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Federal Department of Economic Affairs,
Education and Research EAER

Swiss Science Council SSCt

Funding of research facilities of national importance (Art. 15 RIPA): Assessment of the applications submitted by the AM-TTC Alliance for the years 2022– 2024

Report and recommendations by the Swiss Science Council

Approved by the SSC on 27 October 2022

Introduction

1 Mandate

The Federal Council can support research facilities of national importance based on Art. 15 of the Research and Innovation Promotion Act (RIPA). The State Secretariat for Education, Research and Innovation (SERI) mandated the Swiss Science Council (SSC) on 23 September 2022 to assess two applications submitted by the Advanced Manufacturing Technology Transfer Center Alliance (AM-TTC Alliance).¹ The applications seek funding under Art. 15 RIPA for the Swiss Photonics Integration Technology Center (Swiss PITC) and the Swiss Cobotics Competence Center (S3C) in the years 2022–2024. In its mandate, the SERI provided five evaluation questions for each application and requested the SSC to complete its assessment by 28 October 2022.

2 Assessment procedure

The SSC based its assessment on the proposals submitted to the SERI and the internal assessments of the proposals, which had been conducted by the AM-TTC Alliance. In addition, the SSC conducted virtual site visits with the applicants. The site visits of the S3C and the Swiss PITC took place on 11 and 14 October 2022, respectively.

3 Funding recommendations

The SSC recommends that the Swiss Confederation should fund Swiss PITC under Art. 15 RIPA with CHF 2.2 million for the period 2022–2024.

The SSC recommends that the Swiss Confederation should fund S3C under Art. 15 RIPA with CHF 2.25 million for the period 2022–2024.

The SERI must ensure that the share of federal funding complies with the legal requirements.

¹ The AM-TTC initiative is one of the eight measures defined in the [Action Plan for digitalization in the ERI sector 2019–2020](#) developed by the Department of Economic Affairs, Education and Research (EAER). The AM-TTC initiative is also included in the [ERI Dispatch 2021–2024](#). The [AM-TTC Alliance](#) is the governing body of the initiative and the umbrella organization of different technology transfer centers.

Swiss Photonics Integration Technology Center (Swiss PITC)

1 Background

Swiss PITC is a planned photonics packaging centre and part of the AM-TTC initiative. Swiss PITC aims to offer precision packaging in three photonics systems (Photonics Integrated Circuits PIC, Quantum Photonics Packaging QuPho, and Micro-Optical Hybrid Photonics Systems MOHPS) as well as training and consulting services in designing, engineering and prototyping new photonic solutions. The centre focuses on high technology readiness levels (TRLs) to support small and medium sized enterprises (SMEs) who do not possess the capacity or the capability to package and assemble their own products. The mission of the centre is to provide technology transfer and industrial grade service for photonics packaging and close the gap in low volume manufacturing.

Swiss PITC plans to offer the following services:

- Access to expertise and equipment in assembly and photonics packaging.
- Supporting services in design, testing and process feasibility studies, assembly and production of photonics packaging solutions.
- Prototyping and small to mid-volume manufacturing services.
- Technology transfer to customers for large volume production.
- Training activities (training for industrial partners, internships, apprenticeships, boot camps, online courses).

Research organisations and component manufacturers active in the photonics, assembly, and packaging fields, as well as photonic system providers, will benefit from these services. Additional interested industries include quantum computing, optical communications, sensing applications, miniaturised laser systems, health and medtech, industrial measurement systems, and atomic clocks.

Swiss PITC will be based in Villigen (AG) and operate two sites: one in Villigen focused on photonic chip-based system and optical interconnect activities with ties with the Paul Scherrer Institute PSI; and the other in Buchs (SG) focused on micro system activities with ties to the Institute for Microtechnology and Photonics at the Ostschweizer Fachhochschule IMP-OST.

Swiss PITC is a non-profit association (*Verein*) according to Art. 60 ff. of the Swiss Civil Code (ZGB) and was founded in March 2019. Key partners include the PSI, OST-IMP, ficonTEC GmbH, Ligentec SA, Polariton Technologies AG, and Swissphotonics. Other partners include SUSS MicroOptics SA, CSEM in Alpnach, ETH, ETH-BRNC, EPFL-CMI, and the canton of Aargau.

