Genius Holdings Co.,Ltd.
Taiwan Branch

Genius Holding introduction

Innovative Applications in Sound and Ultrasound Technology

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Company Introduction

1

Genius

Genius Holding founded in 2016, provides creative ultrasound innovations to upgrade products with digitalized and wireless, and AI audio analysis for customers.

2

ezOxygen Smart Breath Checker-2019 CES Innovation Award

- ezOxygen personal spirometer with CES 2019 Innovation Award, Sport Fitness, and Biotech category.
- Strategic cooperation with ***AstraZeneca*** to launch "**Health Lung App 呼吸肺健康**"

3

Our Partnership

Provide Audio AI for smart manufacturing with ***Chang Chun Petrochemical*** (iEar Project), ***Formosa Petrochemical corporation*** (machine monitoring), ***Asia Vital Components*** (Product QA), etc.

Technology Overview

Passive Ultrasound Tech | Ultrasonic Data Transmission | AI Sound Analysis

1 Respiratory

Passive ultrasonic airflow determination: respiratory area (**ezOxygen**), anemometer, and gas flowmeter.

2 Smart Manufacturing

Audio Analysis with hearable and multiple sensors ultrasound wireless.

3 Fitness, VR/AR/MR, home security

Ultrasound Motion Tracking

4 Digitalized Medical Device

Ultrasound wireless medica devices, such as blood pressure, blood sugar, weight scale, etc

5 Non-Digitalized Medical Device

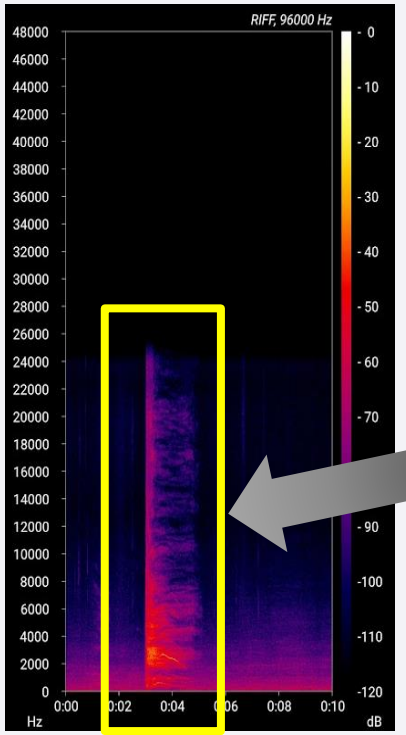
Ultrasound wireless medica devices, such as incentive spirometer, Intravenous (IV) Sets, etc.

Passive Ultrasound Technology

Airflow transducer | Microphone | Algorithm & display

Passive ultrasonic detection

The airflow generates a resonant frequency response through the metal whistle, and the signal to flow rate and volume are both calculated by the exclusive algorithm



Advantage

- Better accuracy than traditional method and no inertia effect or environment interference.
- 10,000 airflow rates per second, v.s. traditional between 50~400 airflow rates per second.)

Calibration-free.

