

Development Stage

(Fiscal Year 2005-2007)

# Kumamoto Area

Development of Next-generation Living Body Information Processing Chip for Humans Movement and Physiological Data.

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**Project Promotion**

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**Major Participating Research Organizations**

Industry... Asahi Kasei Microsystems Kyushu Co., Ltd., K.T. System Company, SAKAMOTO ELECTRIC MFG.CO., LTD., CHISSO CORPORATION MINAMATA, Panapharm Laboratories Co.,Ltd., YASKAWA INFORMATION SYSTEMS Corporation, LIBATAPE PHARMACEUTICAL Co.Ltd., Kumamoto Kinou Hospital, Geriatric Health Service Facilities SEIGAEN  
Academia... Kumamoto University, Kumamoto National College of Technology  
Government... Applied Electronics Research Center - Kumamoto Technology and Industry Foundation, Japanese Red Cross Health Care Center, Kumamoto, Kumamoto City Hospital

**Core Research Organizations**

Kumamoto University,  
Applied Electronics Research Center - Kumamoto Technology and Industry Foundation

**Aim of research and development**

Progressive development of City Area Program --From "experimental animal" to "Human"--  
Kumamoto area marks an important shift from the "experimental animals" to the "human" with another ambitious theme of developing an advanced "Next-generation living body information processing chip" that will enable data-taking about a human body's motion and physiological conditions, without presenting a burden to the person wearing it.  
It aims at the small multifunction sensor chip system development of incorporating the acceleration sensor that enables the movement function measurement in addition to the sensor that enables the electrocardiogram, the heart rate measurement, and the blood pressure measurement, etc. The scientists involved in the project share an even more futuristic challenge of combining the sensor technology with fast communication technology, to build a new health supporting system that will, among others, accumulate chronologically measured vital and motion information along with patients' past medical examination data for viewing from a remote area.  
In addition, cooperation with other regions, the exchanges between different fields, and the development of the personnel training etc. will be aimed. Between engineering sciences (semiconductors, nanotechnology, material sciences, etc) and medical sciences (life sciences) that have flourished over years in Kumamoto Prefecture. Such a fusion is expected to help develop still new technologies which, in turn, will contribute to the solution of local engineering issues and the autonomous activation of the local industries in general.

**Contents of research**

**1. Capturing movements - Movement Information Measurement Development Group**

The Applied Electronics Research Center of the Kumamoto Technology & Industry Foundation has developed A-MES (Activity Monitoring and Evaluation System) for quantitative and objective monitoring of the person's daily activities in a rehabilitation process. The system, in its present phase of development, is capable of constant monitoring around the clock to distinguish between three positions (standing, sitting, lying) and two motions (walking, wheelchair driving).  
The next theme is to develop a motion information analytical and evaluation system using acceleration sensors worn by the patient, and a home gateway for connection the system to a networked medical service. Their potential application includes rehabilitation, nursery care, physical fitness and monitoring of unattended elderly people.



Activity Monitoring and Evaluation System (A-MES)

**2. Measuring physiological information - Physiology Information Measurement Development Group**

The physiology information measurement development group makes the program that generates the warning sound when the physiological trait data when human, and in particular, the sleep of the baby is collected, various parameters (instantaneous and average heart beats, fluctuation of heart rate beats, respiratory rates, Po2, body temperatures etc.) are made as a data base, this parameter is compared with the measurement signal, and the outlier appears. Finally, they will create a program that will compare signal from the sensor with the parameters in the database and issue a warning if a significant deviation is detected.  
Thus, the group will develop an easily portable next-generation type vital and physiological information measuring system using easily detachable sensors which is capable of simultaneous measurement of heart beats, respiratory rates, body temperature, etc.



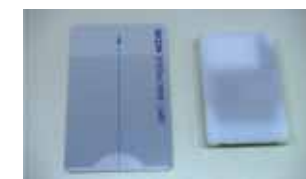
How to monitor physiological information of an infant

**3. Providing necessary elemental technology - Elemental Technology Development Group**

This group will provide technologies to meet the sensor specifications defined by the transceiver system development group and the movement information measurement development group and the physiology information measurement development group. In addition, the smart microchip (SMC) application development group is dedicated to improving peripheral devices (reader writers, chip inserting instrument etc) to establish a marketing model. I will also make the know-how, acquired from the research and development stages of the microchip to its marketing, available for all involved in the project.

**The main study results**

- 1. Development of new model A-MES**  
Technical surveys and discussion were conducted for small size, lightweight and cable-less model between sensor loggers, and a new model A-MES of the all-in-one design of acceleration sensor data logger was created for testing purposes based on the result of discussion.
- 2. Smart microchip system and animal experiment management system software**  
The final prototype of a smart microchip embedded in small animals hypodermics for identification, and measurement of temperature and heart rate was completed. It is the final function test stage with animals. In that case, the transmitter-receiver inside of the body was changed in design from cylinder type to the floor type, so that the design change and trial manufacturing are currently underway. The second prototype of the inserter that was able to insert a smart microchip in small animals hypodermics continuously was completed as the peripheral system. In addition, the third prototype is a planned to be completed at the end of March upon improvement of defects. For non-clinical animal experiment in accordance with the experimental practice that used a smart microchip, the user-friendly integrated management software was almost completed. This software has the function of the all-in-one concerning the animal experiments such as the animal procurement, the animal layout, schedule control, and the testing program.



New A-MES



Smart microchip system



Animal testing management system

