

Protection e-Textiles: Micro/Nanostructured fibre systems for Emergency-Disaster Wear



The PROETEX Project

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The partnership



PROETEX Partners

Project funded during 6th FP, IST programme

Duration:
2006 – 2010

Budget: 12.1 ME

23 partners

Textiles for emergencies



Key issues



Comfort

Working conditions – relevant parameters

Effective alarm generation

System maintenance

Ease of use

Weight

Cost

Robustness

Energy constraints

Long range transmission

The wearable system



Inner Garment



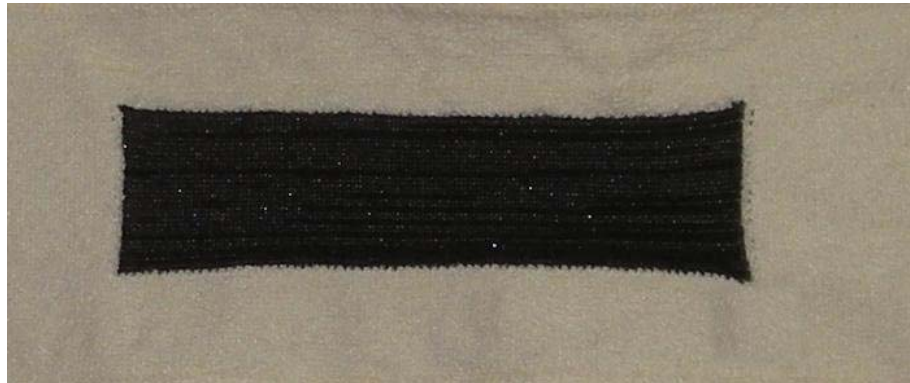
**Physiological
Parameters
monitoring**



Heart rate: Textile electrode

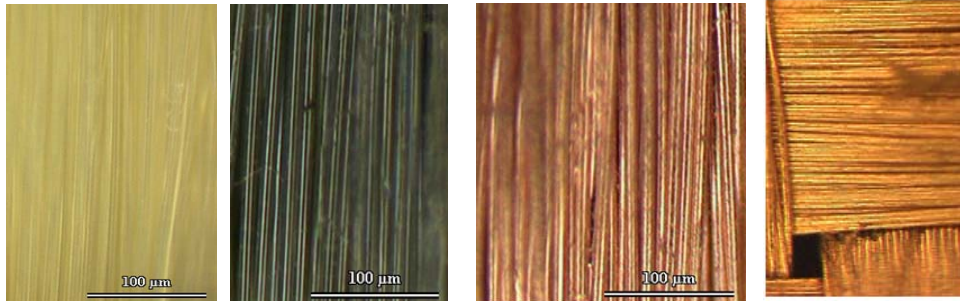


**Body temperature:
Digital Temperature
Sensor**



Respiratory rate :Pletismography

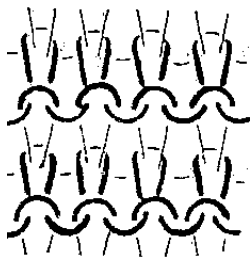
Textile electrodes