Mouthpiece is easy to clean, and detachable

Ultrasonic Data Transmission

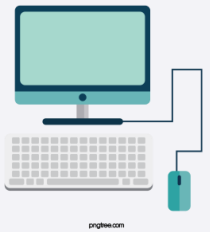
Digital Medical Device

Ultrasonic Signal Transmission

- **Smartphone receiving signal**
- **Data display and recording**

Data Transmission Display

Data Storage



- **PC receiving signal**
- **Data display and recording**

Data Transmission Display

Data Storage

Data Collection and storage

- **Smart receiving signal**
- **Voice Prompt Results**

Data Transmission Display

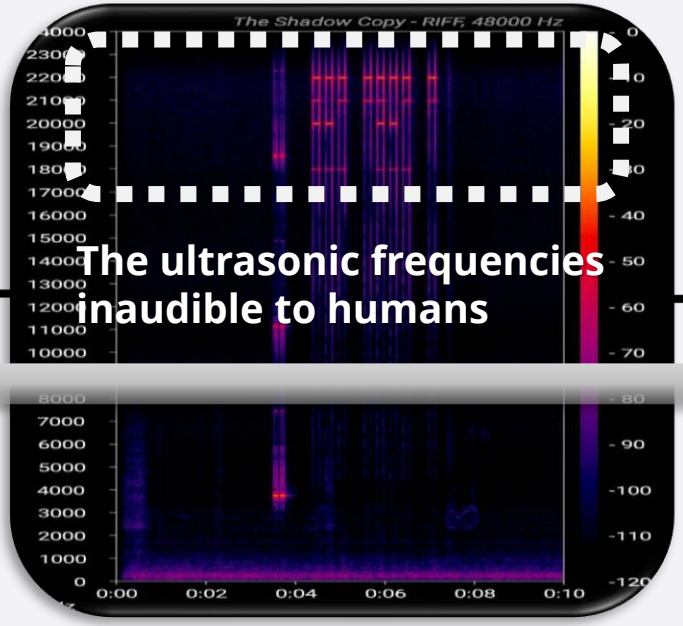
Data Storage

Ultrasonic Data Transmission

Sound wave communication- speaker and microphone.

