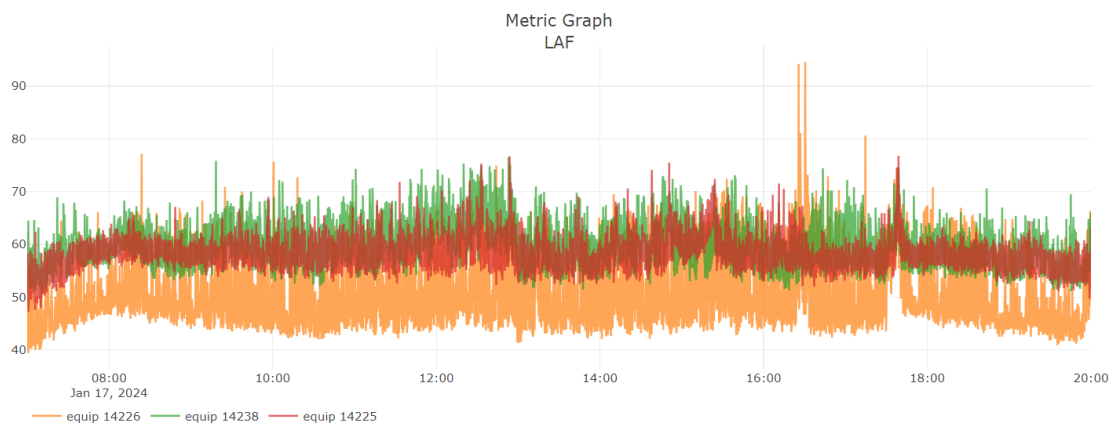


ENVIRONMENTAL NOISE MANAGEMENT AND CONTROL SYSTEM OF THE ESTORIL CIRCUIT

The Estoril Circuit - Autódromo Fernanda Pires da Silva has implemented since the beginning of January 2024, based on studies and actions developed in recent years, an **Environmental Noise Management and Control System**, aimed at controlling noise emission from all private and corporate events (i.e., other than official sporting competitions, respective training and competition tests), based on best international practices and in accordance with current technical and legal standards, the most relevant elements of which are the following:

- **Systematic control procedure for noise emissions** from vehicles allowed to circulate on the track, as well as the number of vehicles that can circulate simultaneously and the time of the events, through:
 - Predefinition of maximum vehicle emission limits for each event, to inform the promoters of these events in a timely manner. and allow them to adjust the type of muffler system and vehicles they can bring to the event.
 - Systematic inspection of all vehicles, before the start of the event, through measurements carried out 50 cm from the exhaust, at $\frac{3}{4}$ of the engine's maximum revolutions and with the sound measured at an angle of 45 degrees in relation to the exit of the exhaust pipe.
 - Registration and dissemination of this assessment.
- **Ambient noise monitoring network** consisting of:
 - 3 permanent continuous monitoring stations for environmental noise, weatherproof, consisting of precision class 1 sound level meters, duly approved in Portugal and subject to annual metrological control, installed within the limits of the circuit, in 3 strategically placed points to determine the noise emission of the various sections of the circuit.
 - Integrated digital platform, MIRA (Intelligent Environmental Noise Monitoring), which communicates with monitoring stations, from which it receives, stores, and processes data from noise indicators relevant for environmental noise assessment (LAeq, Ld, Le, Lden and others, including analyzes in third octave bands), with the ability to generate reports, provide information via the web to those responsible for the circuit, as well as detect specific characteristics of the noise, such as exceeding pre-programmed thresholds and generating alarms for the user.
- **Acoustic simulation model of the circuit and surrounding area**, developed based on 3D cartographic information, including the digital terrain model, buildings and other obstacles as well as the track layout, which constitutes the specific noise source, divided into several segments according to their respective characteristic sound emission levels. The model allows relating the following variables, involved in the circuit's activity:
 - Maximum noise levels allowed at 0.5 m from the vehicle exhaust, taking into account the number of simultaneous vehicles on the track.
 - Noise emitted by each segment of the track, based on the acoustic simulation model developed.
 - Noise levels measured at the 3 permanent monitoring points.
 - Specific noise levels in the most critical sensitive receptors, to check the nuisance criterion, in the area surrounding the Estoril Racetrack, namely in Ribeira da Penha Longa, Quinta da Penha Longa, in Bairro da Cruz Vermelha, in Bairro da Atrozela and, also, in Linhó, namely next to the Prison establishment, and in Quinta da Beloura, namely next to TASIS.
 - Residual noise levels (in the absence of circuit activity) in the most critical sensitive receivers.

