Advanced DAB/DAB+ Receivers – Gains and Impacts

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November 10, 2016

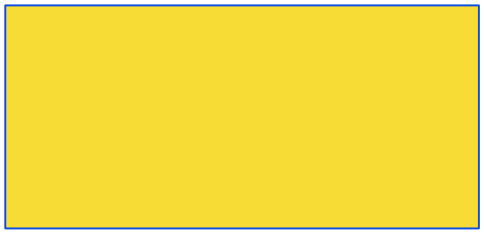
How to Improve DAB/DAB+ Adoption

- **Improved programming**
  - Relevant for new generations of listeners
  - New digital application overlays
  - Interactive broadcast applications
- **Improved QoS**
  - Better codec
  - New air-interface standard – generally undesirable for broadcast systems
  - Receive diversity – limited applicability
  - Advanced receiver design
    - Improved receiver sensitivity
    - Better coverage
    - Better user experience
    - Reduced CAPEX/OPEX

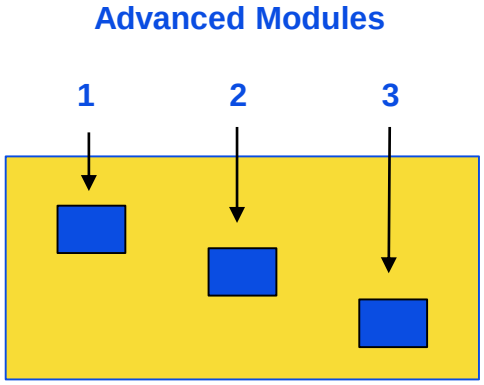
Our presentation will concentrate on gains achievable by Advanced DAB/DAB+ Receivers and their impact on DAB/DAB+ market

DAB/DAB+ Receivers

- **Conventional Receiver**
  - Non-coherent DQPSK
  - Soft input Viterbi algorithm based convolutional decoder
  - Algebraic Berlekamp-Massey Reed-Solomon (255,245) decoder
- **Advanced Receiver**
  - Various advanced modules that attempt to achieve theoretically achievable performance for the given air-interface

