Midterm review – ESR 12

ARDENT
Advanced Radiation Dosimetry European Network Training

Vijayaragavan VISWANATHAN
vijay@jablotron.cz

Contents

- Introduction
- Market research
- Interface development
- Training
- Outreach & dissemination
- Conclusion

Introduction

JABLOTRON CREATING ALARMS

- Reminder
  - Vijayaragavan Viswanathan
  - Tamilnadu, India
  - ESR 12 – JABLOTRON ALARMS, Czech Republic
  - From October 1, 2012
- Job description
  - Development of Medipix based radiation monitoring system
    - System for public security
    - Handheld device
    - License from Medipix collaboration
  - Learning rich experience of successful enterprise
    - Applying academic knowledge in private sector
    - Mastering skills required in industry
  - Secondments – CTU, MI.AM
- Personal objective
  - Reach out to public about radiation
  - Make it understandable by available technology

PhD (2009-2012)
Modeling and design of 3D Imager IC

CENTRALE LYON

Masters research (2008-2009)
Microelectronics and nanoelectronics

UNIVERSITE JOSEPH FOURIER SCIENCES TECHNOLOGIE MEDECINE

Masters (2007-2009)
Microelectronics and nanotechnology

ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE

Grenoble INP

POLITECNICO DI TORINO 1859 1906

Market research

JABLOTRON CREATING ALARMS

- Why?
  - New product portfolio for Jablotron
  - Gap – science & need
  - Technology vs Cost
  - Application areas
- Objective
  - Market requirement
  - Available products
  - Features needed to have successful product
- Focus
  - Academic – Education tool – Schools, Universities
  - Homeland security

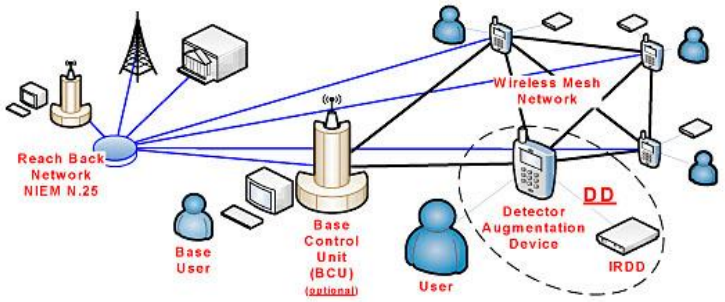
Market requirements

JABLOTRON CREATING ALARMS

- General
  - Mountable/removable on vehicles
  - Data collate able from multiple devices
  - Calibration information/ product information/certifications linked to log file
  - Device registration (similar to security alarms)
    - Alert based on device and location
  - Extreme temperature/humidity/dust/immersion
  - Usable with gloves/protective clothing
- Spec
  - Accuracy +-30% actual dose rate from 1uSv/h to 3 Sv/h
  - Self monitoring for instruments health
  - EMI susceptibility
  - Temperature -30℃ to +61℃
  - Humidity 40% to 93% at 35C
  - Water immersion 1m (atleast)
  - GPS accuracy < 5meters
  - Wi-Fi 802.11g with security

