Hack your body, one implants at a time.

Speaker: Patrick Paumen

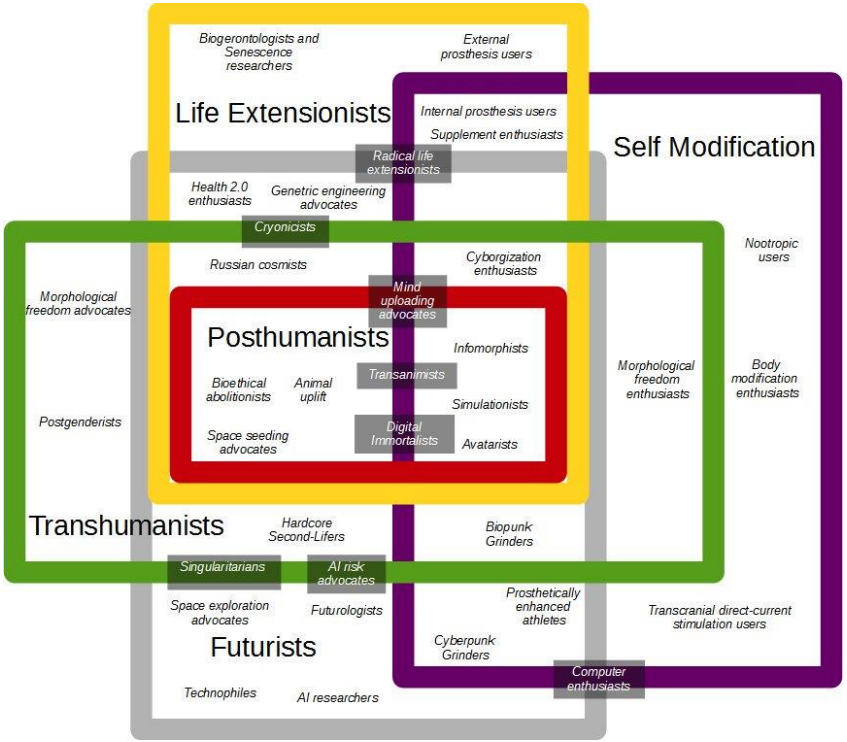
Introduction

Patrick Paumen

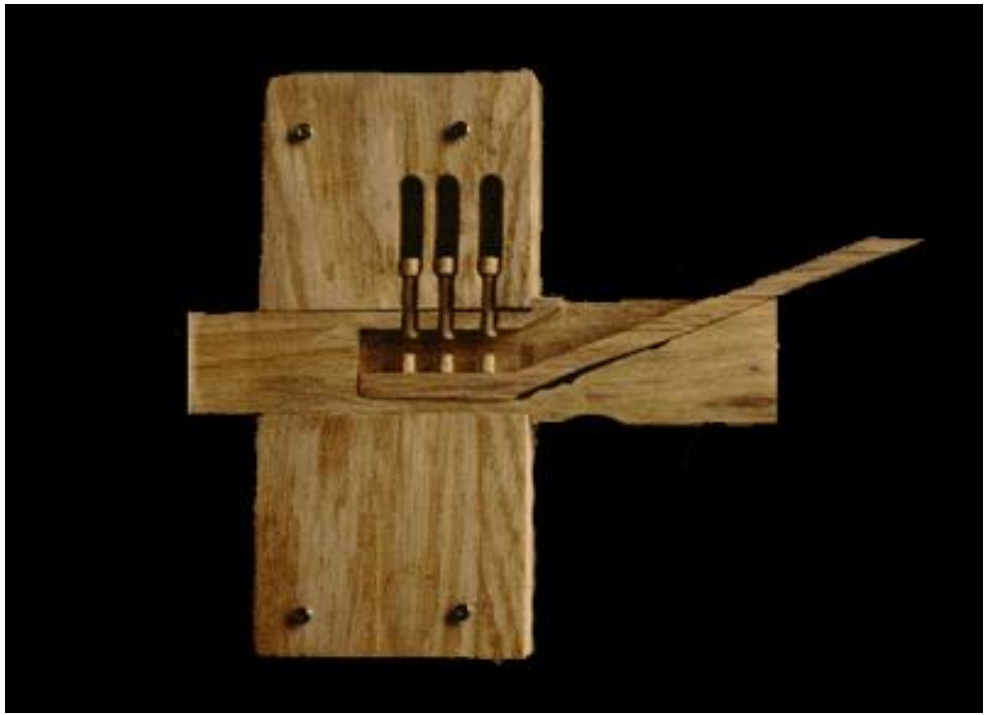
Founder of hackerspace ACKspace

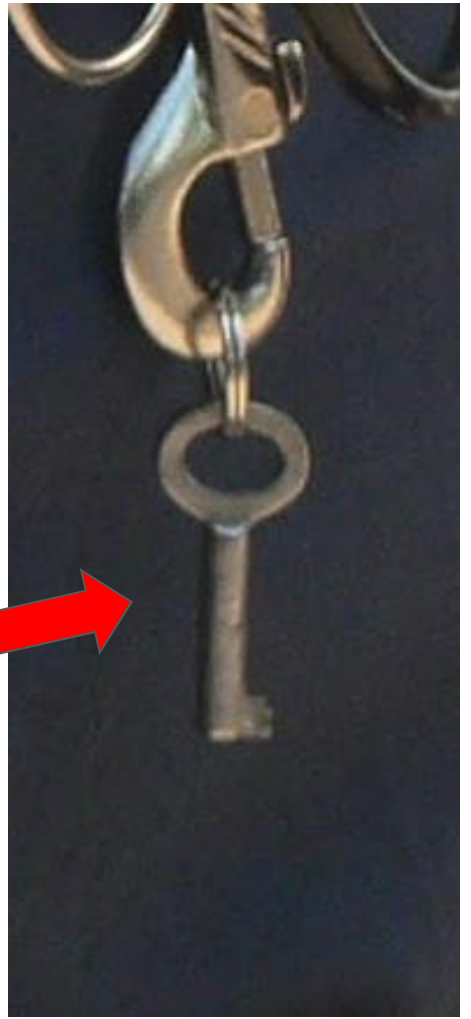
Biohacking history

