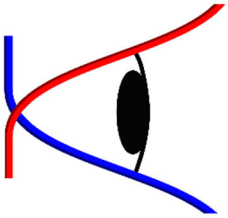

SENSOTERIC

smart SENSOR analog fronT-end powered
by Emerging Reconfigurable devICes

Call: **HORIZON-CL4-2023-DIGITAL-EMERGING-01-11**

Grant Agreement no. **101135316**

Deliverable D7.2
Plan for Dissemination and Communication Actions

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Document Abstract

This document describes the **dissemination and communication strategy** planned for the project SENSOTERIC, throughout its whole duration. This plan allows to strategically identify actions, means, and activities to disseminate the results originated in the frame of the project. As a result of these actions, a strong and diversified community will be created around **SENSOTERIC**, that will be brought up to date with all the public developments of the project. Starting from the project overarching objectives, different target audiences will be considered, and specific actions taken with respect to the strategies identified as the most effective to reach each individual group. In general, this document describes how all these actions are planned and how they are meant to be effectively enforced, given the available allocated budget. In addition, we have **defined quantitative metrics** to assess their success, for each individual communication path pursued.

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1. Project Objectives

Smart cities and smart homes, autonomous vehicles, and industry 4.0 are driving the technology market away from a processing-information-centric past to a **sensing-and-actuation-centric future**. The technological needs for this transformation are complex, as sensing technologies are very diverse and not driven solely by scaling, performance and cost, as opposed to the case of CMOS electronics. From the view of **Europe's industrial landscape**, smart sensors are key technologies in the important automotive and healthcare/medical market segments. Our **global objective** is the development of a **reconfigurable platform** to accommodate both for a **generic analog front-end (AFE) sensor interface** able to adapt to the change in environmental conditions, thus reducing power consumption and improving the signal quality, as well as a **dedicated reconfigurable sensor transducer (RST) element** for the detection of cancer biomarkers. **Reconfigurable Field Effect Transistors (RFETs)** hold the promise to provide the much-needed flexibility for the AFE/RST concepts, and are integrable as add-on into classical scaled CMOS processes like the **22 nm FDSOI, a fully European available platform** offered by GlobalFoundries. These devices provide adjustable device characteristics at runtime, e.g. the dynamic switching from p-type to n-type behaviour or a **negative differential resistance (NDR)** mode, allowing the alteration of circuit behaviour after manufacturing. Circuit characteristics become fine-tuneable at run-time when deploying RFETs into conventional CMOS architectures.

In the frame of the project, **four main objectives** have been identified, and are reported here below to introduce the specific technological advancements that will be generated during the project, and that will need to be disseminated to the different target audiences.

1. *Specific Objective 1 (OBJ1): Enabling Reconfigurable Transistors as Add-On for CMOS Technology*

RFETs are a potential key-enabling technology that can be directly **co-integrated** into the front-end-of-line (FEOL) of a standard **CMOS process**, with only a minor number of changes to the overall process flow. OBJ1 aims to leverage this **co-integrability** to enable a "More than Moore" style of **increasing the system functionality for analog front-end applications**, and beyond. Analog circuit design requires accurate and scalable compact models, as well as proper description of the distinctly different transport physics and its performance boundaries for predicting the application of the emerging technologies. Thus, the **development** of circuit-environment ready **compact models** for RFETs is also part of OBJ1.

2. *Specific Objective 2 (OBJ2): Exploiting Negative Differential Resistance at Room Temperature*

The **negative differential resistance (NDR)** effect observed on lab scale Ge and SiGe geometrically confined Schottky devices shall be leveraged to a) determine its **technological adjustment parameters** and **scaling properties** towards performance enhancement, b) **bridge modelling and technology** towards analog circuit design enablement, and c) exploit its inherent electronic transport features for the realization of **tuneable oscillator circuits** and **bio-functionalized reconfigurable sensor transducers (RST)** for colorectal cancer detection.

