BEATS

Work Package 1

Management of the BEATS project

Notes of the 1st Annual Meeting

D 1.5

March 2020

Funded by the EU's H2020 framework programme under grant agreement n°822535

PROJECT DETAILS

PROJECT ACRONYM
BEATS

PROJECT TITLE
BEAmline for Tomography at SESEAME

GRANT AGREEMENT NO:
822535

THEME

START DATE
01/01/2019

DELIVERABLE DETAILS

WORK PACKAGE 01

EXPECTED DATE: JANUARY 31, 2020

WORK PACKAGE TITLE: BEATS MANAGEMENT

DELIVERABLE TITLE: REPORT ON THE BEATS 1ST ANNUAL MEETING

WORK PACKAGE LEADER: ESRF

DELIVERABLE DESCRIPTION: REPORT

DELIVERAVLE ID D1.4

PERSON RESPONSIBLE FOR THE DELIVERABLE: AXEL KAPROLAT (ESRF)

NATURE

☒ R - Report ☐ P - Prototype ☐ D - Demonstrator ☐ O – Other

DISSEMINATION LEVEL

☒ P - Public
☐ PP - Restricted to other programme participants & EC:
☐ RE - Restricted to a group
☐ CO - Confidential, only for members of the consortium

REPORT DETAILS

VERSION: 1.0 *DATE 13/03/2020* *NUMBER OF PAGES: 13*

DELIVERABLE REPORT AUTHOR(S) AK + KICKOFF-MEETING SPEAKERS

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STATUS

☐ Template ☐ Draft
☒ Final ☒ Released to the EC

CONTENTS

OVERVIEW

As the BEATS kick-off meeting was held in March 2019 at the SESAME site, it was decided during the 4th meeting of the BEATS Steering Committee (03/12/2019) to hold the 1st Annual Meeting end of February 2020 at ALBA-CELLS, Barcelona, Spain.

The meeting was organised by ALBA.

It was attended by the BEATS work package Leaders, the members of the BEATS Steering Committee and major contributors to the currently active work packages, in total around 20 people (one work package leader was excused due to illness, one member of the Steering Committee could not attend due to Corona virus induced travel ban)

The agenda was composed as follows:

- Before the Annual Meeting the BEATS Steering Committee held its 5th meeting.
- The Annual Meeting itself started with a welcome by the chair of the BEATS Steering Committee and the BEATS Coordinator, summarizing the outcome of the previous session and the overall status of the project.
- The first dedicated slot was devoted to the external communication of BEATS.
- This presentation was followed by reports from the work packages that were active during the first year: Work package 1 (Management), work package 2 (User Science Case and Sustainability), work package 3 (X-ray source), work package 4 (Technical design of the beam line), and work package 7 (Data handling and analysis). Work packages 5 (Procurement) and 6 (Assembly, commissioning) will start operation, according to planning, during the 2nd year of BEATS.
- After these reports the Meeting was greeted by the Director of ALBA-CELLS. Participants had then the opportunity to participate in a visit of the facility.
- The 2nd day was dedicated to technical meetings to make reasonable use of the major actors being on site:
    - Members of the Procurement Advisory Board held a preparatory meeting to discuss the collaboration with SESAME aiming at a review of the SESAME procurement procedures
    - Scientists from work package 2 and work package 4 put the final touches to the document describing the User Science Case of BEATS.
    - Scientists and Engineers involved in work package 4 discussed the equipment of the BEATS experimental station as well as the detailed design of the BEATS Front End and general beamline layout.

All presentations are available to the BEATS community, in electronic form, in the BEATS file repository.

BEATS EXTERNAL COMMUNICATION

Kirstin Colvin (ESRF) reported on the communication activities of the first year:

- Creation of a visual identity for the project
- Creation of templates for presentations and reporting
- Creation of a pamphlet
- Creation of a website and regular supply of content to this site (1 article per month)
- Creation of a twitter account and regular tweets (1 per week)
- Creation of a concept poster
- Creation of goodies
- Participation at CERN Open Days

She continued by presenting the planned activities concerning communicating the BEATS project and advancements to the outside world:

- Increase activity on social media to follow the progress of the project (increase subscribers, engagement, number of tweets, creation of other social media accounts (Facebook, LinkedIn)).

