

# Neuro technologies for Brain-Machine Interfacing Industry Connections Activity Initiation Document (ICAID)

Version: 0.0, 29 March 2017

**IC17-007-01 Approved by the IEEE-SASB 4 May 2017**

## Instructions

- Instructions on how to fill out this form are shown in red. It is recommended to leave the instructions in the final document and simply add the requested information where indicated.
- **Shaded Text** indicates a placeholder that should be replaced with information specific to this ICAID, and the shading removed.
- Completed forms, in Word format, or any questions should be sent to the IEEE Standards Association (IEEE-SA) Industry Connections Committee (ICCom) Administrator at the following address: [industryconnections@ieee.org](mailto:industryconnections@ieee.org).
- The version number above, along with the date, may be used by the submitter to distinguish successive updates of this document. A separate, unique Industry Connections (IC) Activity Number will be assigned when the document is submitted to the ICCom Administrator.

## 1. Contact

Provide the name and contact information of the primary contact person for this IC activity. Affiliation is any entity that provides the person financial or other substantive support, for which the person may feel an obligation. If necessary, a second/alternate contact person's information may also be provided.

**Name:** Ricardo Chavarriaga

**Email Address:** ricardo.chavarriaga@epfl.ch

**Phone:** +41(21)6936968

**Employer:** Ecole Polytechnique Fédérale de Lausanne, EPFL

**Affiliation:** Entity Name(s)

## 2. Participation and Voting Model

Specify whether this activity will be entity-based (participants are entities, which may have multiple representatives, one-entity-one-vote), or individual-based (participants represent themselves, one-person-one-vote).

Specify: "Individual-Based".

### **3. Purpose**

#### **3.1. Motivation and Goal**

Briefly explain the context and motivation for starting this IC activity, and the overall purpose or goal to be accomplished.

Interest in Brain-Machine Interfacing (BMI)/Brain Computer Interface (BCI) is consistently growing and state-of-the-art in research is currently being tested on its intended end-users. Translation from laboratory proof-of concepts to viable clinical and assistive solutions, as well as consumer applications entails a large set of challenges.

The possibility of deploying and commercializing BMI/BCI-based solutions requires researchers, manufacturers, and regulatory agencies to ensure these devices comply with well-defined criteria on their safety and effectiveness. Furthermore, BMI/BCI systems typically require integration of multiple sub-components comprising measuring and analysis of neural activity, and provision of feedback to the user through different means (including displays, virtual reality systems, haptic interfaces and exo-skeletons, among others). The lack of specific standards on neurotechnologies for BMI/BCI hinders the interoperability, and regulatory compliance of new devices and in consequence, consists a barrier for industrial applications to access a wide market.

#### **3.2. Related Work**

Provide a brief comparison of this activity to existing, related efforts or standards of which you are aware (industry associations, consortia, standardization activities, etc.).

As of today, there has not been specific consortia or associations directly focused on the development of standards for BMI/BCI-related neurotechnology. Nevertheless, in the last years several activities, comprising multiple stakeholders, have taken place to raise awareness and discuss about the need for these standards. They include:

- NIH Workshop on Standards and Modularity of Brain-Computer Interfaces and Neuroprostheses (Rockville, MA, 30<sup>th</sup> June 2016)
- Panel: Transforming Biomedical Engineering Technologies for “a Better Life” through Open Consensus Standards. IEEE EMBS conference (Orlando, FL, 17<sup>th</sup> August 2016)
- Full-day special session on Standards at the IEEE International Systems, Man and Cybernetics Conference (Budapest, 9<sup>th</sup> October 2016).

The current IEEE **Medical / health device communication standards** suite can be a good starting point to develop a BMI/BCI-specific standard.

#### **3.3. Previously Published Material**

Provide a list of any known previously published material intended for inclusion in the proposed deliverables of this activity.

List the previously published material, if any.

### **3.4. Potential Markets Served**

Indicate the main beneficiaries of this work, and what the potential impact might be.

BMI-related technologies are expected to have increasing impact in multiple markets including:

- Motor rehabilitation
- Assistive technologies, including neuroprosthetics, exo-skeletons, and communication devices
- Diagnosis and therapies for motor and cognitive disorders
- Health monitoring, in particular for healthy aging
- Virtual and augmented reality
- Training in industrial and military applications
- Gaming
- Cognitive training

## **4. Estimated Timeframe**

Indicate approximately how long you expect this activity to operate to achieve its proposed results (e.g., time to completion of all deliverables).

**Expected Completion Date:** March 2018

IC activities are chartered for two years at a time. Activities are eligible for extension upon request and review by ICCom and the IEEE-SA Standards Board. Should an extension be required, please notify the ICCom Administrator prior to the two-year mark.