Philosophy of transhumanism



Disadvantages of mechanical keys and locks

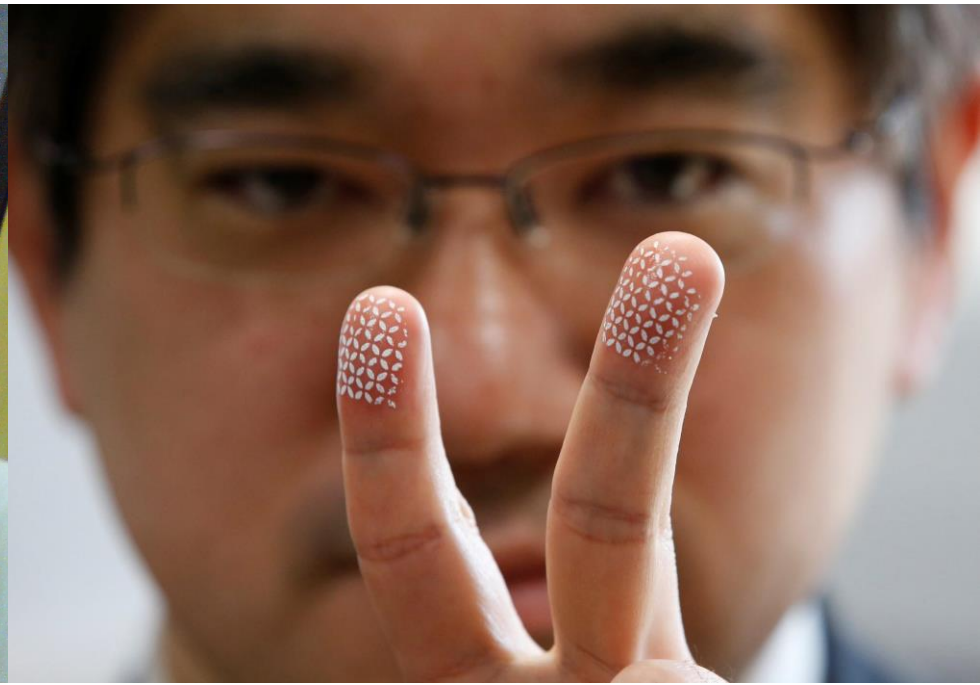




3D model

3D printed key

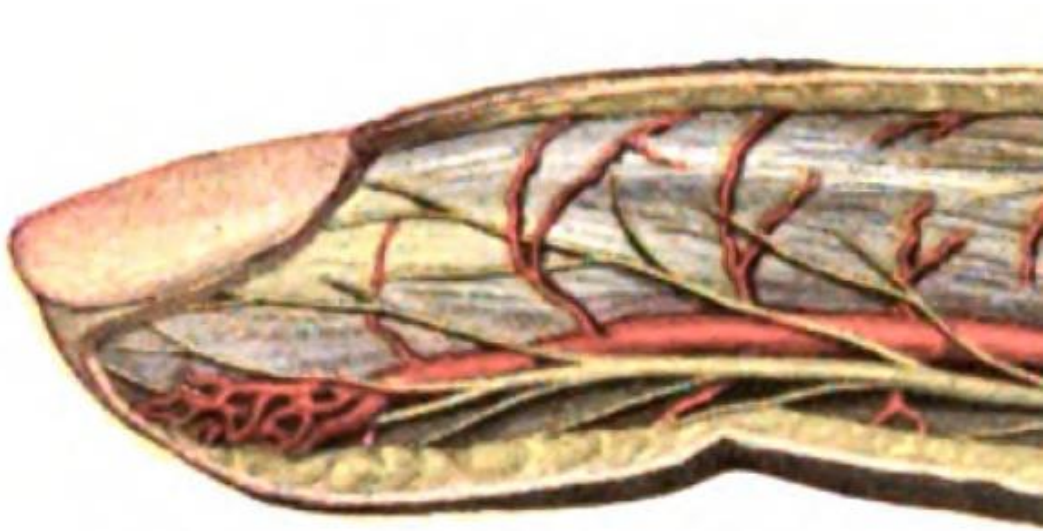
Disadvantages of biometric locks



Overview of non-medical implants:

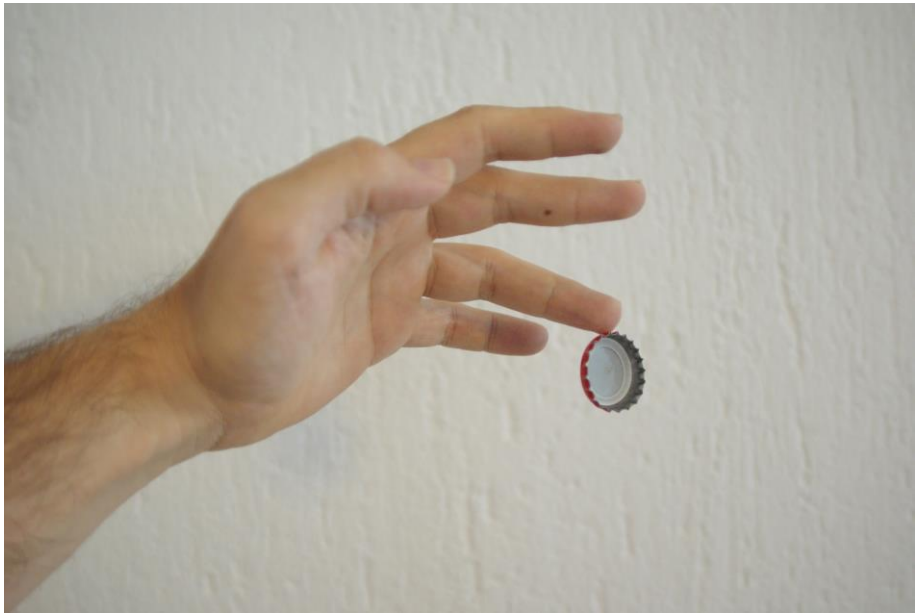
- Bioproof neodymium magnets in fingertips or tragus
- Circadia
- Eyeborg (wireless video camera in prosthetic eye)
- Eyeborg (antenna to hear color frequencies)
- Firefly (night light)
- North Sense (compass)
- NorthStar (LEDs)
- Seismic Sense
- RFID tags

