



Sonotu 

Affordable prescription hearing aids



Challenge

1.57 Billion people worldwide suffer from hearing loss

Current hearing aid suppliers meet less than 10% of the global need

<10%

\$500+ Prescription hearing aids are unaffordable to the majority

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WHO suggest the RRP of an affordable hearing aid is 3% GDP/capita

OECD	Benchmark countries (OECD classification)	GDP/capita	3%GDP/capita
High Income	USA (H)	\$63,500	\$1905
	Germany (H)	\$45,700	\$1371
	UK (H)	\$40,300	\$1209
Upper Middle-lower Middle	Costa Rico (UM)	\$12,070	\$362
	World	\$10,900	\$327
	Argentina(UM)	\$8442	\$253
	Brazil (UM)	\$6,800	\$204
	India*(LM)	\$3690	\$111
	Egypt (LM)	\$3,550	\$106
Low Income	Uganda(L)	\$817	\$25
	Sudan (L)	\$596	\$18
	Sierra Leone(L)	\$485	\$15
	Somalia(L)	\$105	\$3

OECD classification: (H) high income, (UM) upper middle, (LM) low-middle, (L) low income

*based on initial target regions (Goa, Delhi, Haryana, Tamil Nadu, Telangana, Karnataka)

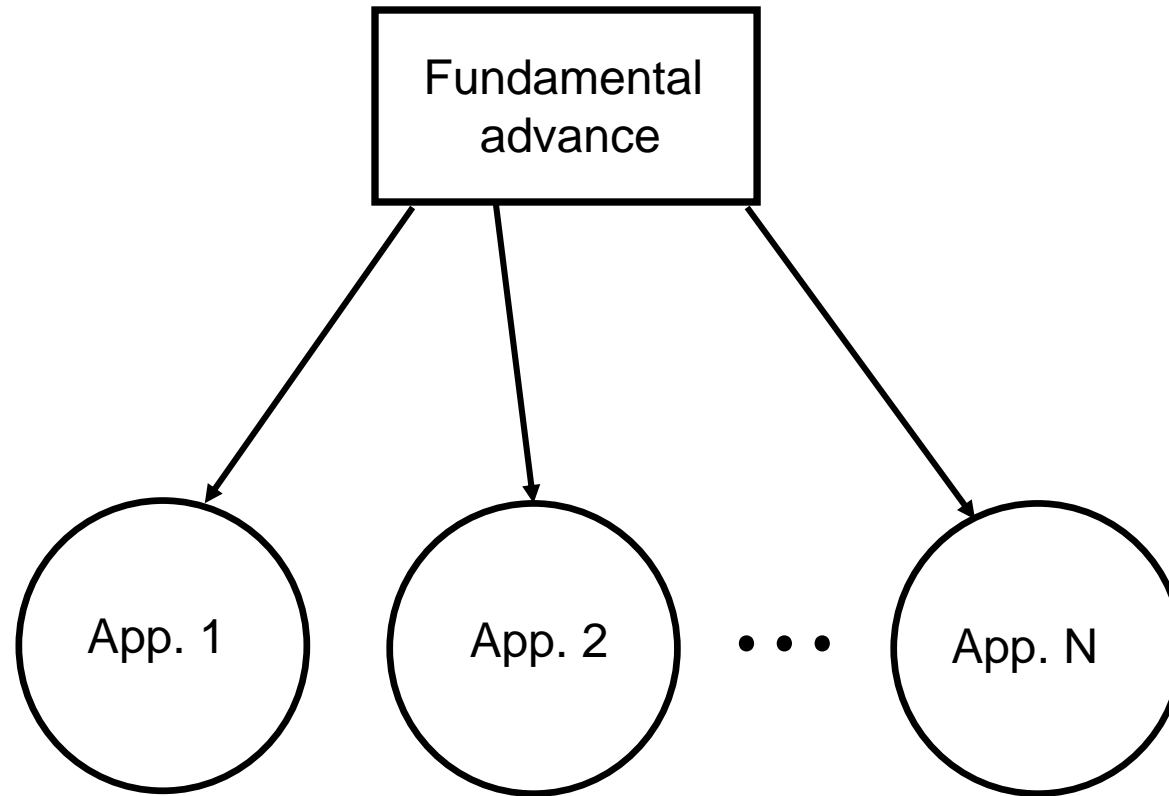
** alternative business models are possible based on different pricing structures.

Design specification

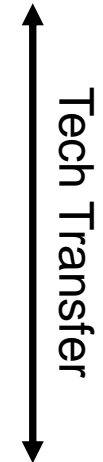
- Affordable in LM countries as per WHO criteria
- Dimensions similar to NHS BTE hearing aids (~ 30x15x8mm)
- Rechargeable Li-ion battery
- 20 hrs continuous operation
- Fully programmable/reconfigurable
- Dual microphones
- 'full suite' of hearing aid algorithms
- Bluetooth programmable via app (to reduced fitting hardware costs)



University Innovation (traditional)