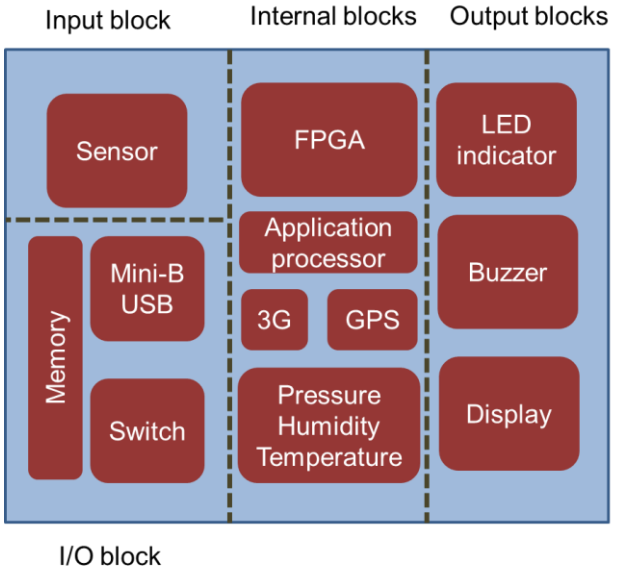
Draft specification

JABLOTRON
CREATING ALARMS

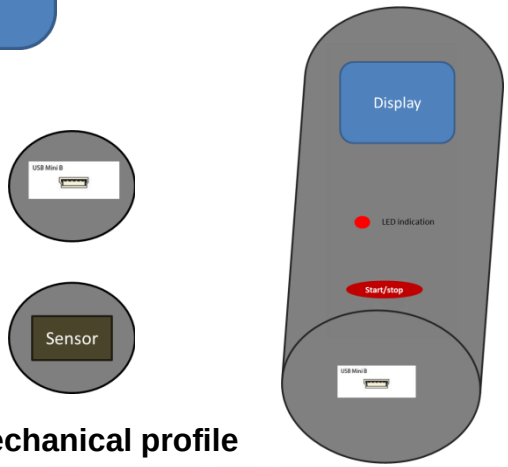


Cloud network with detectors

Display



Functional block diagram



Mechanical profile

But……!!!

Feedback/outcome

JABLOTRON
CREATING ALARMS

Specification	Reaction
Display	☺
Pressure	☺
Humidity	☺
Temperature	☺
3G	☺ ☺
Portability	☺ ☺ ☺
GPS	☺ ☺ ☺

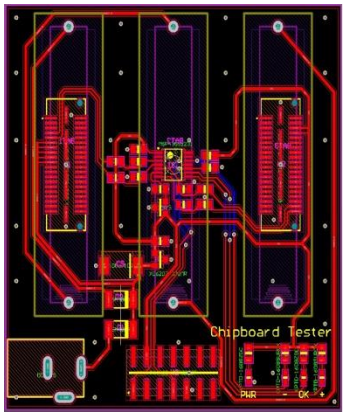
Medipix	Reaction
Technology maturity	☹
Abundant availability	☹ ☹ ☹
Suppliers	☹ ☹ ☹
Warranty	☹ ☹ ☹ ☹
Cost	☹ ☹ ☹ ☹ ☹

- Holding back due to this setback
- Investigation ongoing with partners (e.g: IEAP)
- In the meantime we have a prototype ready with gas based detector

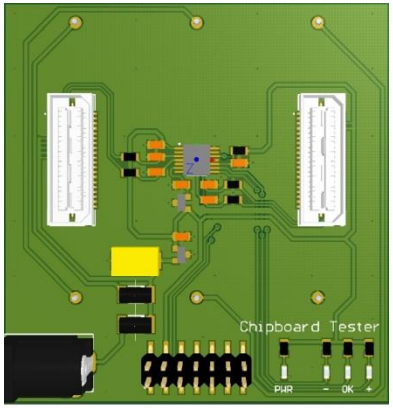
Interface development

JABLOTRON
CREATING ALARMS

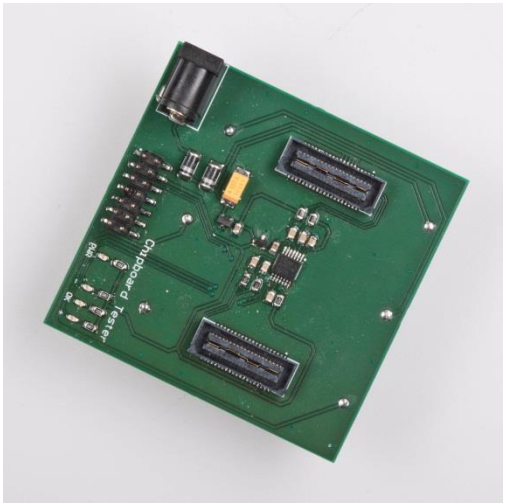
- Skill development
  - On the job PCB design training
    - Best practices in schematic
    - Package selection
    - PCB Placement
    - PCB Routing
  - Soldering training
  - Microcontroller programming
- Chipboard tester
  - Sensitive voltage regulator
  - Fine tune voltage supplied to digital and analog lines
  - 0805 technology
  - MSP430G2231
  - Battery powered or through power adapter



