EPJ Web of Conferences **153**, 08002 (2017) DOI: 10.1051/epjconf/201715308002
ICRS-13 & RPSD-2016

OPEN RADIATION: a collaborative project for radioactivity measurement in the environment by the public.

Jean-François Bottollier-Depois[1,*], *E.* Allain[2], *G.* Baumont[1], *N.* Berthelot[3], *I.* Clairand[1], *C.* Couvez[1], *G.* Darley[1], *B.* Henry[3], *T.* Jolivet[3], *P.* Laroche[4], *A.* Lebau-Livé[1], *V.* Lejeune[1], *J.* Miss[1], *W.* Monange[1], *F.* Quéinnec[1], *Y.* Richet[1], *C.* Simon[5], *F.* Trompier[1], *F.* Vayron[1]

1*: IRSN, Institute for radiological Protection and Nuclear Safety, 92262 Fontenay-aux-Roses, France*
2: *IFFoRME, Institut Français des Formateurs Risques Majeurs et protection de l'Environnement, 9 rue Jacques Louvel-Tessier, 75 010 Paris, France*
3: *Planète Sciences, 16, place Jacques Brel, 91130 Ris-Orangis, France*
4: *Agoralogie, 36 boulevard de la Bastille, 75012 Paris, France*
5: *UPMC, Pierre and Marie Curie University, 4, place Jussieu, 75005 Paris, France*

IRSN/PRP-HOM, France

Abstract. After the Fukushima accident, initiatives emerged from the public to carry out themselves measurements of the radioactivity in the environment with various devices, among which smartphones, and to share data and experiences through collaborative tools and social networks. Such measurements have two major interests, on the one hand, to enable each individual of the public to assess his own risk regarding the radioactivity and, on the other hand, to provide "real time" data from the field at various locations, especially in the early phase of an emergency situation, which could be very useful for the emergency management.

The objective of the OPENRADIATION project is to offer to the public the opportunity to be an actor for measurements of the radioactivity in the environment using connected dosimetric applications on smartphones. The challenge is to operate such a system on a sustainable basis in peaceful time and be useful in case of emergency. In "peaceful situation", this project is based on a collaborative approach with the aim to get complementary data to the existing ones, to consolidate the radiation background, to generate alerts in case of problem and to provide education & training and enhanced pedagogical approaches for a clear understanding of measures for the public. In case of emergency situation, data will be available "spontaneously" from the field in "real time" providing an opportunity for the emergency management and the communication with the public. …

The practical objective is i) to develop a website centralising data from various systems/dosimeters, providing dose maps with raw and filtered data and creating dedicated areas for specific initiatives and exchanges of data and ii) to develop a data acquisition protocol and a dosimetric application using a connected dosimeter with a bluetooth connection.

This project is conducted within a partnership between organisms' representative of the scientific community and associations to create links with the public.

*Corresponding author: jeanfrancois.bottollier@irsn.fr

OPENRADIATION: a collaborative project for radioactivity measurements in the environment by the public

Jean-François BOTTOLLIER-DEPOIS (IRSN)
On behalf of the group

ICRS13 – RPSD2016
4 October 2016

E Allain[2], G Baumont[1], N Berthelot[3], I Clairand[1], C Couvez[1], G Darley[1], B Henry[3], T Jolivet[3], P Laroche[4], A Lebau-Livé[1], V Lejeune[1], J Miss[1], W Monange[1], F Quéinnec[1], Y Richet[1], C Simon[5], F Trompier[1], F Vayron[1]

[1] ***IRSN***, *Institute for Radiological Protection and Nuclear Safety, 92262 Fontenay-aux-Roses, France*

[2] ***IFFoRME***, *Institut Français des Formateurs Risques Majeurs et protection de l'Environnement, 75010 Paris, France*

[3] ***Planète Sciences***, *91130 Ris-Orangis, France*

[4] ***Agoralogie***, *75012 Paris, France*

[5] ***UPMC***, *Pierre and Marie Curie University, 75005 Paris, France*

"Radiation dose to **researchers**:

*- a quantitative value of the **physical agent***

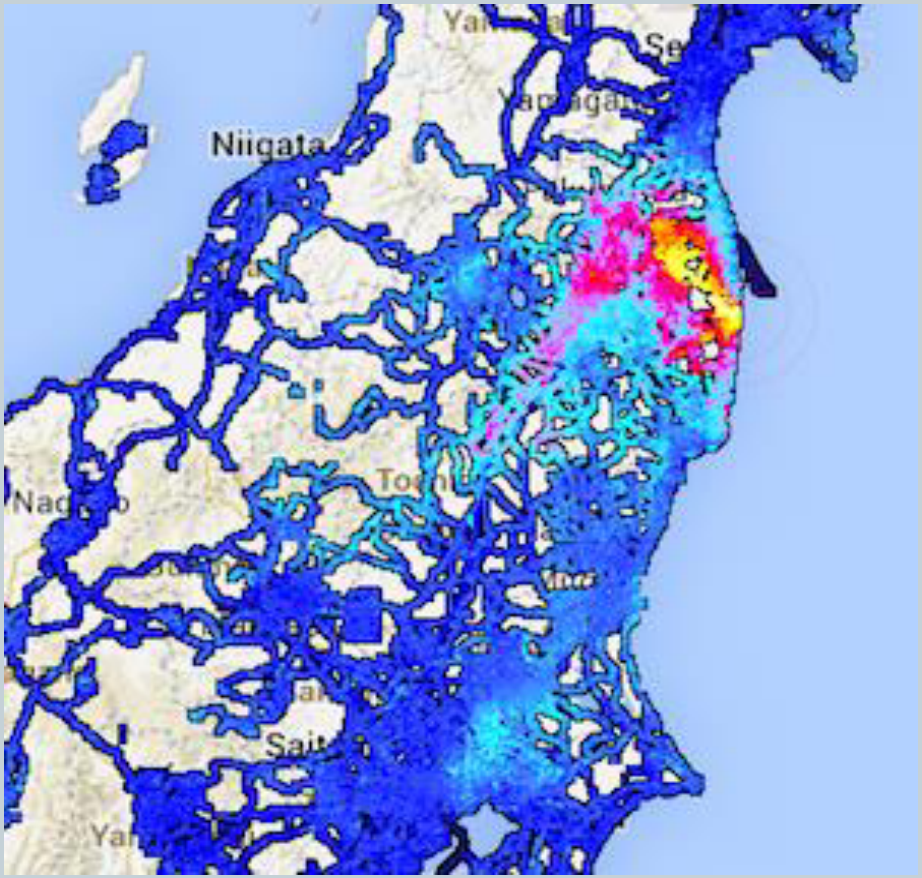
Radiation dose to **residents**:

*- a quantitative value of their **everyday life***

- Working together to support their self-help actions is the only way to help them to gain self confidence. Only then science has some meaning to people
- Provide the most accessible information
- Offer the possibility to each person to assess is own risk by doing himself measurements"

Prof. O. Niwa

The context…



From Safecast

- After the Fukushima accident, **dosimetric applications** dedicated to the **public** appeared to realise **geo-localised measurements of the radioactivity** in the environment
- Today, such systems are used at a relatively large scale, in particular by the Japanese population, providing an interesting feedback

… the context

In case of emergency situation: data from the population using various dosimetric applications

☺ Data coming **from the field in "real time"**

☺ Data provided **in mass…**

☹ … but with a **confident level not always very high**!

☹ **Important solicitation** of authorities/experts by the population foreseen

In « peaceful time »: data provided by the public in the frame of a collaborative approach & citizen science

☺ Data coming mainly from a **"motivated" public**: few% of the general population interesting by the topic, specific projects/studies (students, associations…)

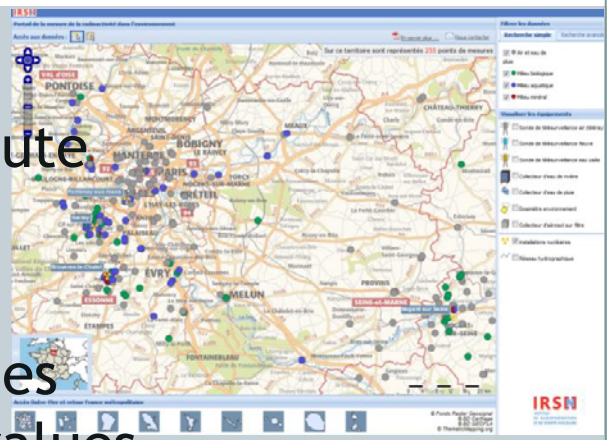
☹ Data with a **confident level to be checked**

☹ **False alarms** may be generated

What is the interest for the scientific community?