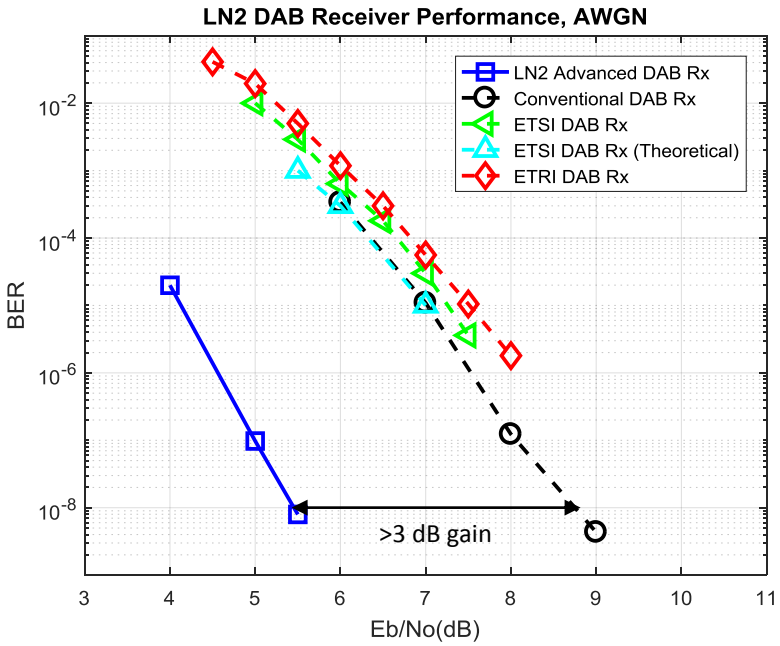


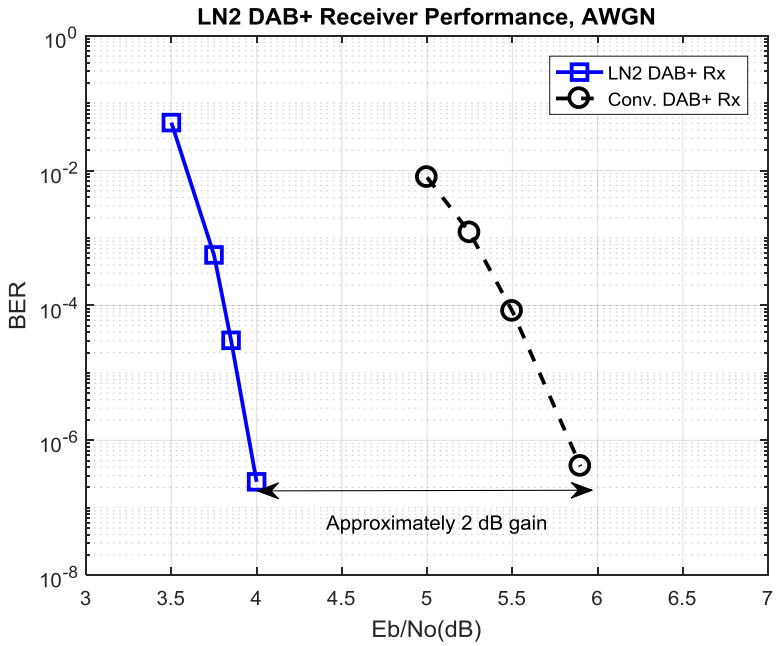
Conventional Receiver



Advanced Receiver

Example 1: DAB/DAB+ in Non-fading Channels



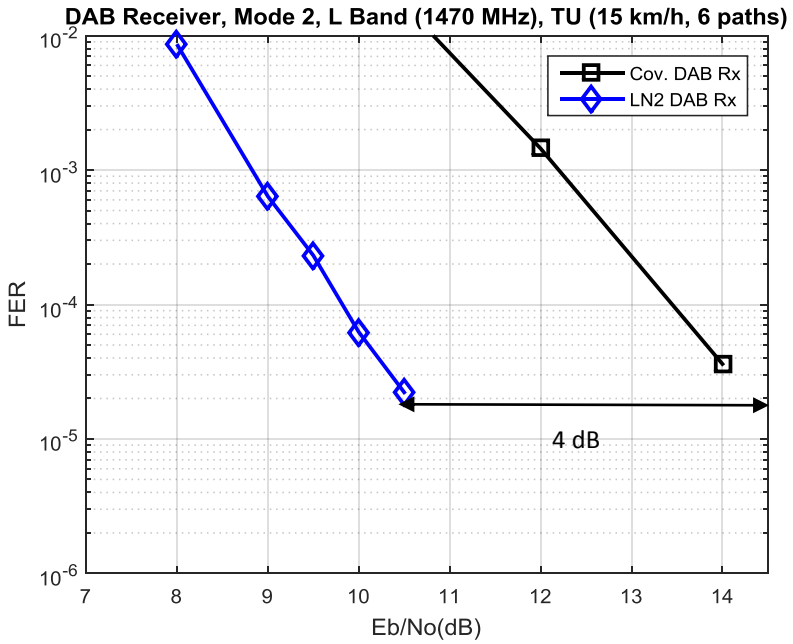


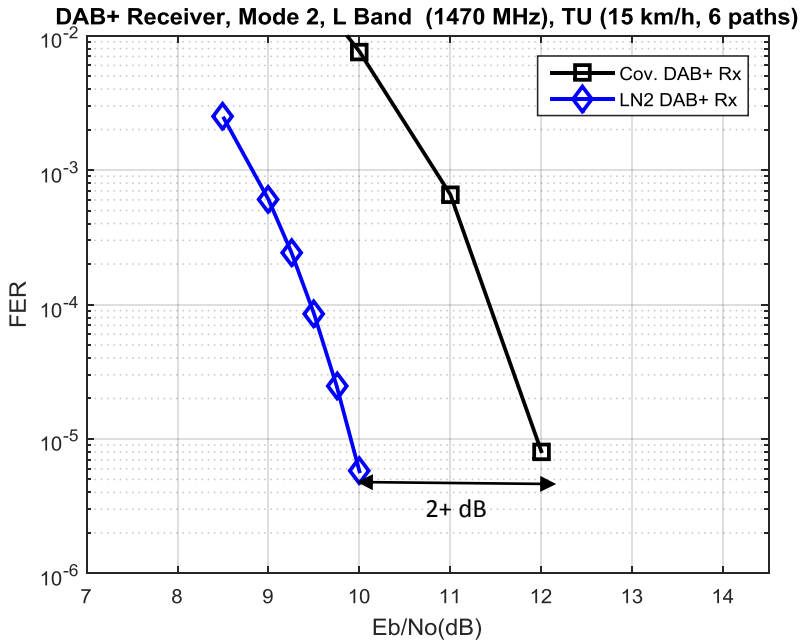
- **Reference Conventional DAB Receiver performance agrees with results reported in literature**
- **Advanced DAB Receiver achieves >3 dB gain (there are variants with larger gains)**

- **Advanced DAB+ Receiver achieves 2 dB gain**
- **Advanced DAB Receiver outperforms Conventional DAB+ Receiver !!!**

→ **Could use DAB format with DAB+ codec and Advanced DAB Receiver in new DAB markets !?**

