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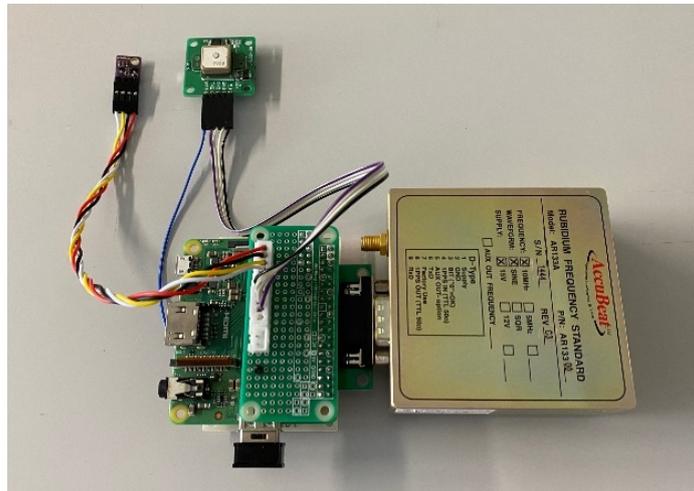
To whom it may concern,

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## Commencement of Research on a Small Atomic Clock and Application Using an Atomic Clock

Please be informed that we, as already notified, have promoted the research and development of optimizing equipment control / monitoring system for surplus energy which is expected to be utilized in natural energy (solar, wind power, biomass, hot spring heat, etc.) field as a joint research with Specially-appointed Professor Yasufumi Furuya of Tohoku University as the research representative. Additionally, for further reinforcement of collaboration, we launched Sendai Office this February.

We have started a joint research of a small atomic clock which is expected to be mounted on mobile terminals, and the application using an atomic clock with Professor Takahito Ono of Tohoku University as the research representative. We also developed a prototype of IoT (Internet of Things) system using an atomic clock as the first step of the research.



Prototype of IoT (Internet of Things) system using atomic clock

Atomic clock is a clock based on the frequency of electromagnetic wave absorbed or radiated by an atom (also including neutral and ionic). We have a small atomic clock used for this development besides the currently most accurate optical lattice clock, cesium atomic clock used to define seconds, photoion clock, hydrogen maser clock.

The small atomic clock is as approximately 100,000 to 1,000,000 times as accurate as the crystal oscillator broadly used and has been expected as a clock to be mounted on artificial satellites, for time synchronization of information communication network, as the standard signal source in the space where GNSS (Global Navigation Satellite System) electric wave cannot reach from the artificial satellites. As attempt for low energy consumption and downsizing are rapidly promoted, there is expectation towards clocks for highly accurate time synchronization and mounting on the base stations and mobile terminals in the next generation mobile communication system.

\*Reference

National Institute of Information and Communications Technology / Tohoku University / Tokyo Institute of Technology

Press release “Atomic Clock into Micromini System Which Can Be Mounted on Smartphones”

<[https://www.tohoku.ac.jp/japanese/newimg/awarding/award20180124\\_01.pdf](https://www.tohoku.ac.jp/japanese/newimg/awarding/award20180124_01.pdf)>

This prototype is an IoT system where the atomic clock synchronizes time accurately at all times and transmits to the cloud the data on time, latitude and longitude, temperature, humidity and air pressure.

As various devices are connected to the Internet on IoT system, it is necessary to synchronize the time on each device in order to provide reliability. IoT system enabling accurate time synchronization is expected to be utilized in a wide range of fields including more accurate automatic driving, aerospace, robot, medical and welfare, infrastructure maintenance, virtual power plant control based on the next generation high-speed and highly concentrated communication.

We will promote development, etc. of small-sized atomic clocks and the application including positioning using the atomic clock based on this prototype in the joint research with Tohoku University.

Our group will put effort in management as an ESG general trading company which enhances and expands our accumulated technologies, strategically analyzes and integrates eco-friendly power generation, green business, communication infrastructure improvement and actively performs a challenge on new business creation and corporate revival.