

DATA-LOGGER TO CHARACTERIZE VIBRATIONS FOR ENERGY HARVESTING SYSTEMS

Fraunhofer Institute for Integrated Circuits IIS

Executive Director
Prof. Dr.-Ing. Heinz Gerhäuser
Directors
Prof. Dr.-Ing. Günter Elst
Prof. Dr. Albert Heuberger

Am Wolfsmantel 33
91058 Erlangen, Germany

Contact
Dr.-Ing. Peter Spies
Nordostpark 93
90411 Nürnberg
Phone +49 (0) 9 11/5 80 61-63 63
Fax +49 (0) 9 11/5 80 61-63 98
peter.spies@iis.fraunhofer.de

www.iis.fraunhofer.de/en

Is your vibration useable for energy harvesting? Our data-logger gives you an answer!

The aim of the data-logger is to characterize vibrations in relation to velocity at moving objects or vehicles. These vibrations can be used for vibration energy harvesting to power small electronic devices without replacing batteries or using power connectors or the mains power supply. With the data-logger you get essential information to optimize the power output of kinetic energy transducers and thus the volume and cost of the energy harvesting system.

System components

The data-logger is designed to measure and store vibration information at moving objects and vehicles. The system consists of the following components:

- A three-axis accelerometer senses the vibrations in all three axes.
- A GPS receiver measures the position and stores it with the acceleration data on an SD card. In this way, it is possible to analyze the vibrations as a function of the velocity of the vehicle.
- A micro-controller manages the overall system functions and enables sleep and standby modes to keep power consumption low.
- A WiFi interface enables online transmission and processing of the available data.
- The micro SD card is capable of storing data for several days, whereas the battery will provide the required electrical energy.
- Additional sensor can be connected to log e. g. temperature, light, orientation, etc.
- A separate interface is designed to measure the output voltage of kinetic energy transducers which can be integrated for special tests.



Application examples

- Subway trains
- Railway wagons
- Cars
- Trailers etc.

First findings

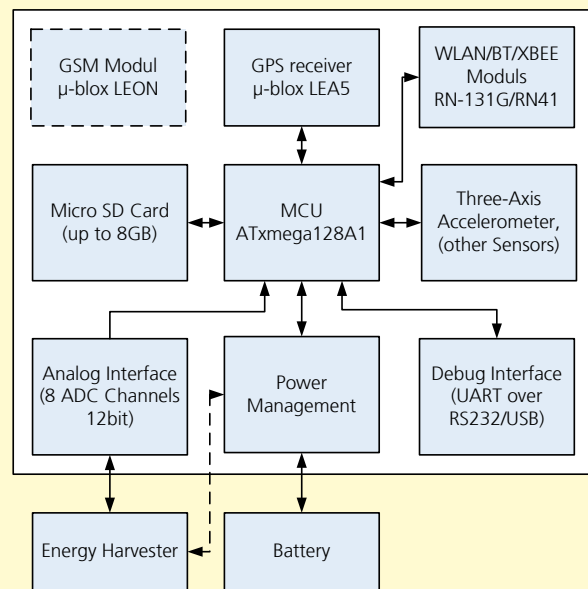
First field tests in a car driving inner-city revealed significant vibrations vertical to the earth surface (x-axis) and in the direction of the movement (figure 2). Typical mean value of the acceleration was 0.1 g at a frequency around 17 Hz. Similar results were achieved in subway train.

Scope of services

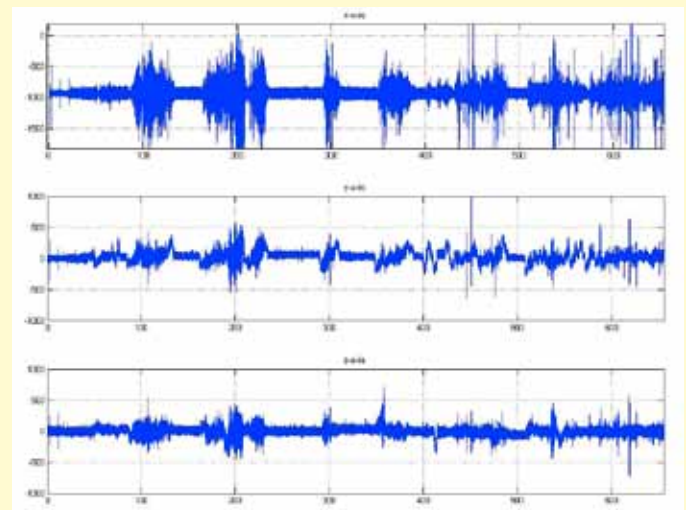
- Characterization of vibrations
- Estimation of the amount of electrical energy delivered by energy transducers like piezoelectric materials or electrodynamic generators
- Analysis of results if vibrations are useable for powering electronic circuits and systems
- Essential information for the design of vibration transducers (esp. present frequencies and amplitudes)
- Characterization of kinetic energy transducers like piezo-materials or electro-dynamic transducers
- Support for the optimization of power output of kinetic energy harvesting systems

Technical data

- **Operation time:** several days to weeks (depending on the desired test scenario)
- **Weight:** Housing with PCBs and batteries: 3 kg
Ground Plate: 1 kg
- **Dimensions:** Housing: 160 x 160 x 90 mm
Ground Plate: 240 x 160 x 10 mm



1 System components



2 Acceleration measurement of a car