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XXX Meeting of the Brazilian Society of Acoustics

The 2023 event brought many new features to the city of Natal

Abstract: Between November 19 and 22, 2023, the XXX Meeting of the Brazilian Society of Acoustics (Sobrac) took place at the UFRN Engineering Technology Center in Natal, Brazil. This event, which marks Sobrac's 40th anniversary, is the largest and only technical-scientific meeting in Brazil focused on acoustics and vibrations. Bringing together 292 participants, the event featured the presentation of 68 papers in 18 thematic areas, as well as five lectures, six short courses, two round tables, and a workshop, with an outstanding international presence. There was also an exhibition fair with 22 exhibitors and two technical visits, which attracted around 250 professionals each day. The event ended with the awarding of seven prizes in a student competition. The final evaluation by the participants highlighted the high level of organization and technical-scientific level of the meeting.

XXX Encontro da Sociedade Brasileira de Acústica

Resumo: Entre os dias 19 e 22 de novembro de 2023, ocorreu no Centro Tecnológico de Engenharia da UFRN, em Natal, o XXX Encontro da Sociedade Brasileira de Acústica (Sobrac). Este evento, que marca os 40 anos da Sobrac, é o maior e único encontro técnico-científico do Brasil focado em acústica e vibrações. Reunindo 292 participantes, o evento contou com a apresentação de 68 trabalhos em 18 áreas temáticas, além de cinco palestras, seis minicursos, duas mesas redondas e um workshop, com presença internacional destacada. Também houve uma feira de exposição com 22 expositores e duas visitas técnicas, que atraíram aproximadamente 250 profissionais por dia. O evento encerrou-se com a premiação de sete trabalhos em um concurso estudantil. A avaliação final dos participantes destacou a alta organização e o elevado nível técnico-científico do encontro.

1. Introduction

The Brazilian Society of Acoustics (Sobrac), founded on November 21, 1984, brings together individuals (researchers, professionals, and students), as well as public and private institutions (industries, service providers, government agencies, universities, among others), and all those interested in the field of acoustics and related areas.

Figure 1: Logo of the 30th Sobrac Meeting 2023.

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Sobrac, recognizing the close connection between acoustics and vibrations, also includes this important area in its activities. Among its main responsibilities, it regularly organizes scientific and technical events such as meetings, seminars, symposia, workshops, courses, as well as regional, national, and international congresses that foster advances in knowledge and the exchange of experiences in acoustics and related disciplines — see the logo of the most recent event in Figure 1.

The Sobrac Meeting stands out as the only national congress in Brazil dedicated exclusively to the field of acoustics, held on a regular basis. In some editions, the event is combined with international meetings, as occurred in 2022, in Florianópolis, when the 29th Meeting was held jointly with the 12th Congress of the Ibero-American Federation of Acoustics (FIA), thus giving it an international character. Since 1985, Sobrac has been a member of renowned international organizations, including the International Institute of Noise Control Engineering (I-INCE), the International Institute of Acoustics and Vibration (IIAV), the International Commission of Acoustics (ICA), and the Ibero-American Federation of Acoustics (FIA), serving as a founding member of the latter. These affiliations attest to Sobrac's strong international presence, evidenced by the frequent participation of foreign speakers and attendees at its events.

Furthermore, Sobrac publishes the Acoustics and Vibration Journal (*Revista Acústica Vibrações*, ISSN: 2764-3611, 1983-442X), currently with over fifty editions, featuring technical articles and information on events and topics of interest to its members — some of the articles presented at the congress are also later published in the journal.

The Sobrac Meetings seek to promote interaction among professionals, researchers, faculty members, and students (including undergraduate and, especially, graduate students) from national and international universities, in addition to establishing a bridge between academia and professionals in companies involved in various specialties related to Acoustics and Vibrations. This is a well-established event in the field that has now reached its thirtieth edition, underscoring its importance to the scientific community.

It is worth highlighting the significance of this national and unique event, which holds great relevance for those undertaking research development in the field, especially for professors and students directly involved in graduate programs. Therefore, the specific objectives are:

- To foster the exchange of experiences among researchers, university faculty, students, and professionals in these fields;
- To encourage the participation of professionals from Brazil and abroad, nationally and internationally recognized; and
- To contribute to the dissemination of methods and techniques in the fields of Acoustics and Vibrations.

This article-insert provides a brief account of the event, including an overview of its numbers, schedule, and various activities that took place.