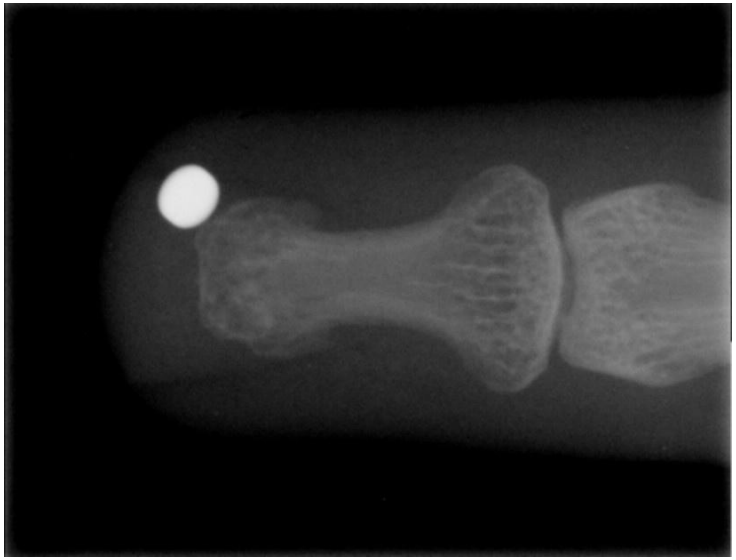
Magnet implants:



Fingertips are very sensitive because there are many nerve endings.
My magnet implants are 3 mm diameter, 1 mm high. Titanium Nitride coating to pre vent rejection.

Magnet implants: lift objects

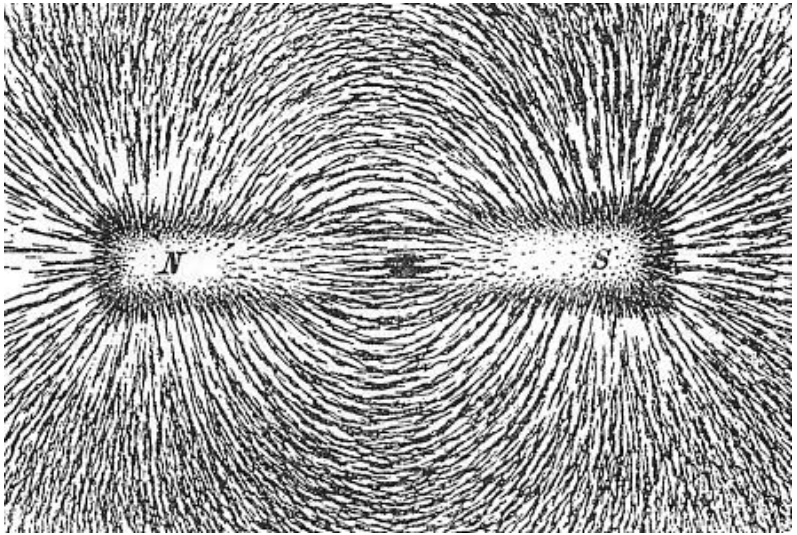


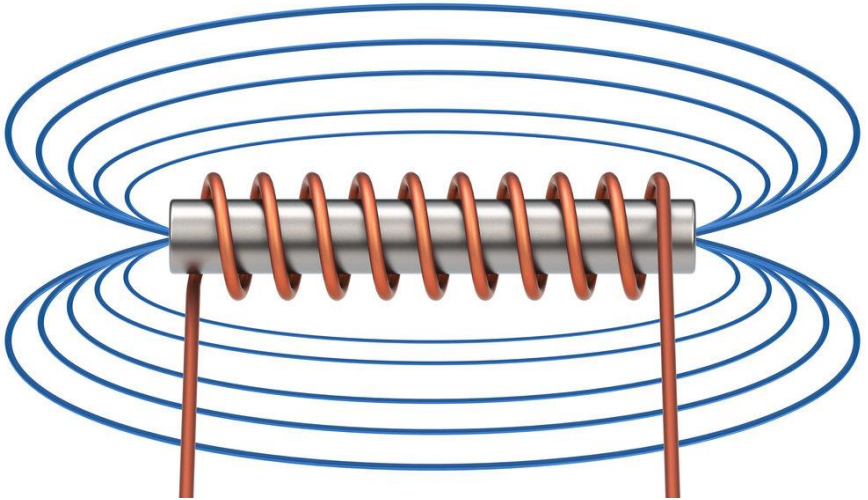


Picking up objects while working or for magic/party tricks:

