Accessible Digital Radio Broadcast Services Project

Developing and Demonstrating Specialized Digital Radio Services for:

Deaf and Hard of Hearing & Blind and Print Handicapped
America’s Only Not-for-Profit Radio Broadcast Technology R&D Center
Established October, 2005

Andrews  Starling  Evans  Kean
Why Accessible Radio?

- Radio is immediate, companion medium
- Radio = hundreds of programs not on TV or web
- Radio works during emergencies with no power grid
- Since 1971 NPR has worked on extending signal reach to the public, now we’re working on reaching the public **better – accessibly, thanks to digital radio!**

The Accessible Digital Radio Service Project:

- Digital radio reading services for the visually impaired and print handicapped
- First ever Captioned Radio for the Deaf and Hard of Hearing
Radio is Primary During Emergencies
Accessible Emergency Information Important for 32 Million Visually and Hearing Impaired in US

FEMA: MAKE SURE YOU HAVE RADIO W/BATTERIES IN CASE POWER GOES OUT WITH THE CDC AND ACCOUNT FOR THEIR SAMPLES ON RESEARCH
Conditional Access Demonstration Configuration

**Functionality:**
- Full HD Radio functionality – can receive “Free’ over the air broadcasts
- Plus the ability to receive and play-out locally generated scrambled audio service (test station KIBI).

**Receiver A: Radio ID01**
CA Entitled Receiver - HD4

- 88.3 HD1 – Free to air
- 88.3 HD2 – Free to air
- 88.3 HD3 – CA audio service
  Not Authorized Pearl Jam
- 88.3 HD4 – CA audio service
  Authorized Radio Reading

**Receiver B: Radio ID02**
CA Entitled Receiver – HD3

- 88.3 HD1 – Free to air
- 88.3 HD2 – Free to air
- 88.3 HD3 – CA audio service
  Authorized Pearl Jam
- 88.3 HD4 – CA audio service
  Not Authorized Radio Reading
Keys to Deployment

Good DESIGN & Process

Spectrum & FCC OK

Accessible Radio

Technology & Delivery

CE Support
Accessible Radio Resides as Advanced Applications Service in Recently Authorized Extended Hybrid Spectrum

**Accessible Radio Resides as Advanced Applications Service in Recently Authorized Extended Hybrid Spectrum**

- **Lower Digital Sidebands**
  - Additional Reference Subcarrier
  - Primary
    - Main
    - Extended
    - 10 partitions
    - 1.2 or 4 partitions

- **Upper Digital Sidebands**
  - Additional Reference Subcarrier
  - Primary
    - Extended
    - Main
    - 10 partitions
    - 1.2 or 4 partitions
    - 76 Subcarriers
    - 191 Subcarriers

**FM Analog Host Signal (Stereo or Mono)**

- 0 Hz (#0)
IBC 07 - First International Demonstration
Protected & Accessible HD Radio Channels
Four Channel Extended-Hybrid HD Radio mode:

Jazz & Oldies - 38 kbps
Classical - 34 kbps
Pay Per Listen Pearl Jam - 24 kbps
Blind Reading Service - 16 kbps

122 kbps total

Plus: Captioned Radio for Deaf - ~1.5 kbps

HD Radio Demonstration Powered by
This data reveals that near CD quality for music can be achieved at 36 kpbs, the same is true for voice at 56 kpbs, and a dual 48 kpbs is a logical default channel for both main and supplemental channels.
Quality Ratings at Very Low Bit Rates for Music, Speech and Voiceover

- **Excellent**
- **Good**
- **Fair**
- **Poor**
- **Bad**

**Music**
- iBiquity
- VoiceAge
- Anonymous
- McMartin Light
- McMartin Medium
- QEI
- SOURCI

**Speech**

**Voiceover**
Captioned Radio Concept Demo
WX3NPR – NPR Labs On-Air Test Station for Captioned Radio and Digital Radio Reading Services for Visually Impaired

50w Experimental FM+HD station on 87.9 FM
Washington, D.C.
1st Over-the-Air Captioned Radio Transmission Using Advanced Applications Services on HD Radio on WX3NPR - 10 AUG 07
Next Steps for Deaf and Hard of Hearing

Sharp® Dual View Display Technology

Front seat “Captioning” Concept

- driver can see traffic map, while listening to radio –
- at the same time a D/HH passenger has same content on Captioned Radio view