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Brightening up the Wireless World with Embedded Passives

The Hong Kong University of Science and Technology (HKUST) has been awarded HK\$29.5 million for a technology project that will upgrade the design and manufacturing capability of the local electronics industry. Wireless communications will be among its many applications.

The "Embedded Passives on Flexible Substrates Program" is the largest project yet sponsored by the Government's Innovation and Technology Fund (ITF). The total project cost will be shared equally by the [Innovation and Technology Commission](#) (ITC) and [Compass Technology Co Ltd](#).

"This project is the largest active R&D project at HKUST. It will greatly upgrade the technological sophistication and the end-use value of products manufactured by the Hong Kong electronics industry. This will help propel our electronic packaging industry to the forefront in the world market," says Prof Otto Lin, HKUST's Vice-President for Research and Development.

"We appreciate the foresight and confidence of the ITC and Compass Technology in sponsoring the project. I am certain that this close university-industry partnership will enhance Hong Kong's competitiveness and bring more quality employment to Hong Kong," he says.

"We believe Hong Kong has the potential of becoming one of the key leading players in the world integrated circuit (IC) packaging market. We have formed a strong alliance with HKUST because it possesses the technical know-how to develop innovative embedded passive technology. This project will enhance the ability of the local industry in exploiting the potential opportunities offered by third generation (3G) electronics, the global multimedia communication standard," says Mr Chee Cheung, General Manager of Compass Technology. Founded in June 1997, Compass Technology is a leading manufacturer of flexible substrate for IC assembly packaging. The company is based in Hong Kong and has approximately 200 staff.

Passive devices (mainly resistors and capacitors) are tiny circuit elements that play a critical role in electronic products. They account for 70-90% of the component placements of circuit boards and take up to 40-70% of the space available. A mobile phone may have a handful of integrated circuits but will usually have several hundred passive devices.

Currently, passive devices are soldered to the top layer of the circuit board. They can be built into the substrate to achieve higher electronics system performance while occupying less valuable surface space. This design concept is referred to as System-in-Package (SiP)-also known as embedded passives.

By embedding passives into multi-layer substrates, product density will be significantly increased, and the board assembly processes will be simplified. Consequently, circuit boards can be smaller and cheaper, yet perform better and faster. Manufacturers will be able to further miniaturize their electronic products, as competition increases over smaller sizes and increased functions.

In terms of application, embedded passive technology will provide a platform for the design of 3G electronics, jewelry-tronics and wearable-tronics. These are state-of-the-art mobile Internet-enabled information devices that perform the functions of an ordinary PC but resemble a piece of clothing or jewelry. With a mobile network, users will be connected to a wide array of real-time information networks anytime and anywhere, through devices such as 3G phones, brooches

and wristwatches. They will be able to send instructions to their home appliances from their offices; pay bus fares or reserve tickets by mobile phone; or receive message alerts on traffic, restaurants and special offers, among other useful functions.

The five-year research project is led by Assistant Professor David C C Lam and Professor Pin Tong from the Department of Mechanical Engineering and Dr David K K Young of the Applied Technology Center at HKUST.