Radio Analyzer Tool
TUNE - the HEAD acoustics Radio Analyzer Tool - allows a **reproducible analytical evaluation** of the **impact of analog radio broadcast disturbances** on perceived audio quality based on auditory test results.

Radio Frequency (RF) recording equipment is used by e.g. the manufacturers of radio broadcast receivers in order to **record a given RF signal**
• under dynamic conditions (disturbed signal; test drives on public roads) and
• under static conditions (undisturbed reference signal).

These RF recordings are then applied to different radio broadcast receivers and **guarantee** absolutely **realistic and reproducible test conditions**.
Various Disturbances to Detect

The reception of radio broadcast signals under dynamic conditions may be *disturbed in various ways* as often experienced in driving situations.

- Audible and disturbing “pops”
- additive noise
- short term “mutes”
- “high cuts”
- noticeable stereo/mono switching occurs
- sender mismatch

Disturbances are caused:

- by **bad reception conditions** (loss of transmission energy, interferences, multiple transmission paths etc.)
- by **masking techniques** applied in order to lower the resulting disturbances and improve audio quality
The HEAD acoustics Radio Analyzer Tool TUNE ...

... automatically evaluates various sound environment scenarios (e.g. different car cabins) in a fast, reproducible and objective manner.

... is based on auditory tests with far more than 2,000 individual quality ratings of license-free speech and music samples in realistic environments.

... detects typical signal impairments and gives a statistic overview of their occurrence over time.

... allows an objective comparison of the performance of different receivers.
Enhanced Analytical Skills

TUNE’s hearing-adequate analytical model is capable to **analyze the processed audio output** of receivers while **considering human perception of typical disturbances**, providing results with high correlation. The disturbances can be divided into the following parts:

**Typical impairments for varying HF conditions**
- Pops: short-time noise bursts (RF multipath effects)
- Noise: constant additive noise (low overall signal level)
- Switching/transition from stereo to mono (low SNR in stereo carrier)
- Sender mismatch

**Typical artifacts resulting from the receiver’s attempt to mask disturbances:**
- High cuts: Insertion of temporal low pass to avoid or at least lower the disturbances caused by audible pops
- Mute: Signal on both channels is muted to avoid audible noise
Orthogonal Analysis

The orthogonal analysis allows to **calculate the individual contribution** of various typical radio broadcast disturbances (pops, noise, mutes, …) to the overall audio quality.

This **requires orthogonality of each analysis** (designed to assess a specific disturbance) to all other kinds of disturbances.

The orthogonal analysis provides
... an overview of the overall quality.
... **tuning hints** to specifically correct each disturbance.
TUNE Features at a Glance

Analysis and Validation
• Hearing-adequate analysis of receiver signals
• HRTF filtering to simulate specific car cabin environments
• Batch calculation possible
• Validation based on extensive auditory tests (> 2,000 single judgments)

Result Presentation
• as overall MOS values
• as easy-to-read “Quality Pie Charts” according to ITU-T P.505
• individual contribution of disturbances

Speech and Music
• Speech and music samples are included
• Three music genres (classic, pop, rock)
• English test sentences (simulated newscaster) according to ITU-T P.501

File Format
• Supported file formats (time signals for input): .dat, .wav, .hdf
• Report generation: doc, .pdf, .rtf