“Peaceful time”

- Offer to the public the possibility to contribute to a **citizen science** project on the **radioactivity measurement**
- Get **complementary data** to the existing ones and consolidate the background reference values
- Provide alerts in case of problem



Emergency situation

- Get data contributing to the **management of emergency situations** (decision making, complementary to the existing measurements and the dispersion models…)
- Provide an **opportunity to communicate** with the public

What is the interest for the public?

Collective use: "I perform measurements and send data for a collective use and to exchange information"

- *In normal situation*, by participating to a **collaborative project / citizen science**
- *In case of emergency*, by providing **spontaneously** data useful for the **stakeholders** involved in the **crisis management** and the **population**

Personal use: *"I perform measurements to assess my own risk, especially in case of emergency situation"*

These different modes have to be taken into account to develop an application for the public

What are the challenges?

Operate the system on a sustainable basis in peaceful time and useful in case of emergency situations

"Peaceful time"

- Set up a **pedagogic and sustainable system** used by the public
- Get data **robust** enough in **complement to the background** reference values
- Manage **alerts** in case of positive measurements
- Operate a **collaborative website**

Emergency situation

- Get data **robust** enough to contribute to the **management of emergency situations** (decision making…)
- Communicate with the **public**
- Operate the **website in "crisis" mode**

The OPENRADIATION project

Collaborative project (open data & source) to measure the **radioactivity in the environment** involving the **public** and using **connected dosimetric applications** on smartphones

Develop an internet site

- **Centralise data** from **various** systems/dosimeters
- Provide dose maps with raw and “filtered” data
- Create **dedicated areas** for projects and information exchange

Develop a dosimetric application

- Develop a **connected dosimeter** using bluetooth (GM…)
- Develop a **smartphone application** to collect and transmit data

