Notes on the Audio Library for the NRSC-R102 AM Field Study Report

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This audio library is a companion to the NRSC-R102 report "Measurement of AM Band RF Noise Levels and Station Signal Attenuation" (12/20/2024). It provides audio recordings matching the six route segments described in section 5 of the report. These are identified by the names of the endpoints and the general environment of the route:

1. Germantown to Mount Airy (Rural)
2. Mount Airy to Ellicott City (Rural-Suburban)
3. Ellicott City to Catonsville (Suburban)
4. Catonsville to West Baltimore (Suburban-Urban)
5. West Franklin to West Mulberry Streets (Urban)
6. West Mulberry Street through downtown Baltimore (Dense Urban)

The measurement campaign used a single antenna and software defined receiver (SDR) system, as illustrated in Figure 2 of the report. This receiver continuously captured the entire AM band, saving all the RF data to an individual digital file every 7 minutes and 9 seconds. Subsequently, the RF signal data from six specific test channels was extracted by the SDR software, which is visualized in the report's graphs and maps. Simultaneously, audio from these RF channels was demodulated to produce the digital audio files presented here.

Each segment contains six recordings:

Frequency (kHz)	Audio Recording	City
555	Quiet channel 1	-
680	WCBM	Baltimore MD
1075	Quiet channel 2	-
1090	WBAL	Baltimore MD
1500	WFED	Washington DC
1625	Quiet channel 3	-

Details on the channels are provided in sections 3 and 4 of the report. The recordings are stored in 16-bit linear digital format at a 44.1 kHz sample rate in lossless FLAC format. FLAC files should be natively playable on browsers or downloaded for common audio file players. Note that FLAC is an adaptive compression which will cause files of the same run time vary in size.

The decoding software for the audio applied a 13th order Butterworth lowpass filter to each audio sample. For the AM stations, a 3 kHz lowpass filter was applied (equivalent to 6 kHz RF bandpass). This is generally representative of many current-day car radios which also use SDR. The Quiet channels are free of regional station signals and are for noise reference. They passed through a 1.5 kHz lowpass filter (equivalent to 3 kHz RF bandpass).

The audio channels from the SDR system required normalization. For the radio stations, each audio clip was normalized to an ITU Integrated Loudness of approximately -20 LUFS. This makes the audio sound similar in loudness, regardless of the signal strength, which is equivalent to standard Automatic Gain Control (AGC) in AM radios.

The Quiet channels are on frequencies as close as possible to the reference stations. The Quiet channel noise levels vary independently of station signal strengths on nearby channels and were intended for objective noise measurement. The variation in perceived noise on these Quiet channels is often difficult to compare to station audio on nearby frequencies, which are loudness normalized rather than peak normalized.

To make the noise more listenable, the computer software has peak-normalized each Quiet channel to a uniform limit of approximately -1.0 dB True Peak. (If one observes a noise file in an audio editor, sharp peaks may be seen. By contrast, the noise graphs in the report show filtered RMS indications, which hide fast, sharp peaks.) A practical use for the audio files would be to hear the audible characteristics in the RF channel noise, such as hissing, buzzing, crackling, etc.