

# Opus Testing Results Experiment 1 and 2

Question: Can Opus replace AMR-  
WB in Cellular Networks?

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# Idea

- Use the same parameter settings as in a typical AMR-WB usage scenario.
- This includes
  - typical AMR-WB bit rates
  - CBR
  - 20ms frame size
  - DTX
  - voice and background noise
  - Not bit errors because Opus cannot cope with them

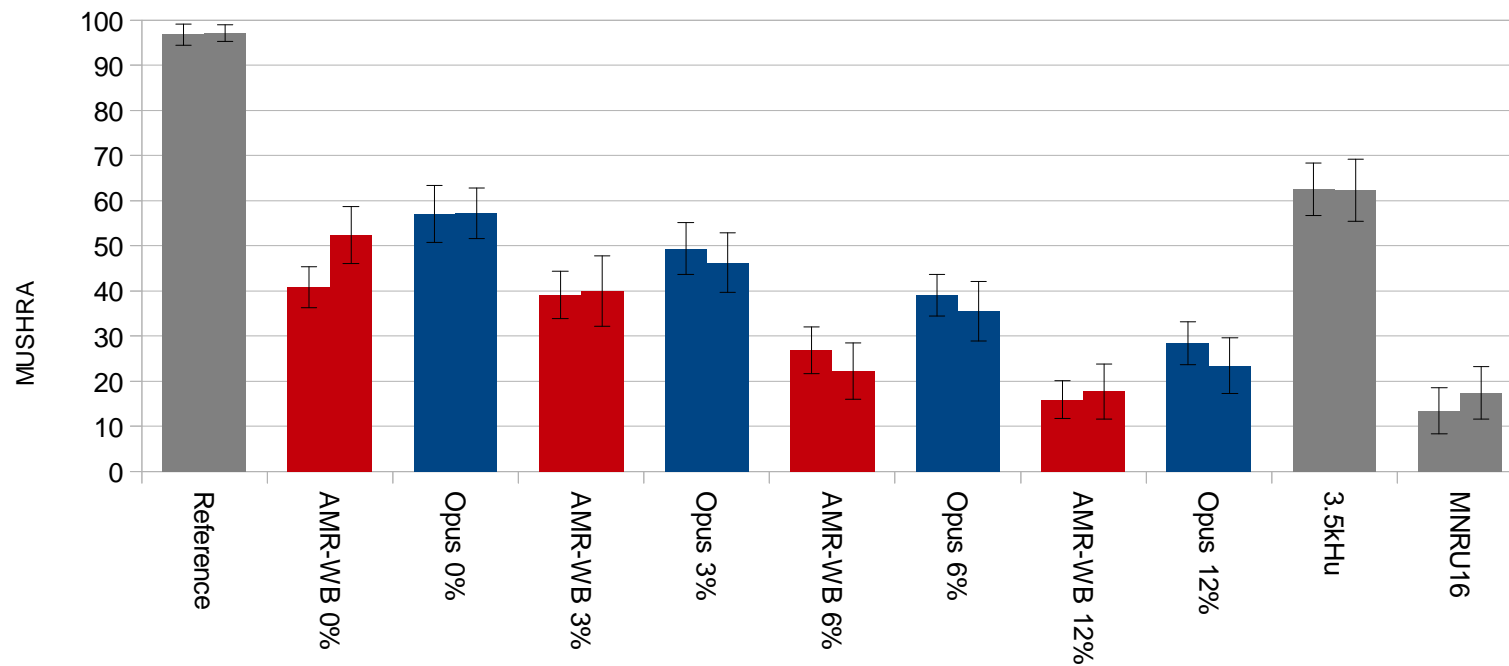
# Experiment 1 - Conditions

*Can Opus replace AMR-WB in cellular networks?*

<b>Main Codec Conditions</b>		
Candidate Codecs	2	Opus and AMR-WB (both CBR)
Sampling rate	1	16 kHz
FERs	4	No error and 3, 6, and 12% random
Input level	1	-25 dbov (refer to ITU-T P.56 and G.191)
Bitrate	3	8.85 with DTX, 12.65 with DTX, 23.85 kbps with DTX
Noise	1	Clean speech

