



Greetings SBE & Thank You for Your Time

September  
2022



# Who is Orban?

- Founded 45 years ago by Robert Orban
- Today – Audio Processing Experts with offices in Stuttgart, Philadelphia, and San Francisco; US and Germany production
- Powering over 14,800 Broadcasts and Live Events every year



# We Are Audio Processing

- Loudness + Dynamic Range measurement and control
- Stereo and multi-channel surround technologies
- Broadcast, consumer and content creation applications



# Introducing: Orban XPN-Enterprise

- Linux-based Dell Blade
- Uses Ross Video's softGear platform



Shipping Now!



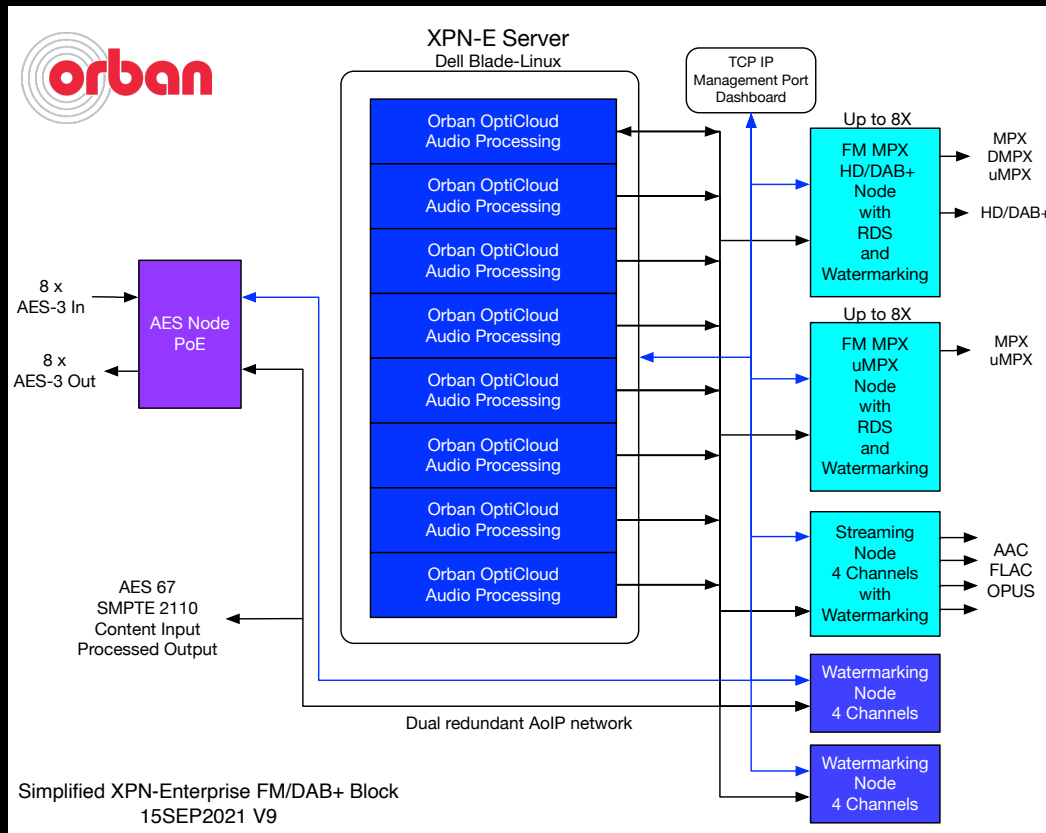
# Orban XPN-Enterprise – Key Features

- Fully modular processing for up to 16 FM plus HD/DAB+ outputs (using the FM MPX HD/DAB+ Nodes)
- Streaming Node brings total channel count to 24
- AoIP: AES67, SMPTE-2110/2027-7 (Dual Redundant Networks) and Livewire +

**Hundreds of Channels On-the-Air**



# Orban XPN-Enterprise



# Audio Processing for Streaming & OTA

- What are we trying to accomplish with processing?
- What are the technical requirements for processing AM, FM, HD & Streaming?
- Regulatory Technical compliance
  - Bandwidth limits & modulation asymmetry (AM)
  - Deviation limits, pilot injection (FM)
- What are other considerations like watermark encoding?



