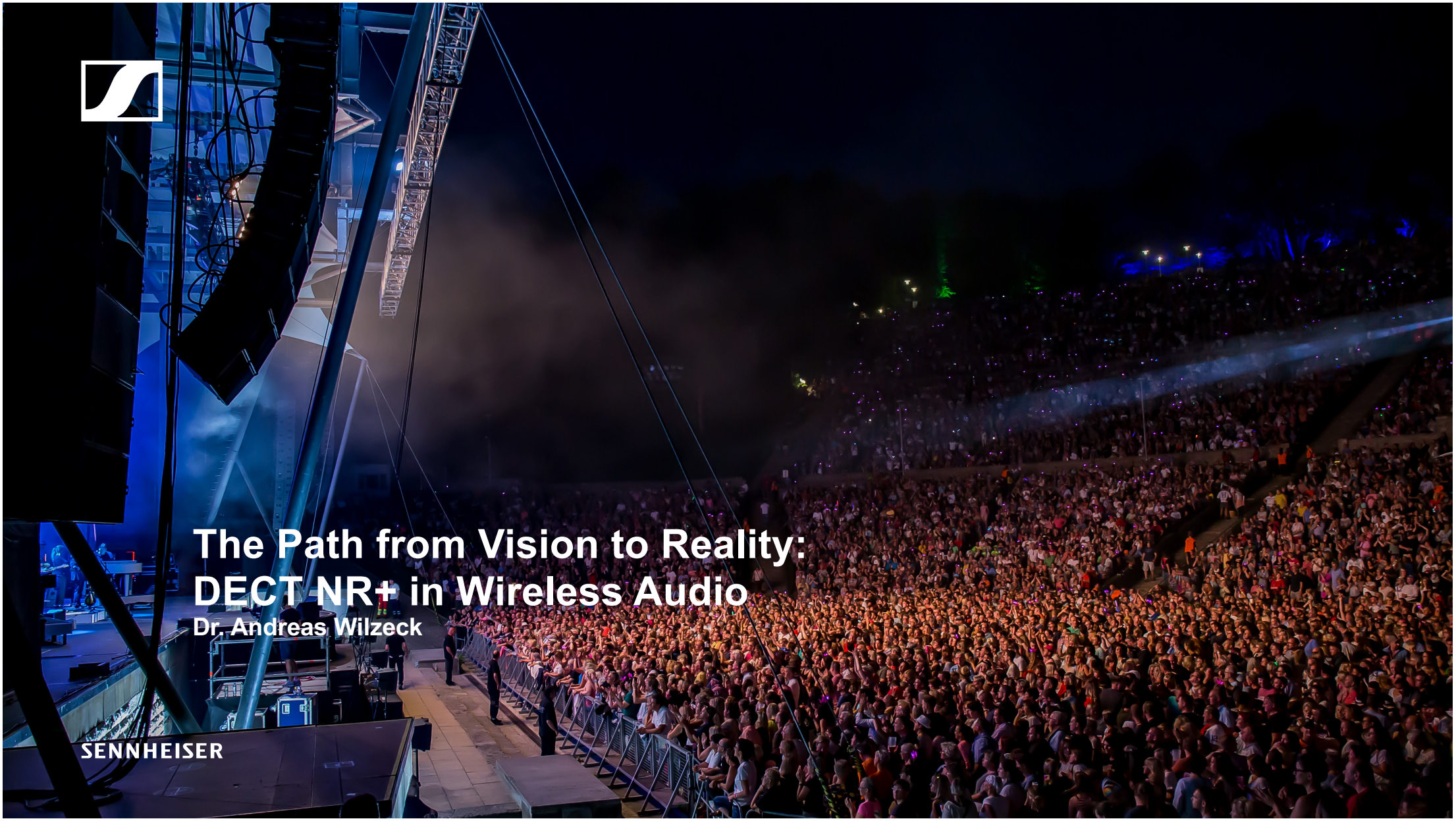


The Path from Vision to Reality: DECT NR+ in Wireless Audio

Dr. Andreas Wilzeck

SENNHEISER

Sennheiser's actions looking on 5G vision in relation to Audio PMSE …

PMSE xG → LIPS → 5G RECORDS

BMVI, 10/2016-3/2018

4G+/5G technology &
Economic feasibility

BMWi, 4/2018-11/2020

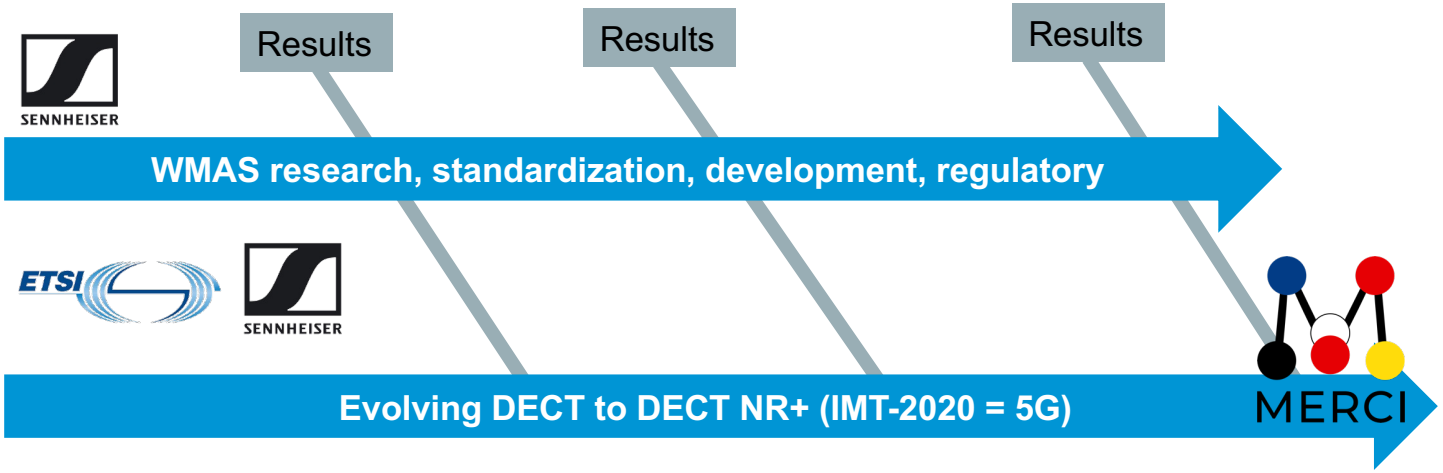
Smart Services
for Live Events

EU, 9/2020-8/2022

5G technology feasibility
End-2-End Trials

10 years+ of research
No economic feasibility
No technical feasibility
Too many business hurdles
NO PRODUCT

Results used to support the parallel activities on
ETSI DECT NR+ and WMAS.



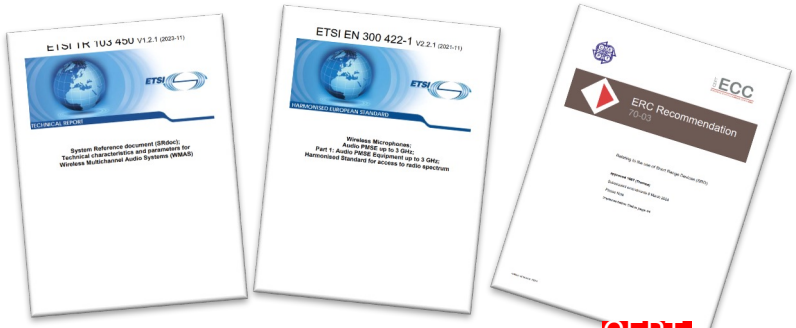
10 years+ of R&D + S&R work
2024: Sennheiser Spectera
Highly optimized audio PMSE ecosystem under EN 300 422.

8-10 years+ of R&D + S&R work
2024: MERCI proof feasibility
Evolution and enriching of existing DECT portfolio possible.

NR+ History

2017	**Initial discussions and early proposals for a new DECT standard to meet IMT-2020 (5G) requirements.**
2018	ETSI Technical Committee DECT begins **formal work on the DECT-2020 NR standard**.
October 2020	ETSI publicly announces the **DECT-2020 NR standard as ETSI TS 103 636 series v1.1.1 – Release 1.**
October 2021	**DECT-2020 NR is officially recognized by the ITU-R** (International Telecommunication Union) and included **as part of the IMT-2020 family of 5G standards**, marking it as the world's first non-cellular 5G technology.
2022 - 2025	**DECT-2020 NR Flagship Research Projects** • USWA (Ultra Scalable Wireless Access) project under CELTIC-NEXT, 2022-2025, lead by Wirepas • MERCI (Media and Event production via Resilient Communication on IoT Infrastructure) Franco-German project, Nov. 2022 – July 2025, lead by Sennheiser
2023	**First chipsets supporting DECT-2020 NR+** became commercially available by Nordic Semiconductor in December 2023.
2024	ETSI TR 103 943 V1.1.1 (2024-01), **System Reference document (SRdoc);** DECT-2020 NR
July 2024	The **DECT Forum formally announced DECT NR+** with a public statement and campaign on , under the banner “NR+ is here and ready for you.”
May 2025	EN 301 406-2 is listed as a **harmonised standard** in the Official Journal of the European Union (OJEU)