An open partnership

IRSN
INSTITUT DE RADIOPROTECTION ET DE SÛRETÉ NUCLÉAIRE

Institute for Radiological Protection and Nuclear Safety

iffo rme

Association involved in E&T for crisis management

Planete Sciences
une aventure pour les jeunes

Association involved citizen science for young people

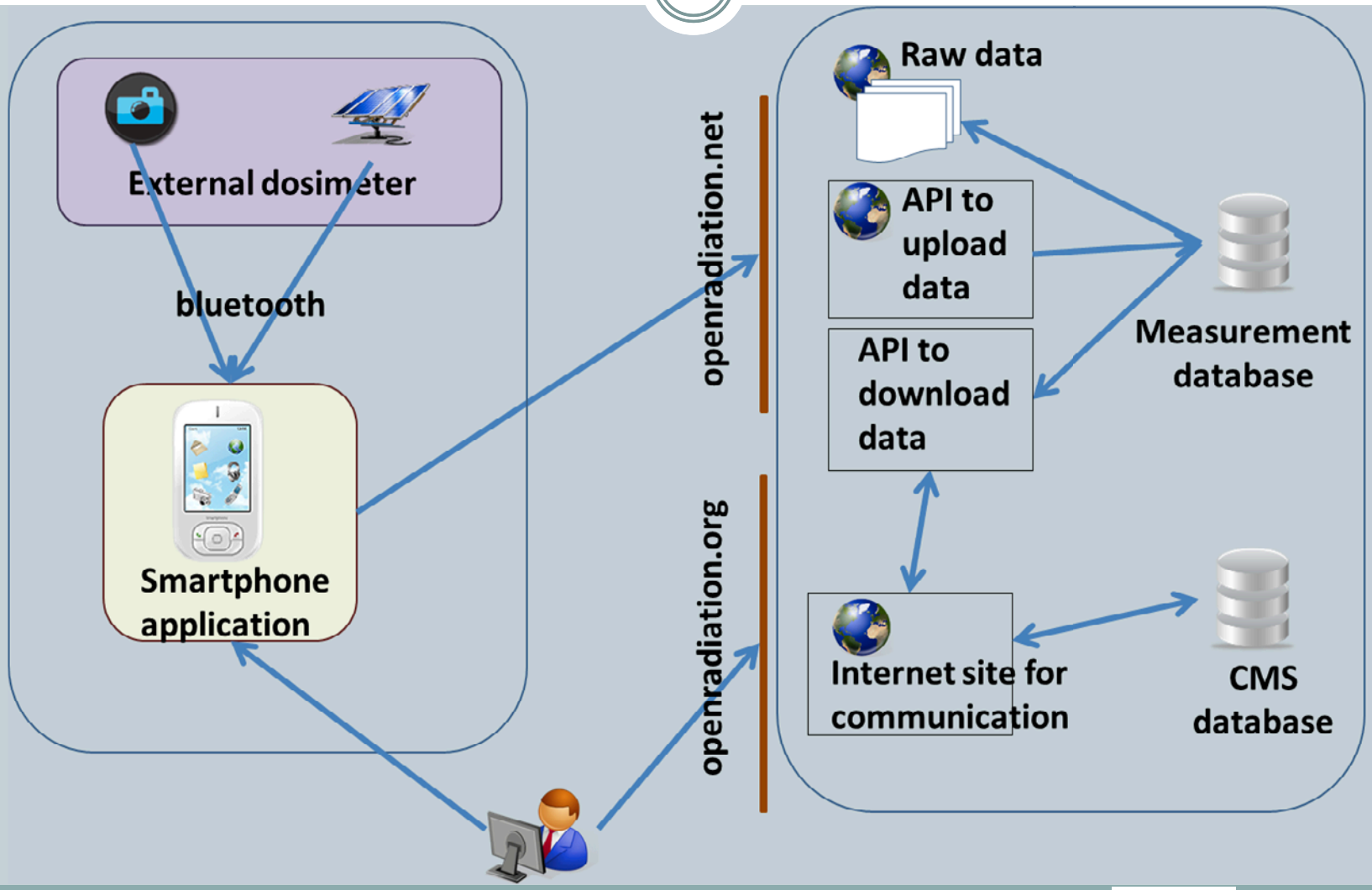
UPMC
SORBONNE UNIVERSITÉS

University Pierre and Marie Curie

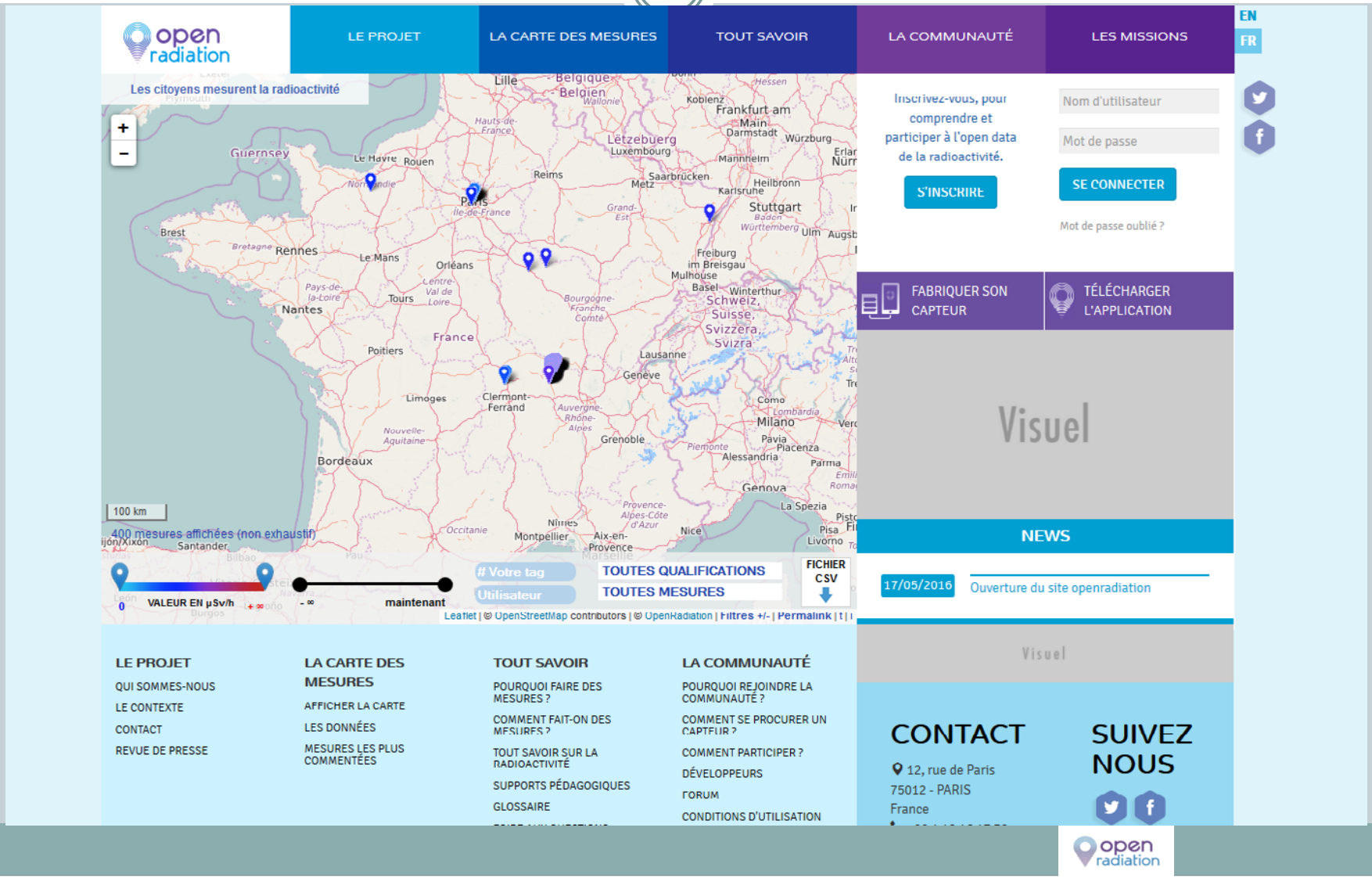
To be enlarged in the future:

