

# JRP EMPIR 15SIB10: MetroBeta

## Radionuclide beta spectra metrology

### Exploitation plan D5.3.1

#### Exploitation plan

<i>Deliverable Number:</i>	<b>D5.3.1</b>
<i>Deliverable Type:</i>	<b>Exploitation plan</b>
<i>Lead Participant:</i>	CMI
<i>Other Participants:</i>	All JRP-Partners
<i>Delivery Date:</i>	Jul 2016, Mar 2017, Dec 2017, Sep 2018, May 2019

## TABLE OF CONTENTS

<b>1. PROJECT DESCRIPTION .....</b>	<b>3</b>
<b>2. EXPLOITABLE RESULTS.....</b>	<b>3</b>
<b>3. DISSEMINATION AND EXPLOITATION ACTIVITIES .....</b>	<b>4</b>
3.1 STAKEHOLDER COMMITTEE (SC).....	4
3.2 JRP MEETINGS.....	4
3.3 STAKEHOLDER WORKSHOPS .....	4
3.3.1. Presentations .....	4
3.3.2. Demonstrations.....	4
3.4 JRP WEBPAGE.....	4
3.5 GOOD PRACTICE GUIDES .....	4
3.6 PUBLICATIONS.....	5
3.6.1. Book publications.....	5
3.6.2. Journal publications .....	5
3.6.3. Public media .....	5
3.6.4. World Wide Web.....	5
3.6.5. Conference publications.....	5
3.6.6. Other publications.....	5
3.7 STANDARD COMMITTEES .....	6
3.8 TRAINING .....	6
3.8.1. E-Training courses.....	6
3.8.2. Training courses .....	6
3.9 FOREGROUND .....	6
3.9.1. Patents.....	6
3.9.2. Registered designs.....	6
3.9.3. Utility models .....	6
3.10 ENGAGEMENT WITH OTHER EUROPEAN PROJECTS AND INITIATIVES.....	6
<b>4. REFERENCES .....</b>	<b>6</b>

## Introduction

The Exploitation plan should help that the results of the JRP are exploited to the benefit of BIPM and ICRM, NMIs and DIs not participating in the project, and other stakeholders interested in radionuclide activity measurement (nuclear medicine clinics, instrumentation manufacturers, environment radiation monitoring laboratories, etc.) The plan will be reviewed and updated 9 monthly at each JRP meeting under CMI's leadership, with participation of all JRP-Partners.

## 1. Project description

This project will take both theoretical and experimental approaches to improving the knowledge of beta spectra. On the theoretical side, we will use existing knowledge of the calculation of nuclear wave functions to account for the nuclear structure effect on these spectra. On the experimental side, we will develop beta spectrometry with metallic magnetic calorimeters (MMCs), a class of cryogenic detectors operating at very low temperature, and solid scintillators containing the beta emitters in the structure of the scintillator crystal. These detectors will have the potential to measure the shapes of beta spectra with unprecedented precision and, in particular in the case of metallic magnetic calorimeters, low systematic errors. Comparison of the newly calculated and measured spectra, as well as the application of several complementary detection techniques, will validate the quality of the spectra. The JRP is subdivided into four scientific/technical work packages:

1. To improve modern measurement techniques for silicon detectors (Si(Li)), solid scintillator crystals (LaBr<sub>3</sub>/CeBr<sub>3</sub>) and magnetic spectrometers for measurements of beta spectra.
2. To optimise beta spectrometers, based on Metallic Magnetic Calorimeters (MMCs), and measure new high resolution beta spectra for low (< 100 keV) and intermediate (< 1 MeV) end-point energy pure beta emitters Sm-151, C-14, Tc-99 and Cl-36.
3. To improve theoretical computation methods on the basis of the measured spectra and compare the measured and calculated beta spectra.
4. To investigate the effect of improved beta spectra on absolute activity measurements and measure Bremsstrahlung cross-sections to quantify their effect on absolute activity measurements.

## 2. Exploitable results

Following exploitable research results are expected:

- Good Practice Guide on Improved Beta Spectra Measurements using solid scintillator crystals.
- Good practice guide on the use and development of Metallic Magnetic Calorimeters.
- Good practice guide on beta spectra measurement using Si(Li) detectors.
- Good Practice Guide on Improved Beta Spectra Measurements using a magnetic spectrometer.
- Beta spectra produced in the project supplied to the DDEP.

## 3. Dissemination and exploitation activities

### 3.1 Stakeholder Committee (SC)

*A Stakeholder Committee (SC) will be established, consisting of at least 15 members from a minimum of 10 organisations.*

Until May 2017, 15 stakeholders registered for the project. 7 from universities, 3 from NMIs/DIs non participating in the project, 4 from industry and 1 from IAEA.