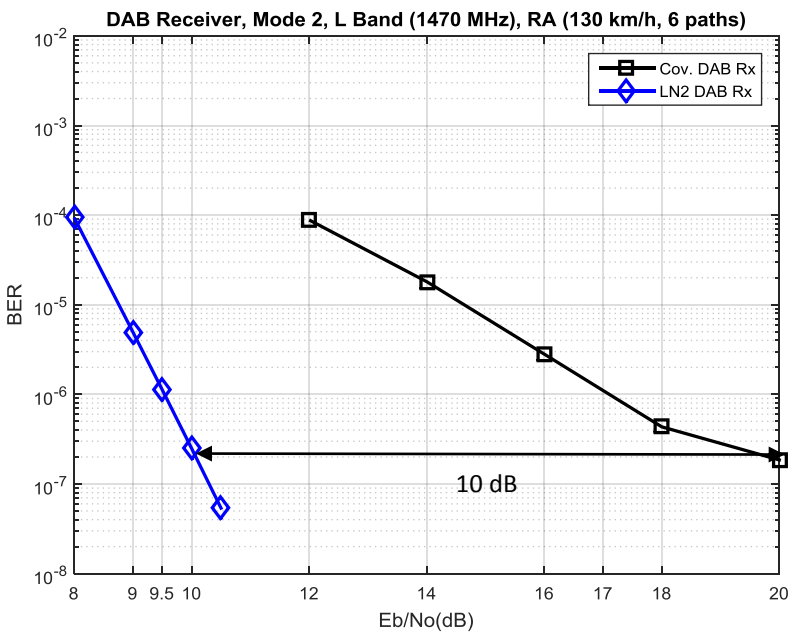
Example 2: TU Slow Fading – L Band

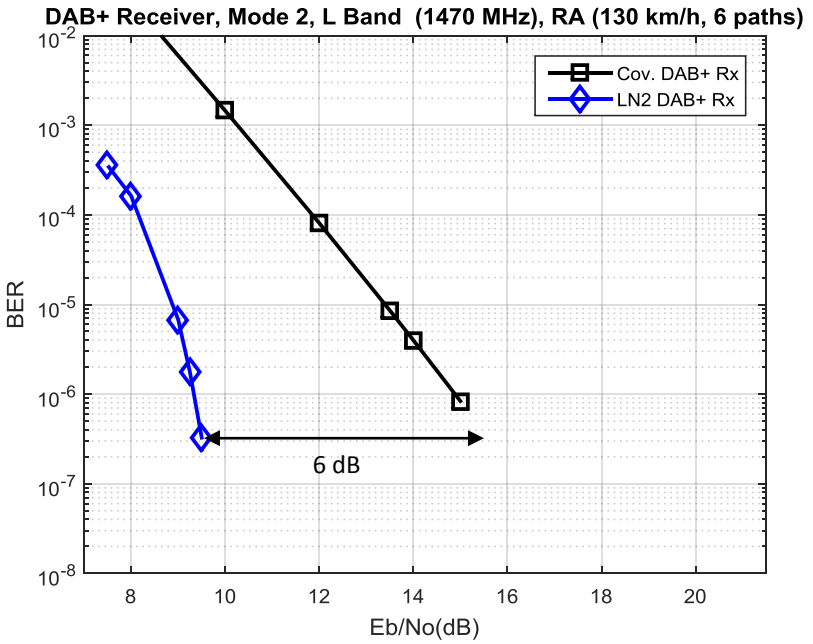




- **Gains due to Advanced Receiver higher than in AWGN**
- **Advanced DAB Receiver is even better than Conventional DAB+ receiver**
- **Advanced DAB Receiver is slightly worse than Advanced DAB+ receiver**
- **Possibility of new option in DAB+: drop Reed-Solomon code**
  - **Improved throughput per channel for overlay applications**
  - **Standardization impact**
  - **Backward compatibility impact – viable in new markets**

Example 3: RA Fast Fading – L Band





- In other fading scenarios gains typically between examples 2 and 3
- Larger gains with interference
- Gains vary with frequency bands, vehicle speeds, market types, station configurations, …
- Gains due to Advanced Receiver could be sliced in different ways to improve:
  - Coverage
  - User satisfaction
  - Reduce CAPEX/OPEX …

Impact of Advanced Receiver Gains

- **Consider 3 dB gain on average over different scenarios**
- **Could reduce Tx power by 2 → significant cost savings**
  - Cheaper transmitters
  - Smaller electricity costs
  - "Greener" spectrum
- **Alternatively, keep Tx power fixed**
  - Improved reliability of service and user experience - less frequent reception errors by orders of magnitude
    - **improved adoption by consumers → economies of scale → improved adoption by consumers …**
    - **Increased revenues for chip/receiver manufacturers, broadcasters, …**
  - Improved coverage
    - **Smaller number of transmitters – Reduced CAPEX/OPEX**
    - **More PoPs → Increased advertising revenues**
- **Small Costs & High Benefits of Advanced DAB/DAB+ Receivers**
- **Accelerated DAB/DAB+ adoption worldwide**