For this, she called on all participants to identify users, or groups of users, or institutes, for BEATS to follow and reach out to. She asked the different work packages to inform her of their activities, progress, attendance at events linked to BEATS, on a regular basis.

- Conduct a series of portraits of actors on the project, called #WorkingTogether to showcase the “people of BEATS”.

  The first series would focus on the BEATS project consortium, highlighting the international collaboration, human aspect of a technical project, skills and steps involved in building a beamline.

  Publication on the BEATS website with promotion through Twitter account, with a frequency of one portrait per week over 10-12 weeks. Start in spring 2020.

  The second series would focus on the people working on BEATS at SESAME, highlighting the international collaboration, human aspect of a technical project, skills, diversity, future users, life in Jordan, etc.

  This series is scheduled for either later in 2020 or in spring 2021.

- Conduct a series of tweets on the theme “Benefits of a tomography beamline at SESAME”

For this, she asked all participant to provide:

1. Real examples of tomography experiments carried out at their institutes and which could potentially be carried out at BEATS
2. Quotes from scientists in the region on why a tomography beamline is essential for their research. For this, she asked participants to collect quotes and photos during the events they attend to promote BEATS, or from within their institutes.

She concluded the presentation by underlining the difficulty of communicating on a project when at a distance from the main activity, and with the different work packages being dispersed over several institutes and several countries. She called for a reinforcement of communications on the project by

each participant and on the need to increase the information flow from each participant involved in the project back to her, or WP1.

WORK PACKAGE 1

The BEATS coordinator reported on the Management activities of BEATS and the results obtained within the individual tasks:

- All project milestones have been met so far, all due deliverables were submitted in time or with only marginal delay. The overall project "health" indicator is green.
- The Executive Group and Steering Committee met according to schedule during 2019.
- The next Annual Meeting will be held beginning of 2021 at the Paul Scherrer Institute, the last one in December 2022 at SESAME. Partners are invited to bid for the organisation of the 3rd meeting, to be held January 2022.
- It was proposed within work package 4 to rearrange the date of delivery of the Technical Design Report (TDR). By postponing the TDR to end of June 2020 and advancing the design of the beamline instrumentation to June 2020 one can include both the results of the latter as well as the radiation protection calculation and thus make the document more valuable. Following consultations with the BEATS EC Project Officer, this will necessitate an amendment to the Grant Agreement, to be effectuated during the second half of 2020.
- The partners were informed about the upcoming reviews/reports:
    - The end of the first reporting period (end of June),
    - The upcoming technical review 2nd week of June.

WORK PACKAGE 2

Frank Lehner (DESY) (Leader work package 2, connected via phone) reported on the progress made by the major tasks within work package 2.

Task 1 Scientific Case and user community building: A BEATS Scientific Case Workshop was organised by The Cyprus Institute end of June 2019, bringing together over 100 attendees discussing applications from

- Cultural Heritage
- Health and Biology
- Energy and Environment
- Materials Science

Furthermore, a User Community Building Event was held in November 2019 in Nicosia, Cyprus, coupled with the ICAS-EMME2 congress, and a User Community Building Session was organised at the SESAME User Meeting on 30/11/2019.

Future events are planned in Iran, Pakistan, Turkey, Israel, Egypt, And Palestine.

The BEATS deliverable "Science Case" is being finalised in collaboration with work package 4.

Task 2 Training: This task will benefit from the experience gained during the H2020 OPEN-SESAME project. First activities are planned and will be carried out during 2020. A new Task Leader from SESAME will be nominated soon.

Task 3 Procurement advice: The BEATS Procurement Advisory Board has been set up and will start its activity on the occasion of the upcoming procurement of the X-ray source.

