

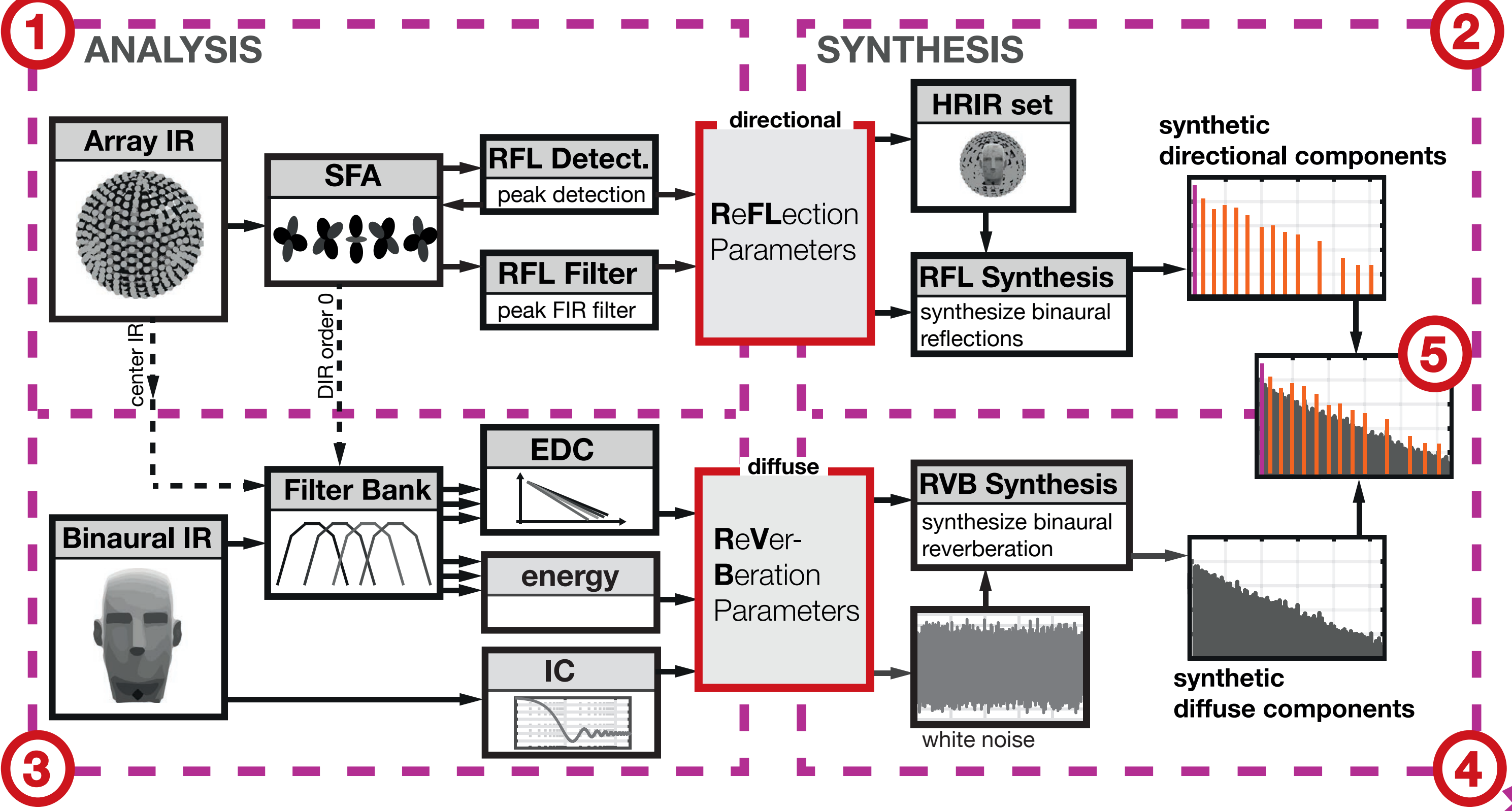


Philipp Stade^{1,2}, Johannes M. Arend^{1,2}, Christoph Pörschmann¹ A parametric model for the synthesis of binaural room impulse responses