# Watermark Encoding for OTA

## Onboard Kantar and Nielsen

- Allows encoder to be placed at the point with the maximum density
- Processor can be fully optimized to support encoder
- This wasn't possible with external encoding hardware
- Significantly better audio quality and encoding performance than using external encoding hardware and "PPM Enhancer"





# AM Noise Challenges

- The AM band is 20 dB noisier in the last 20 years
- Drive around any city with LED stoplights and you will hear an incredible amount of RFI
- EV induction charging is on the horizon and those are 10 kW at 94% efficiency (600 watts worth of heat and RFI) in your garage!
- David Layer @ NAB is working on this battle [dlayer@nab.org](mailto:dlayer@nab.org)



# Audio Processing Requirements for AM

- AM needs as much density as possible
- And 90% of AM listeners are in vehicles
- AM tuners in cars have a 3.5 kHz bandwidth max
- AM Transmitter Power is expensive



# Practical Audio Processing for AM

- Reduce audio bandwidth
  - WSB Atlanta is running 4.0 kHz bandwidth
- Increase density
  - KSL-AM is running an XPN-AM “Music Medium” at 9.5 Less-More
  - WABC NYC is running a custom preset and they are loudest AM signal in **Philly!**
- Run 125% Positive Modulation



# Benefits of Audio Processing for AM

- Reduced TX audio bandwidth only transmits what the radios are capable of receiving
- Improves the loudness/distortion tradeoff
- Higher density improves SNR
- 125% modulation improves SNR



# MDCL: Modulation Dependent Carrier Level for AM

- Suppresses carrier based upon modulation
- Higher Modulation Density
  - = More carrier suppression
  - = More Power savings





# AM MDCL AMC In The Field Testing

At the 0.5 mV/m location

AM 100% Symmetrical Field Strength uV/m	dBm	AC Power kW	MDCL AMC 125%	Field Strength uV/m	dBm	Delta dBm	AC Power kW	Delta AC kW	Reduction in power consumption
610	-51.28	5.26	3 dB	436	-54.20	-2.92	2.74	-2.52	-47.83%
			4 dB	386	-55.28	-4.00	2.21	-3.05	-57.98%
			5 dB	349	-56.13	-4.85	1.96	-3.30	-62.74%
			6 dB	325	-56.75	-5.47	1.18	-4.08	-77.51%



# AM MDCL AMC Testing Results

- Higher modulation density gives the MDCL system the ability to suppress the carrier to a much greater extent for longer periods of time
- At 6dB of AMC a 77% reduction in transmitter power consumption was observed
- Slight degradation in fringe coverage at AMC levels greater than 3 dB
- Townsquare and Bonneville are running 6 dB AMC where possible; zero listener complaints since 2020 and significant power savings





**Date & Time**  
Tue Sep 15 2020  
08:58:39  
Scheduler: On

**Transmitter (KSL AM)**

# 12.1 kW

Reflected: 0.01 kW    Set Point: 48.50kW  
Preset: HD 50kW

**Exciter**

Active Exciter: A

L+R Modulation: -100% -Pk:-97.7    RMS:46.8    +Pk:121.8 +140%

Envelope Magnitude: 0%    RMS:25.6    +Pk:68.5    100%

**Spectrum**

Normalized To Carrier



Center Freq: 1160 kHz

Amplitude (20dB / div)

Frequency (25 kHz / div)

