

EMMA

european mobile media association

www.emmausa.org

**Sound Quality Judgebook
2026**

**USA
Edition**



EMMA USA

european mobile media association

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Welcome to the European Mobile Media Association

4.0 Preface

Introduce yourself in a polite way to the competitor.

4.1 Pre Judging Check

4.1.2 Verification of Reasonable Driving Position Y / N

Check the competitor's ability to operate the gear-stick, the steering wheel & the pedals with the given driver's seat adjustment and document it into the checkbox. **This is not scored in the X class in the USA.**

4.1.3 Channel Verification

The judge will use Tracks 2 & 3 of the CD to check left and right integrity. If they are reversed, the competitor is given up to 5 minutes to repair the fault.

Intro and Welcome Track 1:

This track is a first impression of the sound, which is fast, clean and full.
The voice sounds clear, warm and direct, placed in the center of the sound system.

4.1.4 Calibration of Volume

The competitor suggests the volume to be listened at by the sound judges.
The judges should use this Volume!

Only in case that the suggested Volume is **too loud** (more than 80dB unweighted slow measurement with pink noise), the judges have to take a measurement to correct the Volume.

4.2 Imaging Characteristics

4.2.1 Imaging - Positions (0 to 25 points)

Track 2 to 6: Technical Tracks for Positions and Focus

The sound stage is divided to 4 equal distances by 5 positions in the following order:
Left, Right, Center, Left center, Right center

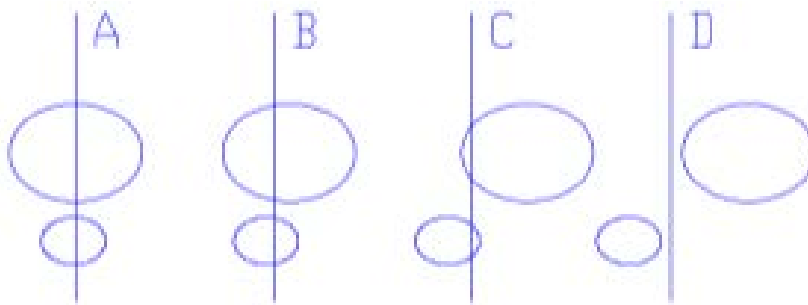
The **Left** and the **Right** positions of the sound stage are relatively easy to score.
Center, Left center and Right center positions are more difficult to be in their exact place.

Use the human voice **for reference** of each position, **and judge the 5 following instruments.**

The 5 different sounds appear at each position in the following order:

Instrument	Fundamental Frequencies
Bass guitar	20 Hz to 500 Hz
Electric guitar	60 Hz to 1200 Hz
Banjo	160 Hz to 5.5 kHz
Vibraphone	200 Hz to 5 kHz
Triangle	2 kHz to 20 kHz

Please note that these are the fundamental frequencies of the instruments. The vocal cue should be used to determine the location for each position.



How to score?

The 5 tones on tracks 2-6 should be heard in their positions.

The height is NOT scored here.

When a tone can be heard in multiple places score 0 points for that instrument.

If the initial sound of the same instrument is in the right place but the 2nd or 3rd sound is not in the same place then score 0.

On the diagram above, A is correct and gets full points.

B, C, and D get 0 points.

Hint :

Every sound starts at one small point which indicates its location, and then spreads equally round it.

Score the location that every sound starts.

4.2.2 Imaging – Focus (0 - 25 points)

Tracks 2 to 6: Technical Tracks for Positions and Focus

There are 5 different instrument tones, appearing exactly in the center.

Use the following scoring system.

Score each tone accordingly

Perfect focus	5 points
Slightly bigger or smaller size	4 points
Clearly bigger or smaller size	3 points
Size cannot be determined	2 points
Size is completely incorrect or in more than 1 place	1 point
	0 points

Focus means correct size of each instrument, relatively to one another.
Do not confuse size with volume. Louder does not mean bigger.
Each different sound in each position should be distinct with the correct focus-size.

Size of each tone should be considered, relatively to one another.
Please note that if the size is not fitting in, the position may be wrong too.

4.3 Sound Stage and Imaging Characteristics Track 12 Moving Track

4.3.1 Sound Stage - Distance to the Soundstage (0 - 15 points)

This is the distance between the listener and where the soundstage begins.

Suggested Track 12: Technical Track for Width, Height, Distance and Room Information

This is a track with moving instruments!

Instruments used in stable position:

Koshi, flute, shaker, deep gong, metal percussion plate, triangle, drums, tambourine, different electric guitars, electric bass, dobro, trumpet, saxes, organ, electric piano.

