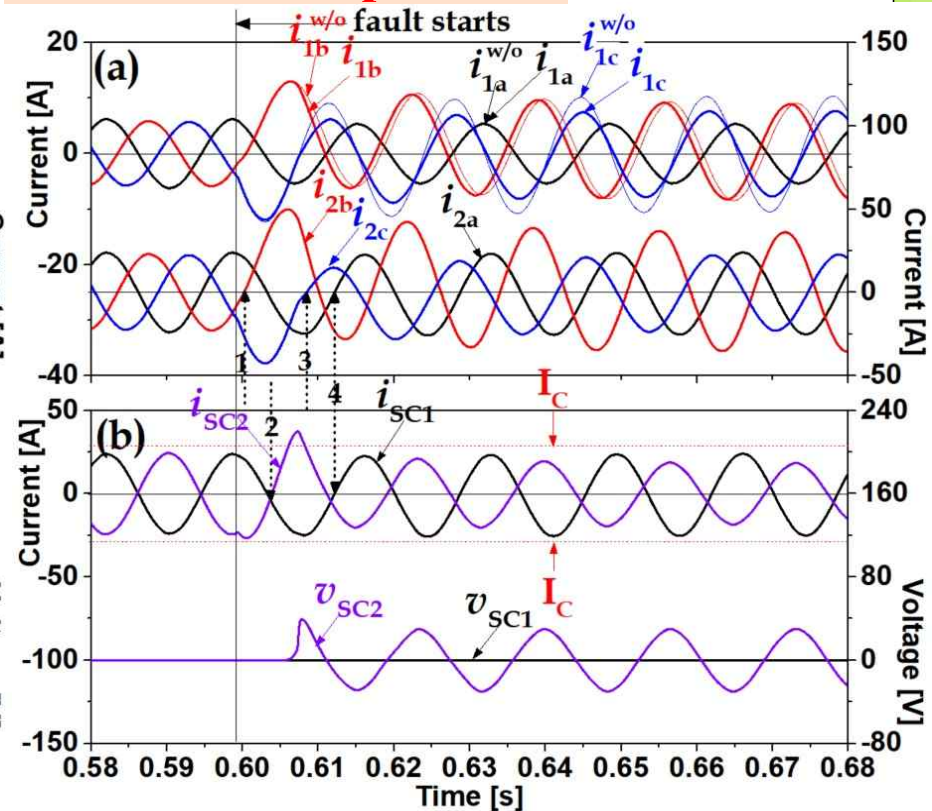
Fault current limiting operational waveforms of three-phase transformer type SFCL using two SCMs in case that single-line ground (SLG) fault. (a) Current waveforms flowing into the primary windings (i_{1a} , i_{1b} , i_{1c}) and from the secondary windings (i_{2a} , i_{2b} , i_{2c}). (b) Current (i_{SC1} , i_{SC2}) and voltage (v_{SC1} , v_{SC2}) waveforms of two SCMs.

Power System Protection
& Superconducting Power Application Lab.

DLG in a & b phases



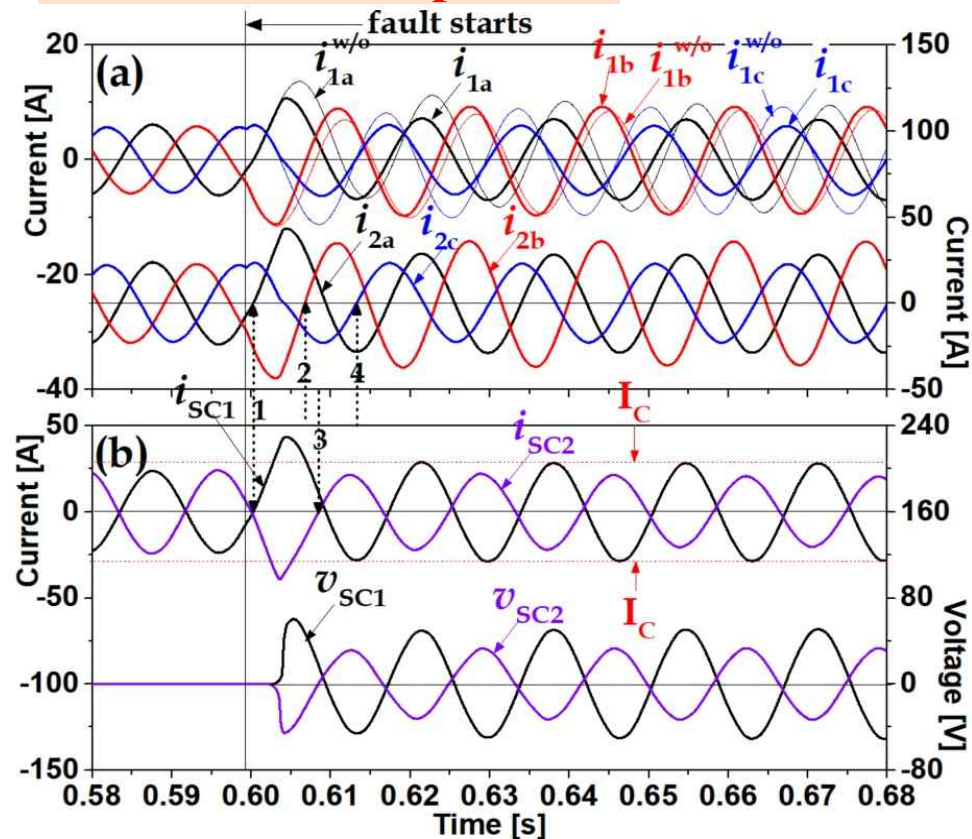
DLG in b & c phases



Fault current limiting operational waveforms of three-phase transformer type SFCL using two SCMs in case that double-line ground (DLG) fault (a) Current waveforms flowing into the primary windings (i_{1a} , i_{1b} , i_{1c}) and from the secondary windings (i_{2a} , i_{2b} , i_{2c}). (b) Current (i_{SC1} , i_{SC2}) and voltage (v_{SC1} , v_{SC2}) waveforms of two SCMs.

Power System Protection
& Superconducting Power Application Lab.

TLG in a, b & c phases



Fault current limiting operational waveforms of three-phase transformer type SFCL using two SCMs in case that Triple-line ground (TLG) fault (a) Current waveforms flowing into the primary windings (i_{1a} , i_{1b} , i_{1c}) and from the secondary windings (i_{2a} , i_{2b} , i_{2c}). (b) Current (i_{SC1} , i_{SC2}) and voltage (v_{SC1} , v_{SC2}) waveforms of two SCMs.

Power System Protection
& Superconducting Power Application Lab.

5. Conclusion

Analysis on Fault Current Limiting and Recovery Characteristics of Three-Phase Transformer Type SFCL using Two SMs between Secondary Windings

In this paper,

Three-phase transformer type superconducting fault current limiter (SFCL) using two superconducting module (SM)s between secondary windings, which consisted of three-phase transformer windings wound on three legs of E-I iron core and two SMs connected between secondary windings, were suggested and its fault current limiting and recovery characteristics using double quench of two SMs were analyzed.

Through analysis on the test results, three-phase transformer type SFCL using two SMs between secondary windings was confirmed to have effective fault current limiting and recovery operations through double quench of two SMs

Power System Protection
& Superconducting Power Application Lab.