Ultrasonic Signal Transmission

Ultrasonic emitter



Decode acoustic signals into data

Microphone

Ultrasound transmission

Ultrasound

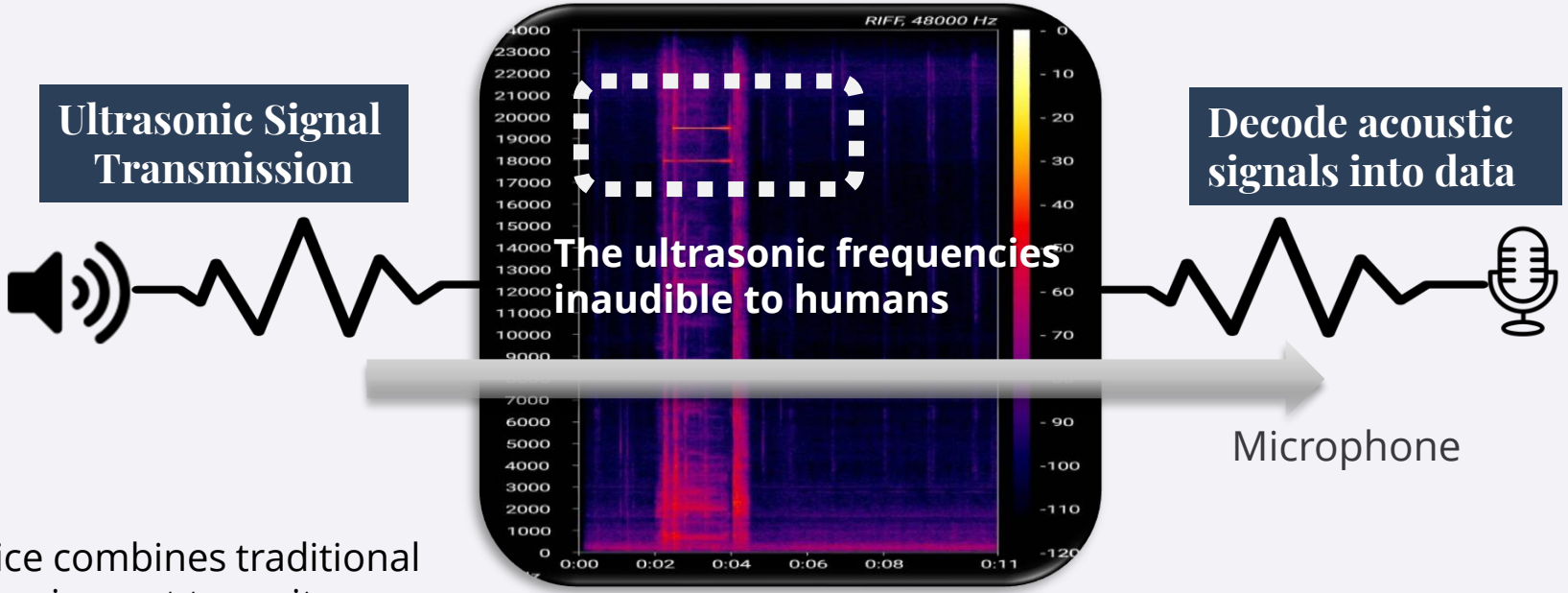
Ultrasound reception

Ultrasonic Data Transmission

Sound wave communication- speaker and microphone.

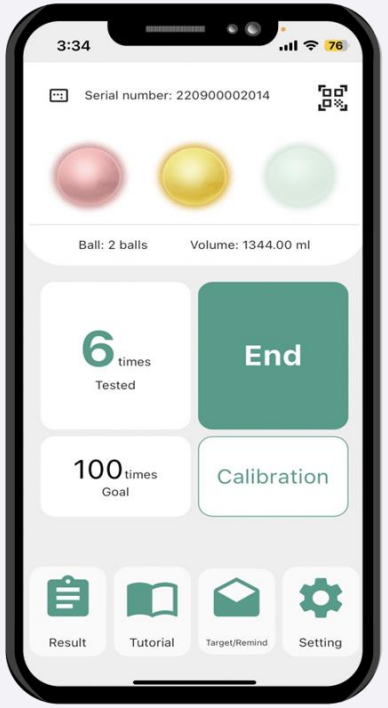
The sensing device combines traditional plastic medical equipment to emit ultrasonic signals

