

# PSCR Audio Testing Update

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DJ Atkinson  
Lead Electronics Engineer  
3/9/11  
[dj@its.bldrdoc.gov](mailto:dj@its.bldrdoc.gov)

# Goals of 2010 Tests

- Use reference systems for P25 full rate, P25 half rate, 25 kHz analog FM, and 12.5 kHz analog FM to enable more consistency in testing and provide a manufacturer-independent performance baseline
- Evaluate changes made since 2008 study
  - Vocoder change to improve PASS performance
  - Updated best practices from IAFC
- Will include moderate RF channel degradation

# Modified Rhyme Test

- Intelligibility, not MOS
- “Please select the word \_\_\_\_\_.”

bed	led	fed
red	wed	shed

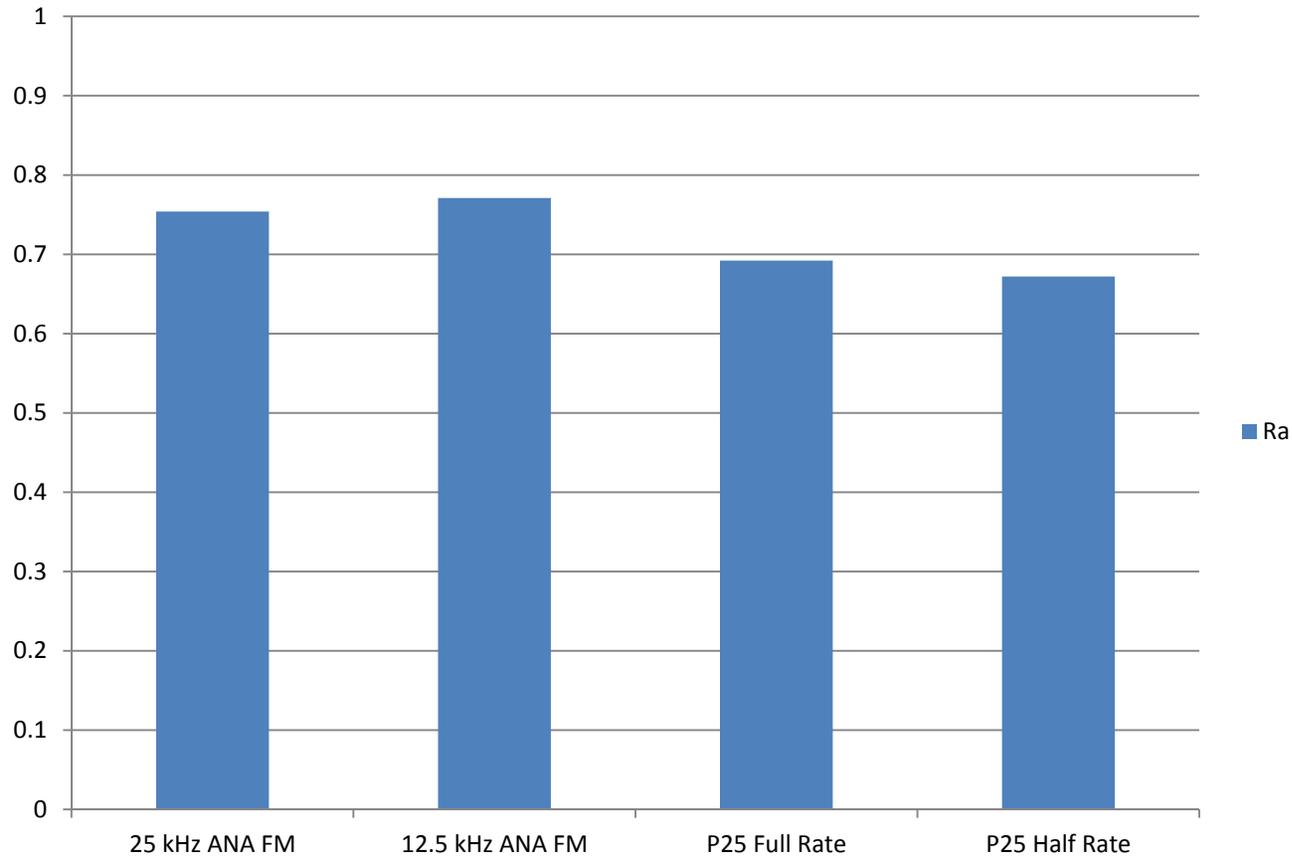
- 50 groups of 6 words (or 6 lists of 50 words)
- 300 words total
- 4 talkers
- 300 words x 4 talkers x 56 conditions = 67,200 samples