PCB – 2D view



PCB – 3D view

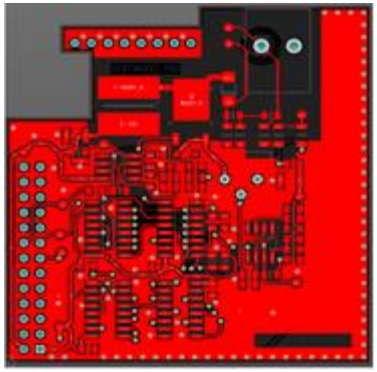


Voltage regulator – Final assembly

Geiger muller counter

JABLOTRON
CREATING ALARMS

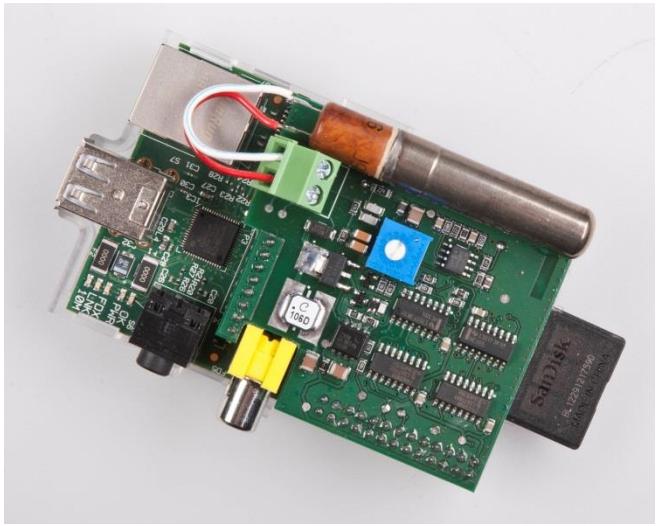
- Investigation of hybrid detector
  - Gas based + Semiconductor based detector
- Study on gas based detector and performance
- SURO proposal of low cost device



PCB – 2D view

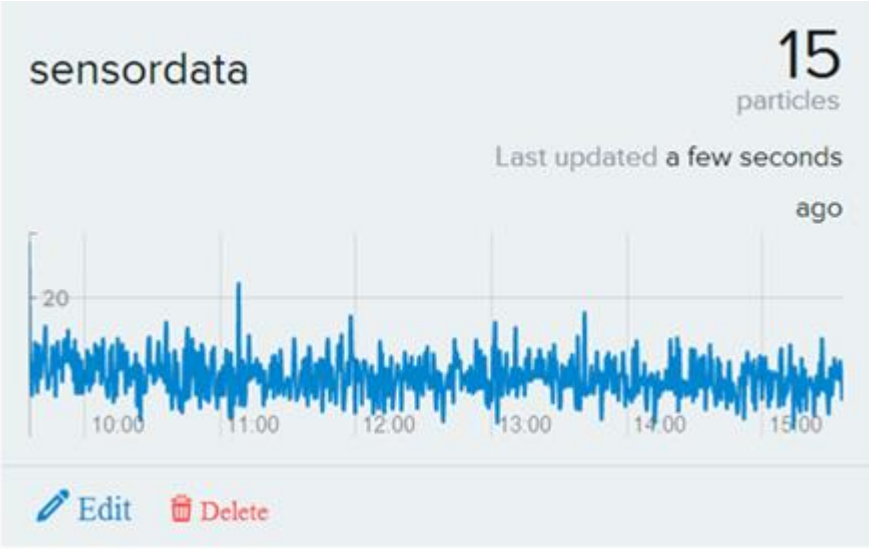
GM counter – final assembly

- Features
  - Shift registers and counters to accumulate data
  - Raspberry Pi to readout data
  - Remote real time monitoring capability
  - Design with easily available parts
  - Mass proliferation of detectors across country for monitoring
  - Low cost

