**FOR IMMEDIATE RELEASE**

# Basic technology for a high-sensitivity photo-acoustic imaging contrast agent

*--To contribute to the early detection of cancer--*

**Tokyo, October 9, 2012** - Hitachi, Ltd. (TSE:6501, "Hitachi") today announced the development of basic technology for a contrast agent(1) to be used with high-sensitivity photo-acoustic imaging, a medical imaging technique suited for the detection of minute tumor growths deep within the body. This contrast agent uses nano-droplets(2) which repeatedly change to a gaseous state and generate ultrasound pulses when irradiated by a light source. In comparison to conventional contrast agents, a high ultrasound signal representing almost a tripling of sensitivity was confirmed. Further, it was found that measurement of tumors deep within the body could be achieved with high resolution, something which had hitherto been difficult with conventional contrast agents. This technology is expected to contribute to the early detection and treatment of cancer.

In recent years, there is growing interest in photo-acoustic imaging which irradiates a tissue region and measures the generated ultrasound pulse, as it offers new possibilities in measurement which were not available in conventional ultrasound, such as adjusting the wavelength of the light to image tumor tissue or narrowing the light to observe minute tumors. The development of a contrast agent which would reach the target tumor and efficiently generate ultrasound signals was an issue which needed to be overcome in achieving high sensitivity detection of tumors. This research successfully overcomes this issue with the development of basic technology for a contrast agent for photo-acoustic imaging by applying the nano-droplet technology developed in 2006. Details of the technology are as given below:

**(1) Development of basic technology for a photo-acoustic imaging contrast agent using nano-droplet technology**

The formation of a light-absorbing layer was added to the nano-droplet technology developed in 2006, to develop a nano-droplet that changes to a gaseous state and generates sound waves when irradiated by light. By employing this nano-droplet, a strong ultrasound signal is achieved representing almost a tripling of sensitivity. The nano-droplet technology announced by Hitachi in 2006 facilitates the delivery of contrast agents to

the target site by reducing the agent to nano-meter size. When an ultrasound pulse is applied to the nano-droplets which have reached the target tumor, the droplets change to a gaseous state to form microbubbles, generating sound waves. A high-definition image of the tumor is obtained by measuring these waves.

**(2) Development of a nano-droplet structure that would repeatedly vaporize with irradiation**

With conventional contrast agents, an ultrasound signal is generated only once when the agent changes to a gaseous state. By optimizing the composition and the particle size, a nano-droplet structure was developed which repeatedly generated sound waves on irradiation. As a result, it is now possible to spend more time in investigating a particular section of a tumor or an entire tumor located deep within the body, opening the way for high resolution measurement of tumors located deep within the body which was hitherto difficult with conventional contrast agents.

The contrast agent is basic technology which can contribute to the early detection or treatment of cancer through the combination with bio-markers which selectively bind to specific diseased tissue.

These results are being presented at the 2012 IEEE International Ultrasonics Symposium (IUS) in Dresden, Germany ($7^{th}$ – $10^{th}$ October 2012).

(1) Contrast agent: A pharmaceutical agent used to increase the contrast between different tissue types in imaging diagnostics.

(2) Nano-droplet: A nano-droplet formed from phospholipid film containing superheated perfluorocarbon. The super-heated state is the opposite of the super-cooled state, where the original phase is maintained even when the temperature exceeds that at which phase change normally occurs. In the case of the nano-droplet, the droplet remains in its liquid state even above boiling point. When a physical stimulus such as an ultrasonic pulse or light is applied, the nano-droplet changes from the liquid state to a gaseous state and becomes a microbubble. Blood vessels lining tumor tissue are irregular structure and known to allow larger substances to penetrate its walls into adjacent tissue compared to vessels lining healthy tissue. The size of nano-droplet developed is large enough not to penetrate the lining of blood vessels lining healthy tissue but small enough to penetrate the tumor tissue, thus having a selectivity for tumor tissue.

**About Hitachi, Ltd.**

Hitachi, Ltd. (TSE: 6501), headquartered in Tokyo, Japan, is a leading global electronics company with approximately 320,000 employees worldwide. Fiscal 2011 (ended March 31, 2012) consolidated revenues totaled 9,665 billion yen ($117.8 billion). Hitachi is focusing more than ever on the Social Innovation Business, which includes information and telecommunication systems, power systems, industrial, transportation and urban development systems, as well as the sophisticated materials and key devices that support them.For more information on Hitachi, please visit the company's website at http://www.hitachi.com.

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