Task 4 Sustainability, Stewardship: Within this task the following activities are planned:

- Prepare and launch, in close collaboration with the SESAME Council Chair, a survey (questionnaire) with SESAME Council members to query their expectations and attitudes towards sustainable operation, funding, new members, partnership models etc.
- then, organize a workshop with senior officials from SESAME members and other stakeholders to informal discuss potential models and perspectives

WORK PACKAGE 3

Andrea Ghigo (INFN) (Leader work package 3) reported on the progress made concerning the BEATS X-ray source:

The partners investigated two possible options for the X-ray source, i) a 3 Tesla super-bend design and ii) a 3 Tesla Three-pole wiggler.

It was found that a super-bend design would in principle be possible, however, it would have adverse effects on the SESAME accelerator/storage ring, as a super-bend requires two new quadrupoles, a new vacuum chamber and substantial modifications to the existing girders.

Therefore, the concept of a Three-pole wiggler as an insertion device at SESAME was thoroughly investigated. A (non-cryogenic) magnetic design was proposed by experts from ALBA that

- does not deteriorate the dynamic aperture of the accelerator,
- has reduced attractive forces of around 100 kg only, and
- shows very low multipole terms and small dynamic disturbance.

It was, in consultation with the SESAME Management, decided in September 2019 to opt for the Three-pole wiggler as the BEATS X-ray source.

Since then, work package 3 established a detailed design of the source together with Call-for-Tender-ready specifications.

WORK PACKAGE 4

Gianluca Iori (SESAME, BEATS beamline responsible) and Axel Kaprolat (ESRF) (Leader work package 4) reported on the progress made and current activities concerning the BEATS technical design and beamline instrumentation:

With the delivery date of the TDR now tentatively coinciding with the delivery of the radiation protection hutches specifications as well as the details of the experimental equipment of the beamline this document will be much closer to a classical Technical Design Report.

The TDR document comprises, among others, chapters on

Data handling: (see dedicated session on work package 7)

Safety: The aspects of classical and equipment safety issues are currently established in consultation between SESAME and ESRF. The measures to protect users and staff against ionising radiation will be investigated during the next months, when the radiation protection calculations are carried out by experts from ALBA and SESAME.

The design of the **Front End** has been frozen, a finite element calculation of thermal effects on and mechanical stress within the Front End components is currently being finalised.

The **beamline optics** will, besides the usual elements for beam shaping (mechanical apertures, slit systems, filters and absorbers) and for beam diagnosis (position monitors, beam viewers) feature a Double Multilayer Monochromator (DMM), allowing to scan the energy from 10 keV up to 50, perhaps 60 keV. A preliminary investigation (numerical simulation) of the DMM performance (e. g. reflectivity, bandwidth) was performed. The detailed design (choice of ML coatings material, number of layers, distance between the crystals, offset) of this device will start immediately.

The **experimental hutch** will be equipped with a tomography sample tower (most likely along the lines of the design used at ESRF's beamlines BM05 and ID19) and a camera / detector tower, both movable on air pads. The design of the experimental hutch considered the maximum length allowed by architectural constrains of the SESAME building. This was done in order to allow flexibility in the choice of sample-source and sample-detector distances.

Operation in white / pink beam is foreseen as well.

Simulations of the BEATS BL performance were conducted making use of standard raytracing software (Oasys/SHADOW). First estimates of the BEATS **performance parameters** show figures comparable to other microCT beamlines (e.g. TopoTomo @ ANKA). With the photon source (three-pole wiggler) proposed by WP3, the electron beam properties (horizontal beam size and divergence) in the straight section of the SESAME storage ring lead to a horizontal photon source size (FWHM) of approximately 1.9 mm and to a horizontal divergence of almost 10 mrad. Calculations of the expected degree of coherence with these photon source properties indicate that a secondary source (primary slits) with reduced horizontal size should be used for phase contrast applications.