Ultrasonic Signal Transmission



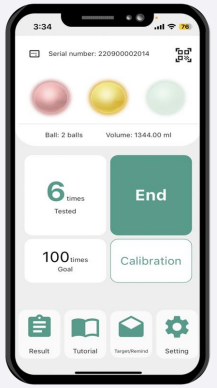
Decode acoustic signals into data

Microphone



Ultrasound transmission

Ultrasound



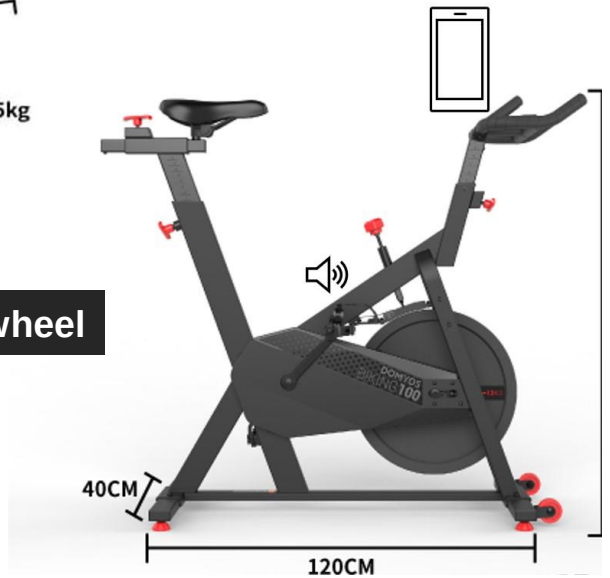
Ultrasound reception

Ultrasonic Data Transmission

Sound wave communication- Position Trigger Module

Ellipticals cross trainers

Rowing machine



Flywheel

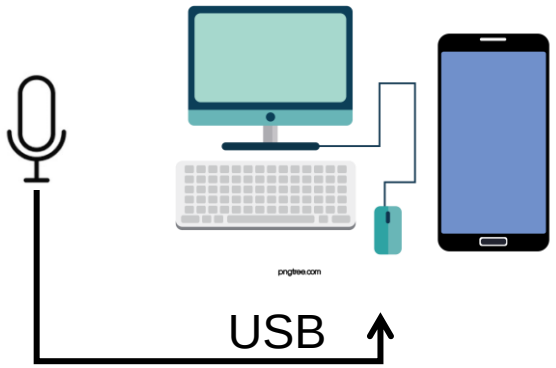
Fitness Exercise Bike

Ultrasonic Data Transmission

Sound wave communication-Motion Detection

Real-time AI

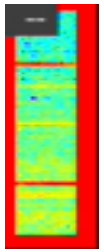
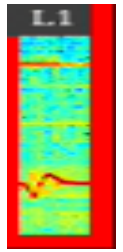
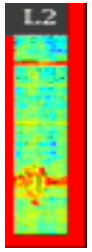
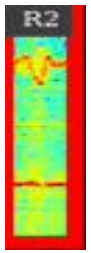
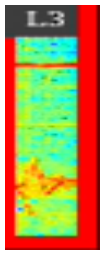
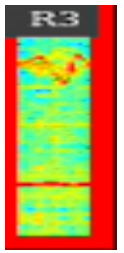
Wearing Genius Ultrasound modules on Left & right hands



Any electronics with microphone & ultrasonic algorithm

Inference Output

Gaming APP

Stop	Straight Punch		Uppercut		Lower Hook	
						

AI Sound Analysis

Applied to Equipment Maintenance and Finished Product QC Inspection

- *WiFi /USB cable connection*
- *Audio chips 96kHz*
- *MEMs Microphone Sensor*
- *Mono record*
- *Chargeable Lithium battery*

Directional Structure

Digital Stethoscope

Application

- *CNC & Metal*
- *Transportation*
- *Factory*
- *Industrial Robot*
- *Wind power generation*

Hardware Audio Sensor

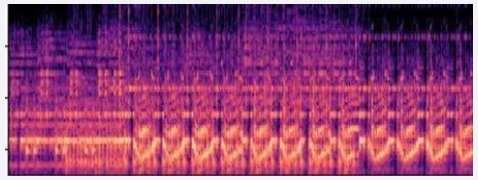
Wi Fi

System

01 Local Sever

02 AWS、Azure、GCP or other

AI Model Training



1. Classification

2. Object detection

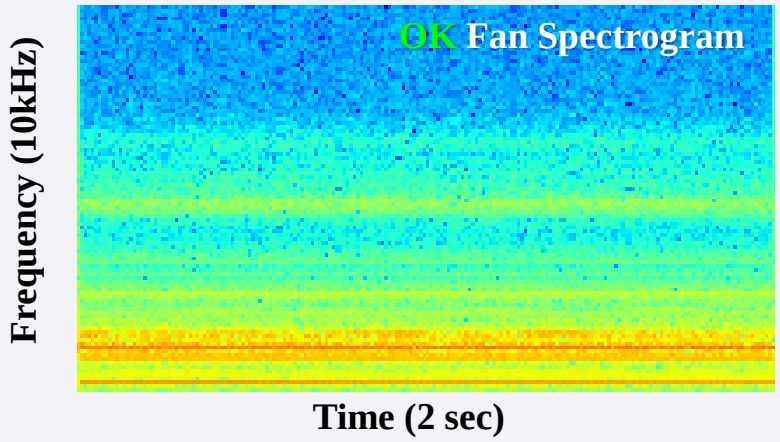
Irregular collection & assessment、model retrain