2. A Report on the 30th Sobrac Meeting

The Brazilian Society of Acoustics (Sobrac) has organized 30 meetings throughout its history, covering different regions of the country. In addition, it has played an active role in co-organizing international congresses in partnership with the Ibero-American Federation of Acoustics (FIA) and the International Commission for Acoustics (ICA). These events stand out by building a strong bridge between academia

and professionals working in companies spanning the most diverse specialties related to Acoustics and Vibrations, thereby promoting the exchange of knowledge and strengthening the dialogue between research and practice. Sobrac Meetings have been held since 1994 every two years in different locations. Below is a list of the cities that hosted the most recent editions: 2008 in Belo Horizonte; 2010 in Salvador; 2012 in Belém; 2014 in Campinas; 2017 in Brasília; and 2018 in Porto Alegre.

In September 2016, the 26th Sobrac Meeting was held jointly with the 10th Ibero-American Acoustics Congress (FIA 2016) and also together with the 22nd International Congress on Acoustics (ICA 2016), in Buenos Aires, Argentina. In August 2022, the 29th Sobrac Meeting was organized jointly with the 12th Ibero-American Acoustics Congress (FIA 2020/22), in Florianópolis-SC, reaching a larger number of participants compared to previous editions and thus assuming an international profile.

Regarding attendance figures, in Belém, in 2012, the event had 197 participants and published 95 papers. In Campinas, in 2014, there were 176 registrants and 96 articles included in the proceedings. In Brasília, the number of participants was 230, with a substantial increase to 298 published papers. In Porto Alegre, in 2018, 214 people registered and 164 articles were published.

The 2023 Sobrac Meeting (Figure 1), in its thirty-th edition, took place from November 19 to 22, 2023, at the Engineering Technology Center (CTEC/UFRN) in the city of Natal, Rio Grande do Norte, Brazil. The event had 292 participants, including researchers, faculty, graduate, and undergraduate students, as well as professionals and exhibitors from the five regions of Brazil, in addition to seven international participants. The event featured its own website at www.even3.com.br/sobracnatal2023 and an Instagram account at @sobracnatal2023.

As with all previous editions of events organized by Sobrac, this edition had a significant impact on the dissemination of scientific and technological advances within the national acoustics community. The event provided a platform for Brazilian researchers to showcase their latest scientific work, fostering fundamental discussions for the advancement of research in the field. The publication of the proceedings gave broad visibility to the contributions presented, thus expanding their reach and impact. From a technological perspective, in addition to the studies focused on basic research, there were notable contributions addressing the development of new technologies, equipment, and experimental and numerical methods applied to acoustics and vibrations, enhancing the practical and innovative relevance of the event.

The field of Acoustics and Vibrations is characterized by its inherently multidisciplinary nature, with advancements having substantial repercussions in a wide range of other areas of knowledge. This multidisciplinary aspect is also a key driver for innovation. In this context, the event stood out by offering an environment conducive to interaction among researchers from different fields, united by intersecting interests in Acoustics and Vibrations. Such knowledge exchange facilitated the presentation of techniques and approaches drawn from diverse domains, broadening innovation prospects and enabling transformative applications for the development of other specific fields.

In addition, the event included a product fair that showcased equipment, projects, publications, and software, where manufacturers and entrepreneurs in the acoustic sector exhibited and interacted with specialists and other interested attendees. The fair was open to the public throughout the event program and featured 22 exhibition booths from companies and institutions, along with booths from Sobrac and the event itself.

Various entities also participated in the event as sponsors and exhibitors at the fair. Furthermore, the opening ceremony welcomed authorities such as representatives of the President of CONFEA/CREA-RN, Mútua/RN, CAU/RN, the Rector of the UFRN, and the Director of UFRN's Technology Center,

as well as department heads from the Technology Center. A photo of these authorities at the opening ceremony is shown in Figure 2.

Figure 2: Photo of the authorities at the opening ceremony.

2.1 Organizing Committee and Sobrac Board of Directors

The Organizing Committee of the 2023 Sobrac Meeting consisted of 15 members, among whom were faculty from the Department of Architecture at UFRN, namely:

- Prof. Bianca Carla Dantas de Araújo (Chair of the Organizing Committee);
- Prof. Virgínia Maria Dantas de Araújo (Vice-Chair of the Organizing Committee);
- Arq. Luciana da Rocha Alves (Secretary General Coordinator);
- Prof. Elcione Moraes from UFPA (Chair of the Scientific Committee);
- Eng. Sérgio Silva (Vice-Chair of the Scientific Committee);
- Arq. Bárbara Fengler;
- Arq. Cândida Maciel;
- Arq. Débora Barreto;
- Prof. Viviane Melo from UFSM (Technical Coordinator);
- Prof. Alexandre Maiorino from UFRN (Social Events Coordinator);
- Arq. Carolina Sousa;
- Arq. Debora Gomes;
- Prof. Marina Cortês from UFRN (Communications and Outreach Coordinator);
- Prof. Juliana Costa from UFPB; and
- Prof. Maria Fernanda Oliveira from Unicamp (Organizing Committee of the 3rd CACS).

