Institut International du Froid
International Institute of Refrigeration

ICR 2019
THE 25th IIR INTERNATIONAL CONGRESS OF REFRIGERATION
August 24-30 | Montréal, Québec, Canada

Acoustic Signatures of Heat Pumps
IEA HPT Annex 51

IEA HPT Annex 51: Acoustic Signatures of Heat Pumps

Overview Task 1

Acoustic Regulations of Heat Pumps

P. Wagner[1], R. Rieberer[1], R. Fumagalli[2]

[1]Graz University of Technology (Institute of Thermal Engineering), Austria
[2]Politecnico di Milano, Italy

contact: rene.rieberer@tugraz.at

Montreal, August 29th, 2019

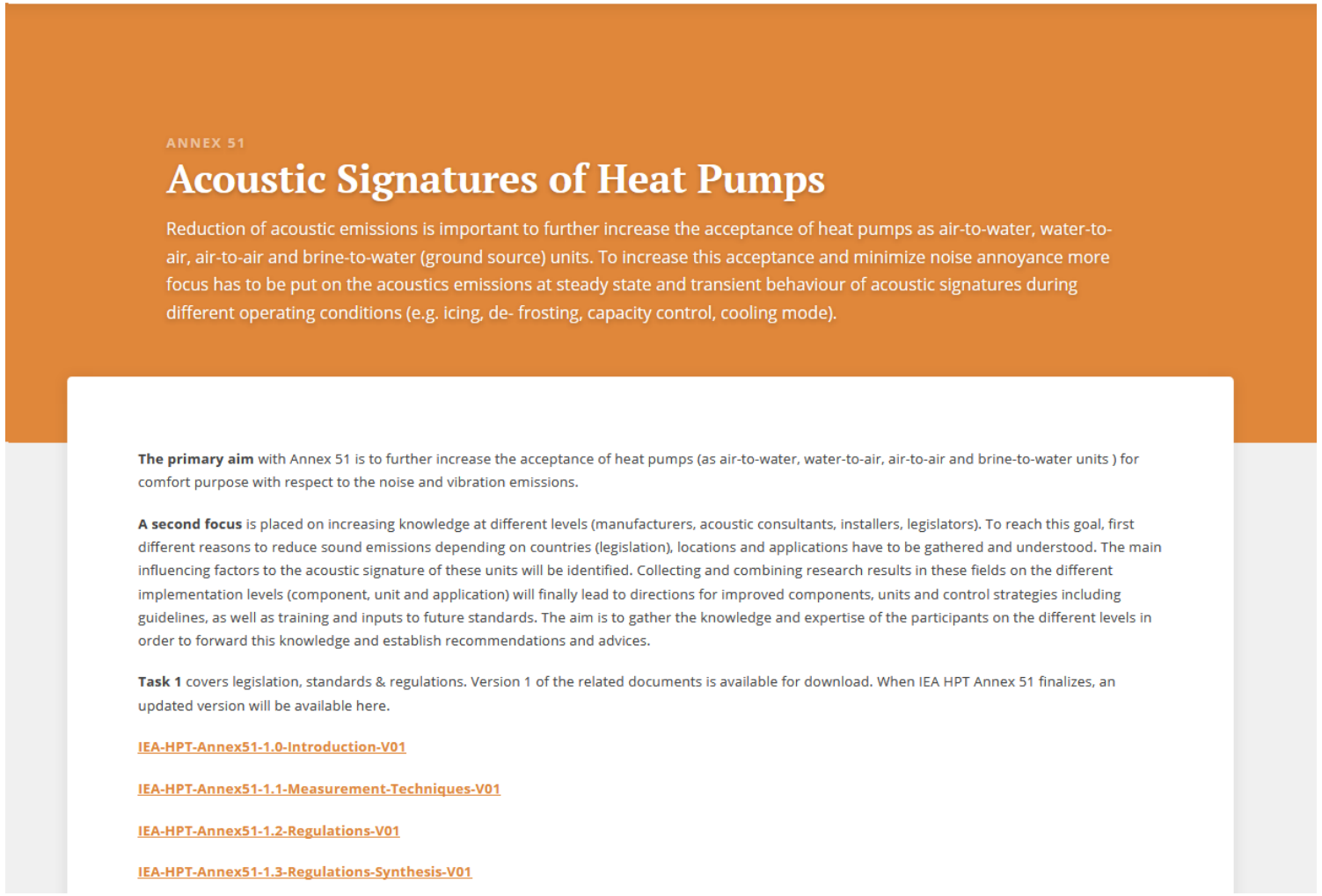
CONTENTS

Available Documents Task 1

- Doc. 1.0 Introduction
- Doc. 1.1 Measurement Techniques
- Doc. 1.2 Regulations
- Doc. 1.3 Regulations (Synthesis)

Documents

https://heatpumpingtechnologies.org/annex51/



Documents

https://heatpumpingtechnologies.org/annex51/

Annex 51

Home Participants Activities Contact Team site