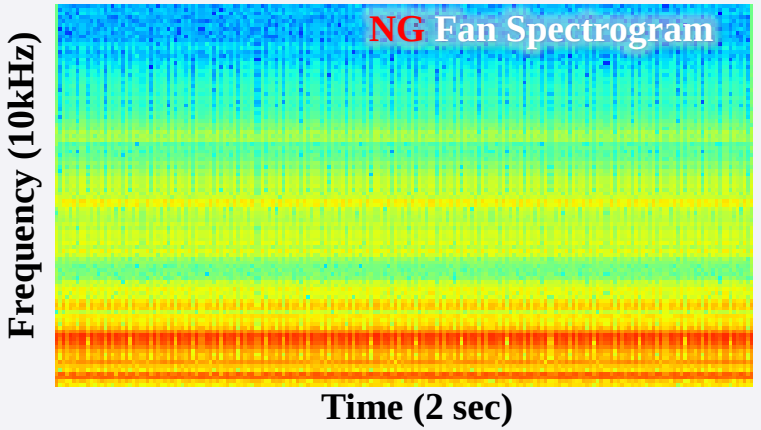
Web Info in Several OS

Fix/ Maintenance

Abnormal Alert

Sound Analysis –AI Validation Model

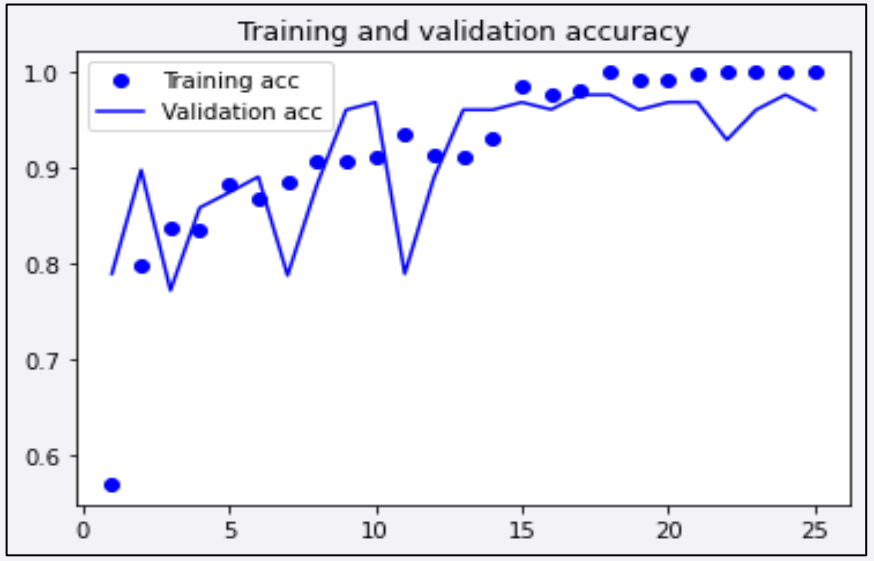


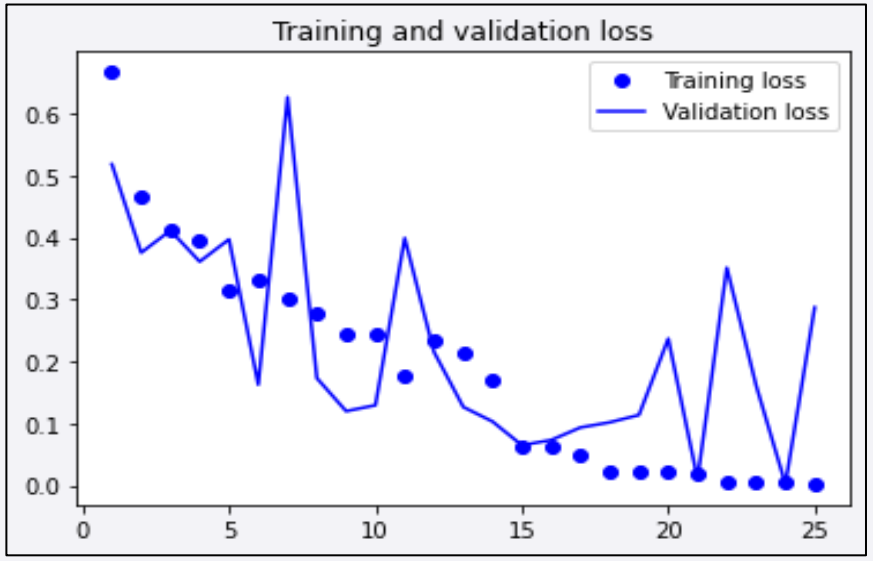


AI Model Specification：

- **Classification Type：OK、NG**
- **OK Training Count： 410 pcs**
- **NG Training Count： 385 pcs**
- **Accuracy：1.0**
- **Loss：0.001719**

Using audio data from verify to train the AI model to achieve testing.