In addition, the support team — comprising 20 undergraduate and graduate students and UFRN staff — played a key role in this event (Figure 3).

The organization of the event was also supported by the Sobrac Board of Directors, composed of: Krisdany Vinícius Santos de Magalhães Cavalcante (President | MG), Cândida de Almeida Maciel (Vice-President | DF), Sérgio Fernando Saraiva da Silva (1st Secretary | MA), Paulo Chagas Rodrigues (2nd Secretary | PA), Viviane Suzey Gomes de Melo (1st Treasurer | RS), and Bianca Carla Dantas de Araújo (2nd Treasurer | RN). Thus, six different states are represented on the Board (Figure 4).

(a) Organizing Committee.

(b) Support team.

Figure 3: Photos of the organizing committee (a) and the support team (b).

Figure 4: Photo of the Board of Directors at the Sobrac assembly.

Sobrac also has Regional Boards (or Regional Coordinations), which serve as regional units of Sobrac aimed at assisting in fulfilling the Society's objectives (the regional division groups members within the same geographical region of Brazil or the same federal unit). Currently, the following are established: Northeast Region, North Region, Midwest Region, Paraná Region, Rio Grande do Sul Region, Rio de Janeiro Region, and São Paulo Region. Consequently, event participants come from all regions of Brazil. This is also evident from the presence of speakers from every region, as well as in the composition of the Organizing Committee.

2.2 Program and Event Statistics

The four-day event featured a full schedule of activities across three sessions each day, except for the final day, which ended in the morning (see Table 1).

Table 1: Technical-scientific program of the event.

XXX Sobrac Natal 2023 Program							
Sunday 11/19/2023		**Monday 11/20/2023**		**Tuesday 11/21/2023**		**Wednesday 11/22/2023**	
8:00 – 9:00	Registration	8:00 – 9:00	Visit to the Fair	8:00 – 9:00	Visit to the Fair	8:00 – 9:00	Visit to the Fair
9:00 – 10:00	Short Courses 1, 2, 3, 4, 5, 6	9:00 – 10:00	Technical Sessions	9:00 – 10:00	Technical Sessions	9:00 – 11:00	Sobrac Assembly
10:00 – 11:00	Short Courses 1, 2, 3, 4, 5, 6	10:00 – 11:00	Technical Sessions	10:00 – 11:00	Technical Sessions	11:00 – 12:00	Lecture 5
11:00 – 11:10	Break	11:00 – 11:30	Coffee Break	11:00 – 11:30	Coffee Break	12:00 – 13:00	Contest Results/ Closing Ceremony
11:10 – 12:10	Short Courses 1, 2, 3, 4, 5, 6	11:30 – 12:30	**LECTURE 2**	11:30 – 12:30	**LECTURE 4**		
12:10 – 13:10	Short Courses 1, 2, 3, 4, 5, 6	12:30 – 14:00	Lunch	12:30 – 14:00	Lunch		
13:10 – 14:30	Lunch/Registration	14:00 – 15:00	TECHNICAL VISITS	14:00 – 15:00	Technical Sessions		
14:30 – 15:30	Technical Sessions	15:00 – 16:00	TECHNICAL VISITS	15:00 – 16:00	Technical Sessions/Workshop		
15:30 – 16:30	Technical Sessions	16:00 – 17:00	ROUND TABLE 1	16:00 – 17:00	Technical Sessions		
16:30 – 17:30	Technical Sessions	17:00 – 17:30	Coffee Break	17:00 – 17:30	Coffee Break		
18:00 – 19:00	OPENING LECTURE	17:30 – 18:30	**LECTURE 3**	17:30 – 18:30	ROUND TABLE 2		
19:00 – 20:00	Opening Ceremony	18:30 – 22:00	Visit to the Fair	18:30 – 19:00	Visit to the Fair		
20:00 – 22:00	OPENING RECEPTION/ FAIR OPENING	18:30 – 22:00	JAM SESSION	19:00 – 22:00	GALA DINNER/ SOCIAL GATHERING		

Six (6) short courses were held during the event, attracting 91 registrants, covering the following topics:

- **Acoustics from heaven to hell: from religious temples to nightclubs**, taught by Danielly Garcia (CEFET-MG);
- **Formulating the main approaches in aeroacoustics and their applications**, taught by Ricardo Musafir (UFRJ);
- **Structural transmission in buildings: a vision beyond ISO 12354**, taught by Julio Cordioli (UFSC);
- **Economic valuation of noise pollution: a public policy strategy to internalize costs**, taught by Luis Bravo (Ecuador/Denmark);
- **Acoustic interventions in heritage buildings: strategies and limits**, taught by Lygia Niemeyer (UFRJ); and
- **A multidisciplinary approach to urban noise: a sociological overview**, taught by Leonardo Cardoso (UT/USA).

