



Contribution ID: 422

Type: **Invited Oral Presentation**

## **[Invited] Development of 22kV HTS Triaxial superconducting bus**

*Tuesday 11 July 2017 16:00 (30 minutes)*

Superconducting cable is expected to be a device to go in a market in near future. As for the applications meet the needs and cost point of view, we selected a high capacity bus connecting between a generator and a step-up transformer in power plant, where an isolated phase bus (IPB) is used for the conventional technology. 2015, we designed a HTS superconducting bus with rated 22kV and 10kA. Basic studies were performed, such as  $I_c$  measurement test of each phase and withstand voltage test thereof, resulting in indicating effectiveness of replacement of IPB with superconducting bus with triaxial cable. In this study, based on the specification designed in 2015, we prepared prototype cables having the carrying capacity of 1/4 and tested them using the test parameter of IPB. We used in-house YBCO superconducting tapes manufactured by MOD process, which have 4155m in length, 4mm in width, and the  $I_c$  values around 150A at 77.3K in self-field. A 20m-long test triaxial bus was manufactured to confirm the electrical and mechanical properties. We performed type test with triaxial bus based on CIGRE TB 538. After loading cycle test we confirmed that test circuit was withstood for AC 52kV and lightning impulse voltage 125kV and partial discharge was not occur over noise level. We also performed 3 phase short-circuit current test on 2.5m sample of triaxial bus applied 25kV with duration 2.0 sec. Sample of triaxial bus could flow such 3 phase short-circuit current without electrical and mechanical damage. In this presentation, we will report those results of a 1/4 scale of superconducting triaxial bus. This works is available for application in the large fields such as electric propulsion aircrafts. Acknowledgment This paper is based on results obtained from a project subsidized by the New Energy and Industrial Technology Development Organization (NEDO).

**Author:** Mr MIDO, Nobuhiro (SWCC SHOWA CABLE SYSTEMS CO., LTD.)

**Co-authors:** Mr SUGANE, Hideo (SWCC SHOWA CABLE SYSTEMS CO., LTD.); Mr ADACHI, Kazuhisa (SWCC SHOWA CABLE SYSTEMS CO., LTD.); Dr SHIOHARA, Kei (SWCC SHOWA CABLE SYSTEMS CO., LTD.); Prof. IWAKUMA, Masataka (KYUSHU UNIVERSITY); Mr KONNO, Masayuki (Fuji Electric Co., Ltd.); Mr HIRONAGA, Ryusuke (SWCC SHOWA CABLE SYSTEMS CO., LTD.); Mr SANO, Shigeki (SWCC SHOWA CABLE SYSTEMS CO., LTD.); Dr HASEGAWA, Takayo (SWCC SHOWA HOLDINGS CO., LTD.); Dr KITAMURA, Tasuku (SWCC SHOWA CABLE SYSTEMS CO., LTD.); Mr KOIZUMI, Tsutomu (SWCC SHOWA CABLE SYSTEMS CO., LTD.)

**Presenter:** Mr MIDO, Nobuhiro (SWCC SHOWA CABLE SYSTEMS CO., LTD.)

**Session Classification:** M2OrE - Focused Symposia - Propulsion VII: Wires & Cables