Social Media/Customer Overview-Smart Factory

Digitimes News

https://www.digitimes.com.tw/tech/dt/n/shwnws.asp?Cnlid=13&cat=20&cat1=50&id=0000623141_BQ12VVDM31V57S2IRUNRR&ct=d

Digitimes Media

https://www.youtube.com/watch?v=CGhu8rRvCkc

Our Customer

CCP 長春集團 CHANG CHUN GROUP

https://www.ccp.com.tw/

台塑企業 FORMOSA PLASTICS GROUP

https://www.fpcc.com.tw/tw

AVC Asia Vital Components Co., Ltd. 奇鋐科技股份有限公司

https://www.avc.co/zh-tw/

Comparison of Ultrasound Wireless Devices

AliveCor, Omron, and Genius

Products/year	Intend use	Differences	Common advantage
KardiaMobile (2014)	ECG, single lead	LTC6990 for voltage changed by fingers (18.5~19.5 kHz); distance <20-30 cm	Smartphone connect, App in iOS and Android, low battery consumption,
Omron MC-6800B (2021)	Body temperature	Frequency ranged between 18.5~19.5 kHz; IC(EPSON 17V14101 G2390234 IC + VRK272 IC); distance < 4 cm.	
Genius Ultrasound Incentive Spirometer (2023)	Lung function rehab	Customized crystal oscillators with specified kHz (18, 19.5, 20); distance <100~160 cm (by smartphones' sensitivity), with calibration to improve signals-noise ratio. Specified coding algorithm for other medical devices.	

Appendix - 1

AliveCor KardiaMobile ECG

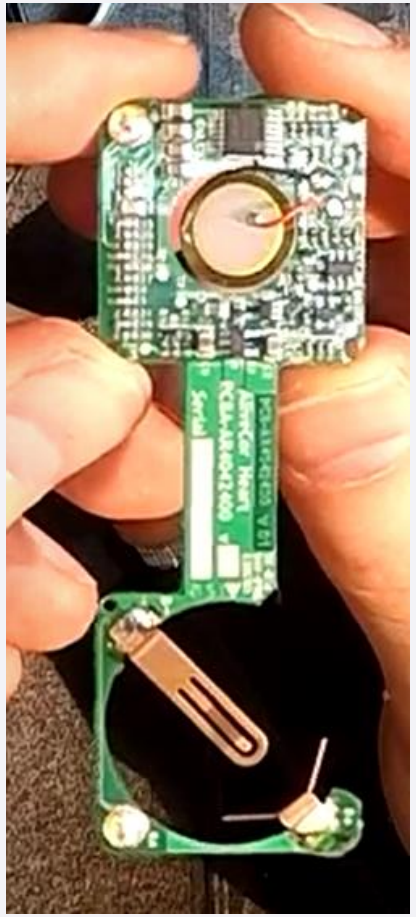
The first & only ultrasonic ECG mobile device

- The original KardiaMobile. FDA-cleared, **single-lead** personal EKG that records medical grade EKGs right on your phone.
- The ultrasonic frequencies are ranged between 18.6~19.1 kHz.
- The device has a 10 mV peak-to-peak input dynamic range, a 300 samples per second sampling rate, and a 16-bit resolution.
- The device is powered by a 3V CR2016 coin cell battery that lasts for about 12 months of typical use.
- The device dimensions are 8.2 cn* 3.2cm*0.35 cm and it weighs 18 grams.
- The distance between the device and the smartphone depends on the placement of the device. If the device is attached to the back of the phone or the phone case, then the distance is minimal. If the device is not attached, then it can be placed within a few centimeters of the phone's microphone for optimal signal transmission.