ANNEX 51

Acoustic Signatures of Heat Pumps

Task 1 covers legislation, standards & regulations. Version 1 of the related documents is available for download. When IEA HPT Annex 51 finalizes, an updated version will be available here.

IEA-HPT-Annex51-1.0-Introduction-V01

IEA-HPT-Annex51-1.1-Measurement-Techniques-V01

IEA-HPT-Annex51-1.2-Regulations-V01

IEA-HPT-Annex51-1.3-Regulations-Synthesis-V01

updated version will be available here.

IEA-HPT-Annex51-1.0-Introduction-V01

IEA-HPT-Annex51-1.1-Measurement-Techniques-V01

IEA-HPT-Annex51-1.2-Regulations-V01

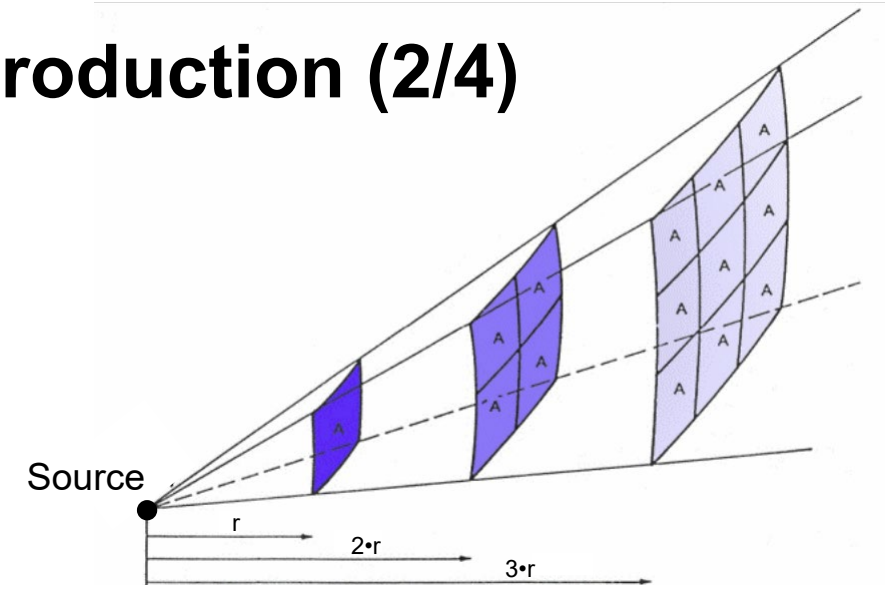
IEA-HPT-Annex51-1.3-Regulations-Synthesis-V01

Doc. 1.0 Introduction (1/4)

- Acoustics
  - What is acoustics and sound?
  - Main acoustic quantities
    - Sound power vs. sound power level
    - Sound pressure vs. sound pressure level
    - Sound intensity vs. sound intensity level