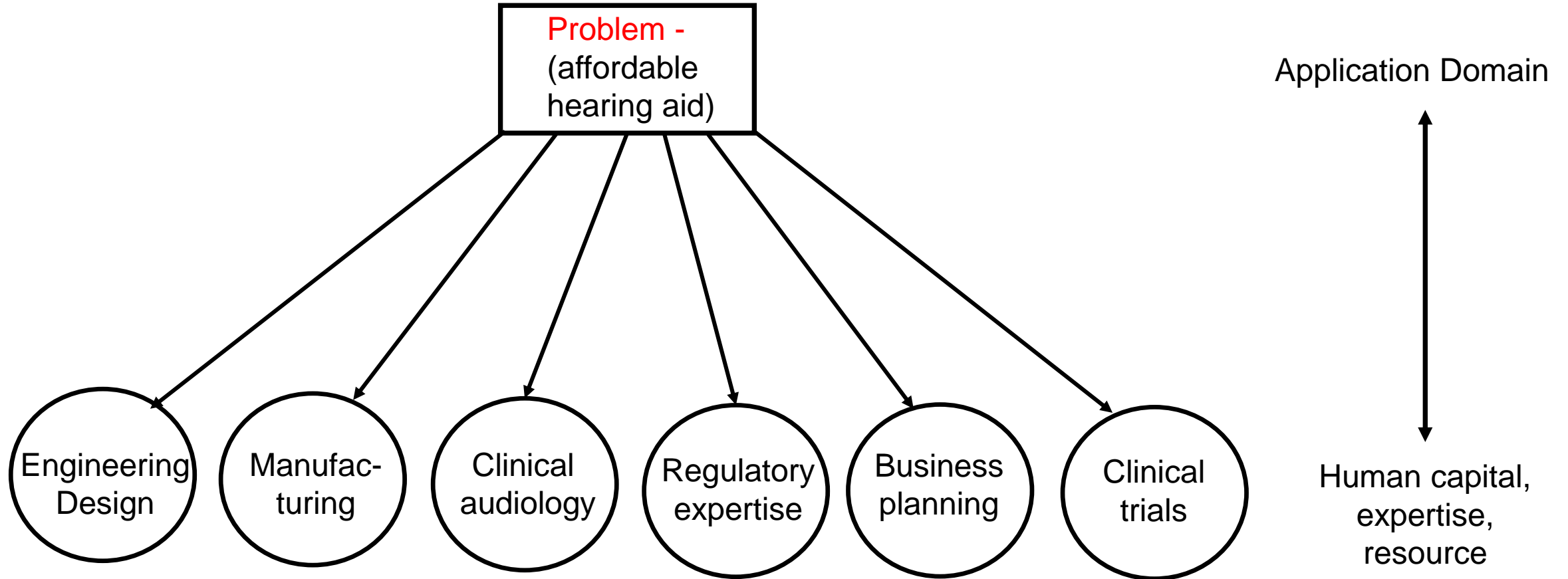


University Research



Application Domain

University Innovation (alternative)



Engineering

- Embedded systems
- Electronic design
- PCB layout
- Firmware programming
- Software programming
- Signal processing
- Bluetooth
- Mechanical CAD design
- App design (Android)
- DFM, DFA
- injection mould design

Manufacturing

- Rapid prototyping (3D printing)
- PCB fabrication
- PCB assembly
- Injection moulding