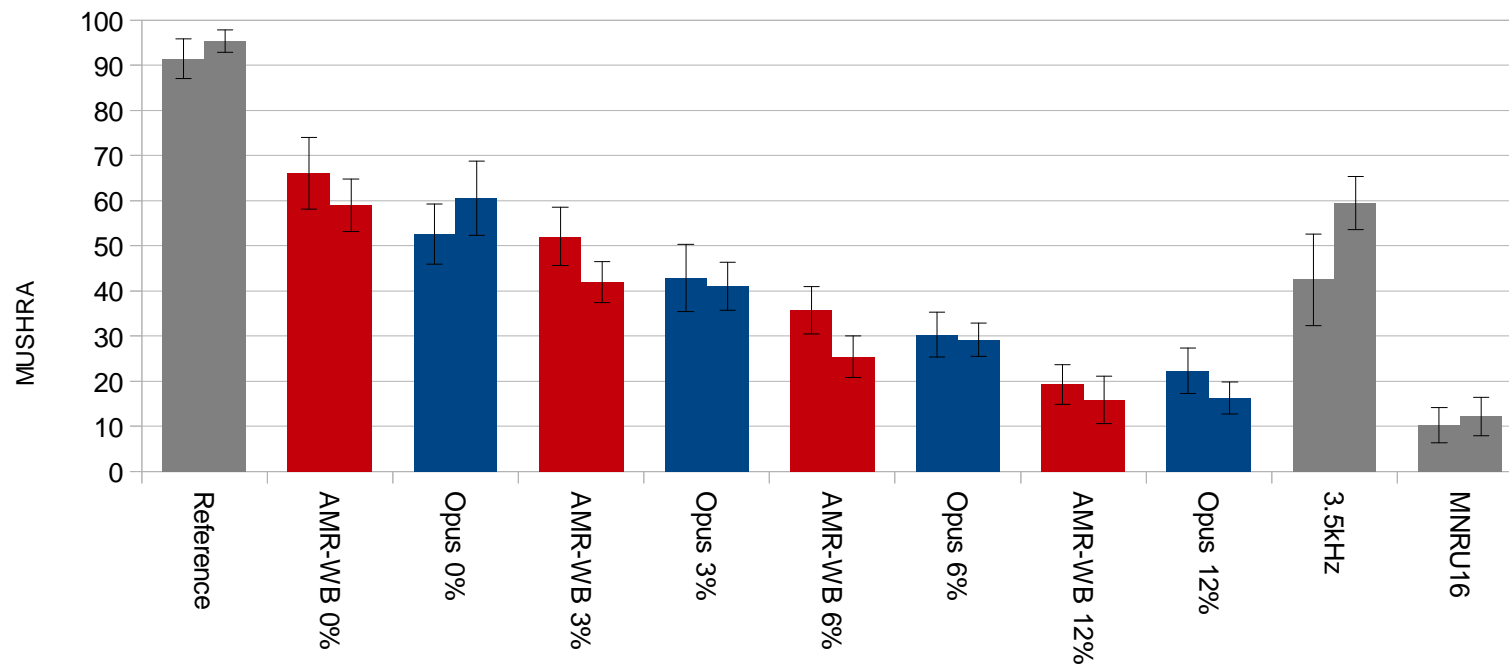
# Experiment 1.1 and 1.2

Female (left) and male (right) voice, 16kHz, mono, 8850bps, each 19 subjects



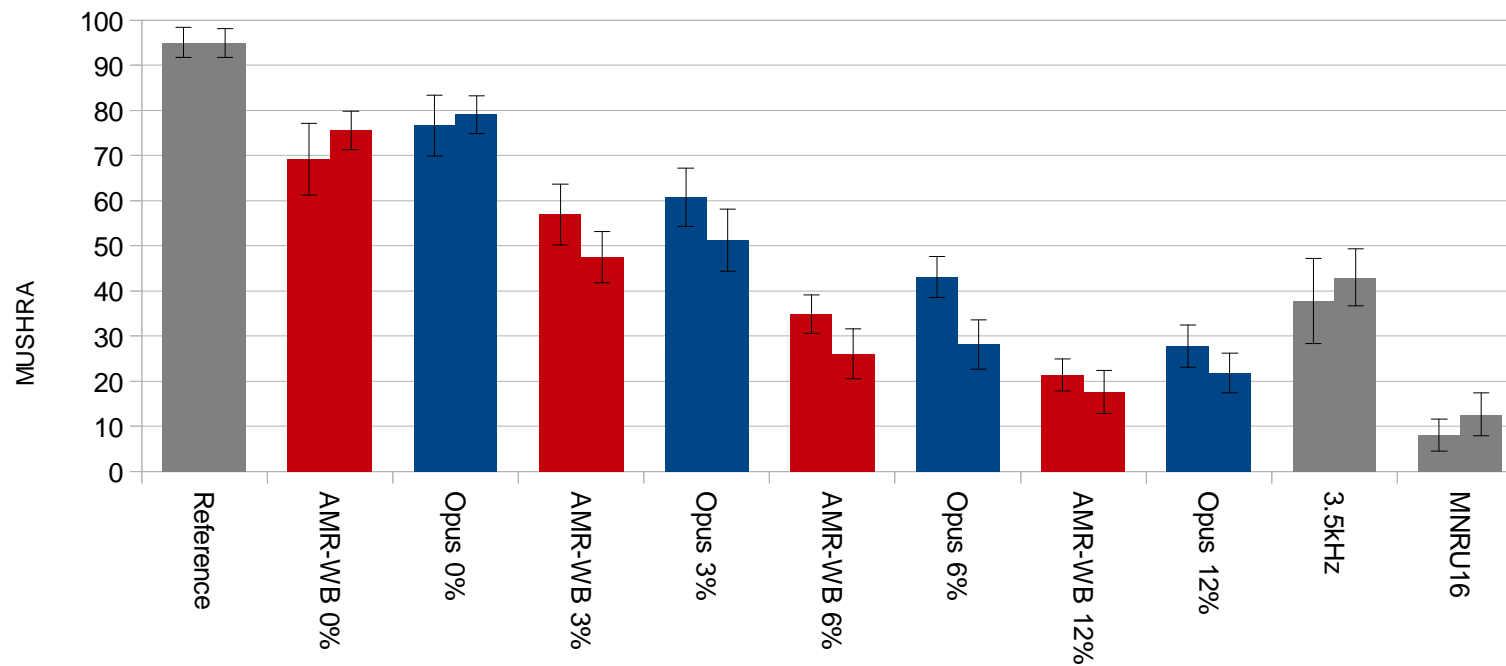
# Experiment 1.3 and 1.4

Female (left) and male (right) voice, 16kHz, mono, 12650bps, 21/23 subjects



# Experiment 1.5 and 1.6

Female (left) and male (right) voice, 16kHz, mono, 23850bps, 23/21 subjects



# Experiment 1 - Conclusion

- Summary:
  - Opus better at bitrate 8850bps for female voice and all loss rates (except for 3% loss → no significant difference)
  - No significant difference at bitrate 8850bps for male voice except at 6% loss where Opus is better
  - All others no significant difference
- Conclusion:
  - Opus compresses clean speech and conceals packet loss at least as good as AMR-WB
  - But: Opus does not allow for bit errors