According to the application, Swiss PITC will be financed from 2022–2024 by the Confederation according to Art. 15 RIPA (34.5%), ETH-Board (18.8%), third party contributions (18.4%), products and services (8.4%), the canton of Aargau (6.3%), through competitive research funding (6.3%), the HEIs (5.7%), and donations (1.6%). The centre reckons with 6 FTE until 2024, rising to 8 FTE from 2025 onwards.

2 The SSC's answers to the SERI's questions

(1) Does the SSC share the internal assessment of the AM-TTC Alliance or does it have well-grounded arguments against this assessment?

The SSC shares AM-TTC's internal assessment of Swiss PITC. The photonics value chain in Switzerland is extremely diversified in terms of competences and stakeholders. Key players offering cutting-edge expertise are spread out across multiple sites and labs. Swiss PITC will offer unique and important services to the Swiss photonics industry by establishing a centralised infrastructure, unifying a multitude of competences, assets, and services and creating synergies among them, and thus provide

prospective customers (especially SMEs) with opportunities to receive customer, high value added solutions. The centre assembles key academic and industrial partners within the photonics field. The diversity and expertise of the board of directors with respect to experience, gender, and age is particularly noteworthy.

Swiss PITC has clearly defined competences, namely in precision packaging, which can be transversally applied to all three photonics systems. The choice of photonics systems is also well-balanced: PICs are more developed and high TRLs, while QuPho and MOPHS are more experimental and low TRLs. The centre consciously decided to offer conventional technologies and methods in the design and development of PICs to respond to the immediate needs of the Swiss photonics industry. The SSC supports the centre's strategy to attract a customer base before focusing on more innovative technologies and methods, but recommends that the centre develop an active monitoring strategy to evolve its products and services, securing a competitive leverage for the customers, and be prepared to respond to future needs.

Swiss PITC is investment heavy, owing to its cleanroom facility and equipment offer. Due to budget constraints, the centre has received in-kind contributions from partners in the form of equipment. However, the centre's cleanroom in Villigen, which will become the centre's headquarters, is under construction until early 2024. Until then, the centre's partners (PSI, OST-IMP, CSEM Alpnach, IBM) will house the equipment and/or offer access to their respective cleanroom facilities. From 2024 onwards, Swiss PITC plans to progressively move its equipment to its new cleanroom facility and thus begin to centralise its equipment and services. During this decentralised process, the centre plans to work virtually.

The decentralised process and service offer represent important challenges to the centre's initial phase. Although it is aware of these challenges, the centre should try to centralise its equipment and services by the end of 2025 (at the latest) in order to assure its identity and attract customers. In addition, Swiss PITC is still looking for a CEO. As the CEO will play a central role in implement this plan to work virtually and manage the decentralised process, the CEO should be recruited as soon as possible to ensure that the centre weathers this critical initial phase.

Once its equipment and services are centralised at its headquarters in Villigen, Swiss PITC plans to continue operations at its second site in Buchs. The centre intends to keep the identity (i.e., services and expertise) of the two sites separate. The SSC wishes to stress that these two sites should not overlap but complement each other.

(2) How does the SSC assess the national importance of the centre and its national embeddedness within the existing centres of technological excellence that are already supported by the federal government?

Swiss PITC has a high relevance for the photonics industry in Switzerland and its adjacent markets. While photonics is an emerging market in its own right, photonics packaging has a technologically disruptive potential. Swiss PITC would therefore be relevant to a number of industries that seek to apply photonics packaging in their own products. These industries, which include quantum and sensing, have a strong presence in Switzerland.

Swiss PITC would cater to these two sets of customers, namely: photonics packaging and manufacturing companies, who wish to develop packaging solutions; and application companies, who wish to apply the packaged solutions to their own products. Both sets of customers will be represented in the advisory board. The SSC stresses that application companies, as end-customers, should be included in the design and development of photonics packaging, as this would lead to improved synergies.