The environmental noise management and control system includes the preparation of monthly reports that will report the results of permanent monitoring at the 3 points, respective detailed analysis, identification and individualized calculation of the noise generated in private and corporate events, estimation of the acoustic impact on the sensitive receivers, with evaluation of the applicable criteria (maximum exposure and nuisance) for the monthly evaluation period, and an annual report, synthesizing and systematizing the information from the monthly reports, and making an annual assessment of noise emissions, control and monitoring measures implemented, and evaluation of the applicable criteria (maximum exposure and nuisance) for the annual evaluation period.



Equipment used in noise monitoring stations and example of the records obtained.

SUMMARY OF APPLICABLE NOISE LEGISLATION

The basic Portuguese legislation on Environmental Noise is the General Noise Regulation (RGR) – Decree-Law No. 9/2007, of January 17th.

The RGR contains two fundamental chapters: Chapter II, dedicated to Municipal Planning, and chapter III, dedicated to the Regulation of Noise Production.

The first essentially presents requirements for municipalities in terms of spatial planning and respective planning instruments, which must include adequate acoustic zoning, as well as the preparation of noise maps, municipal noise reduction plans and reports on the acoustic environment.

The second presents, on the one hand, exposure limit values closely associated with aspects of planning and acoustic zoning as well as mechanisms for prior control of urban operations, and, on the other, limits for the installation and

exercise of noisy activities, whether permanent, whether temporary. In addition to the exposure limit values (Maximum Exposure Criteria), defined in article 11 and applicable to all noise sources co-responsible for noise in a given location, limits are also established for each particular noisy activity, these limits relating to the difference between the noise when this activity is running and the noise when the activity is stopped (Annoyance Criterion).

Maximum Exposure Criteria

This criterion, contained in article 11 of the RGR, establishes exposure limit values, according to the acoustic classification of the areas, in terms of noise indicators Lden and Ln. These values can be viewed in the table below.

Table 1 – Exposure limit values.

Zone	L _{den} (24 hours)	L _n (23:00h to 07:00h)
Mixed	65 dB(A)	55 dB(A)
Sensitive	55 dB(A)	45 dB(A)
To Classify	63 dB(A)	53 dB(A)
Sensitive with GIT in exploration	65 dB(A)	55 dB(A)
Sensitive with GIT projected area	65 dB(A)	55 dB(A)
Sensitive with GIT not projected area	60 dB(A)	50 dB(A)

Number 4 of this article further explains:

For the purposes of verifying compliance with the values set in this article, the assessment must be carried out at or on the sensitive receptor, in one of the following ways:

a) Carrying out acoustic measurements, and the measurement points must, whenever technically possible, be at least 3.5 m away from any reflective structure, with the exception of the ground, and be located at a height of 3.8 m to 4.2 m above the ground, when applicable, or 1.2 m to 1.5 m in height above the ground or the level of each floor of interest, in other cases;

b) Consultation of noise maps, provided that the situation being verified is capable of being characterized through the values represented therein.