## Experiment 2 - Conditions

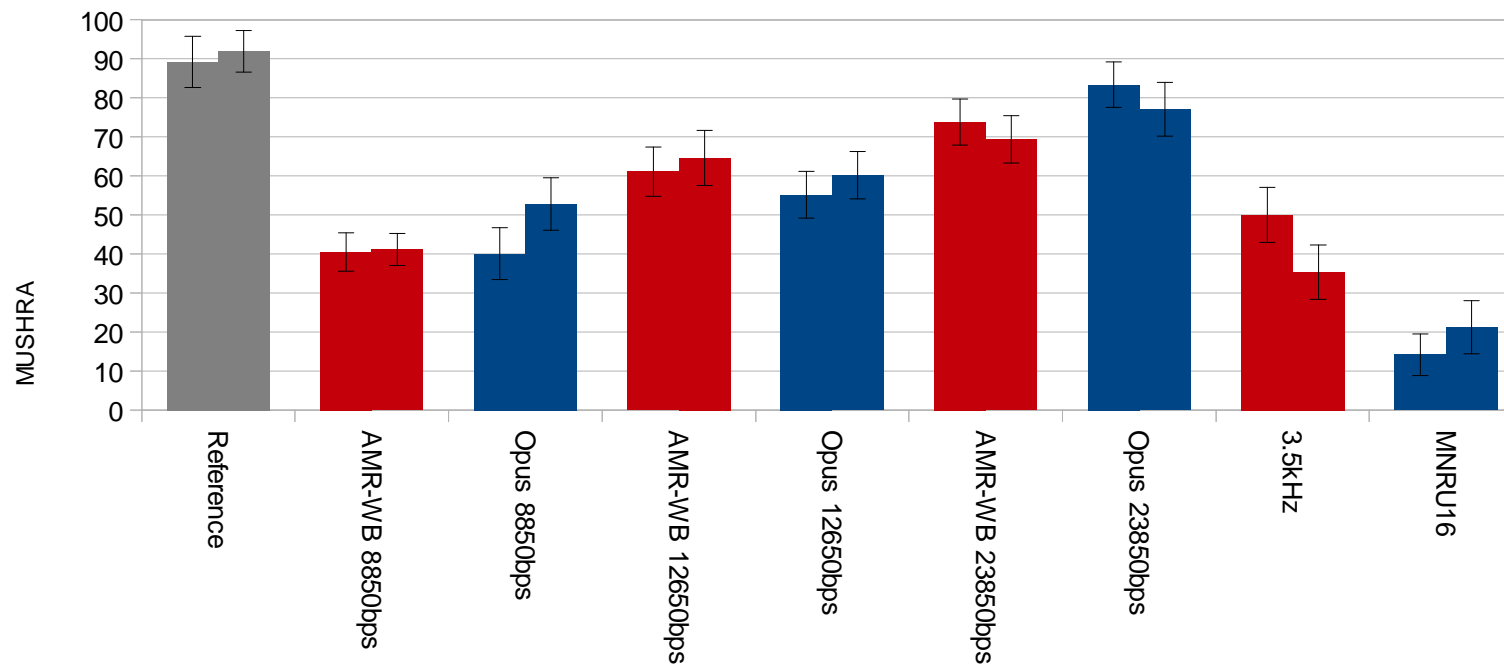
***Does Opus compress speech well in the presence of background noise compared to AMR-WB?***

Main Codec Conditions		
Candidate Codecs	2	Opus and AMR-WB (CBR)
Sampling rate	1	16 kHz
FERs	2	No error and 6 % random error
Input level	1	-25 dbov
Bitrate	3	8.85 with DTX, 12.65 with DTX, and 23.85 kbps with DTX
Noise	2	Types of noises: Office, babble
Input Characteristic	1	Full band