Kevlar with polypyrrole coating

copper coating

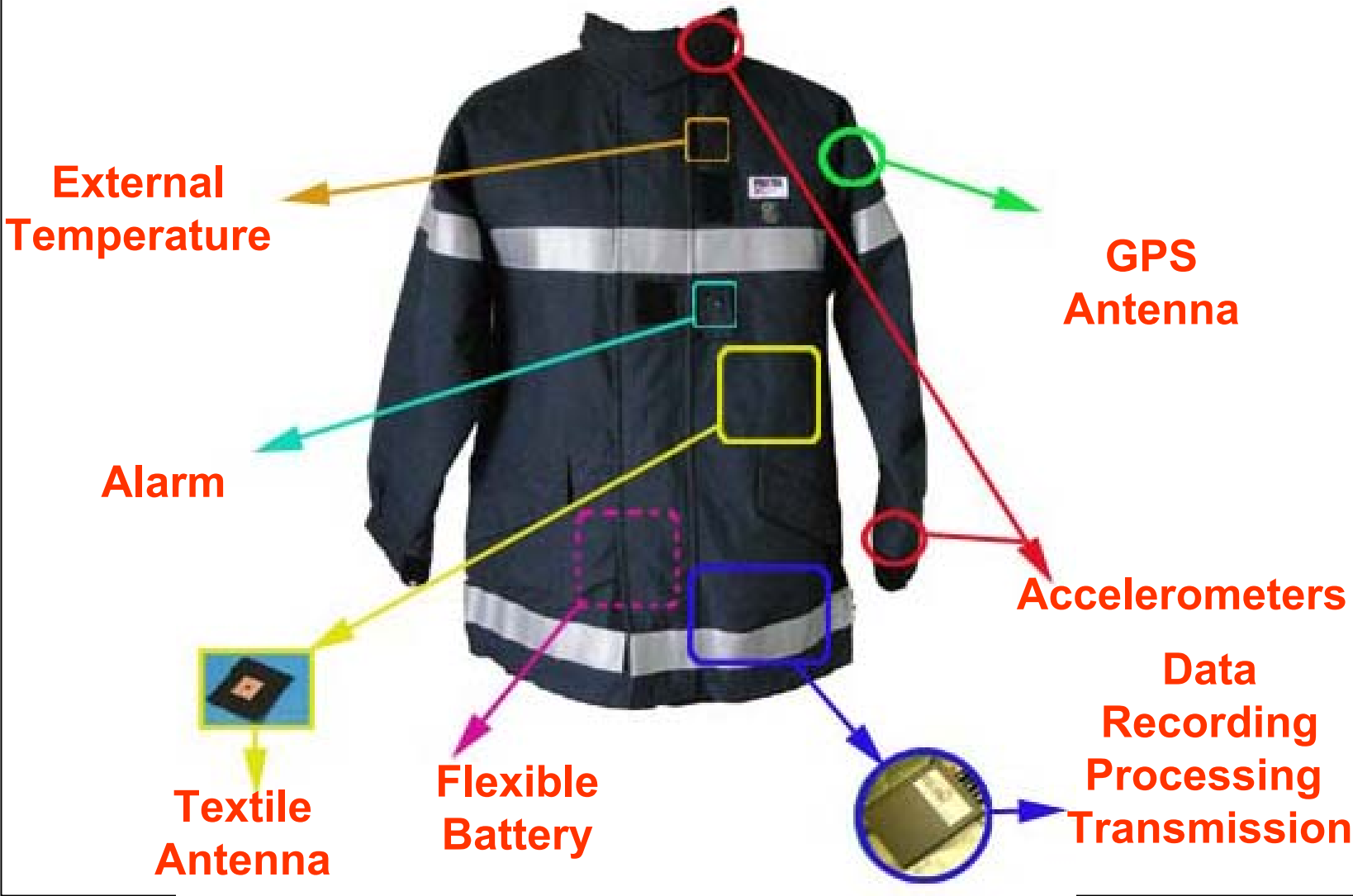
gold coating



Inner Garment



Outer garment



External Temperature

GPS Antenna

Alarm

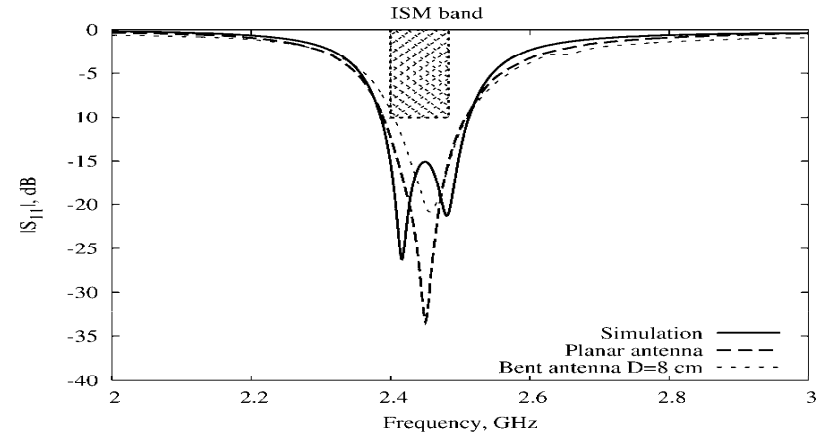
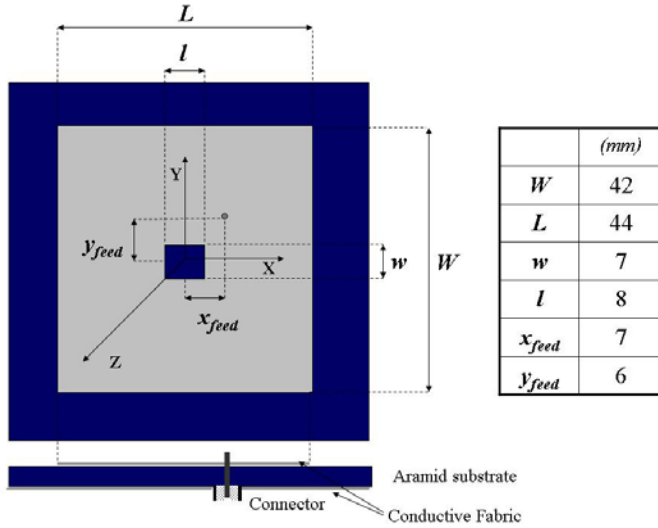
Accelerometers

Textile Antenna

Flexible Battery

Data Recording Processing Transmission

Textile antenna



Structure and dimensions

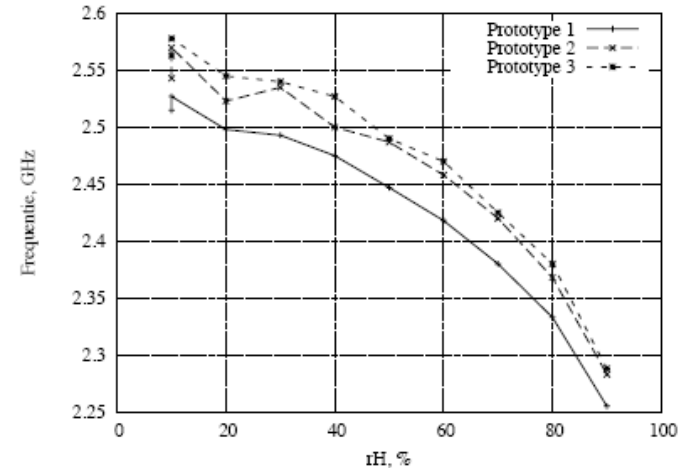
Characteristics:

-Bandwidth

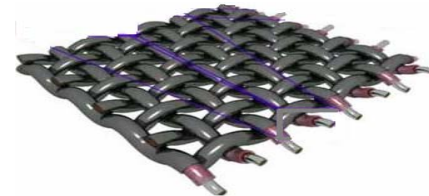
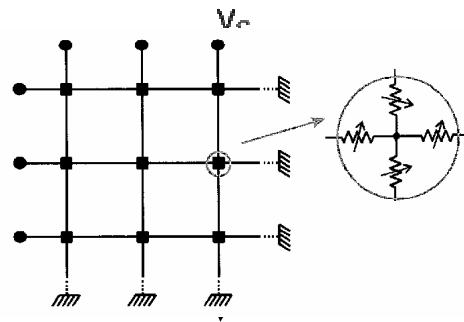
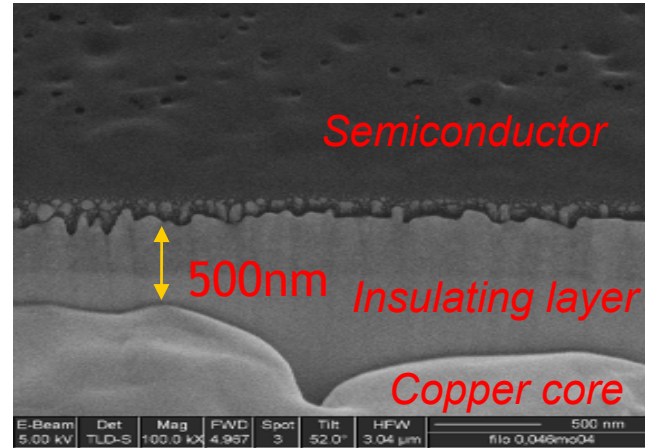
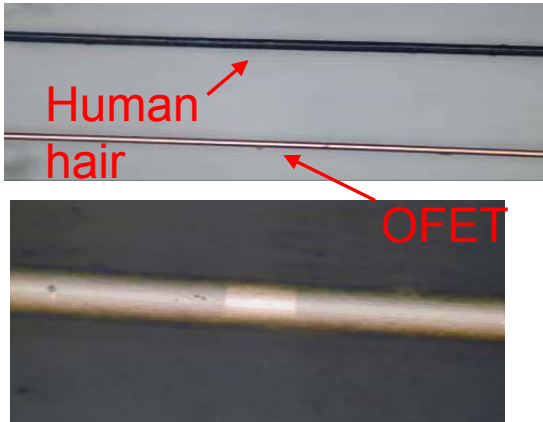
Problems:

-Bending

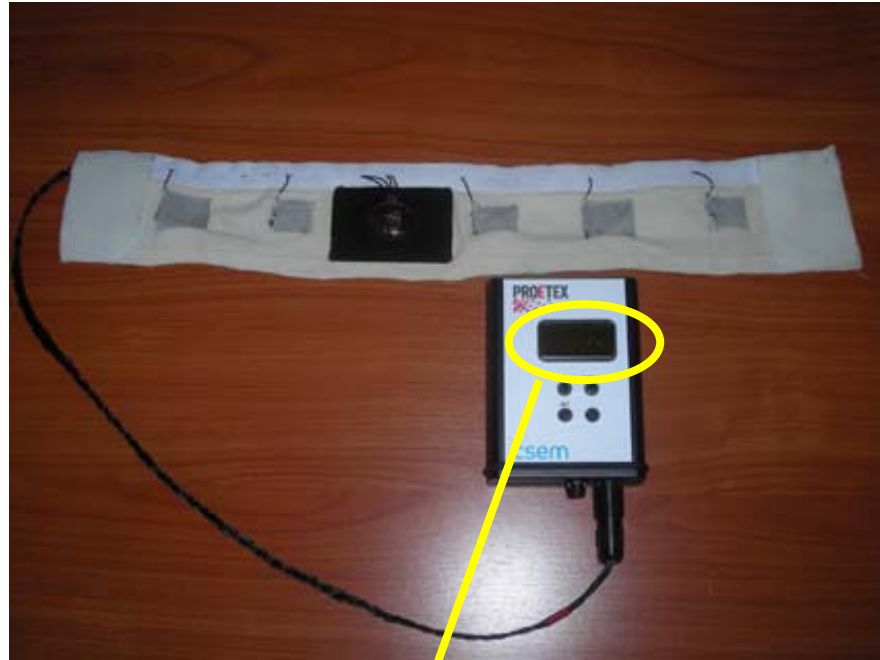
-Humidity



From Silicon to textile transistor



Victim Patch



Parameter

- Heart beat rate
- Respiratory rate
- Body Temperature

Cfr. inner garment



Data Transmission



Monitoring Centre



ProETEX PEB Remote Monitor - v. 2.6

File Configure Help

Connection

Set Up Connection Start Reading N° lines read: 246
Close Connection Stop Reading Unread. lines: 0 Show Unread. Data
Read One Sample Scan Rate (ms): 1000 Warning lines: 0