The World of Wireless Pro Audio



- Technologies based on EN 300 422
  - Analog Narrow-Band
  - Digital Narrow-Band
  - Wireless Multi-Channel Audio System
- 470-698 MHz, 1350-1525 MHz, 700/800/1G8 duplex gaps, …

1,9 ms
Digital
Wireless Mic

Tx-Rx Pair

SePAC

EW-DX, 200 kHz digital NB

0,7 ms – 2,7 ms
Digital IEM, Mic, other
32 channel In
32 channel Out

OFDM TDD TDMA

Raw, SeDAC, Opus

Spectera, Bi-directional WMAS

Standardized Wireless Technology in Pro Audio

Speechline

Education **Corporate**

AVX

Audio for Video

Profile Wireless

Audio for Video

- Ease of Use
- Anywhere, at any time, by anyone

Wireless Audio Platform PCB
2 ch in / 2 ch out / Ethernet
1,728 MHz DECT NR+

Demos
Wireless Headphone
“SEK based on NR+” or Mini WMAS

MERCI

Audio related Work items in ETSI TC DECT

- **Technical Reports (under development)**
  - **TR 103 633** **Performance characterization New operation modes for LC3plus**
    Rapporteur: Tim Trini, Fraunhofer IIS
  - **TR 103 897** **Study on radio spectrum and related technical requirements for DECT-2020 NR**
    Rapporteur: Andreas Wilzeck, Sennheiser
  - **TR 104 044** **Study on Information Elements for network cooperation**
    Rapporteur: Prof. MDP Perez-Guirao, Ostfalia
  - **TR 104 045** **Study on Optimizing Scheduled Access for DECT-2020 NR**
    Rapporteur: Jens Pilz, Sennheiser
  - **TR 104 046** **Study on Information Elements and Functionalities for spectrum management**
    Rapporteur: Prof. MDP Perez-Guirao, Ostfalia

- **Technical Specifications (under development)**
  - **TS 103 634** **Low Complexity Communication Codec plus (LC3plus)**
    Lossless operation mode for LC3plus
    Rapporteur: Tim Trini, Fraunhofer IIS
  - **TS 103 874-5** **Generic Audio Profile**
    Rapporteur: Norbert Werner, Sennheiser

Application Specific Profile delivering generic audio applications profiles dedicated for wireless audio applications such as headphones, headsets, speakers, microphones, intercom, conference units, tour guide systems

OpenDECT-X: Open Reference Stack for DECT NR+

- **German BMWE co-funding for innovation concept**
  - 1 February 2026 to 30 November 2026
  - 18 PM, 18 PM, 9 PM (Ostfalia, LMS, Sennheiser)
    + commitment from Nordic Semiconductor.
  - Volume: approx. 0.55 million, of which approx. 0.36 million is funding.
- **Vision: An open ecosystem for research, industry and users**
  - promotes innovation, interoperability and further development of the DECT NR+ standard.
- **Challenge**
  - No open reference implementation for DECT NR+
  - Barriers to entry still too high for SMEs
- **Objectives**
  - Framework for open, modular protocol stack development from MAC layer
  - Audio, security & mesh functions
  - Integration of standardisation & stakeholders
- **Benefits**
  - Science: Platform for research & 6G impulses (Ostfalia)
  - Industry: Integration into products, new hardware (Sennheiser, LMS, Nordic Semiconductor)

"If I have seen further,
it is by standing on the shoulders of giants"
(Isaac Newton)

- **Feel enabled.**
  Bring ideas based on DECT NR+ to life.
- **Engage in ETSI TC DECT**,
  if you love standardization of DECT NR+ also towards 6G.
- **Engage in DECT Forum**,
  there is also now an **academic membership** and engage in networking for research collaborations of academia and industry in DECT Forum AIR.

Thank you!

