



Conquest Innovations, LLC MAX4 Acoustic Performance

Summary of Conquest Innovations' MAX4
Acoustical Performance Evaluation by The
ARL Penn State Acoustic Hailing Device
(AHD) Assessment Team

PENNSTATE





Background

- The ARL Penn State AHD Assessment Team evaluated performance of six COTS AHDs in early 2006 –LRAD 500, LRAD 1000, MAD LT PMS 54, MAD LT PMS 6, Power Sonix PSAIR 42, and Sound Commander SC 3560
- Summary of Findings from Initial Testing:
 - “Voice warning message will not generally be intelligible at target at 454m (500 yards) in presence of 78 dBA background noise source outdoors let alone in presence of 90 dBA source and/or inside cabin”
 - “Results from the maritime LMUA concur and show that the maximum range at which known two word voice commands were intelligible on moving target was
 - 500m on bow (80 dBA background SPL)
 - 300m inside cabin, windows/doors open
 - 80m inside cabin, windows/doors closed”



Background

- Testing of additional devices performed by ARL Penn State AHD Assessment Team during the fall of 2006.
- Conquest Innovations MAX 4 invited to participate in AHD II Acoustic Evaluation
- Five other AHDs evaluated against MAX4



ARL Penn State AHD Team Assessment Approach

- **Voice warning message intelligibility**
 - 6 person pilot study jury survey, SII, time history recording
 - With and without ambient (snow blower) noise source
 - Assessed at distance of 200, 300, 500, 750, 1000, 1250 and 1500 m
- **Warning signal(s)**
 - SPL and time history recording
 - With and without ambient (snow blower) noise source
 - Assessed at distances of 200, 300, 500, 750, 1000, 1250 and 1500 m
- **Directivity**
 - 800 Hz tone, 2 kHz tone, voice warning message Leq
- **Response to white noise input**
- **Maximum sustainable warning signal sound pressure level output**



ARL Penn State AHD Team Pilot Study Jury Survey

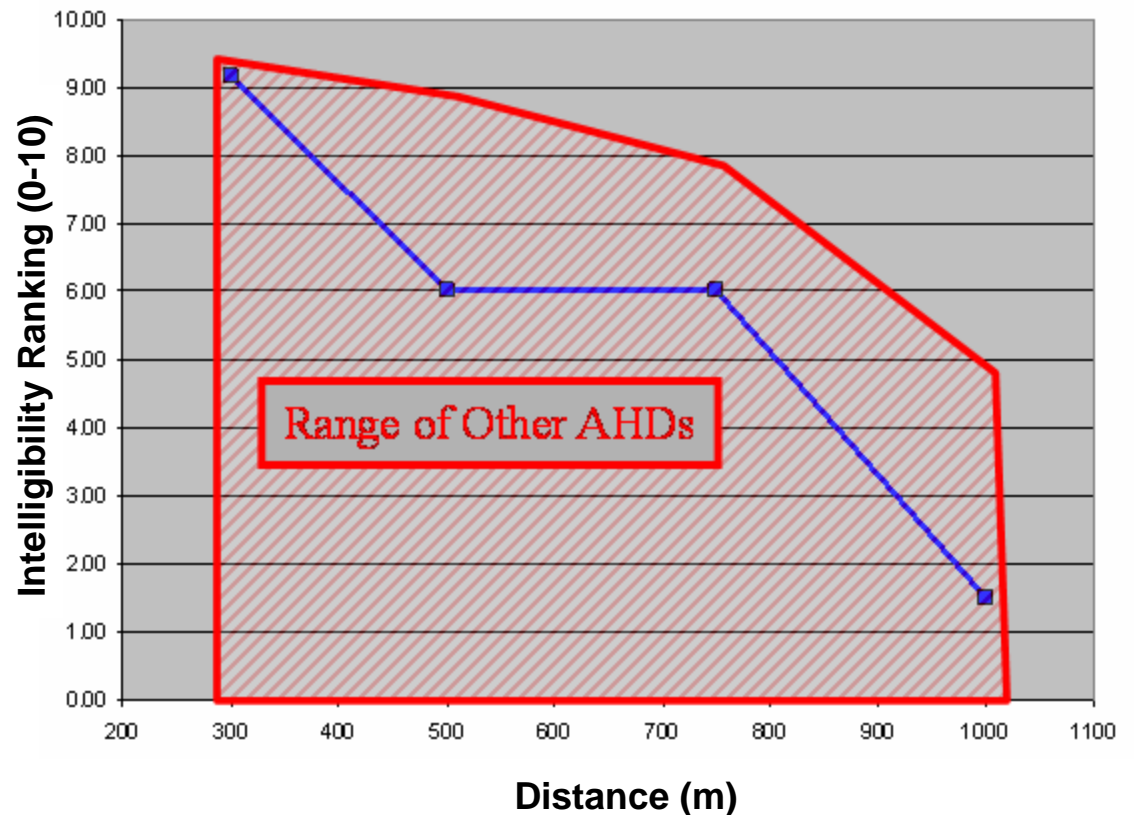
- **Five males and one female selected from pool of applicants whose hearing meets ANSI S3.6-2004**
 - **ARL employees**
 - **Both technical and non-technical backgrounds**
 - **Both extensive and little knowledge of AHD assessment effort**
- **At each test distance, voice warning message played through each AHD one time only due to adverse weather conditions**
 - **Sequence at each distance was randomly generated**
 - **Rate each message 0 – 10 (0 – no words intell, 10 – all words intell)**
- **Skies were overcast and temperature was approximately 55° with 1-2 m/s winds in sound propagation direction**
 - **Good conditions for sound propagation**
 - **AHD time history file recorded at each test condition using SLM with wind screen equipped microphone**