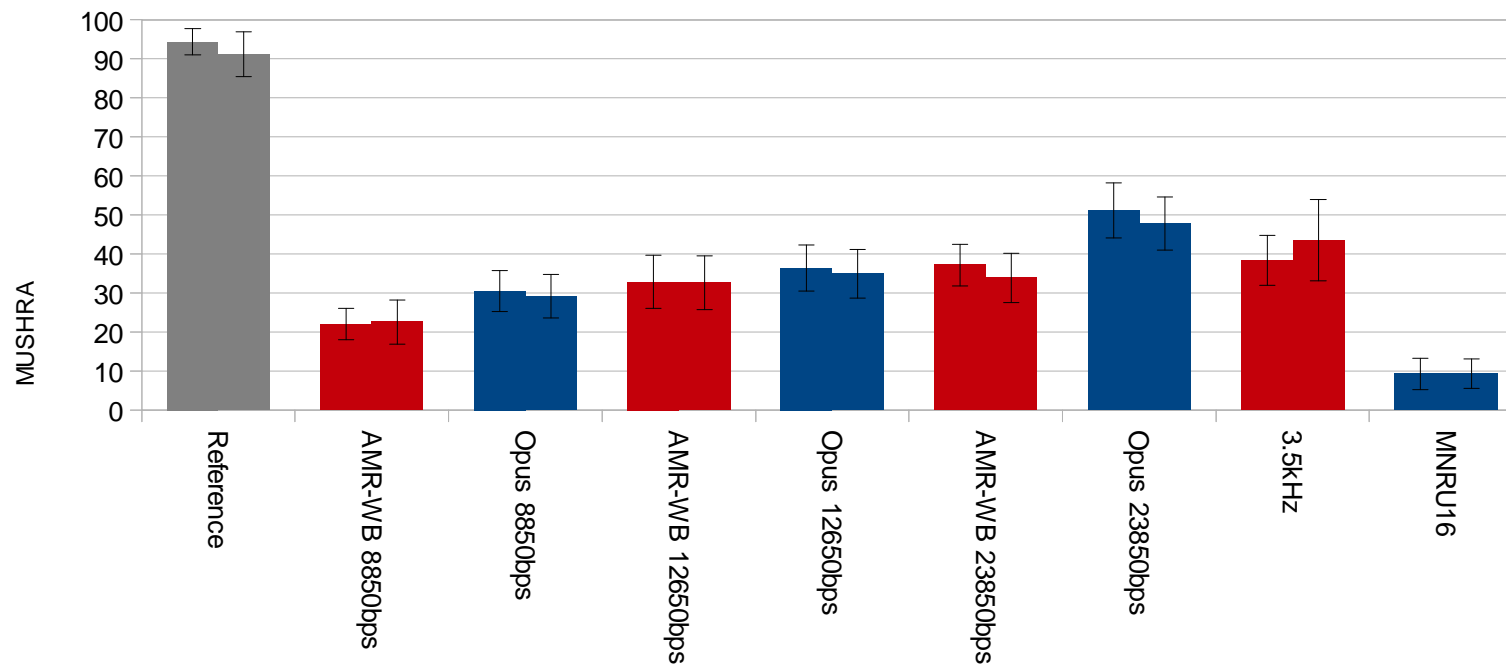
# Experiment 2.1 and 2.2

Female voice, 16kHz, mono, babble (left) and office (right) noise, 0%, 17 and 21 subjects



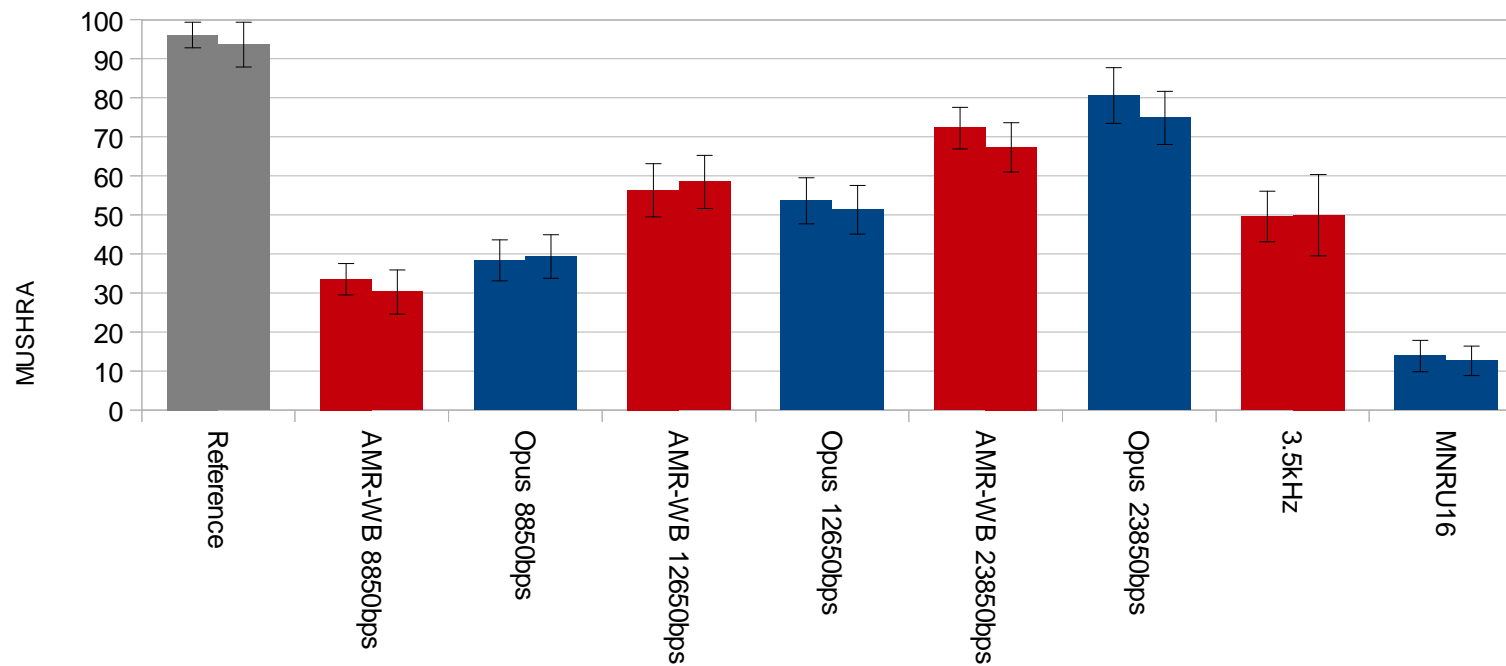
# Experiment 2.3 and 2.4

Female voice, 16kHz, mono, babble (left) and office (right) noise, 6%, 17 and 21 subjects