Regulatory expertise

- ISO/IEC/ANSI etc standards
- medical device certification

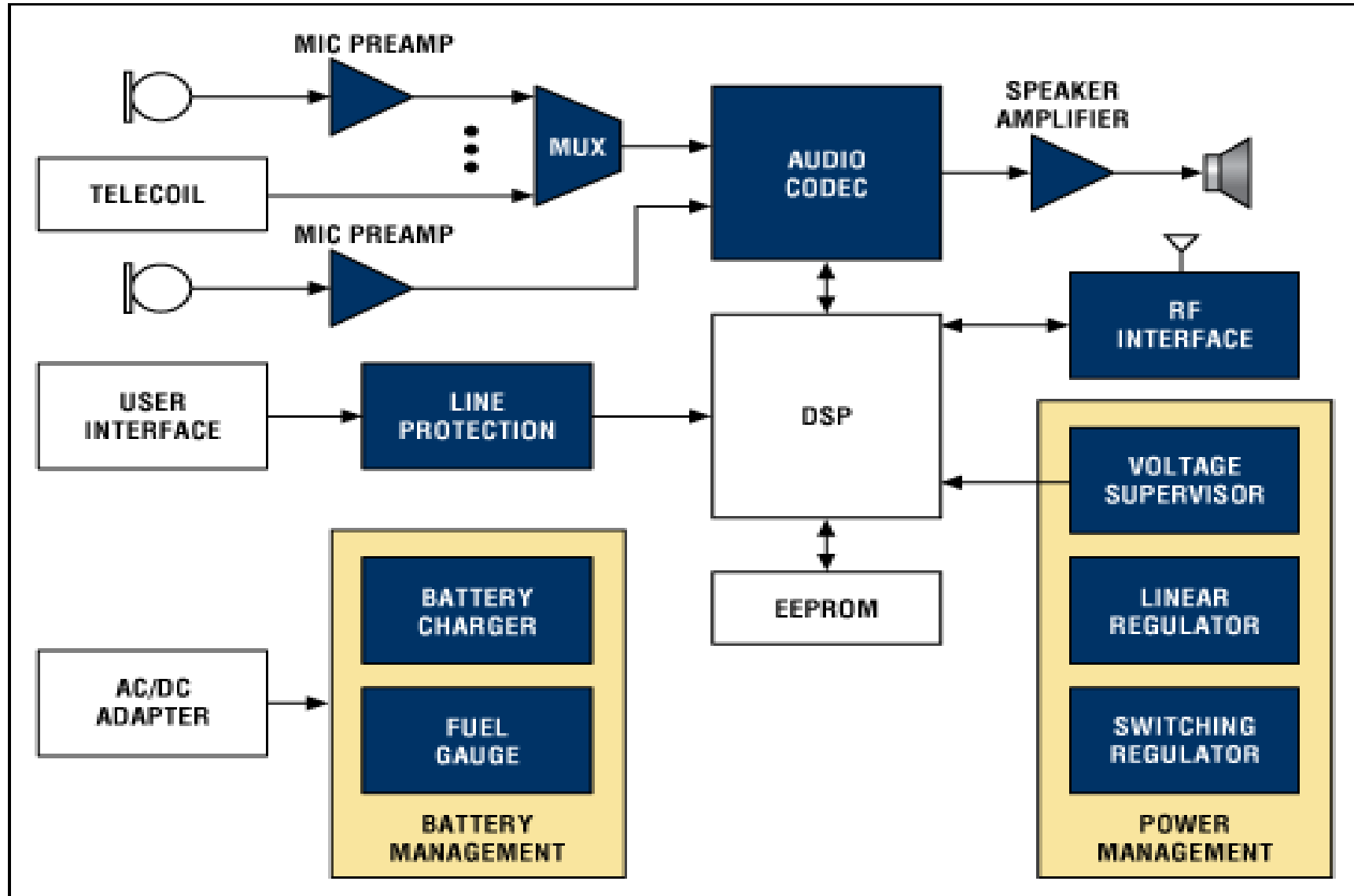
Clinical Audiology

- KEMAR testing
- Electroacoustic performance
- Prescription algorithms
- Patient fitting
- Patient testing (clinical trials)