ARL Penn State AHD Team Intelligibility Results

-“MAX4 showed superior voice warning message intelligibility as compared to other AHDs of similar size and power requirements”

-“Only AHDs with far greater size, weight, and power requirements outperformed MAX4”

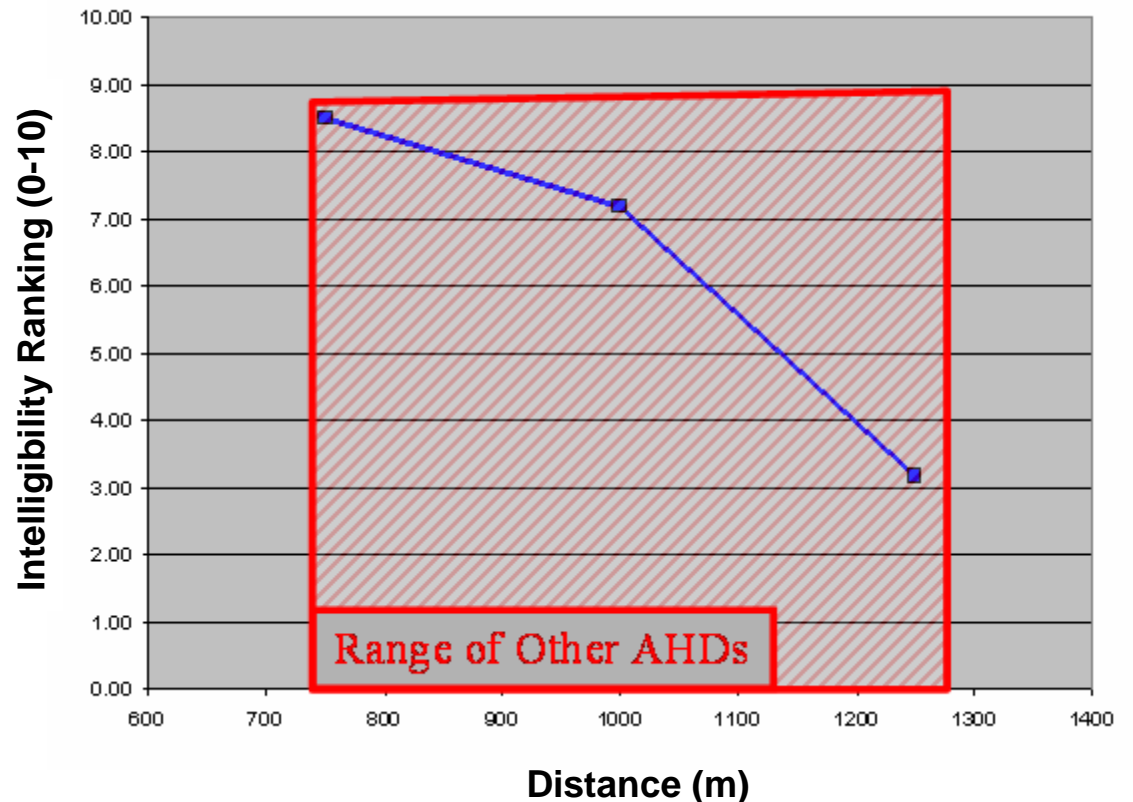
**Voice Warning Message
in Presence of 90 dBA Background Noise**



ARL Penn State AHD Team Intelligibility Results (continued)

- "MAX4 showed superior voice warning message intelligibility as compared to other AHDs of similar size and power requirements"
- "Only AHDs with far greater size, weight, and power requirements outperformed MAX4"
- "MAX4 showed similar intelligibility out to 1000 meters as compared to AHDs of greater size, weight, and power requirements"