OVERVIEW

approach for the **synthesis of BRIRs**
measured BRIRs are **characterized with parametric model**

- system differentiates between **directional** and **diffuse** components
- perceptual evaluation reveals an **adequate performance**
- parametric approach enables several **new possibilities**



diffuse parameters (RVB)

③ **diffuse analysis:**

- based on BRIRs or array data
- filter bank with near-perfect reconstruction
- **determination of EDC + mean energy / f-band STFT late reverberation**
- **determination of interaural coherence (IC)**
- **polynomial approximation**

④ **diffuse synthesis:**

- dual channel **white noise** signal
- f-based decay shaping and coherence matching

PARAMETER / FREQUENCY BAND: EDC, energy, IC

⑤ **SYNTHETIC BRIR DATASETS:**
superimposition of directional and diffuse components

SYSTEM

directional parameters (RFL)

① **directional analysis:**

- **sound field analysis based on array data**
- temporal segmentation of array IRs
- transformation into spatial domain
- pwd: spatio-temporal intensity matrix
- **detection of maxima in matrix (= reflections)**
- directional IRs for every reflection (DOA & TOA)
- **calculation of reflection filters**

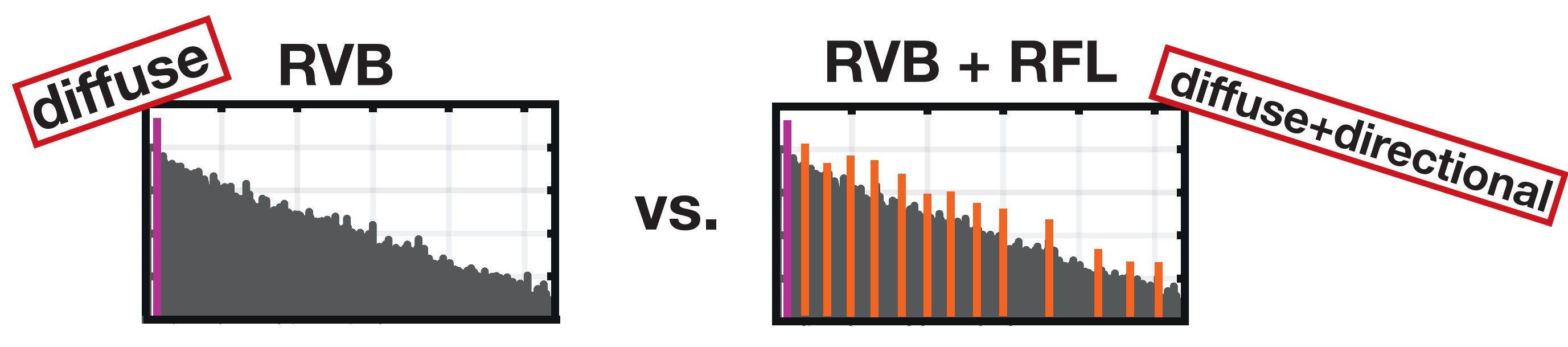