**Audio Inputs**

AES 1 - L: -60dB    RMS:-6    +Pk:1    10dB

AES 1 - R: -60dB    RMS:-6    +Pk:1    10dB

Excite I/Q - I: -60dB    RMS:0    +Pk:4    10dB

Excite I/Q - Q: -60dB    RMS:-1.4    +Pk:0    10dB

**Meters**



**Smith Chart**

Zoom: 200%



**Modulation Levels**

L+R Modulation: -100% -Pk:-97.7    RMS:46.8    +Pk:121.8 +140%

Envelope Magnitude: 0%    RMS:25.6    +Pk:68.5    100%

I Levels: -100% -Pk:-36.0    RMS:7.0    +Pk:35.0    100%

Q Levels: -100% -Pk:-44.0    RMS:8.0    +Pk:35.0    100%

RF On

RF Off

Logged in as: Nautel

Menu

Status

Logs

Local Remote

Reset

Change User



# Real World Results

## Cleaning up an air chain

- News-Talk AM in a major market (top 10)
- We swapped out a legacy AM processor with an XPN-AM
- We removed the three compressors before the STL
- With a combined 45 dB of compression!
- Installed an Orban 6300 set for 2 Band Intelligent AGC with safety limiter and reset levels feeding STL
- The next week the Nielsen numbers were up 25%



# Audio Processing for Analog FM

- We have to deal with the 75  $\mu$ S pre-emphasis
- And the bandwidth limitation to protect the 19 kHz stereo pilot
- And we have to look at multipath and what we can do to minimize it (understanding that its mostly from the L-R)
- And did I mention we need to have competitive loudness without making listeners ears fall off?



# Audio Processing for Analog FM

- The biggest advancement in FM processing is psychoacoustical limiting
- Being able to “mask” the final limiter artifacts revolutionized FM processing
  - But its still a tradeoff between loudness and distortion!
- Coupled with multipath mitigation strategies’ and HF enhancement techniques you can effectively compensate for most of the technical issues of analog stereo FM



# OTA Audio Processing Goals

So what are we trying to accomplish with all of this great technology?

- Consistent loudness and spectral content between all sources
- Competitive loudness on the dial without killing TSL



# OTA Audio Processing Problems

What gets in the way of accomplishing those goals?

- Bad sources
- Bad STL
- Improper processor setup
- Using a 25-year old processor and thinking it's going to be competitive



# Audio Processing – Bad Sources

- Friends don't let friends use MP-3 for music
- Listen to your plant output on high quality headphones
- Figure out what sounds bad and fix it
- I got a call from a customer complaining about lack of stereo separation
- Their whole music library had been ripped to their new automation system in MP-3 128 MONO!



# Audio Processing – Bad Source Solutions

- Everything needs to be listened to
- SAT feeds, remotes, STL's you name it
  - Found a sat receiver in mono once
- There is more bad audio than hydrogen, and that is the basic building block of the universe (HT Frank Zappa)





## Audio Processing – Bad STL Example

- I was working on an AM that was using an “IP” based STL as an STL
- Analog input at the studio and AES at the TX feeding an XPN-AM
- Everything sounded fine until the audio sources got loud and then it all fell apart
- IP I/O meters kind of looked OK (10 dB per segment) but it sounded like Satan’s ShopVac on loud passages



## Audio Processing - Bad STL Solution

- Plant was analog +4 dBv nominal with 20dB of headroom (+24 dBv)
- After a lot of calls the IP vendor admitted there was an undocumented hard limiter on the analog input
- Its threshold was set to +6 dBv!
- We put a 20 dB pad in front of the analog input to the IP box, added 20 dB to the AES input on the processor
- Problem fixed! BUT it took a whole day to figure it out.



# Audio Processing - Improper AGC Setup

- 90% of the sites I have seen in the last three years had the AGC levels “too low”
- On Orban processors the AGC should be running between 9 dB and 12 dB with “nominal” program level
- I find most are running 3 dB of ACG
- That’s going to cause pumping and breathing and general bad audio in large quantities as the down stream multi-band processing will not have the right level



# Audio Processing - Wrong Preset Choice

- Using a “Chernobyl” preset on an easy listening format
- Turning up everything to “11”
- An amazing number of processing problems can be solved by starting from an appropriate factory default preset and going from there
  - Orban provides a “Less-More” control that adjust a myriad of parameters and lets you dial in the density
  - Then Make Modifications from There...