An Overview on ETSI DECT-2020 NR Specifications

Technology Specifications
TS 103 636 series

-1 Overview
-2 Radio Transmission and Reception Requirements
-3 Physical Layer
-4 MAC Layer
-5 DLC and Convergence Layer
-6 Security, pre-shared key management
…

Application/Access Profiles
TS 103 874 series

-1 Overview
-2 Smart Metering, City and Buildings
-3 IPv6
-4 Over the Air Software Update Operation
-5 **Generic Audio**
…

Conformance Test Specifications
TS 104 047 series

-1 radio and reception
-2 radio protocols
…

Market Access & Regulatory

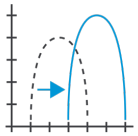
EN 301 406-2 Harmonized Standard
TR 103 943 System Reference Document

About the DECT Family of Standards

DECT Family of Standards

- Classic DECT
- DECT ULE
- DECT Evolution
- DECT 2020 NR / DECT NR+

License-free 1.9 GHz


Auto. Frequency Management


Auto. Interference Management

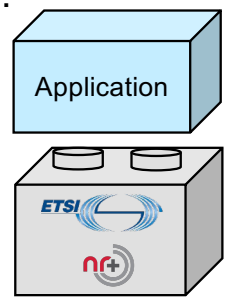
DECT NR+ is more than just 1,9 GHz

Markets

- Cordless Telephony
- Professional Communications
- **Wireless Audio**
  - Presentation
  - Conferencing
  - Audio for Video
  - Headset
  - Intercom
- Smart Home / IoT / Industrial
- Smart Grid / Smart Meter

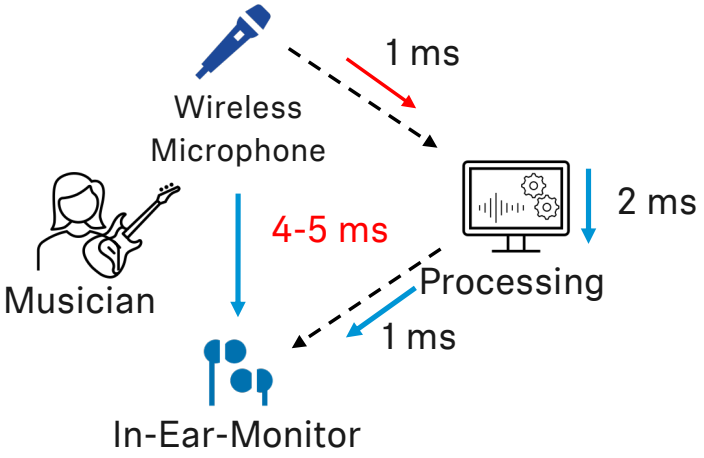
Common advantages of DECT technologies

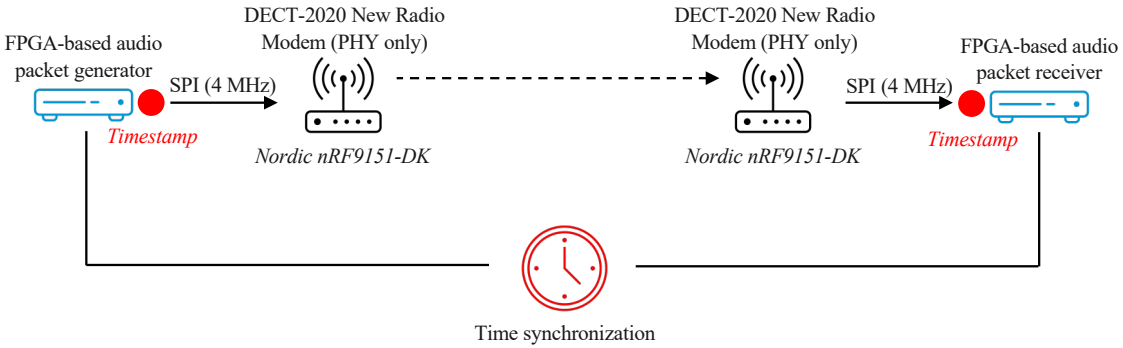
- Ease of Use
- Use can be anywhere, at any time, by anyone
- Automatic Frequency and Interference Management
- High Connection Density
- Technology Dedicated Band in EU, with similar radio spectrum availability globally.



Pro Audio Exploration based on current chipsets

- Pro Audio requires turnaround latencies of below 4-5 ms
- Data-rate target is at least 200 kbit/s per audio channel
- Trade-offs: latency, data-rate, number of channels and range





Audio-Latency [ms]	*RF-ch. alloc. [%]*	*MCS = (1/Robustness)*
2.312	33.3	1
2.517	50	0
3.671	16.7	3
3.87	25	1
4.587	12.5	4
4.783	18.8	2
6.576	12.5	3