### 3.2 JRP meetings

The JRP kick-off meeting was held on the 5<sup>th</sup> and 6<sup>th</sup> of July 2016 at LNHB in Saclay. All presentations and meeting minutes are available at the JRP webpage with restricted access.

The first JRP meeting was held on the on the 28<sup>th</sup> and 29<sup>th</sup> of March 2017 at PTB in Braunschweig. All presentations and meeting minutes are available at the JRP webpage with restricted access.

The second JRP meeting will be held in November 2017 at CMI in Prague together with the first workshop for stakeholders and end-users.

### 3.3 Stakeholder workshops

*At least two workshops for stakeholders and end-users will be organized and held.*

The first workshop will be held in November 2017 at CMI in Prague.

#### 3.3.1. Presentations

All presentations from the workshops will be available at <http://metrobeta-empir.eu> (Impact-Training-Workshops).

#### 3.3.2. Demonstrations

### 3.4 JRP webpage

The JRP webpage with open and restricted access has been established on the CMI's server: <http://metrobeta-empir.eu>.

The webpage contains all meetings and workshops presentations, links to conference presentations and publications abstracts, trainings and exploitation information.

### 3.5 Good Practice Guides

*At least four good practice guides will be written:*

- *Good practice guide on the use and development of Metallic Magnetic Calorimeters.*
- *Good practice guide on beta spectra measurement using Si(Li) detectors.*
- *Good Practice Guide on Improved Beta Spectra Measurements using solid scintillator crystals.*
- *Good Practice Guide on Improved Beta Spectra Measurements using a magnetic spectrometer.*

The good practice guides will be prepared at the end of the project till April 2019 and disseminated to stakeholders and end-users.

## **3.6 Publications**

### **3.6.1. Book publications**

### **3.6.2. Journal publications**

*At least 12 papers will be submitted to peer-reviewed journals and at least 2 papers will be submitted to trade and popular journals.*

Abstracts will be available at <http://metrobeta-empir.eu> (Impact-Knowledge transfer-Publications).

### **3.6.3. Public media**

### **3.6.4. World Wide Web**

### **3.6.5. Conference presentations**

*At least 4 contributions will be presented at target international conferences.*

Links to the conferences webpages will be available at <http://metrobeta-empir.eu> (Impact-Knowledge transfer-Conference Presentations).

### **3.6.6. Other presentations**

ICRM Beta Spectrometry WG, 21-22 September 2016; F. Juget: Beta spectrometry with magnetic spectrometer MetroBeta Project.

ICRM Liquid Scintillation Counting WG, 7-8 November 2016, Rome; K. Kossert: The importance of beta spectra for LSC.

ICRM Life Sciences WG, 10-11 November 2016, Rome; F. Judget: MetroBeta and Bremsstrahlung measurement at IRA.

3rd International Workshop on Superconducting Sensors and Detectors, November 2016, Japan; Joern Bayer: SQUID current sensors for the readout of Metallic Magnetic Calorimeters for high-resolution beta spektrometry.

Strategy meeting 'Cutting-edge detectors-cryodetectors', 2016, Germany; Karsten Kossert: The importance of beta spectra for LSC; Joern Bayer: PTB SQUID-sensor development for EMPIR MetroBeta.

SSNET'16 - International Workshop on Shapes and Symmetries in Nuclei: from Experiment to Theory, 7-11 November 2016, France; X. Mougeot: Reliability of information in nuclear databases through comprehensive tests - The example of beta decays.

Invited Seminar - Institute of Nuclear and Particle Physics, TU Dresden, 13 April 2017; X. Mougeot: Resurgence of beta spectrometry in a metrological context.

XXIII Nuclear Physics Workshop "Marie and Pierre Curie" Essential Problems in Nuclear Physics, 27 September – 2 October 2016, Poland; I. Dedes, J. Dudek: Narrowing the confidence intervals in nuclear structure predictions through elimination of parametric correlations.

## **3.7 Standard committees**

*JRP-Partners will contribute to ICRM Working Groups, EURAMET TC-IR, BIPM CCRI(II), ISO/TC86, IAEA/TC45 and IAEA ENSDF.*

The project was presented on the ICRM working groups and on the DDEP consortium meeting.

## **3.8 Training**

### **3.8.1. E-Training courses**

### **3.8.2. Training courses**

*Three training courses will be organised at PTB, CEA and CMI.*

## **3.9 Foreground**

### **3.9.1. Patents**

### **3.9.2. Registered designs**

### **3.9.3. Utility models**

## **3.10 Engagement with other European projects and initiatives**

## **4. References**

[1] Kellett M. et al.: EMPIR 2015 JRP 15SIB10 Protocol.

[2] Reference2.

[3] Reference3.