Project**: SEAWave**

In vivo exposure system acceptance test

Work Package:	WP6
Deliverable:	D6.1
Deliverable No.:	D18

Abstract

Deliverable 6.1 is related to the acceptance test of the in vivo (animal) exposure system for the Work Package 6. The exposure system was built by ZMT, delivered to ENEA and tested.

Project Details

Project name	SEAWave
Grant number	101057622
Start Date	01 Jun 2022
Duration	36 months
Scientific coordinator	Prof. T. Samaras, Aristotle University of Thessaloniki (AUTH)

Deliverable Details

Deliverable related number	D6.1
Deliverable No.	D18
Deliverable name	In vivo exposure system acceptance test
Work Package number	WP6
Work Package name	Health Risk Studies: Animal Study on Skin Carcinogenicity and Other Endpoints of FR2 Exposure
Editors	Mariateresa Mancuso, ENEA
Distribution	Public
Version	2
Draft/final	Final
Keywords	Animal Studies, In Vivo Exposure Setup, FR2 exposure

Contents

1 Introduction

To conduct the in vivo experiments outlined by WP6 of the SEAWave project, ZMT has designed and constructed three reverberation chambers. These chambers are equipped with sensor boxes for temperature measurements, warning lights, a cooling system, a generation and a control system, and electric field probes to measure electric field levels. The system also includes a control computer, software, and safety features. Hereafter, we will refer to this entire setup as the in vivo exposure setup.

2 In vivo exposure setup: Reception

Initially scheduled for July 2023, the complete in vivo exposure setup was delivered by ZMT to the ENEA Casaccia Research Centre in Rome, Italy, on January 9th, 2024. Dr. Myles Capstick assembled the entire setup at the Casaccia Research Centre over the following days, with finalization and operationalization completed on January 17th, 2024.

The in vivo exposure setup for SEAWave experiments is a complex system consisting of various interconnected units, as specified above. These units are controlled by dedicated software accessible remotely via TeamViewer, enabling continuous monitoring of environmental parameters (such as temperature, electric fields, and power) by both the ENEA and ZMT teams, in accordance with the research agreement issued.

3 In vivo exposure setup: Acceptance tests

The in vivo exposure setup underwent three different trials:

- The first trial, conducted after assembly, involved switching on the exposure setup with no cages inside. This initial test was essential to verify the functionality of all generation devices (including power amplifiers, upconverter phase-locked loops, upconverter power detectors, and signal generators), the control unit, and the monitoring sensors (temperature and electric field probes). The test passed successfully as the nominal power levels and electric field levels were reached in each chamber. The test ran for 2 hours, during which it was determined that the setup could reach maximum output power within 30 seconds of starting.
- A second test was conducted with animal cages containing bedding and food placed inside the chambers. This test aimed to verify whether nominal power levels and electric field levels could be achieved in loaded conditions. The presence of bedding and food absorbed most of the electromagnetic power. However, the test also passed successfully, with nominal power and electric field levels reached inside the exposed chambers. This test also lasted 2 hours.

- During the first two tests, the ENEA team of engineers received training on switching the in vivo exposure setup on and off and using the control software to remotely manage the setup. The team also learned how to visualize data and access the logbook. The training was successful, and the ENEA team is now capable of safely and efficiently managing and controlling the in vivo exposure setup.

- Finally, a third test was conducted to verify the maintenance of correct temperature levels inside the chambers when loaded with cages, bedding, and food. This requirement is of paramount importance to ensure a stable temperature of 21°C throughout the chronic exposure of the mice. The test ran for 2 days and was successfully completed. Temperature variations were kept below 0.5°C after analyzing the data stored in the logbook. Additionally, during this test, the intensity of lights was regulated to provide optimal comfort for the animals.

4 Conclusions

The in vivo exposure setup for the SEAWave experiments was installed in the animal house of the Casaccia Research Centre and tested for its full operability for chronic in vivo experiments scheduled in the SEAWave project. The performed tests demonstrated that the system works properly and reliably. The ENEA team learned how to use it effectively, including the dedicated control software. The first experiment run was scheduled to begin in Mid-February, 2024.