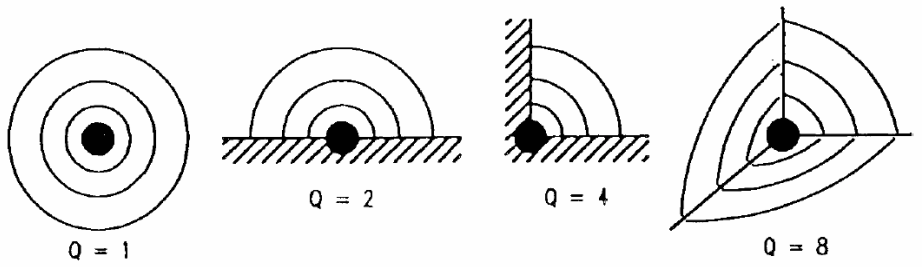
Doc. 1.0 Introduction (2/4)

- Sound propagation



(Illustration from Annex 51 Task Report: 1.0 Introduction)

- Directivity of sound

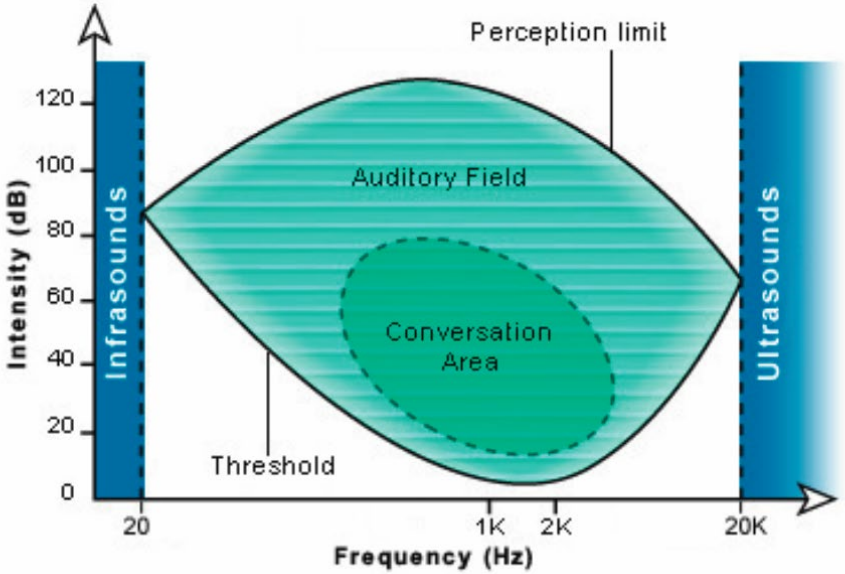


(Illustration from Annex 51 Task Report: 1.0 Introduction)

- Absorption, Reflection and transmission of sound waves

Doc. 1.0 Introduction (3/4)

- Psychoacoustics
  - Main acoustic quantities do not correspond to human ears
  - Perception of hearing is depending on frequency and loudness