Associations, academic partnerships, public representatives…

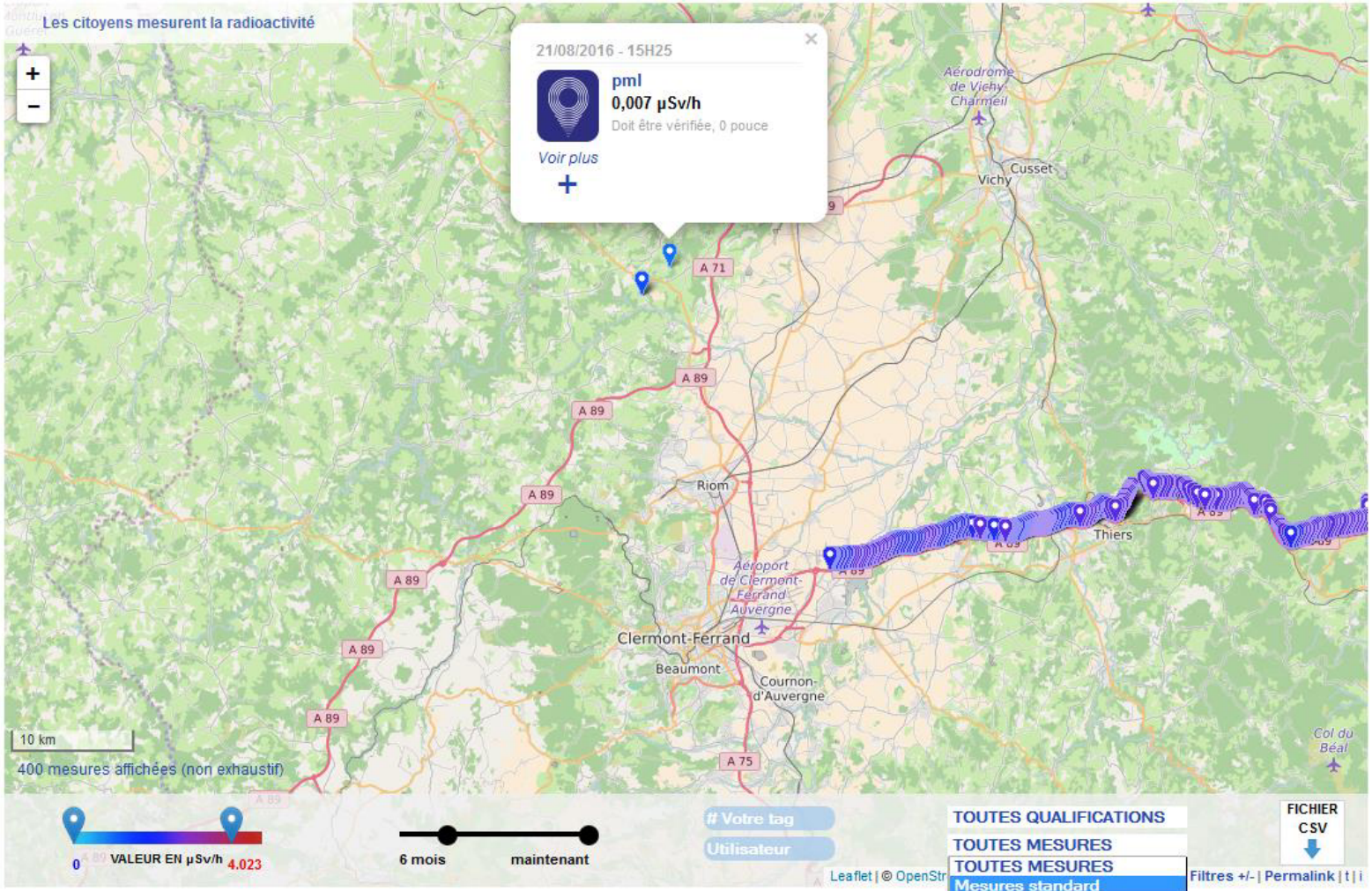
The website… his architecture



The website… under commissioning



… the website


Les citoyens mesurent la radioactivité
21/08/2016 - 15H25
pml
0,007 µSv/h
Doit être vérifiée, 0 pouce
Voir plus
Aérodrome de Vichy Charmeil
Vichy
Cusset
A 71
A 89
Riom
Thiers
Aéroport de Clermont-Ferrand Auvergne
Clermont-Ferrand
Beaumont
Cournon-d'Auvergne
A 75
Col du Béal
10 km
400 mesures affichées (non exhaustif)
0
VALEUR EN µSv/h
4.023
6 mois
maintenant
Votre tag
Utilisateur
TOUTES QUALIFICATIONS
TOUTES MESURES
TOUTES MESURES
Mesures standard
Mesures atypiques
FICHIER CSV
Leaflet | © OpenStr
Filtres +/- | Permalink | t | i

… the website

open radiation

LE PROJET | LA CARTE DES MESURES | TOUT SAVOIR | LA COMMUNAUTÉ | LES MISSIONS

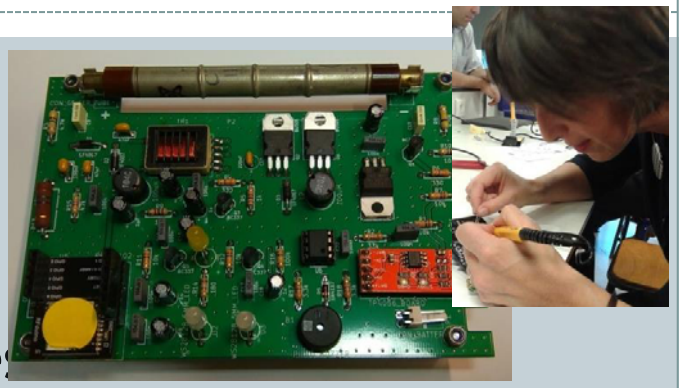
LES MISSIONS EN COURS

Les missions / Les missions en cours

	Mission	Chef de mission	Date de fin	Adhésion
	La radioactivité en Auvergne Dans le cadre d'un TPE, utiliser un radiamètre, comprendre l'unité de mesure, découvrir le fond radiologique local et émettre des hypothèses sur l'origine de la radioactivité ambiante.	root-user	06/06/2016	S'abonner au groupe
	Du radon dans ma maison ? Appréhender la mesure de la radioactivité à partir d'un cheminement pédagogique sur le Radon et en utilisant le dosimètre canary.		17/06/2016	S'abonner au groupe
	Atom'Investigation Intégrer la mesure dans une démarche pédagogique sur la radioactivité, qui se décline selon quatre entrées : - faune/flore, - activité nucléaire, - mémoire, - vivre à proximité. Placer les jeunes dans une situation d'investigation sur la radioactivité. Dans un travail d'enquête, mobiliser des ressources variées : interview d'acteurs, articles de presse, ressources internet etc..... Comprendre et contribuer à une cartographie de la radioactivité dans l'environnement	root-user	30/06/2017	S'abonner au groupe

The Open Geiger dosimeter

- GM counter (silicon diode in the future)
- Bluetooth connection
- Application on iPhone, Android and tablet
- Collaboration UPMC/IRSN/Planète Sciences
- 2 versions: “kit” and “packaged”