PEB State

Device ID: 43981
Sample N°: 866
Battery Level (%): 31

ECG Alarm: [Red Box]
Activity alarm: [Yellow Box]
Fall Alarm: [Green Box]

Clear Displayed Values
Clear Graphs

Detected Parameters

User's Health State Monitor

Heart Rate (b/s):	109	Signal Quality (0-255):	222
Breathing AC (b/s):	81	Signal Quality (0-255):	175
Breathing DC (b/s):	160	Signal Quality (0-255):	80
Body Temp. (°C):	35.6		

User's Activity Monitor

	Mod (V)	Activity	Warning	Moving?
Accelerometer 1:	0.587	Unco	Unco	NA
Accelerometer 2:	0.326	Unco	Unco	NA

User's Position (GPS data)

UTC Time:	18:14:06.00	
Latitude (°):	32.377982	N
Longitude (°):	447.157202	E
Altitude (s.l.m.):	41749.99	Unit: M
PosFix:	DifferentialGPS	Sats N°: 11
Status:	DataValid	HDDP: 2.33

Environmental Variables Monitor

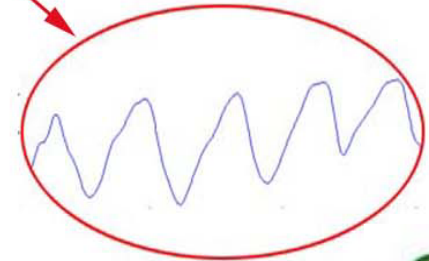
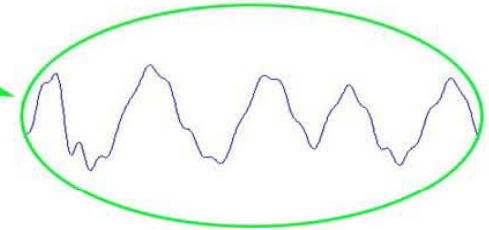
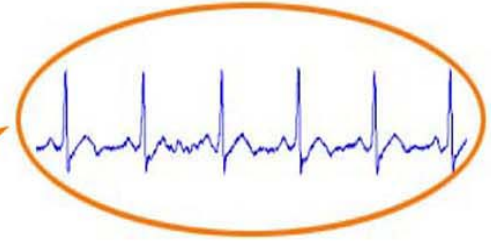
Inter-Garment Temperature (°C):	33
Outside Temperature (°C):	893

Heart Rate Breathing AC Breathing DC Body Temp. Ext. Temp. Activity Shoulder Activity Wrist GPS

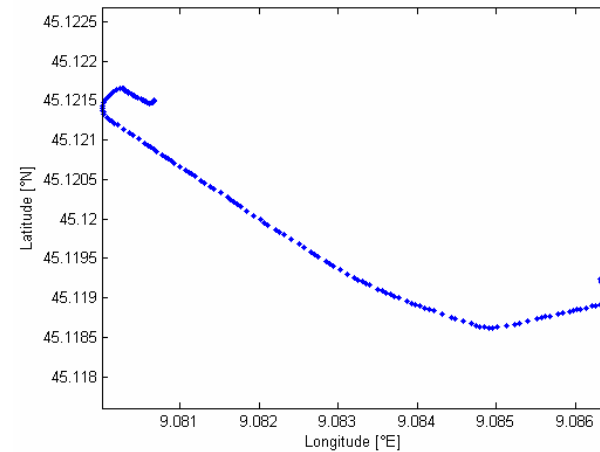
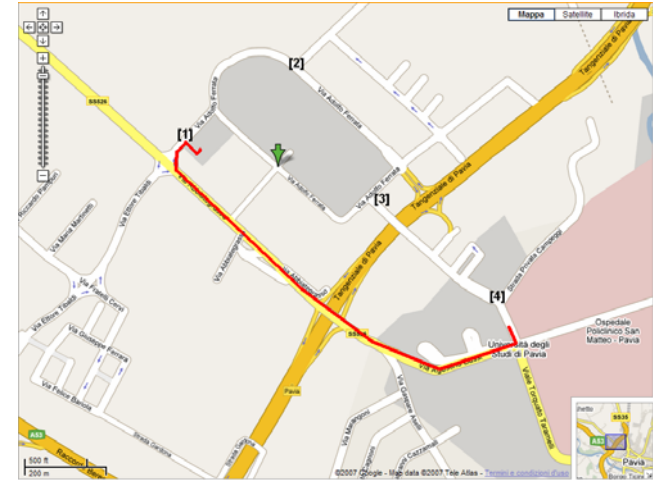
Heart Rate