3. *Specific Objective 3 (OBJ3): Design of a Generic Highly Adaptable Reconfigurable Sensor Front-End*

Device level features, like NDR and reconfigurable polarity, provide **new functionalities for circuit design**. In this project, these functionalities are exploited to create a **generic analog front-end (AFE)** which **adapts to**

various sensor application environments. OBJ3 aims to provide an AFE, that a) can adapt to various sensor application needs, by adjusting input parameters, gain, range and bandwidth, and b) dynamically tune those parameters on user request or through a feedback from environmental influences. The higher functionality will be embedded by the inherent features of RFETs and NDR devices. Energy efficiency will be ensured by utilizing FDSOI baseline technology.

4. *Specific Objective 4 (OBJ4): Low Noise Sensor System based on Doping-Free Technology*

RFETs feature a **doping-free channel** and a transport behavior which is more oriented towards the bulk, rather than at the surface, as opposed to a classical inversion type MOSFETs. This property can lead to a **beneficial 1/f noise behavior** for the AFE, as well as for the RST. Low-frequency noise is of fundamental importance in AFEs, and its reduction through additional overhead circuitry always results in increased circuit complexity and power consumption. Thus, the use of RFETs in AFEs holds the promise for a **breakthrough in power efficiency**, enabling energy autonomous and/or very high sensor count applications. The altered transport properties of RFETs with NDR also promise an **increased detection range of RST elements** with the same base technology. As part of OBJ4, this will be demonstrated by bio-functionalized transducers and photo detectors with extended measurement range.

2. Dissemination Activities

In this section, we introduce and present the **strategy** and the planned concrete **activities identified for putting** into action the **communication and dissemination plan** for the scientific achievements of the project **SENSOTERIC**. The consortium recognizes the essential importance of successfully carrying out the tasks related to this work package, since it allows to **spread the results originated within the project** to potentially **interested audiences**. For this reason, WP7 is the only work package that interacts directly with all the other, scientific ones, in order to establish a channelling mechanism to bring out the results to the interested communities. This document is now presented at M6 of the project full duration, and it will be integrated at M48 with a final report where it will be presented how the planned actions have been implemented, and potentially steered, to fulfil the targeted performances in terms of dissemination of the project results, based on the changing needs of the project itself and of the receiving audience. Performance metrics are enforced to ensure that all the activities are in line with the expected outcomes, and can be updated and revised to further excel in the dissemination of our scientific results, also after the end of the project.

Our **main objective is to reach out to the society** and showcase how impactful the results of the scientific research originated in the project are. Nevertheless, the **receiving community is diverse** and segmented **actions must be tailored to the specific audience** in order to successfully disseminated those results. In the next paragraphs, these target audiences will be presented together with the specific actions and metrics identified to successfully reach out to them.

1. *Target Audiences, Dissemination Channels, and Expected Feedback*

The **catchment area** of a large European scientific project such as SENSOTERIC is very extended, and all the different actors need to be considered to ensure that the results are best conveyed and redirected to the interested parties. This consideration must go through an analysis of the means that all these segments of interested entities generally use to communicate, or receive information. An overview of the target audience identified by the SENSOTERIC consortium is given here after in **Table 1**. In general, we considered the following actors across the potential community of entities interested in our project results:

- the **Scientific Community**: scientists and engineers, more generally researchers in the field of electronics, sensorics, and healthcare, are the first and main category of professionals who will directly benefit from the results of the project and need to be addressed in our dissemination strategy. Here, the **dissemination channels** are conventional and embedded in the normal course of the scientific progress of a research project: **scientific publications** in journals and proceedings of international conferences, together with the **attendance** to such **conferences** will largely disseminate the results to this audience, that is already familiar with these means of communication. The organisation of **workshops**, in the best case in parallel to larger conferences, will serve as a further means of attracting interest in the project and disseminate its results. All the interested parties reached thorough these means, will have the chance to remotely follow the progress of the project on the **website** and on **social media**. We expect that the Scientific Community will transfer and adopt our results, further enriching them with their own expertise, leading also to the establishment of novel research proposals fostering and igniting a mechanism of generation of always novel research and training of student talents.