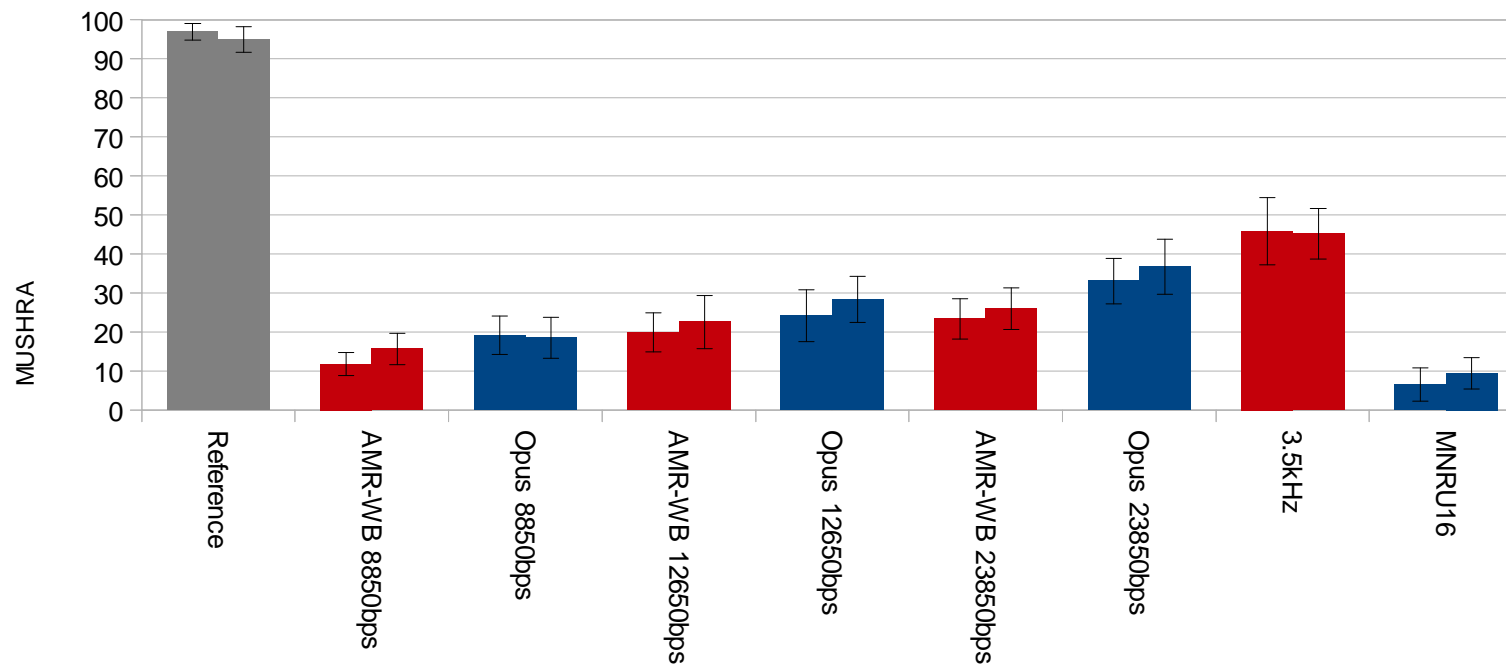
# Experiment 2.5 and 2.6

Male voice, 16kHz, mono, babble (left) and office (right) noise, 0%, 19 and 16 subjects



# Experiment 2.7 and 2.8

Male voice, 16kHz, mono, babble (left) and office (right) noise, 6%, 17 and 22 subjects



# Experiment 2 - Summary

- Both codecs compress voice with background noise well.

# Conclusion

- The results are based on 1386 individual
- In many of the studied cases, Opus is slightly better than AMR-WB
- However, as Opus is not tolerant to bit errors thus in a cellular network, more FEC on the wireless link is needed.

Result: On a Par