- Bottlecaps, coins, nails, paperclips, safety pins and screws.

Magnet implants: Enhance senses

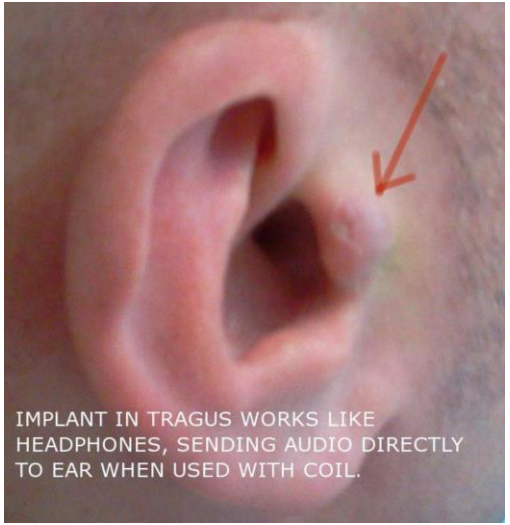




Fields are invisible, but they exist. This is how I can detect them.

- Detect magnetic fields from short distances, magnet moves fingertip skin.
- Magnet oscillates when near electromagnetic field, feels like tingling.

Magnet implants: invisible headphones

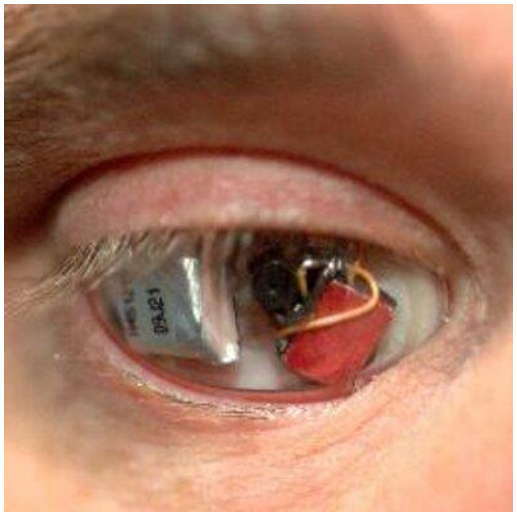


- subdermal headphones
  - When implanted in the tragus and in combination with an amplifier and co pper coil worn around the neck, the magnet can function as subdermal sp eaker.

Circadia:

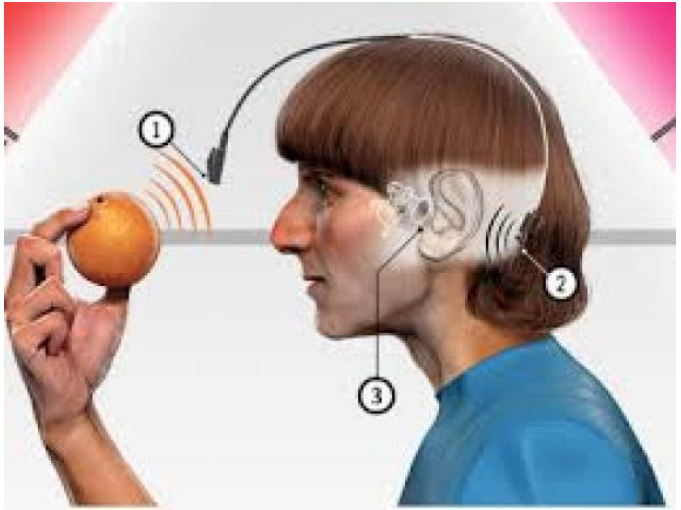
- Made by Grindhouse Wetware
- Measures body data, transmits data via Bluetooth.
- Charging via induction, but implant was removed after battery problem.