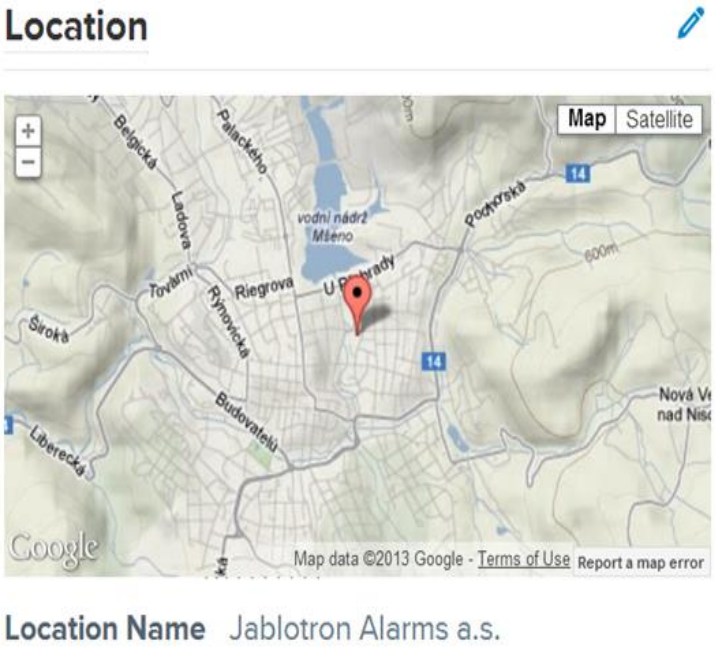


GM with Raspberry Pi – final assembly

Remote monitoring



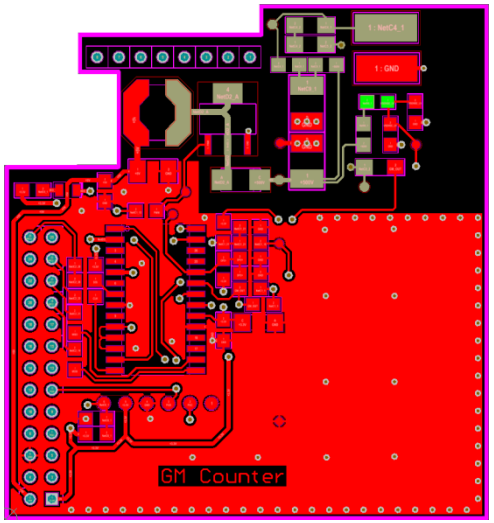
Remote monitoring



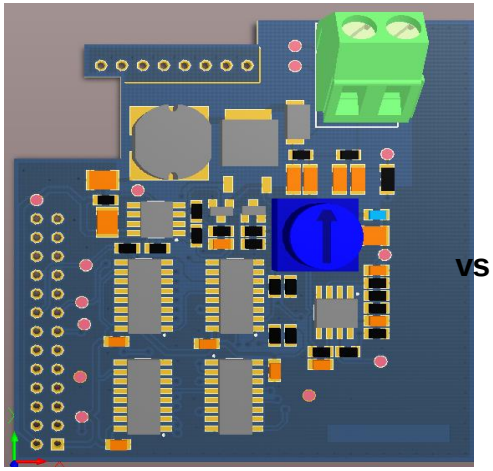
GM counter (contd)

JABLOTRON CREATING ALARMS

- PIC microcontroller based GM counter **(Ongoing)**
  - Reduction of components
    - Shift registers
    - Counters
    - 555 timer IC
    - Several discrete components
  - PCB design completed
- Voltage monitoring
- Monitoring aging of GM tube
- Reduction in components
- Better reliability
- Reduction in area
- Low power consumption