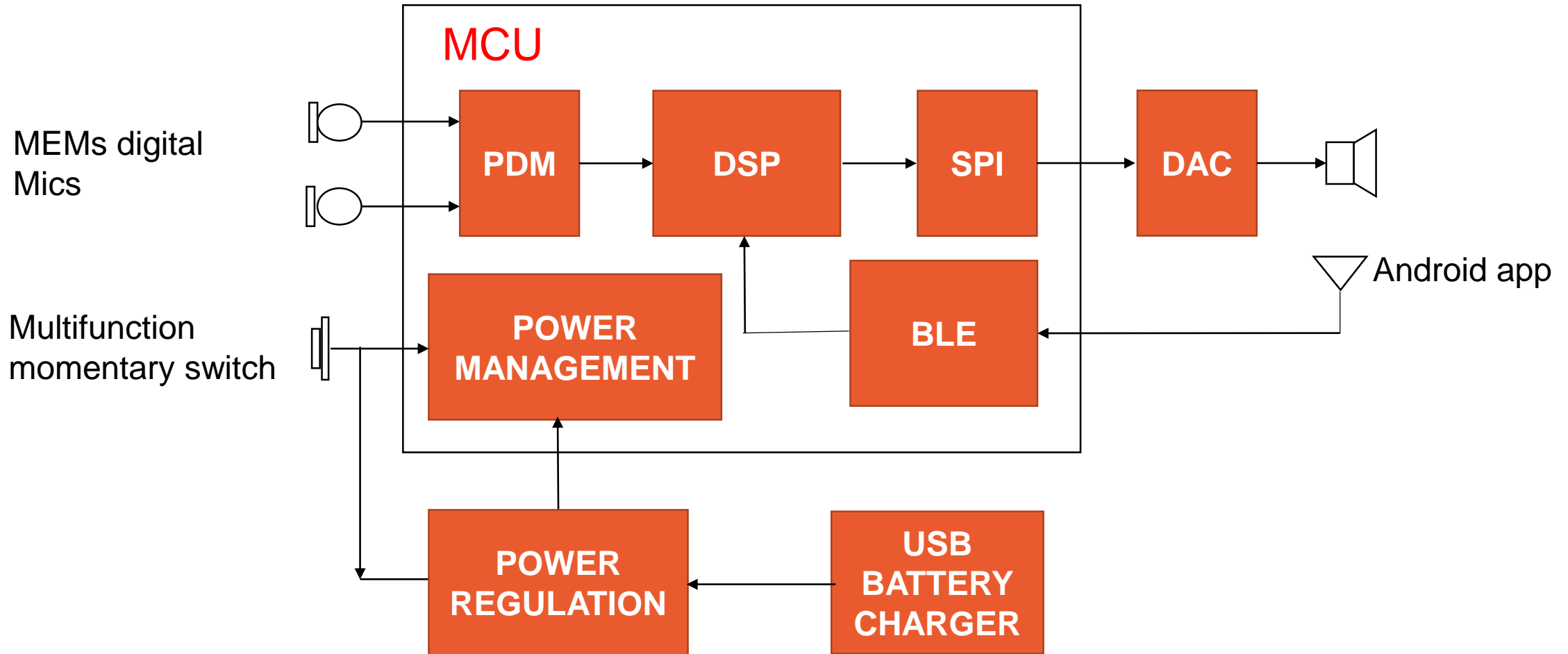
Business planning

- Market analysis
- Business plan

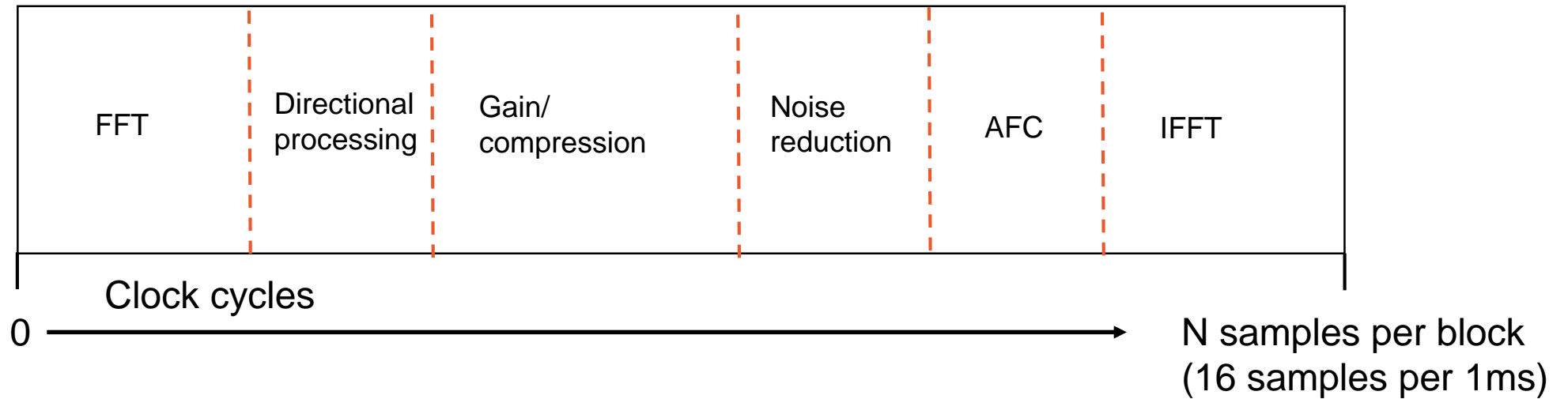
Digital hearing aid SoC



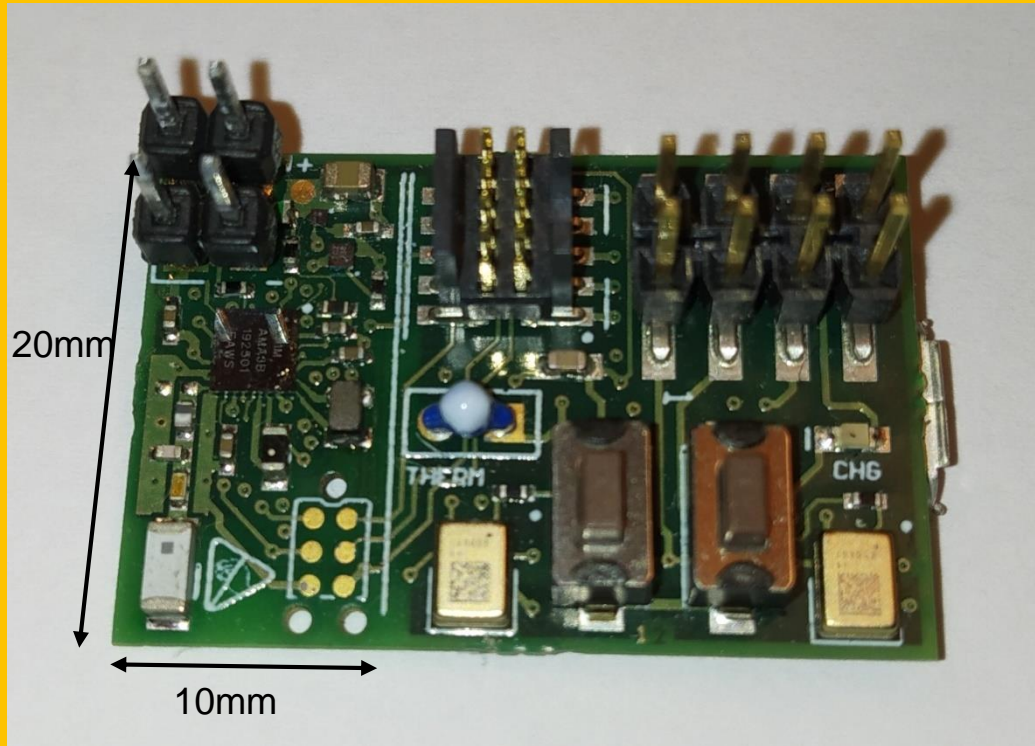
MCU based design



Real time block processing (development board)