Raw Data: *12&EEE1D181406.00,28262.6789,N,44709.4321,E,2,11,2.33,41749.99,M,A,68
Info:

Connected to COM22 --- Baud Rate: 115200 - Parity: None - Data Bits: 8 - Stop Bits: One - Handshake: None



Position	ProeTEX	PDA	Google Earth
1	45.202740	45.202624	45.202755
	09.133803	09.133932	09.133844
2	45.203345	45.203210	45.203322
	09.134353	09.134457	09.137197
3	45.201181	45.201847	45.201555
	09.139856	09.139828	09.139477
4	45.200705	45.198690	45.198816
	09.143692	09.143832	09.143833



Field Trials



Work in progress

Sensor systems:

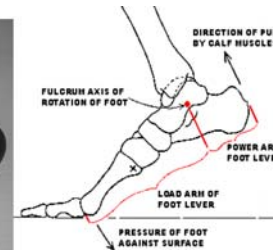
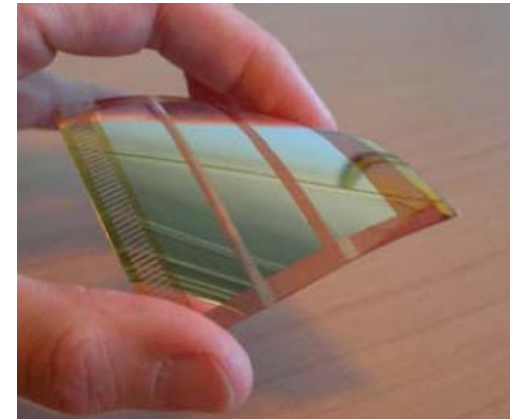
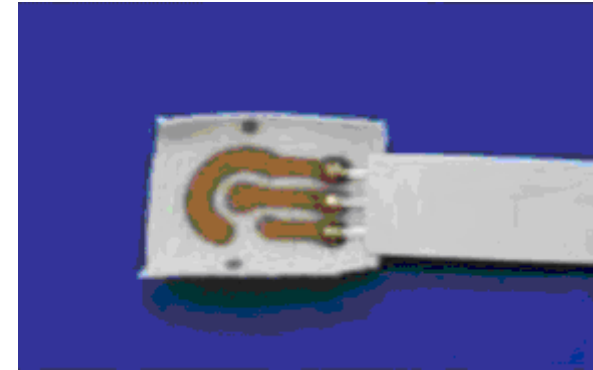
Motion analysis by means of piezoresistive sensors and active sensors on plastic substrates

Biochemical analysis of sweat with textile devices and optical biosensors

Energy: Harvesting through body motion, thermal generation, solar cells

Transmission:

Long range, low power transmission systems



Generic technologies for multiple use

User conditions are challenging

User acceptance:

- Cost
- Regulation

Development of platform

Huge potential



Proetex first case of inter-project cooperation
in the framework of SysTex CA

www.proetex.org

www.systemex.org