- **End User Companies** for sensing devices and systems, semiconductor industry, and TCAD users will be an important audience towards which to direct exploitable results. While a proper exploitation plan will be introduced at M12 with D7.4, and reviewed at M48 with D7.5, it is important to already set up a plan to communicate with these entities. In general, attendance to **conferences** where a **strong industrial presence** is expected will give the chance to the SENSOTERIC partners to interact with this audience, raising attention on the topics and results of the project. Suited **trade fairs** will also be considered to interact with industrial actors. Moreover, industries with active R&D departments will find in the **publications** originated from the project a large source of information about the results. Last but not least, the **industry advisory board** will play a major role in receiving this information and steering the wheel in the direction of a successful dissemination in this context.

- **Policy makers, public institutions and EU initiatives** are also considered among the most important recipients of the results of SENSOTERIC. Here, the context drifts away from a purely scientific/technical audience, and with it also the platforms for communication and the strategy need to vary. Besides **trade fairs** with a peak participation of those actors, the **European Innovation Radar Platform** will be a valuable communication channel to reach out to those entities, as well as **factsheets** and the participation of project representatives to EU institutions driven events, where project results can be presented and discussed at a higher level. We expect that our results will lead to the public endorsement of our project`s success from the institutions as well as the inclusion of our ideas into the research agenda of the EU and of other international institutions.

- Of major relevance is being able to address the **Public** audience. Non-experts in the technical domain, as well as people not involved in the evaluation of the impact of the project results outside the purely scientific context, need to be informed on how SENSOTERIC is employing public funding to advance the society with its scientific research. The main media to intersect this audience is **online**: a varied strategy involving the **project website**, a strong presence on **social media** and more direct communication activities such as video interviews and podcasts can engage more easily with this audience and are considered in SENSOTERIC's strategy for a successful dissemination of the project results to this audience. We expect as feedback from this share of audience the recognition in communicating our results as well as an increased awareness about how the scientific research and

the technological advancements can support the solution of global challenges in the specific fields addressed by the project in the environmental and healthcare sectors.

- Last but not least, it is important that the project dissemination activities reach the community of **Young Researchers** and of **High School Students**. They represent **the future of our society** both as main actors in leading the scientific and technological advancement, and in receiving the related benefits. In order to reach **undergraduate researchers**, two SENSOTERIC **workshops** will be organized either at partner sites or as side-events of international conferences, thus we aid the education of young talents. In order to motivate kids at an early stage to join a path in technology and research a **high school student course** will be organised and the consortium partners plan to present this to students between grade 8 and 12 to encourage them early to join the scientific path. Moreover, to match the communication platforms used nowadays a strong presence on the web and on social media platforms will be used to communicate with these audiences. We expect to gather new young talents to join the scientific world in science and engineering, thus providing a highly specialized work force to the EU. At the same time, we believe that the younger generation will be more prone to receive our message on how science and technology can serve a more just, fair and respectful world.

Table 1: *Planned dissemination activities divided by main audience groups. For each audience dissemination channels are identified as well as expected feedback.*

Audience description	Dissemination channels	Feedbacks expected
Scientific Community (researchers & engineers specialized in electronics, sensors, health care or cross field)	Publications in international conferences and journals Workshops Website	Transferring and adopting results, designing new collaborative research proposals, stimulating new research collaboration and training of students.
End User Companies for Sensors and Sensor Systems; Chip Designers and Chip Manufacturers; TCAD Users	Project website, conferences, trade fairs, publications, advisory board meetings	Feedback during workshops and board meetings, increase acceptance of the applications developed, and adoption by potential users.
Policy makers; **Public institutions;** **EU initiatives**	European Innovation Radar Database, Factsheets; Working groups and events of EU association, trade fairs	Endorsement of public institutions; Strategic Research Agenda of EU/international associations
Public	Online: project website, press releases; social media, videos, podcasts, etc. Offline: Public science events	Distribute general information about the project; raise awareness for the importance of science and technology to solve global challenges.
Young (undergraduate) **Researchers and High School Students**	Dedicated SENSOTERIC workshops for university or PhD students; high school student courses; public science events (lab tours); social media presence (LinkedIn, Facebook)	Gather young talents to join science and engineering; raise awareness for importance of science and technology to solve global challenges

2. *Metrics to Quantify Success*

Given the identified audience and the strategies to best convey the project results described in the paragraph above, we have defined a set of **quantitative metrics to assess the success** of those activities. In fact, it is important to understand that it is short-sighted to consider only a few parameters to evaluate a dissemination strategy that needs to address so many different targets.

