



GT Ref: 7105

## **Analogue Time Division Multiplexing for Cable Reduction in Imaging Catheters**

Category: Medical Imaging Technology

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### **Summary**

The technology focuses on addressing the challenge of cable reduction in imaging catheters, particularly for Intracardiac Echocardiography (ICE). It uses Analogue Time Division Multiplexing (TDM) alongside a novel digital demultiplexing technique to minimize the number of analogue signal processing stages required. This method allows for the continuous sampling of multiple CMUT elements, facilitating the collection of reflection data of all devices simultaneously to avoid motion artifacts and enhance the system's frame rate.

### **Development Stage**

Prototype Complete

### **Problem Statement & Solution**

Current Intracardiac Echocardiography (ICE) devices face several significant challenges. They offer a limited 3D view and often require harmful X-ray imaging. Additionally, gathering data from multi-element transducer arrays is difficult due to the high number of required cables. The complexity and space constraints within catheters further hinder the use of existing cable reduction methods. Moreover, the length of the catheter and lack of power for on-chip cable drivers lead to reduced signal strength at the receiver end.

Researchers at the Georgia Institute of Technology have developed a new technology that utilizes Analogue Time Division Multiplexing (TDM) alongside a novel digital demultiplexing technique. This approach minimizes the number of analogue signal processing stages required, allowing for continuous sampling of multiple CMUT elements. This innovation reduces the cable count, enhances data collection, and improves the system's frame rate, effectively mitigating the problems faced by current ICE devices.

### **Advantages**

- Significant reduction in the number of electrical connections required for catheter operation.
- Enables real-time 3D imaging by overcoming cable count limitations due to catheter size constraints.
- Eliminates the need for harmful X-ray imaging by making catheters MRI compatible.
- Improves signal strength at the receiver end despite the length and power limitations of catheters.
- Reduces system complexity and potential for cable-related issues.

### **Commercial Applications**

- Intracardiac Echocardiography (ICE) catheters for real-time 3D heart imaging.
- Ultrasound imaging catheters for non-invasive internal body imaging.
- Any ultrasound probe technology requiring cable count reduction or system complexity minimization, including 1-D or 2-D arrays.



- Potential applications in other medical imaging technologies that benefit from reduced cable complexity and enhanced imaging capabilities.

**Lead Inventor:** [Fahrettin Levent Degertekin, PhD](#)

**Intellectual Property Status:** US Patent Issued - [US10869652B2](#)

**Scientific Publication(s):** Carpenter, T., Degertekin, F., et al.: (2015.: Time-division multiplexing for cable reduction in ultrasound imaging catheters. [2015 IEEE Biomedical Circuits and Systems Conference \(BioCAS\)](#).