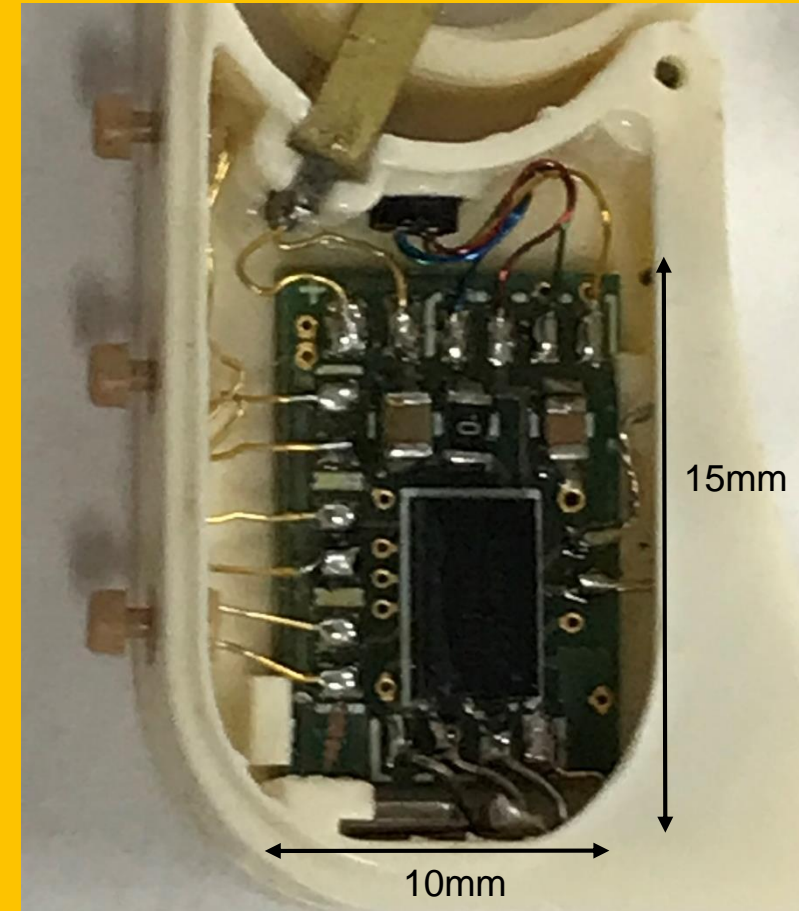


mark 1 PCB



Current consumption ~3mA,

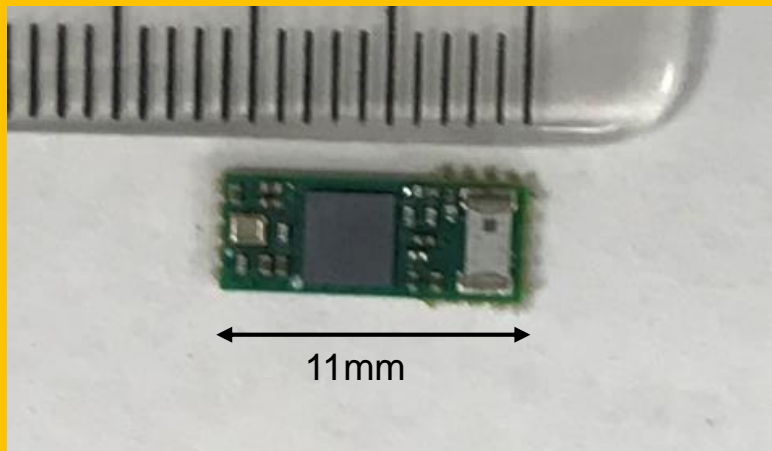
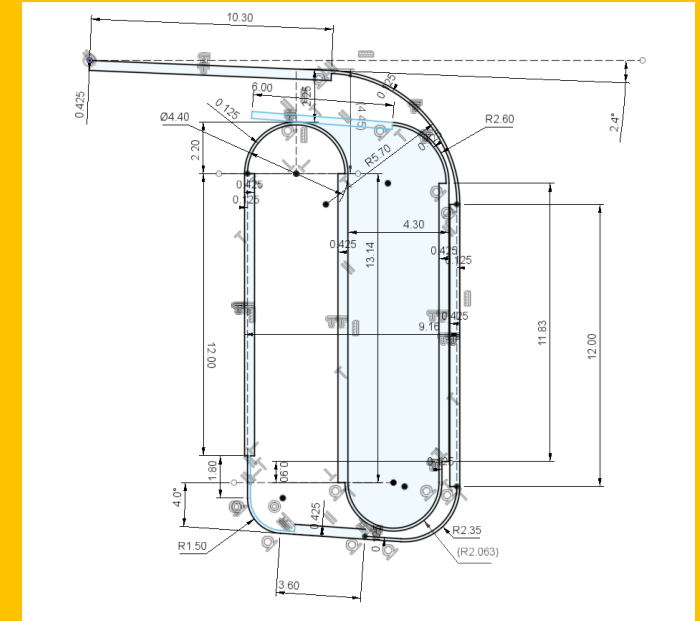
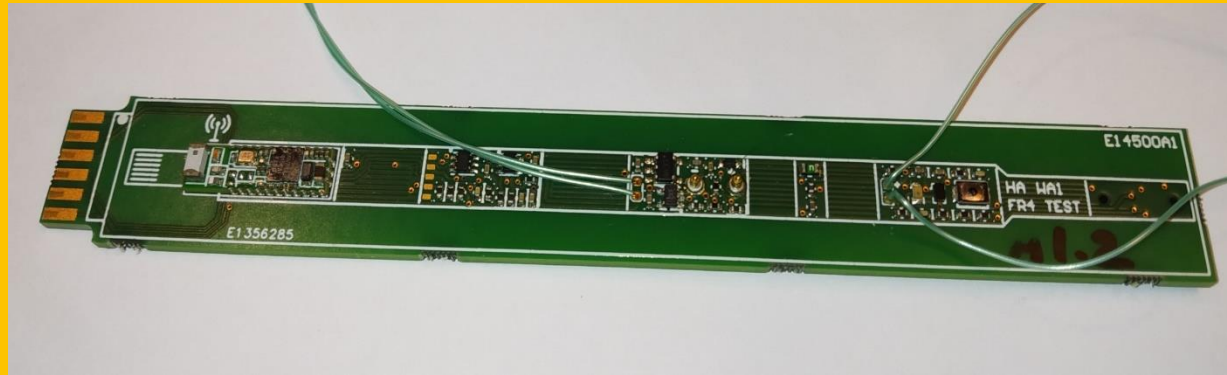
Gen 0 Hearing Aid