Eyeborg: wireless video camera in prosthetic eye



- Prosthetic eye with wireless video camera.
- Worn by director / filmmaker Rob Spence.

Eyeborg: transform colors to audio frequencies



- Neil Harbisson is color blind, but his implant changes color to tone frequency.
- Government approved his passport photo with visible implant.

Firefly: tritium lighting implants

- Created by cyberise.me, this tritium implant glows in the dark.
- Implant emits a small amount of ionizing radiation.
- Radiation reduced by special coating of lead oxide glass.

North Sense: external compass

- Created by Cyborg Nest.
- Compass vibrates when facing north.
- Not an implant, but attaches to piercings.

NorthStar V1: 5 red SMD LEDs

- Made by Grindhouse Wetware. LEDs are activated by magnet.
- Backlight tattoos, mimick bio luminescence.
- Next version has gesture recognition.

Seismic Sense

- Implant in elbow allows wearer to feel earthquakes through vibrations.
- Wirelessly connects to online seismographs, any earthquake in the
- world of 1 Richter and above.
- Worn by Moon Ribas, who uses it in her choreography.

RFID tag implants: x-series

- Made by Dangerous Things.
- Biologically safe 2x12mm cylindrical bioglass tube
- Pre-tested and pre-loaded in sterile injection assembly
- No “anti-migration” coating means easy removal/replacement

RFID tag implants: xBT

Technical specifications:

- 134 kHz FDX-B Bio-Thermo LifeChip
- 38 bit unique read-only ID number
- Will read and report temperatures between 23.5C and … TBD
- BioBond “anti-migration” cap secures the tag once inside the body

My purposes:

- Read temperature of my lower arm.
- I registered my xBT implant on an animal database with "pet owner" emergency contact details.

RFID tag implants: xEM

Technical specifications:

- 125kHz Low Frequency ISO11784/785 Atmel ATA5577 RFID chip.
- Compatible with EM41xx, HID ProxCard II, and Indala systems.
- Clone EM41xx IDs, HID ProxCard II, and Indala IDs to the xEM.
- Pre-programmed in EM41xx mode with a 40 bit unique ID.

My purposes:

- Unlock car doors: tag in EM41xx mode, RFID access controller connected to c entral door locking system.
- Hobby projects with RFID reader, access controller.
- 2nd implant: Unlock doors at another office building, gain access to parking lot (HID, Wiegand protocol).

RFID tag implants: xIC

Technical specifications:

- 13.56MHz High Frequency ISO/IEC 15693 I-CODE SLI RFID chipset.
- 8 byte UID and 112 bytes of user read/write memory
- 10 year data retention. Rated for 100k writes per memory block.

RFID tag implants: xM1+

Technical specifications:

- 13.56MHz ISO14443A compliant Mifare Classic S50 1k emulator.
- Emulates MF1ICS50 1k chip with "Chinese Magic Backdoor" command support.
- 7 byte UID and all of sector 0 is writable using CMB commands.
- 10 year data retention. Rated for 100k writes per memory block.
- Encased in 3x13 mm bioglass with non-toxic epoxy.

My purpose:

- Unlock the door at the building where my hackerspace is.

RFID tag implants: xNT

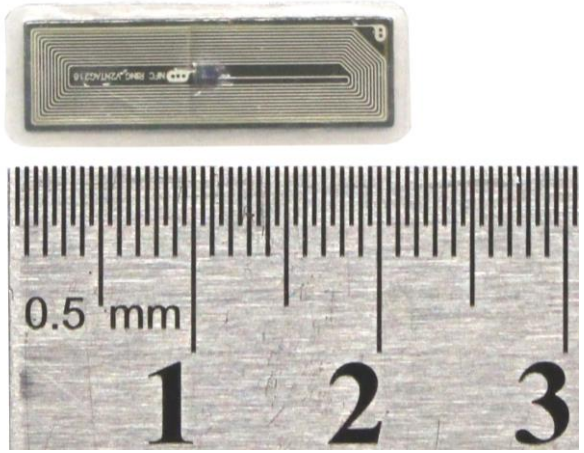
Technical specifications:

- 13.56MHz ISO14443A & NFC Type 2 compliant NTAG216 RFID chipset.
- 7 byte UID and 880 bytes of user read/write memory.
- 10 year data retention. Rated for 100k writes per memory block.