② **directional synthesis:**

- using **spherical HRIRs** + reflection list & reflection filters

PARAMETER / REFLECTION: DOA, TOA, level, refl-filter

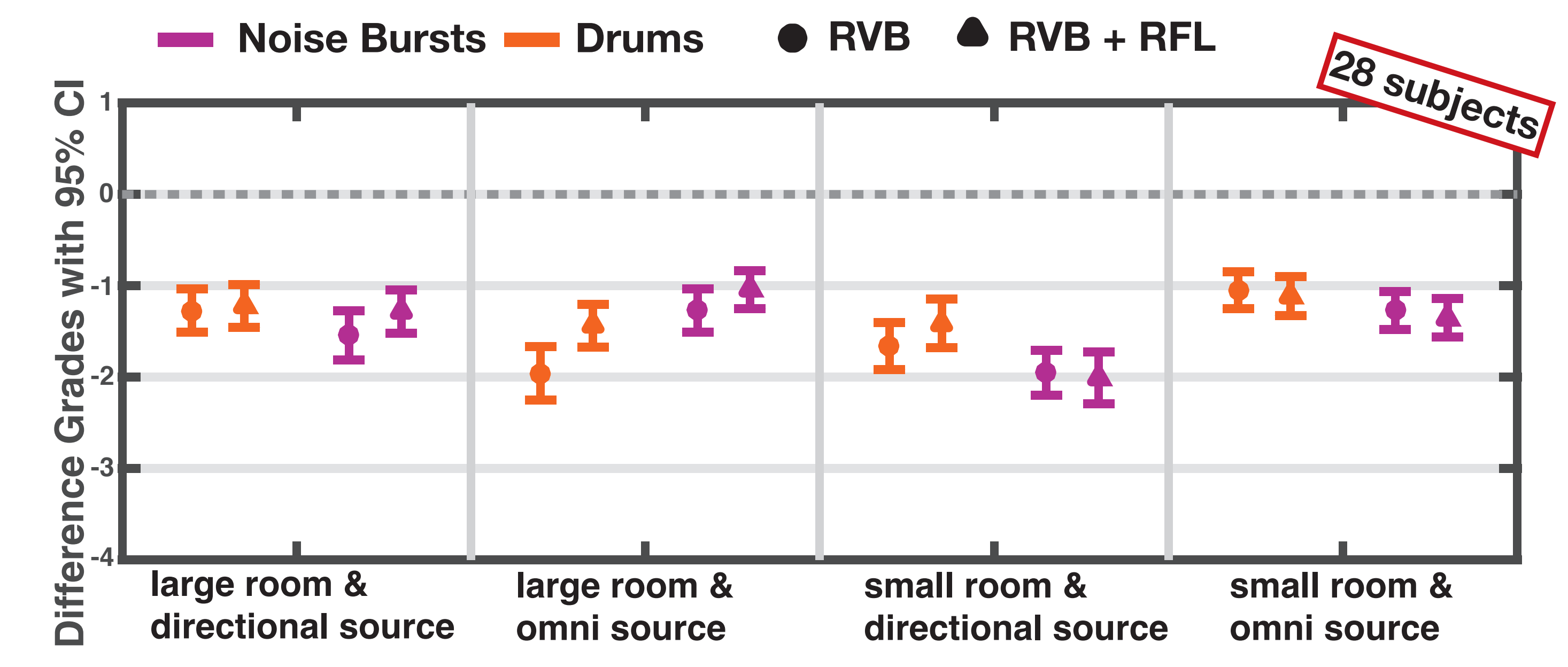
SETUP AND TEST DESIGN

- dynamic binaural synthesis
- SoundScape renderer / AKG K601 / Polhemus Fastrak
- ABC/HR test design
- 2 rooms (large & small concert hall), 2 sound sources (omni & directional), 2 test signals (drums & noise bursts)
- 2 gradations of the algorithm:



subjects were asked to identify the synthesis and rate the impairment to the reference (measured BRIR)

RESULTS



DISCUSSION

- approach **works satisfying** without big variations across rooms, test signals and sound sources
- ratings in the **upper third** of the grading scale
- perceptual **highest similarity** for **RVB + RFL**
- surprisingly **RVB** was rated **nearly equal** with adequate performance
- **personalization** possible (individual HRIRs)
- systematic **adaptation** of room acoustical parameters
- parametric **convolution reverb**
- **data reduction**

Future work: resolution of the directional analysis can be scaled down and its impact should be investigated

REFERENCES

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