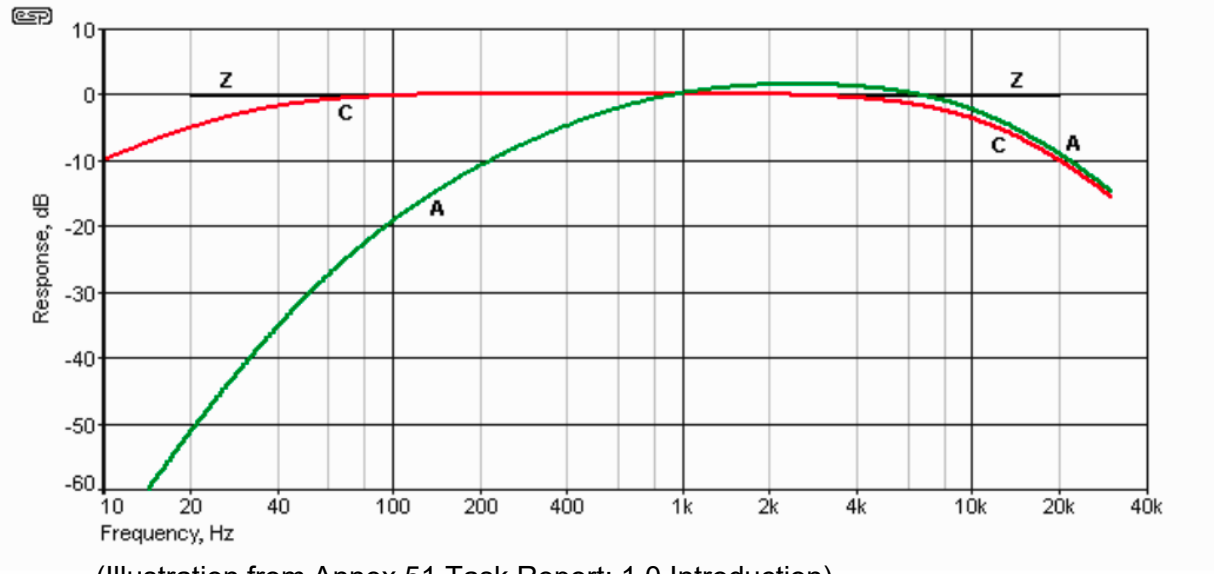


(Illustration from Annex 51 Task Report: 1.0 Introduction)

Doc. 1.0 Introduction (4/4)

- Psychoacoustics
  - Main acoustic quantities do not correspond to human ears
  - Perception of hearing is depending on frequency and loudness

    ↳ A-rated values



(Illustration from Annex 51 Task Report: 1.0 Introduction)

Doc. 1.1 Measurement techniques

- Measurement instrument: Sound level meter
  - Microphone
  - Preamplifier
- Different categories/classes depending on precision
- Determination of
  - Sound pressure level (simple)
  - Sound power level (more elaborate)
  - Acoustic mapping and study of the directivity of the sources (microphone arrays)
  - Psychoacoustic investigations

Doc. 1.2 Regulations (1/2)

- Overview of the regulations in
  - Austria
  - Denmark
  - Finland
  - France
  - Germany
  - Italy
  - Japan
  - Norway
  - Poland
  - South Korea
  - Sweden
  - Switzerland
  - Spain
  - United Kingdom
  - United States
- European Standards
- European Regulations on Noise
- Ecolabel

Doc. 1.2 Regulations (2/2)

- Types of Regulations of noise immission
  - Laws
  - Guidelines (non-binding)
- All countries have different regulations
- In some countries different regulations in the federal provinces
- Noise immission limits depending on
  - Time of the day
  - Location (e.g. resting area, residential area, industrial area)
  - Limit between 25 and 45 dB(A) in the residential area

Doc. 1.3 Regulations Synthesis

- Summary and comparison of the legislative situation in the investigated countries
- Questionnaire for the permanent revision and extension of the document

Acknowledgements

The work on “IEA HPT Annex 51” is financially supported within the framework of the “IEA Research Cooperation” on behalf of the “Austrian Federal Ministry for Transport, Innovation and Technology”.

Institut International du Froid
International Institute of Refrigeration

ICR 2019
THE 25th IIR INTERNATIONAL CONGRESS OF REFRIGERATION
August 24-30 | Montréal, Québec, Canada

Acoustic Signatures of Heat Pumps
IEA HPT Annex 51

IEA HPT Annex 51: Acoustic Signatures of Heat Pumps

Task 1

Acoustic Regulations of Heat Pumps

P. Wagner[1], R. Rieberer[1], Roberto Fumagalli[2]

[1]University of Technology (Institute of Thermal Engineering), Austria
[2]Politecnico di Milano, Italy

contact: rene.rieberer@tugraz.at

Montreal, August 29th, 2019