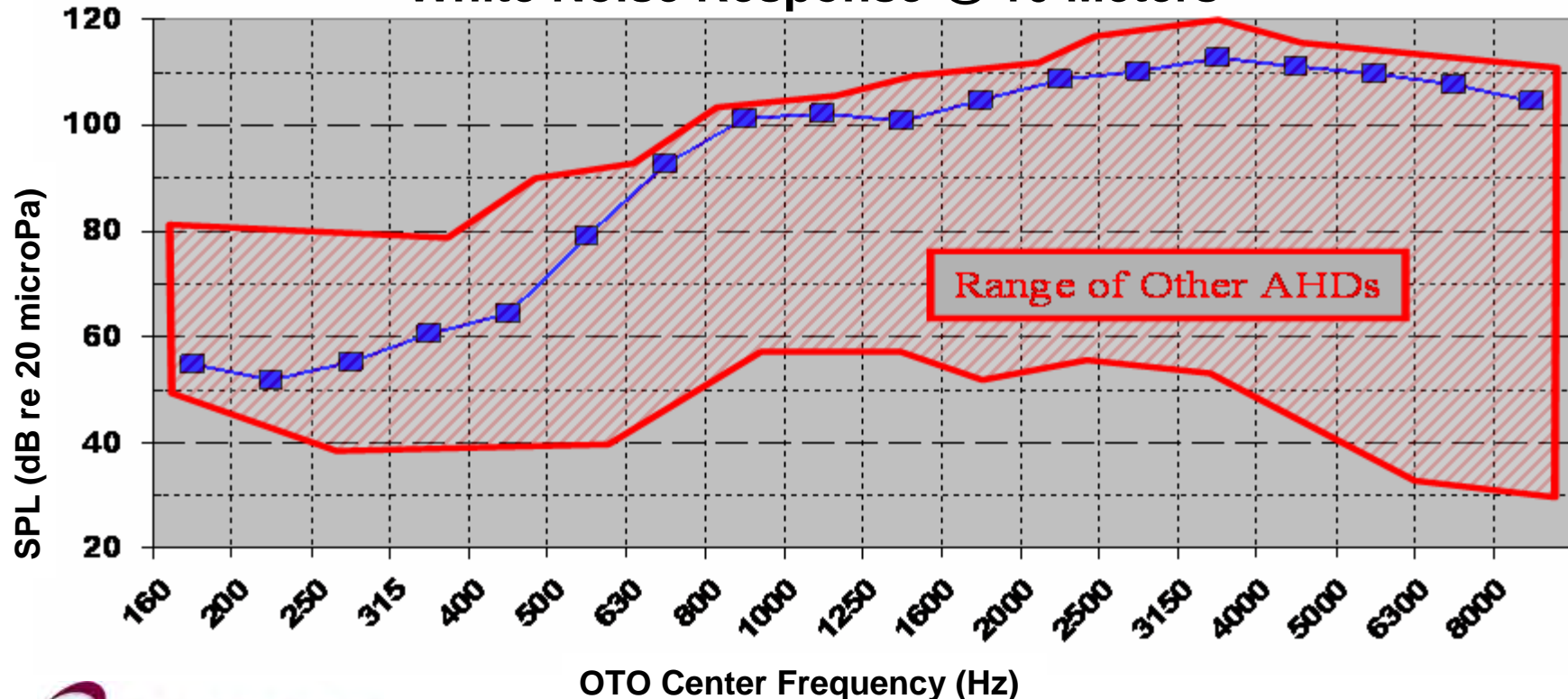
Voice Warning Message in Presence of 78 dBA Background Noise



ARL Penn State AHD Team Frequency Response Results

“MAX4 showed better low frequency (500-2000 Hz) response than competitors of similar size and weight characteristics resulting in better sound propagation at critical intelligibility frequency bands”

White Noise Response @ 10 Meters





ARL Penn State AHD Team Summary of Findings

- ARL Penn State AHD Team assessed ability of 6 AHDs to project intelligible speech to targets at distances of up to 1500 m and in presence of background noise
- “MAX4 performance was equal to or exceeded that of other AHDs of similar size, weight, and input power requirements”
- “MAX4 intelligibility was only exceeded by very large system”
- “MAX4 warning signal projection authority was among the best tested”
- “MAX4 has very good low frequency response, resulting in better sound propagation to long ranges”
- “MAX4 showed no problems with sustaining high intensity signals for extended periods of time”

ARL Penn State AHD Team backup data

- Data Contained in this document provided to Conquest Innovations and summarized from: Applied Research Laboratory, Pennsylvania State University Presentation, Conquest Innovations MAX4 Acoustical Performance Evaluation dated November 29, 2006



Applied Research Laboratory
The Pennsylvania State University



CONQUEST INNOVATIONS, LLC

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