# Audio Processing for Analog FM & HD-1

- You need to listen carefully to the blend transition from analog FM to HD-1
- You want to get the levels matched
- The problem is that HD-1 has a 20 kHz bandwidth and unlimited stereo separation
- If you are a Public Radio station running mono analog FM and blending to stereo HD-1 it's going to be a challenge



# Audio Processing for analog FM & HD-1

- HD-1 Blend issue with analog
- Listen, Listen & Listen in moving vehicles not your office
- No hard and fast solutions to this problem
- Compromises will have to be made to keep from knocking listeners out of their cars
- These might include reducing the HF on HD -1 via EQ
- You might need to increase the density on the HD-1 and reduce the level to trick listeners if the FM processing is very dense



## Audio Processing HD-2/3/4

- Appropriate factory preset as a starting point
- Proper ACG levels!
- HD-2/3/4 very low bitrate
- Reduce the HF bandwidth on low bitrate HD channels
  - Don't feed the HD Radio codec audio that will cause it to misbehave
  - 8-10 kHz clean is better than a 20 kHz Kazoo
  - Again Listen, Listen & Listen in a moving vehicle!



# Audio Processing for Streaming

- Loudness?
- Spectral signature?
- Listen to your competitors' streaming
  - What are they doing right?
  - What are they doing wrong?
  - How do your streams stack up?
  - Listen on a PC, Smartphone (with cheap earbuds) and moving vehicle (8% of your streaming listeners will be in a car)





# Audio Processing: Listen, Listen & Listen

- [https://www.siriusxm.com/music?intcmp=Global%20Nav\\_NA](https://www.siriusxm.com/music?intcmp=Global%20Nav_NA)  
[www:Home Music](http://www.HomeMusic.com)
- <https://www.highlands1043.com>





Miles Davis Radio  
Ch 502


On Air Show

Miles Davis Radio >


# Miles Davis

The Man With The Horn

## Related Content



Ch 67  
Art Blakey and The Jazz...  
Waterfalls




Ch 310  
R.E.M.  
Orange Crush



Ch 66  
Chuck Mangione  
Bellavia



Ch 710  
Mountain Goats  
Corsican Mastiff Stride




Ch 311  
Player  
Baby Come Back

Classic Hits Designed For You

## WELCOME TO THE ONLINE HOME OF HIGHLANDS 104.3!

Classic Hits designed for you, whether you grew up in the Highlands, or just moved here! From The Marshall Tucker Band to the Allman Brothers to AC/DC, Duran Duran and the Eagles, it's all Classics, all the time for Highlands County and surrounding area ... yours on "The New FM Station in Town," Highlands 104.3."