# Systems Tested

1. 25 kHz Analog FM Reference System
2. 12.5 kHz Analog FM Reference System
3. P25 Full-Rate (ver. 1.60) Reference System
4. P25 Half-Rate (ver. 1.60) Reference System

# 2: Mask (vox port), no background noise

## Intelligibility Scores for Scenario 2

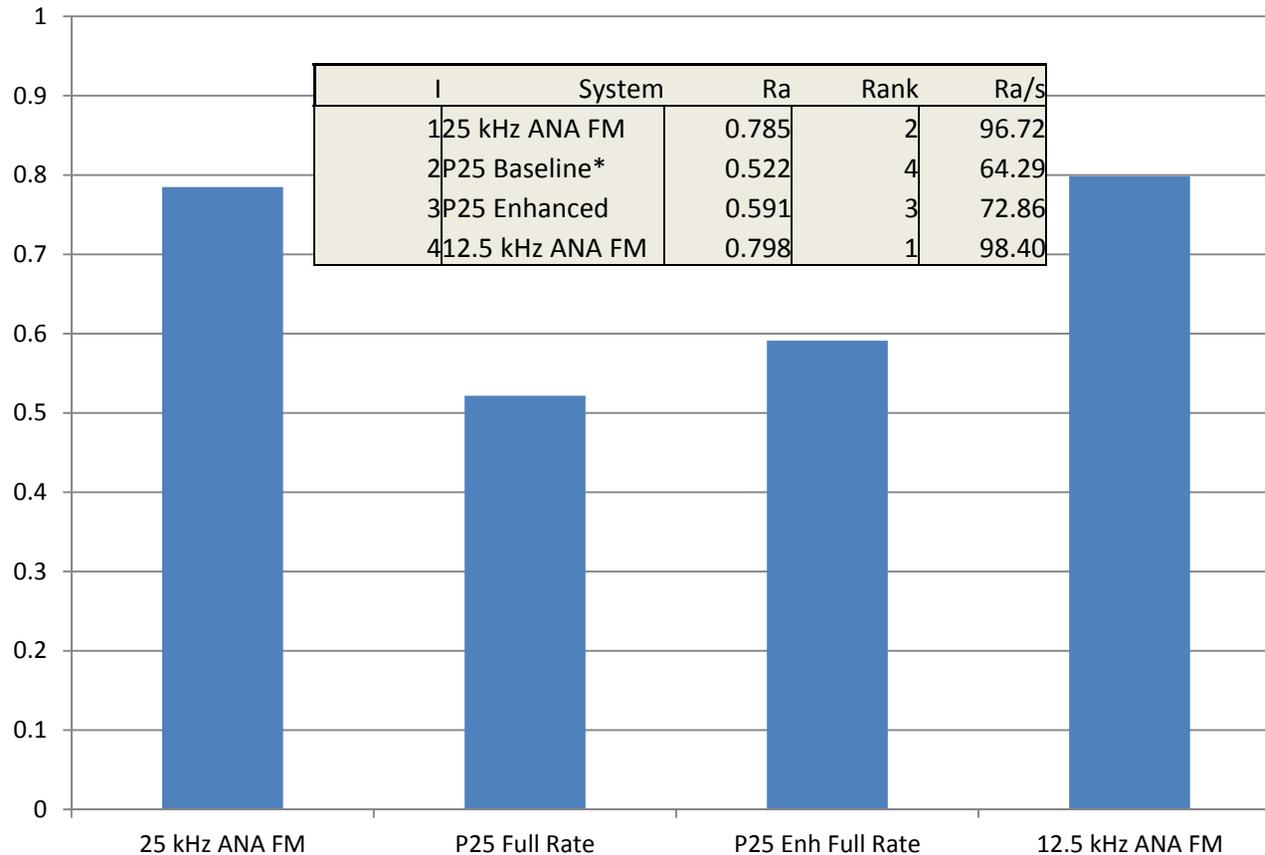


### Tukey Multiple Comparison Results

System	Mean	StDev	"YES" means significance			
			4	3	2	1
1 - 25 kHz ANA FM	0.754	0.0994	NO	NO	NO	
2 - 12.5 kHz ANA FM	0.771	0.06897	YES	NO		
3 - P25 Full Rate	0.692	0.1005	NO			
4 - P25 Half Rate	0.672	0.09273				5

# Previous Result: Mask (vox port), no background noise

## Intelligibility Scores for Environment 3



2008



Click in box to listen.