Instruments moving:

Guitar, Cowbell

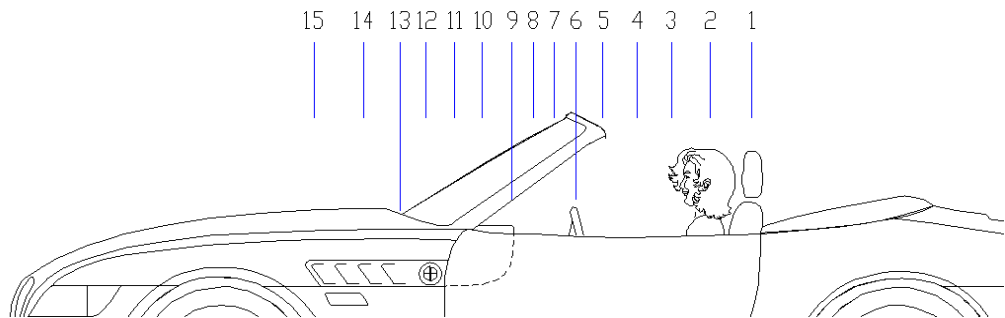
Listen to all Instruments.

The instrument that sounds the nearest/closest to you is the instrument that is judged in this section.
It can be a moving instrument OR a stable instrument.

How to score?

15 points	Is well out of the front windshield
14 points	Is just out of the bottom end of the front windshield
13 points	Is at the bottom end of the front windshield
10 to 12 points	Is between the beginning of the dashboard and the windshield
9 points	Is where the dashboard begins
7 to 8 points	Is between the top of the steering wheel & the beginning of the dashboard.
6 points	Is on top of the steering wheel
4 to 5 points	Is between the top of the steering wheel and the listener's body.
3 points	Is touching the face or chest of the listener.
2 points	Is on the head/body of the listener.
1 point	Is anywhere behind the listener.
0 point	No sound.

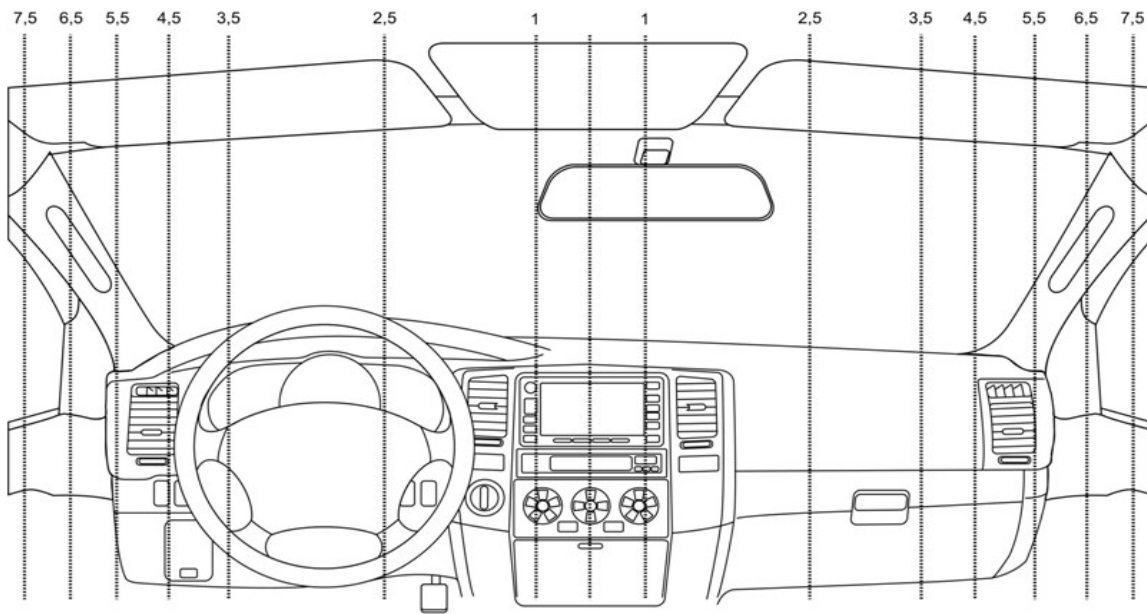
Avoid scoring 0 or 1 unless it's absolutely necessary.



4.3.2 Sound Stage - Width of sound stage (0 – 15 points)

This is the distance between the left and the right side of the soundstage.