Actions targeting mainly the **scientific and technical community** will be evaluated based on the **quality** and the **quantity** of **publications** originated throughout the project's duration: a target of 15 open-access, peer-reviewed journal publications is set as an indicator of success of the activity, with the desired goal of placing a high fraction of them in Q1 journals (https://www.scimagojr.com/) within our respective areas of expertise. An exemplary target list of suitable journals is given in **Table 2.** The same target of 15 contributions is set for international scientific conferences, in order to share effectively and quickly the latest project results within the respective communities. Here we target a good mix between attending international flagship conferences (IEDM; VLSI; ISSCC; MRS; IEEE SENSORS) as well as conferences and events hosted in Europe (ESSERC; DATE; E-MRS; NEWCAS; MOCAS; EUROSENSORS etc.).

Table 2: *Exemplary list of suitable target journals with a Q1 rating*

Area	Journal
Electrical and Electronics Engineering	Nature Electronics, Nano-Micro Letters, IEEE Sensors Journal, Nano Research, IEEE Transactions on Circuits and System I/II, Microsystems and Nanoengineering, Sensors and Actuators B: Chemical, IEEE Trans. On Biomedical Circuits and Systems, Materials Today Electronics, IEEE Signal Processing Letters, IEEE Electron Device Letters, Sensors International, Smart Cities, Sensors and Actuators Reports
Material Science	Nature Nanotechnology, Advanced Functional Materials, Small, Small Science, Materials Today, InfoMat, ACS Nano, Nano Letters, Materials Horizon, Advanced Electronic Materials, IEEE Access
Biomedical Engineering, Cancer Research	Biosensors and Bioelectronics, Materials Today Bio, Colloids and Surfaces B: Biointerfaces, IEEE Transactions on Biomedical Circuits and Systems, Nano Today, Signal Transduction and Targeted Therapy, Molecular Cancer, Cancer Communications, Nature Communications

Dedicated in-person **events** are fundamental in the strategy identified by SENSOTERIC in order to disseminate the project's results. A targeted number of 2 workshops about the scope and the results of SENSOTERIC will be organized to attract interested scientists of all levels, possibly in conjunction with relevant conferences in Europe (e.g. DATE, ESSERC, E-MRS, etc.) already attended by profiles spanning vertically from young researchers to experienced ones, and horizontally from professors to industry leaders.

In addition, the consortium decided to put a great deal of attention and effort in interacting with the young generation, at a step before university. Attracting **young talents** to join research in the semiconductor industry, in fact, must happen before they decide which university courses to choose. Research in electronics must be sponsored and advertised long before, and for this reason we decided to target **high school students** with at least 4 dedicated events across multiple cities.

Online communication tools are nowadays of fundamental importance when it comes to disseminate any kind of content. For this reason, a project **website** has been set up (http://sensoteric.eu), see also Deliverable D7.1) in English language to communicate advancements of the project through news items, as well as to make public all the documents and content generated throughout the duration of the project. The website serves also as a platform for making available all this content after the completion of the project. More than

ten news items per year are planned. **Social media** accounts have also been set up to quickly disseminate content diversified with respect to the items on the website. On these platforms we target to share on average one post per week after month 12. Moreover, internal analytics can serve as an important support to quantify the engagement of the public with the pages (e.g. LinkedIn Impressions, number of posts, etc.). To support these platforms and produce a more engaging type of content, in the more advanced phases of the project a promotion video will be realised that discusses the scope and the results of the project.

All metrics considered for quantifying the success of the project in terms of outreach to the different targeted audiences are reported in **Table 3**, sorted by the respective dissemination channels considered.

