

# DOMESTIC JUNIOR RESEARCHER EXCHANGE PROGRAM

## 若手励起プログラム報告

### ムハマド・シャーバズ・アンワー

京都大学 大学院理学研究科 PD

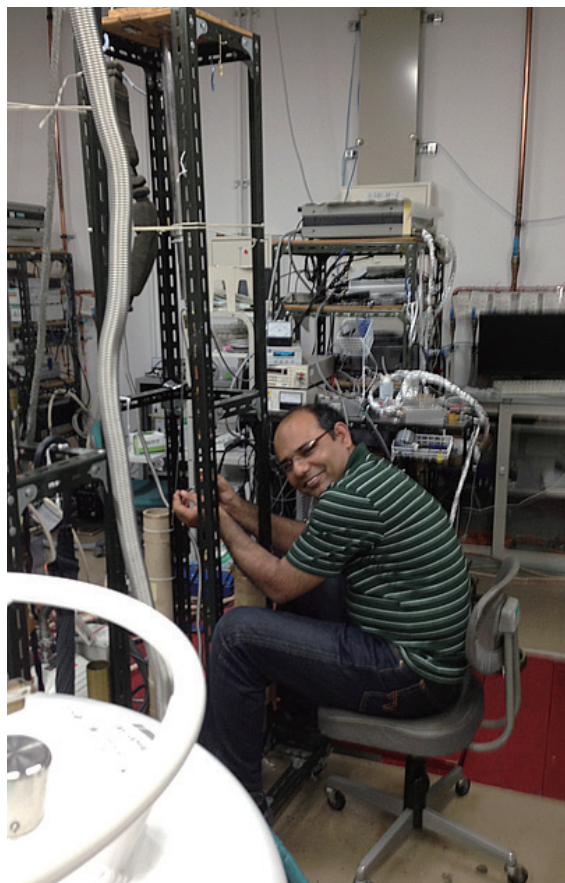
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**Self Introduction:** After my PhD at Leiden University, I moved to Kyoto University. Here, I have been working at with Prof. Yoshiteru Maeno since 2012. During my stay at Kyoto, I worked on Topological superconducting junctions and spin-triplet superconductor based proximity hybrid systems. Very recently, I successfully completed my JSPS fellowship and started my research work as a TMS researcher in December. Thanks to TMS project, I got a chance to visit Prof. Satoshi Kashiwaya at AIST.

**Visit to AIST:** Since the discovery of unconventional superconductivity in  $\text{Sr}_2\text{RuO}_4$ , various experiments demonstrate that the orderparameter of  $\text{Sr}_2\text{RuO}_4$  exhibits the chiral p-wave spin-triplet nature with time reversal symmetry breaking. Such superconductors can form domains with degenerate chirality of their superconducting order parameter. A chiral-domain wall separates two domains with opposite chirality. Chiral-domain walls must exhibit dynamic behavior just like ferromagnetic domain walls [M. S. Anwar *et al.*, Sci. Rep. (2013)]. Recently, we systematically observed telegraphic-like noise in Nb/Ru/ $\text{Sr}_2\text{RuO}_4$  topological superconducting junctions, with which the phase winding of order parameter can be effectively probed by making use of real-space topology. The observed anomalous telegraphic-like noise is well explained by chiral-domain-wall motion. It is a natural question, whether we can control the motion of chiral-domain walls? To answer this question, we studied topological junctions in various configurations and collected interesting data. Prof. S. Kashiwaya is one of the experts of superconducting



junctions based on unconventional superconductors. During my stay at AIST, we discussed and studied our data in detail to establish a strong conclusion. Furthermore, we also discussed our very recent observation of direct induction of spin-polarized supercurrents into a ferromagnetic  $\text{SrRuO}_3$  out of  $\text{Sr}_2\text{RuO}_4$  [M. S. Anwar *et al.*, Nat. Commun. (2016)]. My visit to AIST also provided me opportunities to discuss our data of  $\text{SrRuO}_3/\text{Sr}_2\text{RuO}_4$  junctions. I also visited the facilities available to fabricate complicated novel Josephson junction based on spin-triplet superconductors. We planned our future experiments and collaborations to extend on exotic proximity effects. We believe that our work has important implications in the field of Superspintronics. I am thankful to TMS project for giving me a chance to visit AIST-Tsukuba.