Suggested Track 12: Technical Track for Width, Height, Distance and Room Information



4.3.3 Sound Stage - Height of the sound stage (0- 15 points)

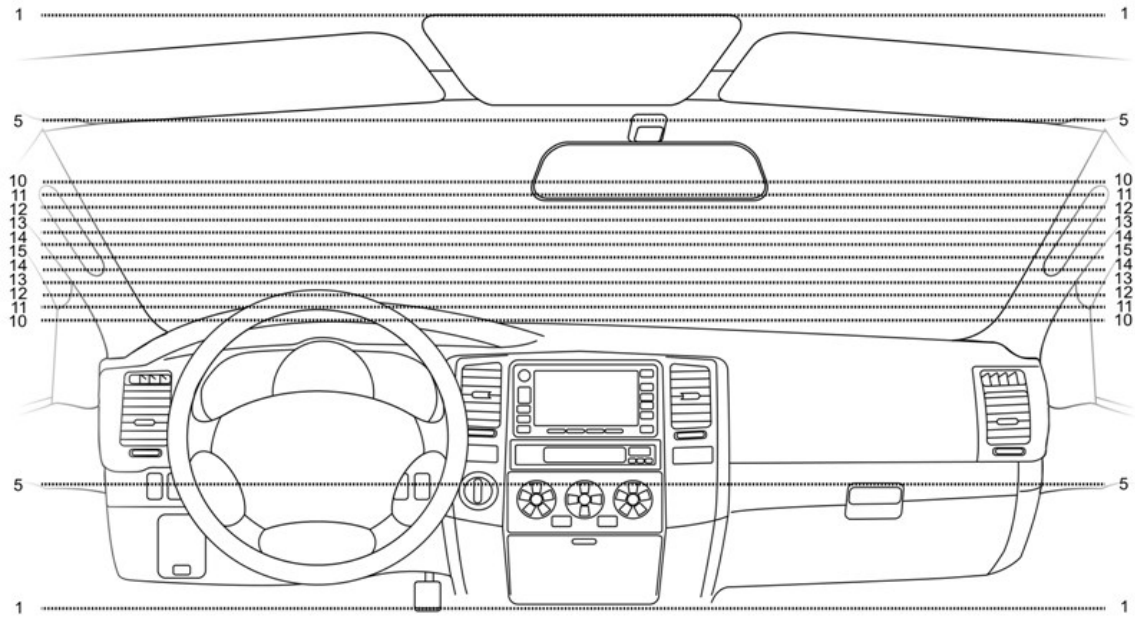
Ideally the stage height should be stable at horizon level from left to right, with some vertical spread below and above that level. It means, that some instruments may appear a little lower or a little higher than most of the others who appear at horizon level.

Suiggested Track 12: Technical Track for Width, Height, Distance and Room Information

All instruments should be at the same height. All stable AND moving instruments. Ideally at eye level.

How to score:

Follow all moving instruments and use the stable instruments too. Some moving instruments can fall a little bit down on some positions. Deduct 1 point for every instrument that is NOT at eye level at any position.



Be careful: Score only the height – NOT the positions.

4.3.4 Sound Stage – Room Information (1 to 5 points)

Suggested Track 12: Technical Track for Width, Height, Distance and Room Information

This is the sense of space around the music created by room reverberations (aka echoes), in which the recording took place or created by the engineer.

Either way you should close your eyes and imagine the room size you are listening in.

Imagine the size of the room.

You should sense the size of the room and the reflections of the sound on the side walls, (left-right & front-rear) and the floor - ceiling. Within Track 7 the impression should be created that the rainmaker is far behind the Instruments in the center position and also many of the moving instruments are closer or more far away. This feeling of a room size the source for the scoring.

How to score:

Start with 1 point and add on the following points

- | | |
|----------|--|
| 2 Points | there is some room audible but not big |
| 3 Points | a room is to feel |
| 4 Points | a big room is audible |
| 5 Points | the impression of an extraordinary big room is audible |

A FEW THINGS ABOUT TONAL ACCURACY

PHASE

In the car we can detect phase differences, mostly from the passenger side.

Small phase problems: Most people cannot detect them as they are too small and you have to concentrate on details to spot them.

We can describe these problems in the same way as we do in **Medium**, but the effects described are a lot less hearable.

Medium phase problems: most people detect that something is wrong about the music, but cannot describe or explain what.

The music sounds like as if it is coming from further away, creating an ambience as if we were in a small or big church.

Or you feel that an instrument is moving forward or backward depending on the frequency. Some instruments sound natural, but some others sound unnatural, depending on the frequency.

Small or big emptiness in low frequencies are easier to detect.

A phase difference on only one frequency makes instruments sound unnatural on this frequency only.

It can also be that the same sound e.g. Floor Tom comes from Subwoofer with a time difference than from Midbass.

Big phase problems: are easier to detect as they make music sound completely unnatural and annoying.