Assembly issues: connectors are expensive and/or assembly difficult

Solution: Flex PCB?

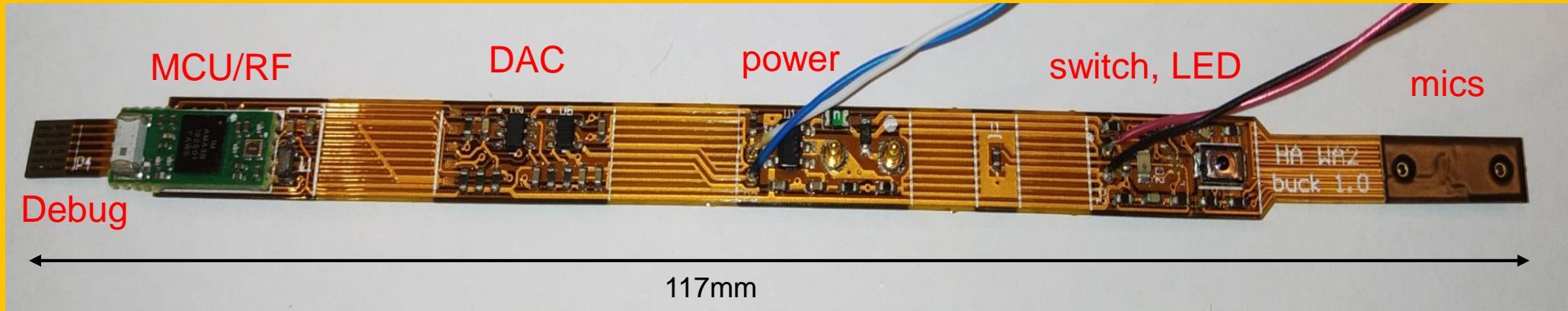
mark 2 PCB: flex concept design



Flex would require 4-6 layer HDI board (expensive!)

Solution: MCU/RF module + 2 layer flex (min. vias .2mm)

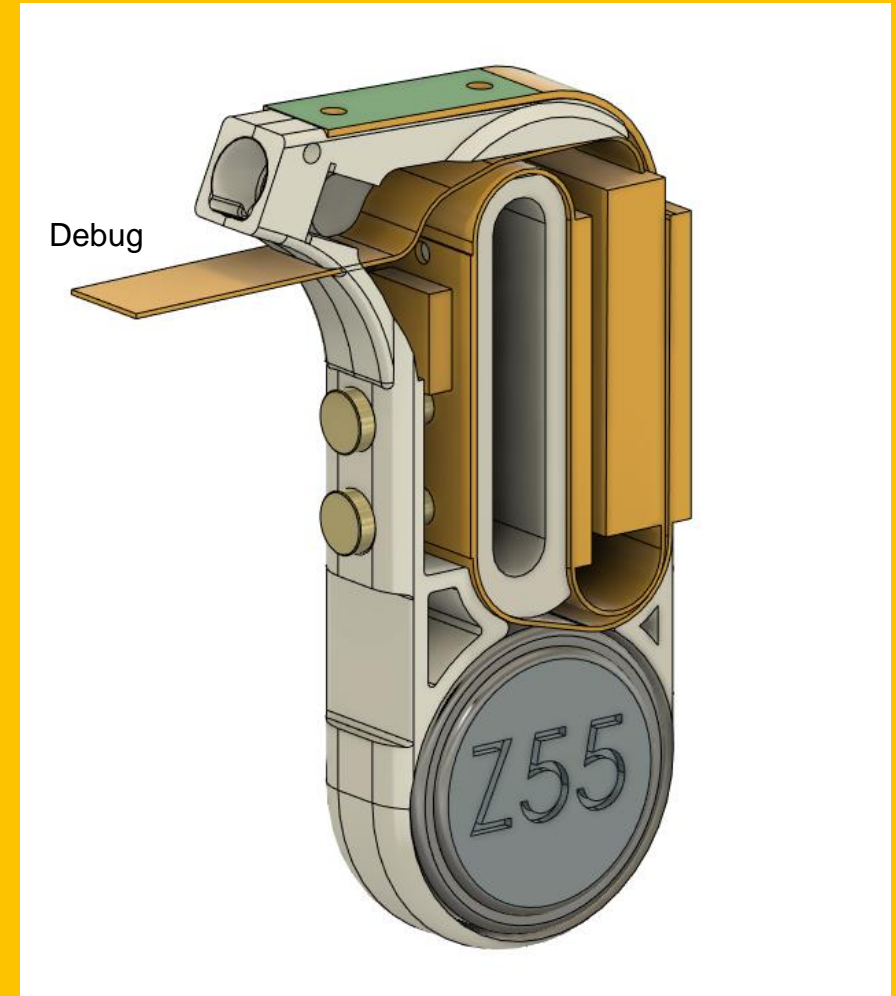
mark 3: flex PCB (only 4 flying leads)