2010

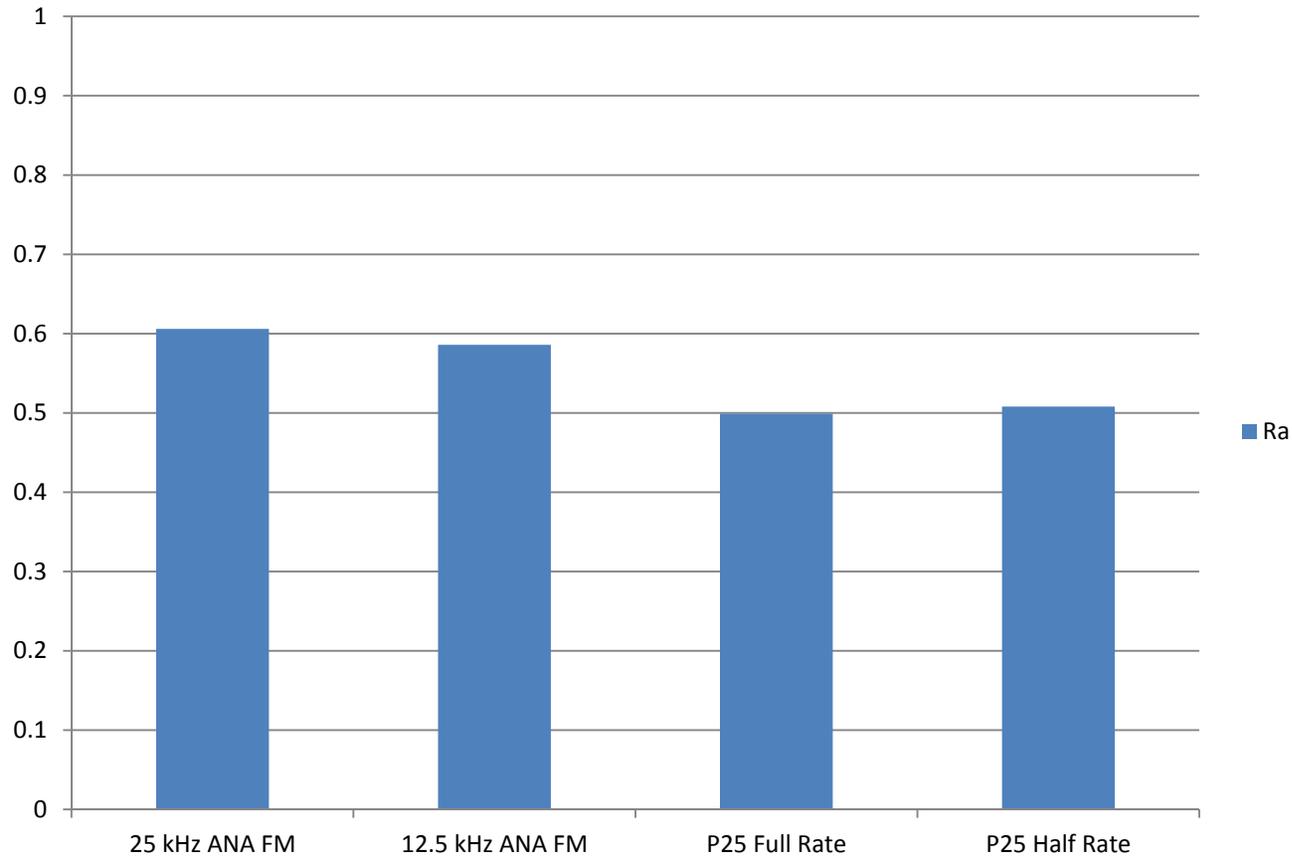


Click in box to listen.