In short, the focus and services of Swiss PITC are unique, both in terms of the Swiss photonics industry and in term of existing centres of technological excellence, none of which are active in the photonics field. Although Swiss PITC includes partners hailing from the French-speaking parts of Switzerland, the

centre is geographically based in the German-parts of Switzerland (Villigen and Buchs). As only 2 of 8 centres of technological excellence currently funded under Art. 15 RIPA are based in the French-speaking parts of Switzerland, Swiss PITC would further add to this imbalance.

(3) How does the SSC assess the potential for knowledge and technology transfer (KTT) at the centre?

The SSC considers the KTT potential of Swiss PITC to be high. The center's strategy for KTT is twofold. On the one hand, the centre aims to provide a fully integrated service along the value chain from ideation to manufacturing. The centre wishes to generate and standardise competences by customising systems to enable the packaging matching the customer design, establishing the process recipe of technologies to execute the packaging while targeting the customers' key performance indicators, ensuring responsive manufacturing at small to medium scale, and the design of custom photonics systems.

On the other hand, Swiss PITC also aims to provide technology transfer to customers and contract manufacturers once production volumes at the centre's sites reach levels where the internalisation of production lines becomes cost-effective to its customers. In other words, once production lines have been perfected at the centre's sites, Swiss PITC will provide support in externalising production capacities.

(4) How does the SSC assess the centre's long-term financial independence?

Swiss PITC wishes to become self-sustaining on the basis of its services and products revenue and on competitive research funding. It plans to decrease its dependence on institutional funding and Art. 15 RIPA over the 2025–2028 period, and intends to continue decreasing this dependence beyond 2028.

The centre is very industry focused in terms of its business-model and in the composition of its board of directors. The estimated revenue from customers in the application is rather conservative and is thus likely to be higher given that the centre expects to have international customers. Despite this and its aim of sustainability, Swiss PITC is unlikely to be financial self-sufficient by 2028.

(5) What funding recommendations can the SSC make?

The SSC recommends that the Swiss Confederation should fund Swiss PITC under Art. 15 RIPA with CHF 2.2 million for the period 2022–2024.

Swiss Cobotics Competence Center (S3C)

1 Background

The S3C is a planned cobotics centre and part of the AM-TTC initiative. The centre is in the process of becoming a non-profit association under Swiss law. It will be located at *Switzerland Innovation Park Biel/Bienne AG* as of 2022.

The overarching mission of S3C is to contribute to the safeguarding of employment levels and manufacturing sites in Switzerland by scaling up and “broadening the application of cobotics in the Swiss manufacturing industry.” More specifically, the S3C aims at overcoming “current roadblocks by providing a state-of-the-art test and experimentation facility for the Swiss industry to explore and extensively test the suitability and quantitative advantages of cobotics.”

The S3C infrastructure will host modular Cobotic Base Cells (CBS), which include the following components: cobot, vision, cognition, gripping & feeding, safety, and interfaces. CBS will be commissioned via two calls, which are planned to open in December 2022 and September 2023. Besides providing infrastructure for testing and experimentation activities, S3C will also offer training and consulting services. While the main S3C infrastructure will be hosted in Biel/Bienne, mobile setups will also enable testing cobotic solutions at end-user sites. Furthermore, cobotic cells may also be deployed at S3C partner sites. The most important customer groups are the watchmaking and precision industry, the medtech industry, the machine-tool industry, and the lab automation industry. Industrial value chains strongly reliant on manual work will also be considered potential customers.

The main founding institutions of S3C are the Swiss Smart Factory Association (SSF), also the applicant of the proposal, and the Bern University of Applied Sciences (BFH). Private individuals as well as any organisation may become members of the S3C. The executive bodies of the association are the general assembly and the board of directors. The personnel includes a managing director (supported by an administrative collaborator), an innovation manager, and several technical project managers and automation engineers.

The scientific partners of the S3C are the SSF, universities of applied sciences, the ETH Zürich and the EPF Lausanne, and other research centres. All regions of Switzerland are represented. Industrial partners include SMEs as well as bigger companies such as Siemens or Stäubli. Other public partners are industrials networks and competence centres.