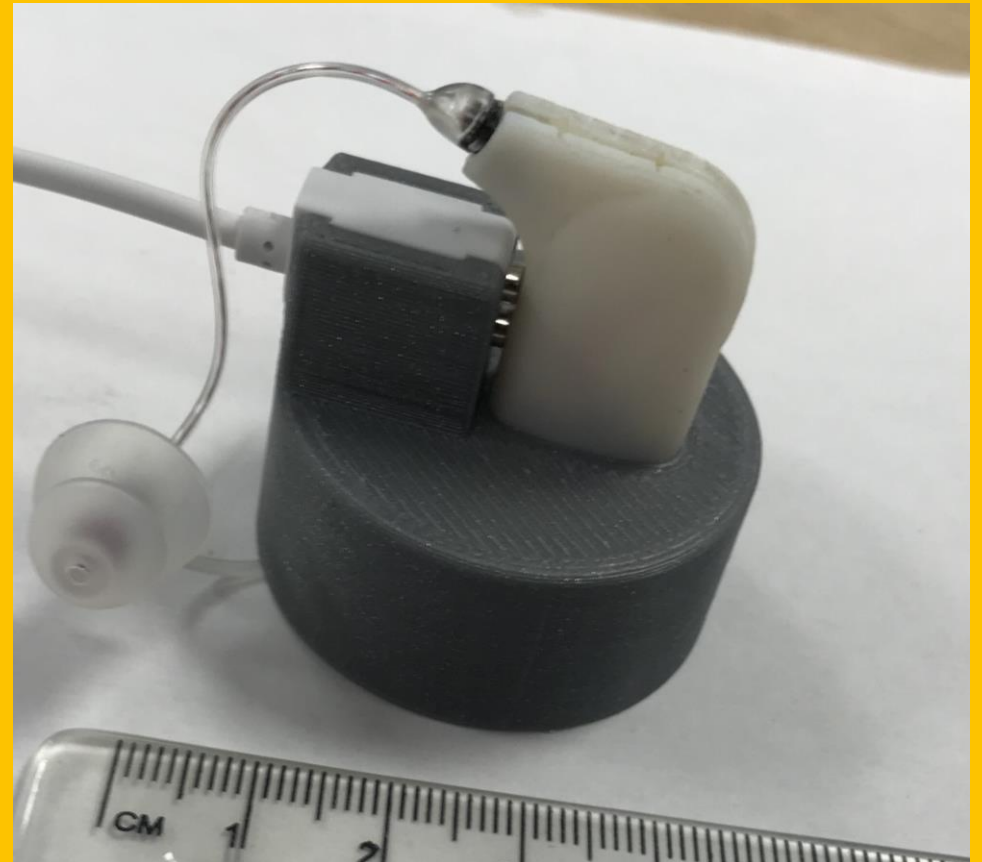
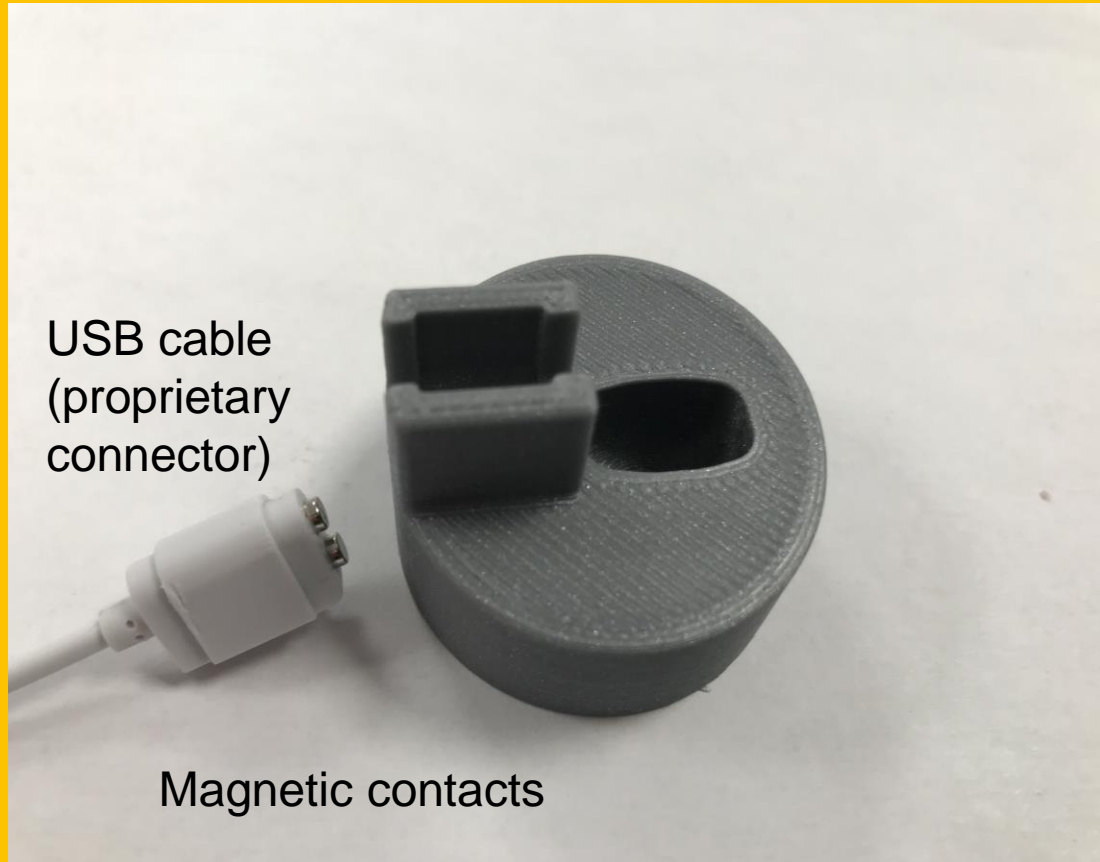
Debug interface