Table 3: *Quantitative metrics defined for the self-assessment of the success of our dissemination and communication actions*

Channel	Measure to quantify success
Scientific Journals	Publications in peer-reviewed (open access) Journals; Target: 15 Quality: 50% in Q1 journals in the respective fields of the PIs
Scientific Conferences	Contributions in international scientific conferences. Target: 15
Workshops	SENSOTERIC Workshops held at partner sites or as side-events of international conferences: Target 2
High School Events	Low-entry level scientific talks at high-schools in the partner cities; lab-demo tours wherever suitable. Target: 4
Project Website	Dedicated project website in English. All communication documents will be made available (posters, scientific papers and public deliverables). The project website will be maintained for 3 years after the project ends to support project impacts. Target: 10+ news items per year
Social Networks	Professional and Public Social Network Accounts (LinkedIn, Facebook) will be set-up in order to maximize the visibility of the published results and partners organization/participation of international events, and also to monitor the feedback (number and type of followers, comments) Target: 1 post per week after month 12
Promotion Video/Audio	A promotional video will be prepared to distribute the project results in social media/via YouTube in year 4 of the project. Other promotional options like podcasts, interviews, science fair talks will be evaluated.

3. *Preliminary Analysis of LinkedIn Metrics*

Regardless of the current preliminary stage of the project (M6) some **early metrics** of its success on social media platforms can be extracted, especially for the **LinkedIn profile**, that automatically extrapolates some relevant data to quantify the engagement of the project profile. Until month 6, already **more than 250 followers/connections** were obtained for the project website, showing that the initial approach to public engagement is successful. An overview of the **impressions** of the posts calculated by LinkedIn itself is presented in **Fig. 1**, and shows impressive results even just after a few months of activity with less frequent posts compared to the intended frequency after month 12.

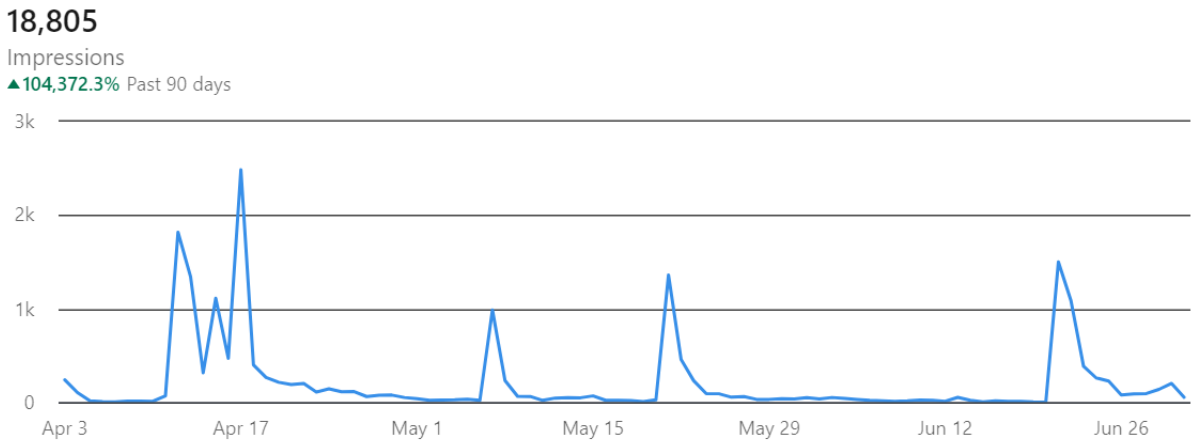

***Fig. 1**: M6 impressions of SENSOTERIC's LinkedIn profile, with respect to the first few months of the profile activity. The top three performing posts were, in order: in-person kick-off meeting post, RFET background post, and open position advertisement for partner UBx.*

3. Summary and Conclusion

The main output of this deliverable is a **plan** for actions taken in SENSOTERIC to cover the specific **dissemination actions** of the project. Various **target audiences** and the most likely channels to address those audiences have been identified. This includes scientific dissemination such as journal articles, conference presentations, and scientific events as well as broader communication mechanisms such as website, social media, and events designed for a non-technical public. **Quantitative metrics** have been defined to self-assess the performance of our communication activities.

Until M6, the focus was on setting up public communication channels: the project website (http://sensoteric.eu) has been launched, profiles have been created on social networks (LinkedIn and Facebook) and communication has started to attract a reasonable small community given the early phase of the project.

4. Glossary

AFE: Analog Front-End
NDR: Negative Differential Resistance
RFET: Reconfigurable Field Effect Transistor
RST: Reconfigurable Sensor Transducer