My purposes:

- Unlock smartphone.
- Share contact details (vCard) via NFC.
- Share GPS coordinates, medical data, text, lyrics, poem, URL.
- Control electronics with Arduino & NFC module.
- Control slides of this presentation.

RFID tag implants: flexNT



Same tag as xNT, but different shape and size.

- 8x22x0.4mm flexible biopolymer package

My purposes:

- Unlock doors at home, office.
- Share contact details (vCard) via NFC.
- Share GPS coordinates, medical data, text, lyrics, poem, URL.
- Control electronics with Arduino & NFC module.

RFID tag implants: flexDF

BETA product

Technical specifications:

- 13.56MHz ISO14443A & NFC Type 4
- Mifare DESFire EV1 8k chip
- 10x22x0.5mm flexible biopolymer package

RFID tag implants: VivoKey

BETA product
Technical specifications:

- 13.56MHz ISO14443A & NFC Type 4
- NXP SmartMX2 chip
- Java card applets
- 10x22x0.5mm flexible biopolymer package

My purposes:

- Generate OTP codes for 2-factor authentication for more secure logins.
- PGP data & e-mail encryption, decryption, signing.

Potential future purposes:

- Financial transactions at any contactless payment terminal?

RFID tag implant safety tests

- Vacuum test to 0.42mBar.
  It would survive the vacuum of low earth orbit or outer space.
- Liquid nitrogen tested
- Electromagnetic pulse (EMP) machine tested.
- Growth / sterilization tested.
- Cooked in an oven at 375F for 30 minutes.
- Crush tested up to 500 Newton (machine maximum).
- MRI tested up to 7 Tesla.

Implant methods

Methods of inserting implants in the body.

- RFID glass tags: RFID tag pre-loaded in sterile injection assembly.
- Other types of implants: scalpel, dermal separator, stitches.

Implant coatings

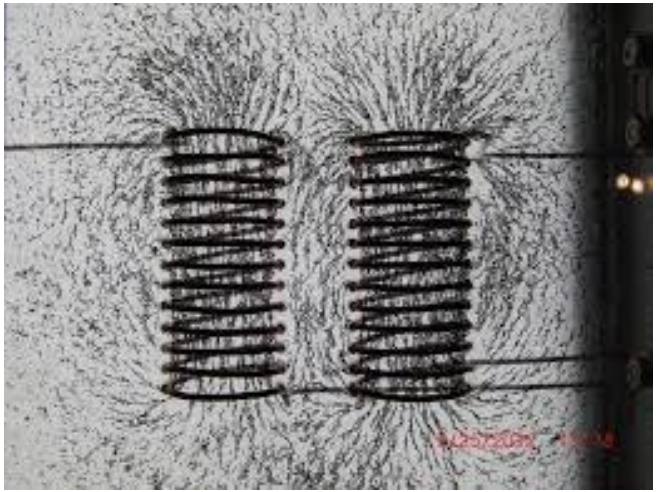
Materials used by professionals to make implants bioproof:

- Bioschott glass
- Parylene-C
- Titanium Nitride (TiN)

Materials used by DIY biohackers:

- Hot glue
- Sugru

Advantages & hardware limitations:



- Limited data storage capacity.
  See technical specifications of individual implants.
- Don't worry about forgetting or losing keys.
- Passive devices, no battery required.
  RFID tag implants only are active when near an RFID reader.
  Read range depends on strength, shape and orientation of coils, magn etic coupling between RFID reader and tag.
- Short reading distance; no long distance data collection.
  Sometimes you need to find the “sweetspot” in smartphones.

Common questions and concerns

- Airport security
- Laws
- Payments
- Privacy concerns

Demo

Cloning RFID tags with RFID cloner and Proxmark3

Thank you!

Contact information:

E-Mail: v@icario.us
Twitter: Vicarious1984