« kit » prototype

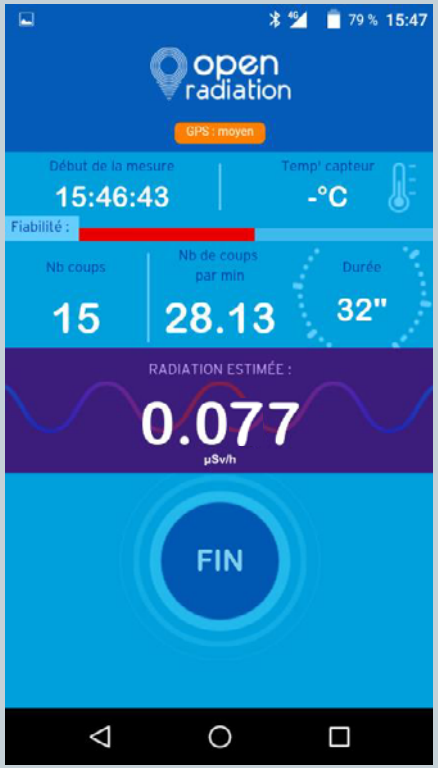
FabLab de Sorbonne Universités

« packaged » prototype

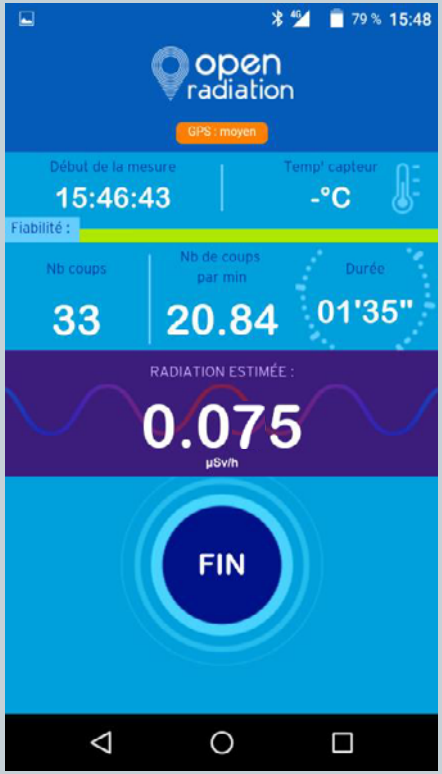
The smartphone application

Measurement

Home page



"Poor" statistic



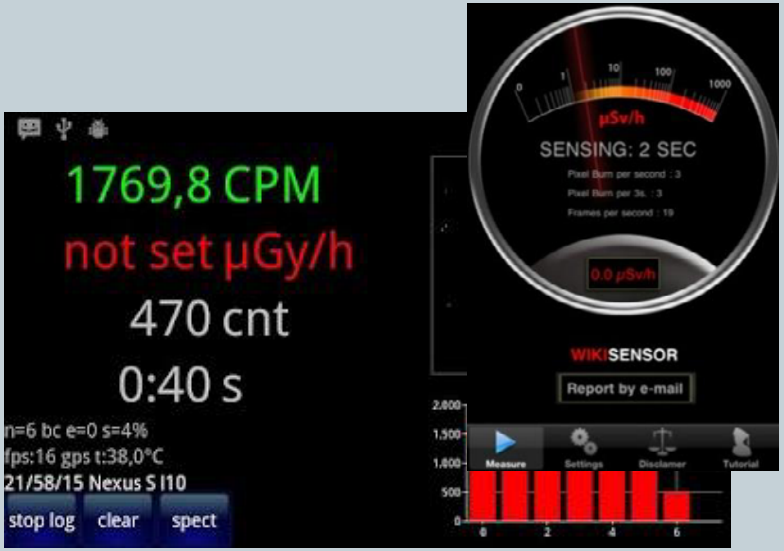
"Acceptable" statistic

Metadata

Other dosimeters

Other dosimeters can be used using a **specific interface** or enter **manually** measurements

Specific interface: Safecast



Around the project today

- **Projects with students:** Measurements with high schools from *Vichy et Villeneuve-sur-Lot*, *project « Atom' investigation » with high schools from Perpignan et de Dieppe*, *contact with Fukushima high school…*
- **Contact with other collaborative projects:** *Safecast*, *D-Shutle…*
- **Presentation of the project to potential users in France:** *ANCCLI (local committees)*, *Paris district…*

Milestones and futures actions

- **February 2017:** *beta version available*
- **May-June 2017:** *site and dosimetric application available for the public*
- **2017-2018:** *definition and implementation of protocols for data analysis*
- **2017-2018:** *development of an application using the CMOS camera*

Thank you for your attention

ご清聴ありがとうございました