## **5. Proposed Deliverables**

Outline the anticipated deliverables and output from this IC activity, such as documents (e.g., white papers, reports), proposals for standards, conferences and workshops, databases, computer code, etc., and indicate the expected timeframe for each.

The deliverables for this IC activity are expected to:

1. Provide an integrated overview of all standards activity that is specifically related to BMI-related neurotechnologies
2. Identify any gaps in the existing standards and a plan to address these gaps

## **6. Funding Requirements**

Outline any contracted services or other expenses that are currently anticipated, beyond the basic support services provided to all IC activities. Indicate how those funds are expected to be obtained (e.g., through participant fees, sponsorships, government or other grants,

etc.). Activities needing substantial funding may require additional reviews and approvals beyond ICCOM.

Specify funding requirements and sources, if any.

## **7. Management and Procedures**

### **7.1. IEEE Sponsoring Committee**

Indicate whether an IEEE sponsoring committee of some form (e.g., an IEEE Standards Sponsor) has agreed to oversee this activity and its procedures.

**Has an IEEE sponsoring committee agreed to oversee this activity?:** Yes

If yes, indicate the sponsoring committee's name and its chair's contact information.

**Sponsoring Committee Name:** IEEE EMBS Standards Committee

**Chair's Name:** Carole Carey

**Chair's Email Address:** carolecarey@mac.com

**Chair's Phone:** 301-776-9882

Additional sponsoring committee information, if any.

### **7.2. Activity Management**

If no IEEE sponsoring committee has been identified in 7.1 above, indicate how this activity will manage itself on a day-to-day basis (e.g., executive committee, officers, etc).

Briefly outline activity management structure.

### **7.3. Procedures**

Indicate what documented procedures will be used to guide the operations of this activity; either (a) modified baseline *Industry Connections Activity Policies and Procedures*, (b) Sponsor policies and procedures accepted by the IEEE-SA Standards Board, or (c) Working Group policies and procedures accepted by the Working Group's Sponsor. If option (a) is chosen, then ICCOM review and approval of the P&P is required. If option (b) or (c) is chosen, then ICCOM approval of the use of the P&P is required.

EMBS standards working group procedures under the EMBS Standards Committee Sponsor procedures

## **8. Participants**

### **8.1. Stakeholder Communities**

Indicate the stakeholder communities (the types of companies or other entities, or the different groups of individuals) that are expected to be interested in this IC activity, and will be invited to participate.

Companies working in neurotechnologies including, but not limited neural acquisition systems (Neuroimaging, EEG, ECoG, and multiunit activity), electrostimulation at central (TMS, tDCS, tACS) and peripheral (FES) levels. Related technologies comprising virtual reality systems and gaming, haptic devices and rehabilitation robotics. Interested companies in healthcare and rehabilitation, gaming applications, and wellness, as well as regulatory agencies (NIH, NINDS) are strongly involved in these topics, and have shown their interest in the development of standards.

### **8.2. Expected Number of Participants**

Indicate the approximate number of entities (if entity-based) or individuals (if individual-based) expected to be actively involved in this activity.

Approximately 15-20 individuals from research institutions, companies and regulatory agencies are expected to join the activity.

### **8.3. Initial Participants**

Provide a list of the entities or individuals that will be participating from the outset. It is recommended there be at least three initial participants for an entity-based activity, or five initial participants (each with a different affiliation) for an individual-based activity.

Use the following table for an entity-based activity:

<b>Entity</b>	<b>Primary Contact</b>	<b>Additional Representatives</b>
Entity Name	Contact Name Email Address Phone Number	Name, Email Address Name, Email Address

Use the following table for an individual-based activity:

<b>Individual</b>	<b>Contact Information</b>	<b>Employer</b>	<b>Affiliation</b>
Nick Langhals		NIH	
Ricardo Chanvariaga		EPFL	
Margret Thompson		Unv. Of Washington	
Ratko Petrovic,		Brain Products	
Sumit Soman		CDAC	
Hasan Ayaz		Drexel Unv.	
Gangadhar Garipelli		Mindmaze	
Banu Onaral		Drexel Unv.	
Walt Besio		Unv. Of Rhode Island	
Christoph Guger		G Tec	
Carole Carey		Self	
Louis Mayaud		Mensia Technologies	
Jose Contreras-Vidal		Univ of Houston	
Stephen Bush		GE	
Narisa Chu			
John Moreland		NIST	
Khizer Khaderi		Vizzario	

Tim Mullen		Qusp	
Aureli Soria-Frisch		Neuroelectrics	
Louis Mayaud		Mensia Technologies	