The event featured five (5) lectures given by national and international invited speakers:

- Opening lecture: **Soundscape assessment by structural equation modeling**, Luis Bravo (Copenhagen/Denmark);
- Lecture 2: **Metamaterials for sound absorption and vibration isolation**, Paulo Mareze (UFSM);
- Lecture 3: **Limits of acoustic intervention in heritage buildings**, Lygia Niemeyer (UFRJ);
- Lecture 4: **A sociological approach to urban noise**, Leonardo Cardoso (UT/USA); and

- Lecture 5: **Aeroacoustics — basic principles and applications: how measurements of the acoustic field inform what is happening in the flow**, Eng. Ricardo Musafir (UFRJ).

Additionally, there were two (2) round tables, as follows:

- **First Round Table:** Importance and challenges of laboratory accreditation for acoustic testing in Brazil.
  - Moderator: Cândida Maciel (Síntese Acústica Arquitetônica, Federal District);
  - Panelists:
    - Eng. Krisdany Cavalcante (Sobrac Minas Gerais),
    - Eng. Maria Luiza Balderrain (CLB Engenharia, São Paulo), and
    - Arq. Maria Fernanda Oliveira (Unicamp).
- **Second Round Table:** The trajectory of acoustics companies in Brazil — past and present.
  - Moderator: Bianca Dantas (UFRN);
  - Panelists:
    - Arq. M.Sc. Débora Barretto (Audium),
    - Eng. M.Sc. Davi Akkerman (Harmonia),
    - Eng. José Carlos Giner (Giner Designing Sound Space), and
    - Eng. M.Sc. Paulo Chagas (Viço Acústica).

Within the scientific program, papers were presented in 18 thematic areas. During the call for papers, 86 full papers were submitted, of which 81 were initially accepted for presentation and publication (with 69 ultimately published). In total, 180 authors participated, covering the following topics:

- Acoustic and vibration measurement/instrumentation (2);
- Acoustic materials (1);
- Acoustics education (2);
- Building acoustics (14);
- Environmental acoustics (16);
- General acoustics (1);
- Legislation and standardization in acoustics (3);
- Metamaterials (1);
- Musical acoustics (1);
- Noise and vibrations in the workplace (1);
- Noise control (5);
- Room acoustics (20);
- Signal processing (1);
- Soundscapes (10);
- Subjective acoustics (1);
- Vehicle acoustics (1);
- Vibrations and vibroacoustics (3); and
- Virtual acoustics and binaural techniques (3).

Ten technical sessions were devoted to these full papers, which were published in the proceedings available at: www.even3.com.br/anais/sobracnatal2023. The papers were reviewed by 56 referees on the scientific committee, and a total of 180 authors contributed.

The scientific program included the third edition of the student contest **III CACS – Conrado Silva Acoustics Contest**, aimed at sparking undergraduate student interest in acoustics, with a focus on the school environment. The theme was "Acoustic quality of school settings: emphasis on learning environments", attracting 12 submissions from schools of architecture in Brazil, of which 7 teams submitted the required documents. The judging panel selected the following three winning projects:

- **1st Place:** Team of Débora Nogueira Pinto Florêncio (advisor) and Nailma Cavalcanti da Cunha, from the Rio Grande do Norte University Center – UNI-RN;
- **2nd Place:** Team of Ranny Loureiro Xavier Nascimento Michalski (advisor), Edna Sofia de Oliveira Santos (co-advisor), Marco Aurélio Stoppe Nogueira, and Ruan Matos da Silva, from the University of São Paulo – FAU-USP;
- **3rd Place:** Team of Bianca Carla Dantas de Araújo (advisor), Vitoria Jade Alves de Carvalho, and Gabriela Tabita da Silva, from the Federal University of Rio Grande do Norte – UFRN.