## LISTEN LIVE!



**Jump**  
Van Halen

On now

Share Songfacts®

3:17 3:53

Artist Bio Facebook Twitter Website Discography

rate

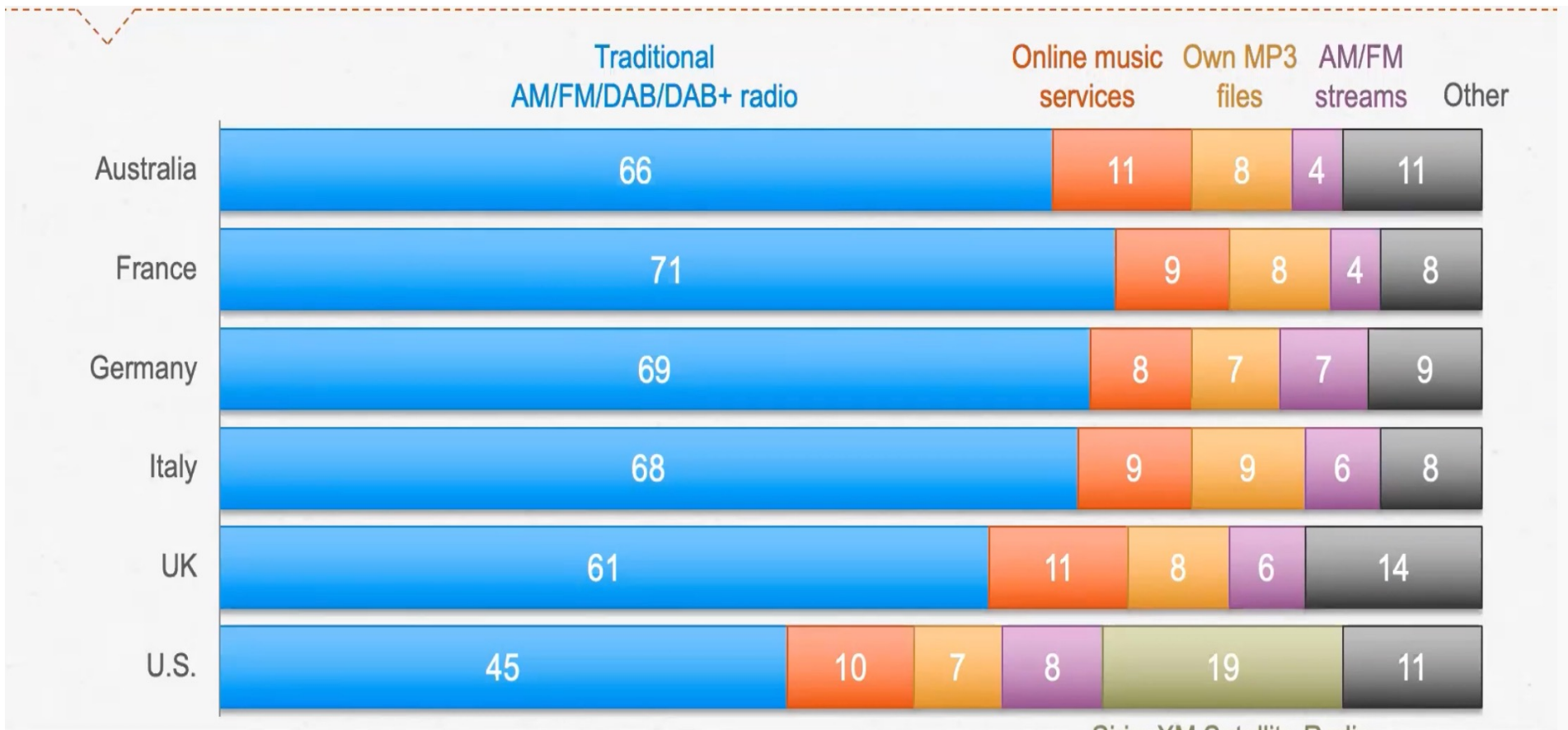


# Audio Processing: Listen, Listen & Listen

- Listen to your competitors
- Listen in moving vehicles
  - Listen in a bunch of vehicles
  - **90% of listening is in vehicles**
- Streaming: Listen on PC's and smartphones
  - In noisy environments
  - On cheap ear buds along with quality headphones
- **Don't forget Sirius XM**