- Current test shows similar results for analog systems
- Significant improvement for P25 Full Rate (.591 to .692)
- Shows improvements in best practices make a difference, especially for P25 systems

# 4: Mask (vox port), PASS 1 (-2 dB SNR)

## Intelligibility Scores for Scenario 4

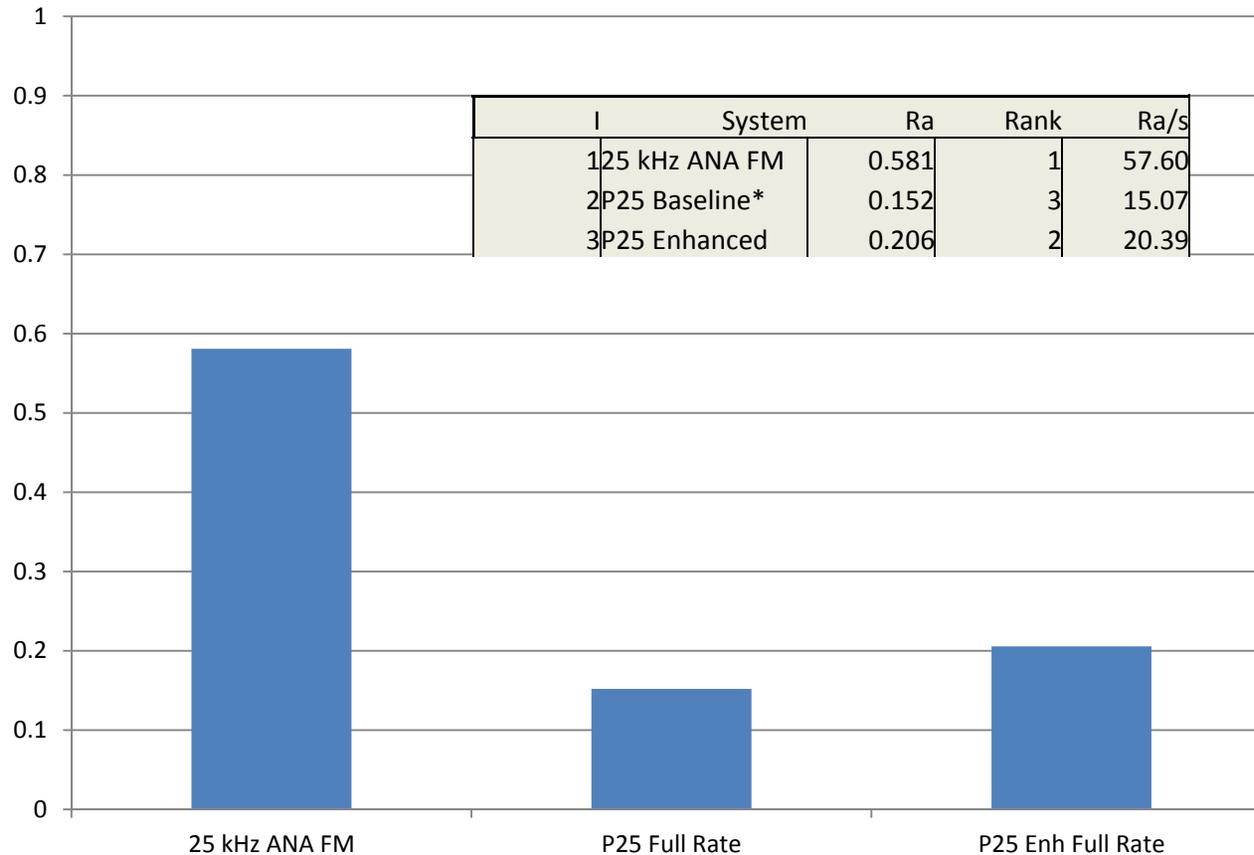


### Tukey Multiple Comparison Results

System	Mean	StDev	"YES" means significance			
			4	3	2	1
1 - 25 kHz ANA FM	0.606	0.09413	YES	YES	NO	
2 - 12.5 kHz ANA FM	0.586	0.11218	NO	NO		
3 - P25 Full Rate	0.499	0.08353	NO			
4 - P25 Half Rate	0.508	0.1071				

# Previous Result: Mask (vox port), PASS 1 (-2 dB SNR)

## Intelligibility Scores for Environment 5



2008



Click in box to listen.