Two main **operation modes** of the beamline were identified:

- "high-flux" mode: with primary slits open and accepting the whole photon beam divergence provided by the fix mask. This leading to large beam size and high (total) flux at the sample. Possibility to operate in (filtered) white beam. Potential applications are in-situ studies in absorption mode as well as studies of large samples and fast tomography

- "high sensitivity" mode: by closing the primary slits, a secondary source with reduced size and providing a beam of higher spatial coherence can be applied. This reduces the beam size at the sample position and can be used for phase contrast imaging.

WORK PACKAGE 7

Charalambos Chrysostomou (CYI) (Leader work package 7) reported on the progress made concerning Data analysis and management. More specifically:

- **Task 1.** The first draft of SESAME's data policy is ready with inputs from SESAME, CYI, ESRF and PSI. The SESAME Data Policy defines the rules of data ownership, data curation, data archiving, and open access to data and covers the short and long term plans for the whole SESAME needs concerning the generated data by any SESAME beamline, and tomography experiments in particular. The document is now in preparation for submission to the SESAME Council for endorsement.
- **Task 2:** definition of the requirements for hardware and software for the BEATS beamline. The anticipated strategy for data collection, manipulation, reconstruction and storage for the BEATS beamline was presented. The envisioned hardware and software follows standard guidelines as inspired by microtomography beamlines at European synchrotron facilities. The specific hardware and software for BEATS will be adapted to the needs of SESAME. SESAME will investigate the cost of materials and software acquisition required to set up the proposed pipeline.

VISIT OF THE FACILITY

Following the plenary sessions, all participants joined in an extensive visit of the ALBA facility.

GROUP PHOTO

Annex 01 Agenda

BEATS General Assembly 2020

27th & 28th February 2020

Meeting agenda

27th February 2020

09:00 – 10:30	Meeting of the BEATS Steering Committee (closed session) / Registration *Marie Curie meeting room / Reception at Tesla Training room*
10:30 – 11:00	Coffee break
11:00 – 11:15	Status overview of the BEATS project *Marie Curie meeting room*
11:15 - 12:00	Communications meeting (Kirstin Colvin, ESRF) *Marie Curie meeting room*
12:00 – 12:30	WP1 report session (Axel Kaprolat, ESRF) *Marie Curie meeting room*
12:30 – 14:00	Lunch at ALBA canteen
14:00 – 14:30	WP2 report session (Frank Lehner, DESY) *Marie Curie meeting room*
14:30 - 15:00	WP3 report session (Andrea Ghigo, INFN) *Marie Curie meeting room*
15:00 - 15:30	WP4 report session (Axel Kaprolat, ESRF) *Marie Curie meeting room*
15:30 - 16:00	WP7 report session (Charalambos Chrysostomou, CYI) *Marie Curie meeting room*
16:00 – 16:30	Coffee break
16:30 – 18:30	ALBA's Director welcome and visit around ALBA facility *Marie Curie meeting room*
20:30 – 22:30	Social dinner *Bocca Restaurant in Sant Cugat del Vallés*

BEATS General Assembly 2020

27th & 28th February 2020

Meeting agenda

28th February 2020

09:00 - 09:30	Technical meeting: Procurement Advisory Board *Bragg meeting room / Reception*
09:30 – 10:00	Technical meeting: Science case update *Marie Curie meeting room*
10:00 – 10:30	Technical meeting: Update on BEATS experiment *Marie Curie meeting room*
10:30 – 11:00	Coffee break
11:00 – 11:45	Technical meeting: Radiation Protection Calculations and procedure to establish Radiation Hutches specifications *Marie Curie meeting room*
11:45 – 12:30	Technical meeting: Front End Design and Beamline Layout *Marie Curie meeting room*
12:30 – 14:00	Lunch at ALBA canteen
14:00 – 15:00	Closure of the GA meeting *Marie Curie meeting room*

The Tesla training room (2nd floor) will be available at all times for those wishing a separate work space during both meeting days.