https://www.alivecor.com/products/
https://www.alivetec.com/pages/alivecor-heart-monitor
https://www.alivecor.com/previous-labeling/kardiamobile/00LB17.1.pdf

Core ICs of KardiaMobile

LTC6990 & AD8502



LTC6990 is a **voltage-controlled oscillator (VCO) with a wide frequency range**, Key features of the LTC6990:

•Wide frequency range: 488 Hz to 2 MHz；4 frequency selection pins (FSEL) for 16 possible configurations

•Frequency adjustment via a single external resistor or voltage input；CMOS output with 50% duty cycle

•Low supply voltage range: 2.25 V to 5.5 V；Low supply current: 72 µA at 100 kHz

•Temperature stability: ±50 ppm/°C (typical)

AD8502 is a precision, low power, **dual operational amplifier** (op-amp) require high accuracy and low power consumption, Key features of the AD8502:

•Low offset voltage: 1 µV (typical)；Offset voltage drift: 0.005 µV/°C (typical)

•Wide supply voltage range: 2.7 V to 5.5 V；Low supply current: 1.1 mA per amplifier (typical)

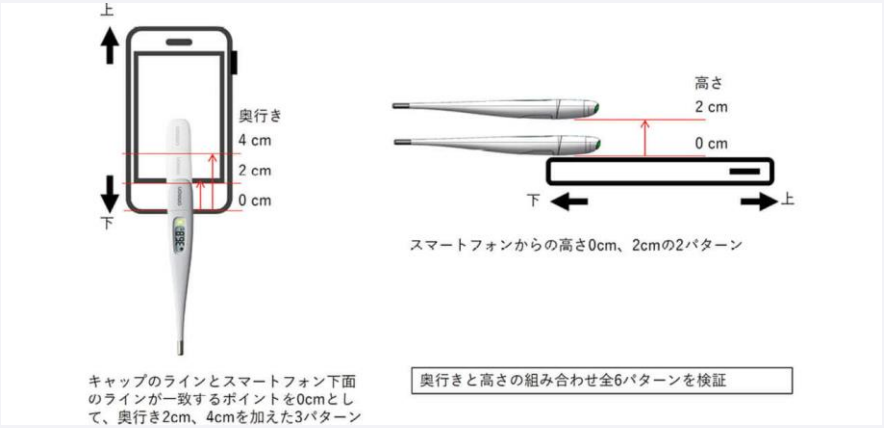
•Rail-to-rail input and output；Gain bandwidth product: 2 MHz (typical)

•Unity-gain stable

https://youtu.be/UBWGEskkyfk
https://www.analog.com/en/products/ltc6990.html
https://www.analog.com/media/en/technical-documentation/data-sheets/AD8502_8504.pdf

Omron音波通信体温計MC-680oB

2021 on Japan market；**短時間で検温できる、約15秒の予測検温**



- このことから、通信成功率が35％以上であれば、5秒以内に95％以上の確率で通信が完了すると考えられる。
- 表2は、各測定ポイント（奥行×3、高さ×2）における、通信成功率の分布をまとめたものである。目標とする通信成功率を達成できなかった機種は2～5％程度あるが、94％以上の機種で通信成功率80％以上という高い通信精度を達成している。
- この検証では、一度スマートフォンで採取したPCMデータをwavファイルに保存しておき、復調アルゴリズムをチューニング→wavファイルを用いて復調アルゴリズムの検証を繰り返すことで、復調アルゴリズムおよび各種パラメータのブラッシュアップにも寄与している。
- EPSON 17V14101 G2390234 IC + VRK272 IC

https://www.healthcare.omron.co.jp/product/mc/mc-6800b.html