charging contacts
(nickle/gold plated steel)



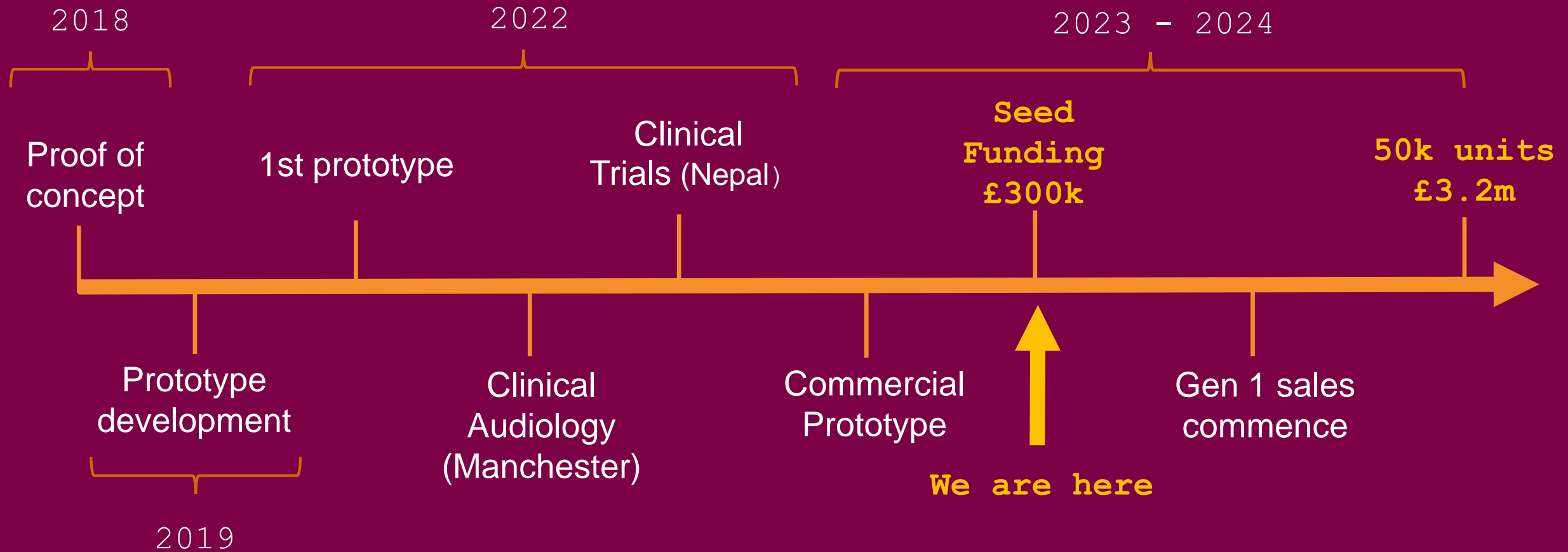
HA Docking station





- battery: >20 hours per charge
- Full suite of algorithms
- Bill of Materials < £35 (1000 units)
- Size: 33x15x8mm
- Programmable by app

Journey so far...



Markets ...

Europe,
USA:
mature
market

SAARC
developing
markets
3 x larger
than the
mature market

- US+EU combined population of **900m**
- **46m (4.6%)** suffer from significant impairment
- Sales **>\$5bn** per annum
- **>10m** devices per annum
- Southern Asia population **>2bn**
- **127m (7.4%)** suffer from significant impairment
- SAARC is the **largest global market**
- **Only 2%** can afford prescription hearing aids

Thank You

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