Article 12 – Prior control of urban planning operations, states in its numbers 6 and 7 *that the licensing or authorization of new residential buildings, as well as new schools, hospitals or similar facilities and leisure spaces is prohibited as long as there is a violation of the limit values set out in the previous article, with the exception of new residential buildings in consolidated urban areas, provided that this area is covered by a municipal noise reduction plan; or that does not exceed the applicable limit values by more than 5 dB(A) and that the acoustic design considers values of the sound insulation index for air conduction sounds, standardized, D_{2m,nT,w}, greater than 3 dB above the values contained in the subparagraph a) of paragraph 1 of article 5 of the Regulation on Acoustic Requirements for Buildings (D.L. 96/2008).*

In the case of the Estoril Circuit, considering the acoustic classifications existing in the surrounding area, the applicable limits will be those of a Mixed Zone.

Finally, it should be noted that in article 3 of the RGR, the definition of the indicators referred to in article 11 states that they must be determined during a series of daytime periods representing one year. In other words, the Lden and Ln indicators must be representative of a year and not a particular day or period.

Nuisance Criterion

The Nuisance Criterion contained in article 13 of the RGR, establishes the limit values for the difference between the value of the LAeq indicator of ambient noise determined during the occurrence of the particular noise of the activity or activities under evaluation and the value of the residual noise LAeq indicator, according to the following table.

Table 2 – Nuisance criterion.

Period	$L_{Aeq,ra} - L_{Aeq,rr} + K1 + K2$
Daytime	$\leq 5 \text{ dB(A)} + D$
Evening	$\leq 4 \text{ dB(A)} + D$
Nighttime	$\leq 3 \text{ dB(A)} + D$

Notes: $L_{Aeq,ra}$ is the Equivalent Continuous Sound Level of the ambient noise determined during the occurrence of the particular noise of the activity or activities under evaluation; $L_{Aeq,rr}$ is the Equivalent Continuous Sound Level of the noise determined in the absence of the particular noise of the activity or activities under evaluation; K1 is tonal correction; K2 is the impulsive correction and D is the correction relative to the duration of the activity.

To the limit values of the difference between the L_{Aeq} of the ambient noise, which includes the corrected particular noise (L_{Ar}), and the L_{Aeq} of the residual noise, the value D indicated in the following table must be added. The D value is determined as a function of the percentage relationship between the accumulated duration of occurrence of the particular noise and the total duration of the reference period. For the night period, the values of $D=4$ and $D=3$ are not applicable, maintaining $D=2$ for percentage values lower than or equal to 50%. The application of $D=3$ for activities with opening hours until 24 hours is exempt from this restriction.

Table 1 –D. values

Value of the percentage relationship (q) between the accumulated duration of occurrence of the particular noise and the total duration of the reference period.	D
$q \leq 12,5\%$	4 dB(A)
$12,5\% < q \leq 25\%$	3 dB(A)
$25\% < q \leq 50\%$	2 dB(A)
$50\% < q \leq 75\%$	1 dB(A)
$q > 75\%$	0 dB(A)

As an example, the applicable limit for a noisy activity, occurring only during the day and which, during a monthly evaluation period, has not occurred for more than 12.5%, will be $5 + 4 = 9 \text{ dB(A)}$.

It should also be noted that, according to the RGR (point 4 of Annex I): *For the purposes of verifying the values set in paragraph b) of paragraph 1 and paragraph 5 of article 13, the range of The time to which the L_{Aeq} indicator is reported corresponds to a period of one month, and must correspond to the most critical month of the year in terms of sound emission from the noise source(s) under assessment in case marked annual seasonality is noted.*

This means that the assessment of the nuisance criterion should not be carried out for the period of one specific day, in which a certain noisy activity occurred, but rather for a period of one month. As there is, a priori, no marked seasonality known in the noise emission of the activities of the Estoril Circuit, the most correct thing is to analyse every month of the year and verify compliance with the Nuisance Criterion for all of them.

Finally, it should be noted that the Nuisance Criterion does not apply, in any of the reference periods, to a value of the L_{Aeq} indicator of outdoor ambient noise equal to or less than 45 dB(A) or to a value of the L_{Aeq} noise indicator environment inside reception locations equal to or less than 27 dB(A).