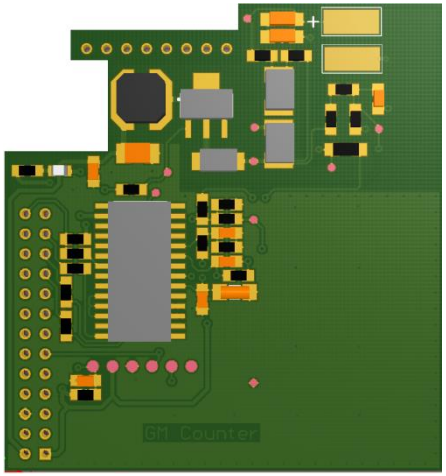


GM- PIC based PCB 2D view



GM- 555 based PCB 3D view

vs



GM- PIC based PCB 3D view

MX-10

JABLOTRON
CREATING ALARMS

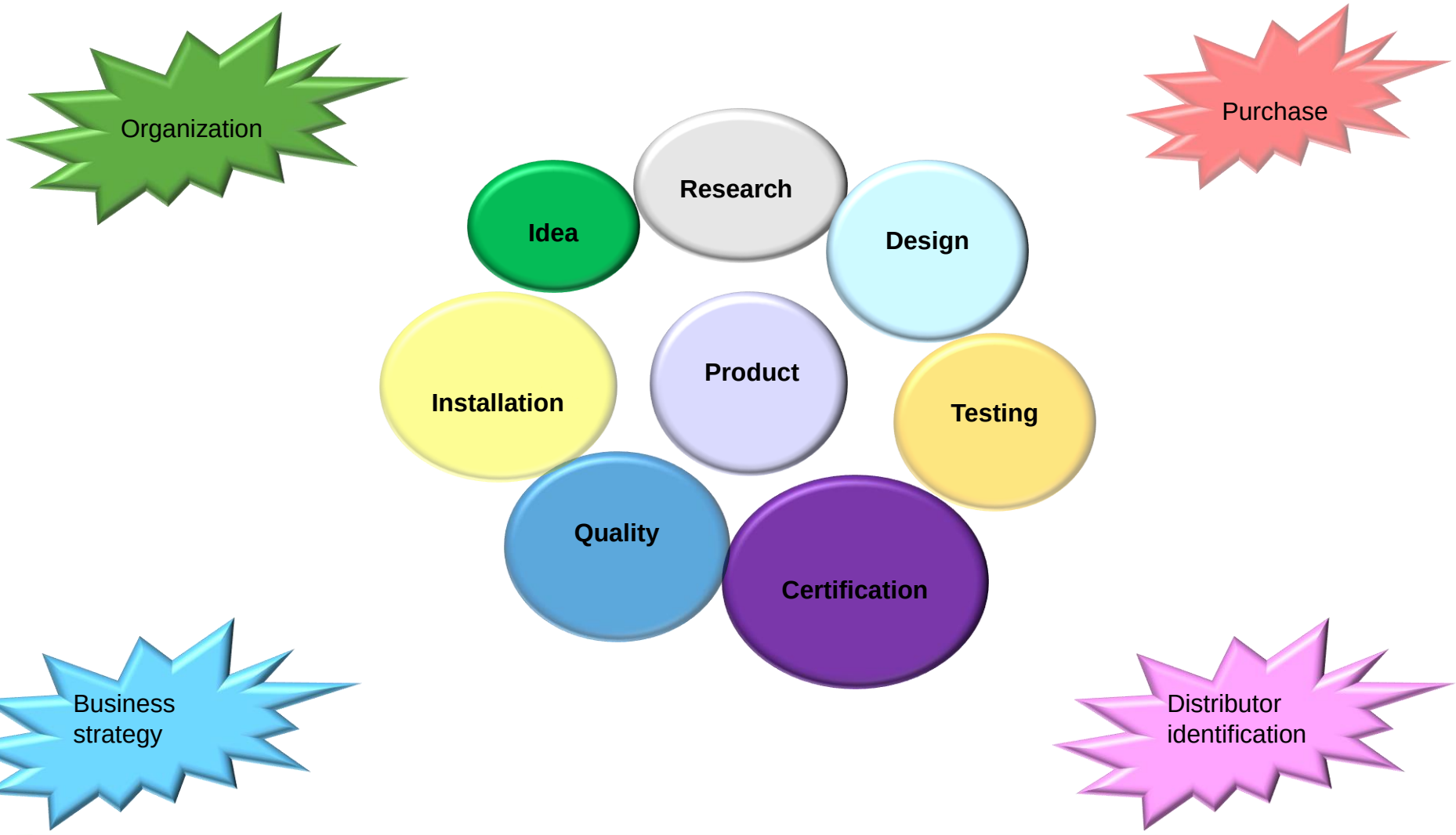
- Educational kit for schools, universities
- Awareness in radiation
- Involvement
  - Testing – Equalization, Stress test etc.,

Jablotron – MX-10

Jablotron – MX-10 – Education kit

Training – In-house

JABLOTRON
CREATING ALARMS



Training - External

JABLOTRON CREATING ALARMS

- Market research feedback
  - Amsterdam Scientific Instruments
  - SURO
  - Schools/Universities

- Radiation related training/workshop/conference
  - Vienna workshop
  - MMNT,Wollongong, Australia
  - ICPE, Czech Republic (August)
  - Heraeus physics school , Germany(August)
  - IEEE – NSS, South Korea (October)

Outreach/Dissemination

- Foreign ministry, Czech Republic
- European research career and mobility conference, Dublin
  - Winner of bursary competition
- Appreciation from Ambassador of India at Czech Republic
  - Network with BARC
- Invitation from
  - Embassy of France in India (next visit to India)
  - Few universities in India

Conclusion

JABLOTRON CREATING ALARMS

- GM counter prototype ready and tested
- GM counter with microcontroller – Ongoing
- Skill development – PCB design and product development
- Discussions/investigation on Medipix based security product – ongoing
- Medipix based educational kit is ready and few are in the market
- Regular in-house and external training
- Regular outreach activity to reach out to public
- Submitted an abstract to IEEE-NSS workshop

- Updated
  - Profile page
  - Logbook page
  - Excel sheet for training
  - Deliverable 2.1 submitted

Acknowledgment

- Colleagues at Jablotron Alarms
  - Pavel Hubner, Stepan Martinek , Martin Honig, Vladimir Stanislav
  - CEO Mr.Dedek
- Thanks colleagues from IEAP
- Marco Silari for his encouragement
- Blandine Faure for her support
- Erik and Stuart for their help
- ARDENT project partners and ESRs