2010

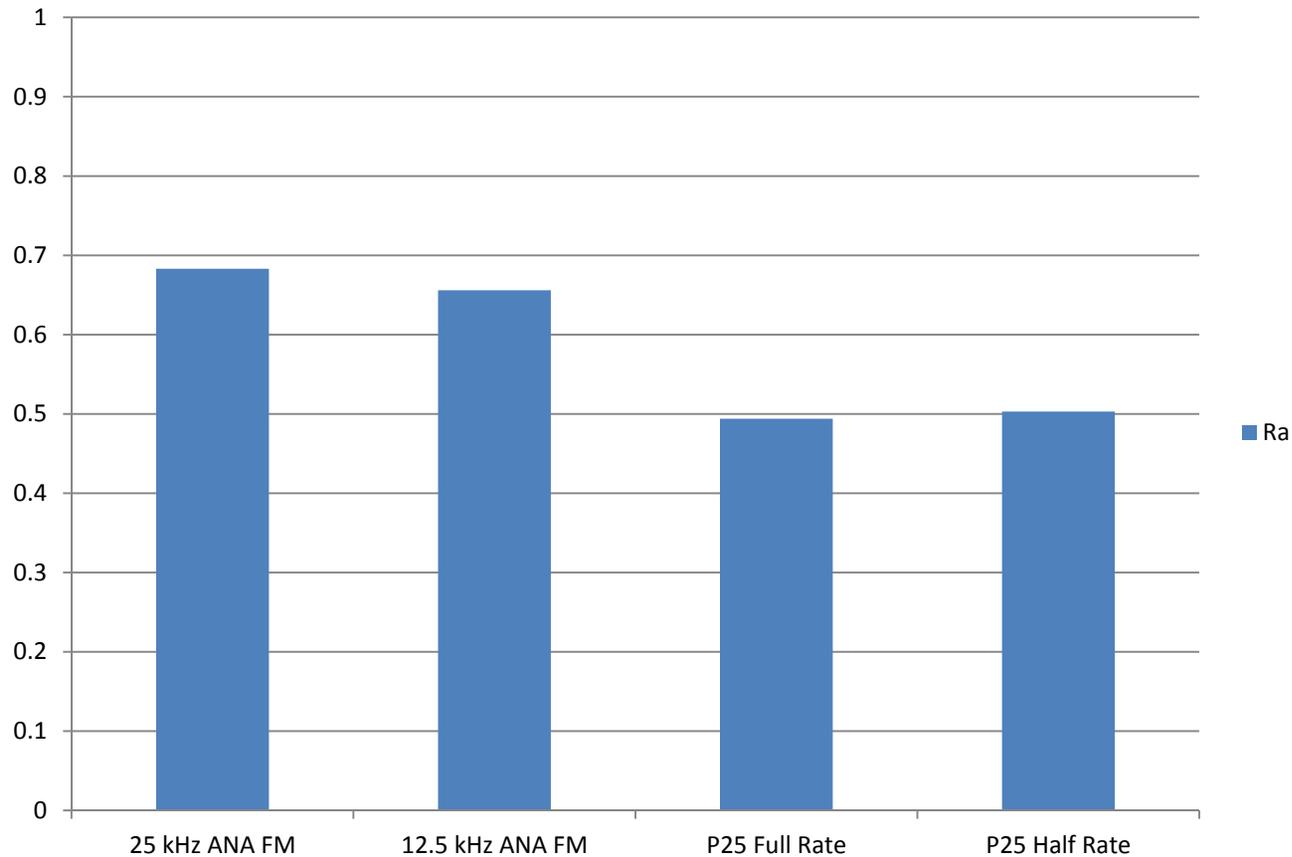


Click in box to listen.

- Current test shows improvement on these results for all systems
- Significant improvement for P25 Full Rate (.206 to .499)
- Shows improvements in best practices and vocoder make a difference

# 8: No mask, night club noise (5 dB SNR)

## Intelligibility Scores for Scenario 8



### Tukey Multiple Comparison Results

System	Mean	StDev	"YES" means significance			
			4	3	2	1
1 - 25 kHz ANA FM	0.683	0.1148	YES	YES	NO	
2 - 12.5 kHz ANA FM	0.656	0.0992	YES	YES		
3 - P25 Full Rate	0.494	0.1454	NO			
4 - P25 Half Rate	0.503	0.12				

# Observations on Clean Channel Scenarios

- Improvements to best practices and vocoder make a difference
- There are still differences between analog and P25, but the gaps are narrowing
  - Biggest difference in this test was Scenario 8 (Night club noise)
    - Smaller than those gaps observed in previous test
    - Noise spectra similar to speech