SiriusXM Satellite Radio



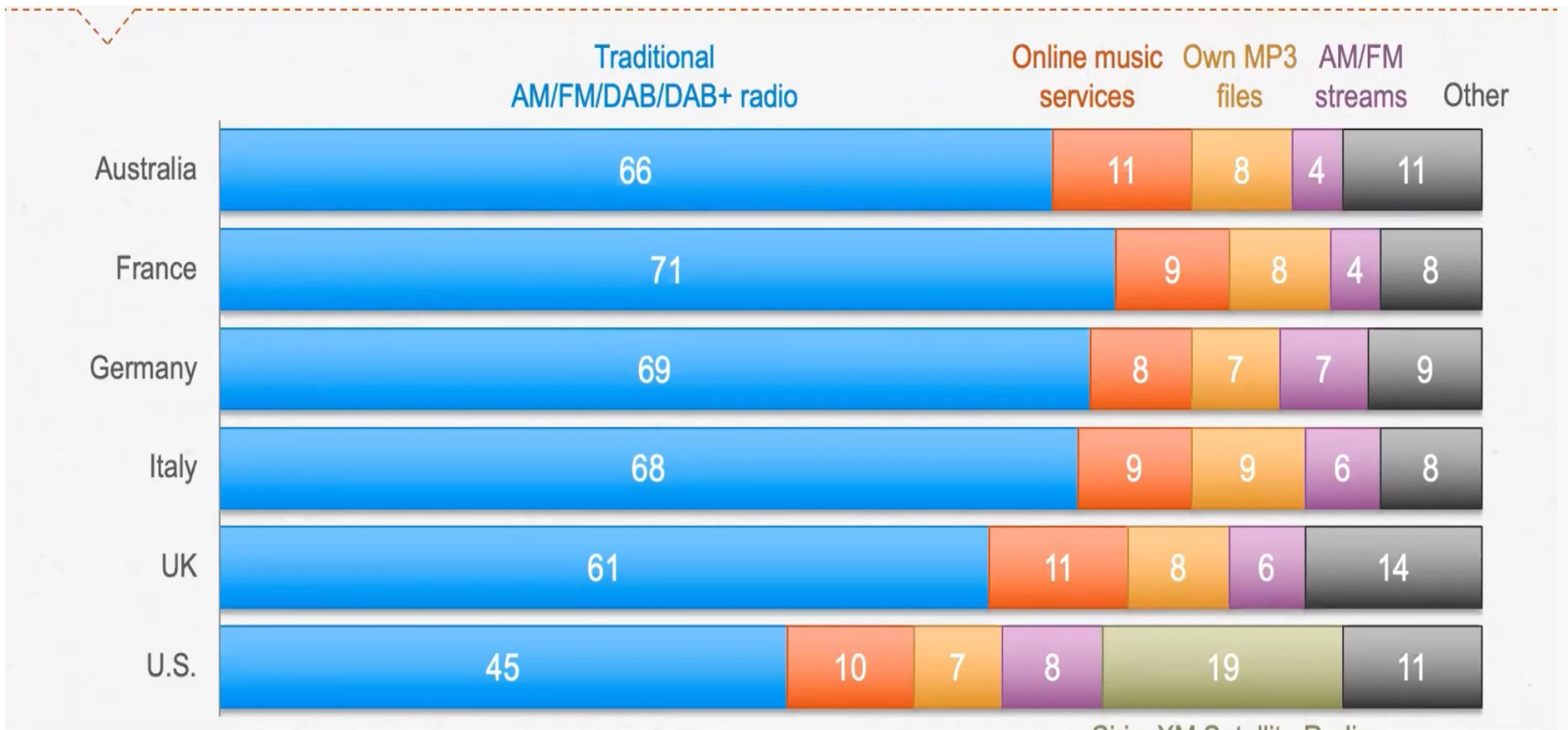
Base: Typically spend any time in a car/vehicle

# Audio Processing Listen, Listen & Listen

- Xperi survey of vehicle listening trends
  - 19% of the listener listening time is Sirius XM!
  - 8% of listener listening time is to your streams in a car!
  - OTA is 45%
  - OTA (combined with OTA streaming) is 53%

**47% are not spending time in their vehicle listening to  
YOU!**





SiriusXM Satellite Radio



Base: Typically spend any time in a car/vehicle



# Audio Processing: Listen, Listen & Listen

- You just need to be competitive
  - Listen, Listen & Listen
  - Does the loudest station on the dial sound like Satan's ShopVac?
  - Are the Announcers "Raspy"?
    - Do you want to sound like that???
  - And look at your TSL and the competitors
    - Keeping them listening to your station is easier than trying to get them back!





# Audio Processing Listen, Listen & Listen

- Processing is a long journey
- The first step is to make sure your sources are clean
- Second is to start from a factory preset instead of trying to beat whatever has been done previously
- Get the density you are looking for using Less-More and tweak from there
- Save all of the iterations so you have somewhere to go back to!



# Audio Processing: Listen, Listen & Listen

- Let us know how we can be of assistance!



Questions?



Thank You!

