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SUPERCONDUCTING QUANTUM INTERFERENCE DEVICES MADE FROM HIGH-TEMPERATURE SUPERCONDUCTORS

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In 1986 a new class of materials was discovered which exhibited superconductivity at temperatures which exceeded those of all previously known materials and all theoretical estimates of where conventional superconductivity could occur. Unlike the majority of conventional superconducting materials, high-temperature superconductors have properties that are extremely dependent upon details of their crystal structure and oxygen content, both of which are very sensitive to preparation conditions and subsequent handling. This new class of superconducting materials is very difficult to make in technologically useful forms but, nevertheless, its discovery fueled a great deal of speculation on new applications for the phenomenon. Active electronic devices (Josephson junctions) were made from these materials shortly after their discovery, but devices such as SQUID magnetometers exhibited performance lagging their low temperature counterparts by as much as 6 orders of magnitude in relevant parameters such as noise level. In the intervening years, the performance of state-of-the-art high-T_c SQUIDs has closed to within less than a factor of 5 of that of low-T_c SQUIDs, and commercially available high-T_c SQUIDs are now comparable in most respects to commercially available low-T_c SQUIDs. As improvements in high-T_c SQUID technology has proceeded, the list of applications for which they could be employed has grown. The development of high-T_c SQUIDs at Conductus and Conductus' pursuit of applications for these devices will be discussed.

* This talk is based on the work of a large number of Conductus people including (in alphabetical order): Andy Barfknecht, Robin Cantor, Kookrin Char, Mark Colclough, Steve Garrison, Luke Lee, Joseph Longo, Ward Ruby, Mark Teepe, Vladimir Vinetskiy, and Greg Zaharchuk