Parallel to the technical sessions, participants visited the Riachuelo Theater (83 attendees) and the facilities of UFRN's School of Music (66 attendees), in addition to a workshop offered by Saint Gobain. A *jam session* and a networking dinner were also held, as well as the Sobrac Assembly. During the opening ceremony and the opening reception of the exhibitors' fair, musical groups from UFRN's School of Music gave cultural performances.

2.2.1 Sunday: November 19

On the first day of the event, registration took place in the morning alongside the short courses. In the afternoon, the program continued with the first technical sessions. Figures 5 (a) and 5 (b) show scenes from the short courses.

Early Sunday evening featured the event's opening lecture, followed by the Opening Ceremony led by the Organizing Committee Chair, Prof. Bianca Araújo, accompanied by officials, Sobrac board members, and event attendees. Bianca welcomed all participants and officially inaugurated the event. The first day concluded with the opening of the Exhibitors' Fair and a reception for attendees at the exhibitors' booths (Figure 5 (c)).

2.2.2 Monday: November 20

On the second day, the morning session included technical paper presentations. In the afternoon, technical visits took place at the Riachuelo Theater and at UFRN's School of Music. Two lectures and the first round table were also held. At the end of the day, attendees gathered for another social event, a *jam session*, located in the Exhibitors' Fair area (see Figures 5 (d), 5 (e), and 5 (f)).

2.2.3 Tuesday: November 21

The third day was marked by numerous technical presentations and a morning lecture. The afternoon schedule concluded the technical sessions, followed by the Saint Gobain *workshop* and Round Table 2. The day also provided opportunities for further interaction with exhibitors. It ended with a gala dinner at the Natal Yacht Club, attended by speakers, researchers, organizers, and participants (Figures 5 (g) and 5 (h)).

(a) Short course in progress.

(b) Short course in progress.

(c) Opening reception.

(d) Participants on the theater technical visit.

(e) Evening of music and *jam session*.

(f) Evening of music and *jam session*.

Figure 5: Snapshots of activities and moments throughout Sobrac 2023 (Part 1/2).

2.2.4 Wednesday: November 22

On the morning of the final day, the Sobrac Assembly was held with its members, during which tributes were paid to attending members, followed by the last lecture. Finally, the announcement and awarding of the III Student Contest – III CACS took place, followed by the congress's Closing Ceremony (Figures 5 (i) and 5 (j)). The 30th Sobrac Meeting concluded with great enthusiasm and satisfaction on the part of the organizing committee and all other participants, who ensured that the four days were rich in discussion, debate, and learning. The 30th Sobrac Meeting thus ended successfully, with high anticipation for the next event, which will be held in Minas Gerais in 2026. Additionally, in 2025, Internoise will take place in the city of São Paulo.

(g) Attendees at the Exhibitors' Fair.

(h) Guest speakers and organizers at the networking dinner.

(i) Winners of the student contest (III CACS).

(j) Sobrac 2023 participants at the Closing Ceremony.

Figure 5: Snapshots of activities and moments throughout Sobrac 2023 (Part 2/2).

(a) Gold Sponsor.

(b) Silver Sponsor.

(c) Bronze Sponsor.

(d) Support / Sponsorship.

(e) Promotion and execution.

Figure 6: Companies and institutions that sponsored and supported Sobrac 2023.

Sobrac 2023 was a numerical success in all areas, from overall attendance to the comprehensive range of papers presented. Naturally, the event could not have been held without the support of the sponsoring companies and partner institutions. There were 49 participating exhibitors, with 24 booths in total, covering 22 companies. In this context, the following companies and institutions served as sponsors (19) and supporters (6) of the congress (see the logos in Figure 6).

In addition to everything described above, all organizational actions were guided by sustainability measures wherever possible: the use of plastic cups was discouraged, and participants were given water bottles in their registration kits, while paper cups were provided at the water stations; leftover folders and paper supplies from the Department of Architecture's inventory were repurposed for the event; pencils instead of pens were placed in participants' kits; digital resources were maximized for communication, with minimal printing; both the kit bag and the name badge were made of sturdy, reusable fabric to ensure practical reuse, and participants were encouraged to donate their badges at the end of the event so they could be repurposed for another UFRN event — in this regard, more than 70 badges were returned.

3. Final Considerations

Overall, the congress provided a valuable space for discussions on developing new technologies, equipment, and experimental and numerical methods in the fields of acoustics and vibrations. It should be emphasized that these fields are intrinsically multidisciplinary, with broad impacts that extend to many other areas of knowledge. Hence, Sobrac 2023 fully achieved its goal as a comprehensive, multidisciplinary event, giving participants the chance to directly experience the latest advances in various acoustic domains and establishing itself as an important forum for innovation and scientific exchange.