During phase I (2022–2024), the S3C estimates a total revenue of CHF 5.24 million. CHF 2.25 million (42.9%) are requested from Art. 15 RIPA and CHF 850'000 (16.2%) are requested from the ETH-Board. Additional contributions include CHF 1.23 million (23.4%) under third party contribution, CHF 477'000 (9.1%) under services and products, CHF 378'000 (7.2%) under contributions of higher education institutions, and CHF 60'000 (1.1%) under competitive research funding. Costs are mainly caused by investments in the CBCs and from personnel costs.

2 The SSC's answers to the SERI's questions

(1) Does the SSC share the internal assessment of the AM-TTC Alliance or does it have well-founded arguments against this assessment?

The AM-TTC Alliance recommends funding the S3C. It considers that the demand for cobotic solutions in the Swiss industry, particularly among SMEs, is high. Furthermore, there is a potential for upscaling S3C initiatives in the medium-term, which could also benefit Swiss cobotics suppliers. Finally, the consortium has sufficiently integrated stakeholders from industry and research (including the ETH-domain).

In addition, the AM-TTC Alliance has found several areas of improvement, such as a more precise market analysis, the definition of key performance indicators, and the independence of the S3C centre from the Swiss Innovation Park Biel Bienne AG (SIPBB) and the Swiss Smart Factory (SSF), which would strengthen the centre's chances of success.

The SSC shares the decision and recommendation of the AM-TTC Alliance, yet proposes to take additional areas of improvement into account. Both the potential and the challenge of cobotic solutions lie in machine-human interactions, and – more generally – in the social acceptance of robots as instrumental resources that improve the quality of one's job. This triggers a key need to develop and deploy frictionless technology, and thus puts a strong focus on interaction interfaces and advanced (i.e., more natural) communication dynamics. In addition, employees who work directly with cobotic technologies first have to accept the technology. This acceptance means embracing a number of fundamental social needs, especially while operating repetitive tasks and, consequently, ensuring support in up-skilling and re-skilling blue-collar workers in Switzerland. While those issues are already partly addressed in the S3C application, they should be strengthened, especially through the calls for the Cobotic Base Cells in 2022 and 2023. The centre should ensure that researchers from the humanities and social sciences (including behavioural and gender studies) are sufficiently represented in the S3C activities, thus enabling a strong inter- and transdisciplinary foundation to address cobotics in industry and society. A dedicated advisory board could help to address and implement such inter- and transdisciplinary aspects of holistic cobotic solutions.

One of the strengths of the S3C is that it is very close to industry. Apart from the human aspects mentioned above, most of the required technology already exists at high TRLs. The centre should aim to become independent from Art. 15 RIPA funding as soon as possible and finance its activities through services and products as well as competitive funding. The SSC considers that from 2028 onwards, the S3C should be financially self-sufficient and no longer rely on Art. 15 RIPA funding.

While the S3C has the potential to boost the cobotic industry, the SSC considers that this requires a specific strategy and is separate from the end-users addressed in the proposal ("pilot customers").

(2) How does the SSC assess the national importance of the centre and its national embeddedness within the existing centres of technological excellence that are already supported by the federal government?

The SSC is of the opinion that the S3C has the potential to become an infrastructure of national significance. There is a demand of cobotic solutions within the Swiss industry and no similar facility exists so far in Switzerland.

(3) How does the SSC assess the potential for knowledge and technology transfer (KTT) at the centre?

The SSC considers that the S3C shows sufficient KTT potential. It is important that the S3C ensures that this KTT also includes issues of human-machine interaction (see above). In this context, the cobotics industry itself should not only be seen as an enabler of KTT towards the Swiss manufacturing industry, but also as a specific target group for KTT.

(4) How does the SSC assess the centre's long-term financial independence?

The SSC estimates that there should be a more ambitious vision regarding the financial self-sufficiency of the S3C. As the main technology setup (i.e., the CBCs) is planned to be finished by the end of 2024 and the S3C is working closely with industry from the beginning, financial independence from Art. 15 RIPA funding should be considered by the end of 2028.

(5) What funding recommendations can the SSC make?

The SSC recommends that the Swiss Confederation should fund S3C under Art. 15 RIPA with CHF 2.25 million for the period 2022–2024.

The SSC strongly recommends that S3C addresses the issues raised in evaluation question (1). Moreover, the centre's infrastructure should be fully established and the facility should aim to be financially self-sufficient by the end of phase II (i.e., 2025–2028).