We can describe these problems as in Medium, but on a superlative degree.

EMPTINESS IN SOUND

For the low frequency instruments, the Subwoofer and Mid-Woofer, Frequencies are responsible.

For human voices and mid frequencies instruments, the Mid-Woofer and the Midrange Frequencies are responsible.

For human voices and High Frequency Instruments, the Midrange and High Frequencies are responsible.

BASS & BASS DRUM

Most of the time, Bass Drum and Bass, hit at the same time in same or similar tones.

On well-adjusted systems you will be able to distinguish & separate them from one another. They affect the SUB & MIDBASS area.

ATTACK

Describes the feeling that the reproduction speed playing on the soundstage is according to the instrument playing. This means how fast the attack is coming and how fast it disappears and is no longer audible.

Some sounds come in very fast (snare, cymbal), while others come in, slower (piano, bass).

A good system is able to reproduce all of them very realistically.

DECAY

All sounds, even the most sharp ones after the initial attack/strike have a continuation of sound (decay - ambience) after they finish called Decay.

The slower sounds have bigger decay while the fast ones have smaller decay.

Suggested tracks to use for tonal Accuracy: 13, 14, 15 and 16

Every instrument & voice should sound very natural & distinct, without affecting the sound of another.

Track 13: Ocean Drive

Instruments:

Grand Piano, 6 & 7-string acoustic guitars, female voices, deep toms, hi-hat, wood block, cymbals, bass drum, different shakers, wooden agogo, electric guitar, bass trombone (processed), ocean drum

The track begins with an atmospheric introduction that gradually establishes the musical environment. In a properly adjusted system, the opening elements should appear clearly defined while maintaining a smooth and natural tonal balance.

As the arrangement develops, the rhythm section forms a solid low-frequency foundation (0:18). The bass line extends into the lower registers and should be reproduced with precision and control.

Judges should pay particular attention to the articulation of bass notes and the relationship between bass and percussion elements. In a well-balanced system, these components remain clearly separated without excessive resonance or masking of midrange detail.

From 0:40 the female voices are introduced, which blend in with the instruments without taking a central focus.

Supporting instruments are distributed across the stereo field, contributing to the perceived width and depth of the soundstage. Subtle ambient cues and reverberation help create a sense of space, allowing judges to evaluate the stability of the stereo image and the natural layering of musical elements.

Overall, this track provides a valuable reference for assessing low-frequency integration, spatial imaging, and the overall balance of a competition sound system.

Track 14: One Fine Day

Instruments: Hang Drum (handpan), male & female voices and choir, Ride Cymbals, African djembe, electric guitars, acoustic guitar, electric bass, double bass, Udu drums (big and small), triangle, cabasa, cajon, piano, Wooden tongue drum (processed as sound effect)

“One Fine Day (Competition Edit)” is a carefully produced modern studio recording created to demonstrate several key aspects of sound quality reproduction in a competition audio system. The mix combines a clearly recorded lead vocal with a well-balanced instrumental arrangement, creating a mix that allows judges to evaluate tonal accuracy, imaging stability, and overall musical coherence.

The track is an excerpt from the longer composition and begins with a relaxed intro where the instruments are gradually introduced. Absolute instrument separation and background silence form an ideal stage for evaluating overall spectral balance and noise floor. The lead vocalist enters at 0:29 and becomes the central focus of the recording. The voice should appear firmly centered in the soundstage and positioned slightly forward relative to the accompanying instruments. Its natural timbre and subtle dynamic details make it particularly useful for assessing midrange accuracy and vocal realism. A correctly tuned system will reproduce the voice with warmth, clarity, and controlled stability, while maintaining a stable center image. Behind the lead singer, the background choir spreads across the stage from mid-left to mid-right, with individual voices remaining distinguishable. Around 0:39, the rhythm section develops further as bass and percussion elements are introduced. The bass line forms a solid low-frequency foundation while maintaining clear separation from the other instruments. In a well-balanced system, the bass should sound tight and controlled, without boominess or masking of midrange information. Throughout the track, supporting instruments are distributed across the stereo field, Ambient cues and subtle reverberation contribute to the perception of space and realism. Overall, this track offers a balanced reference for judging vocal accuracy, spatial presentation, dynamics, and the overall musical integration of a competition sound system

Track 15: Coming Back to You

Instruments:

Drums, timbales, male & female voices and choir, electric bass, trumpets, tenor sax, alto sax, trombone, div. electric guitars, div fx Guitars, wah guitar, acoustic guitar, guiro, congas, cabasa, Hammond Organ, Bubble organ, Piano

“Coming Back to You” features a prominent lead vocal supported by a carefully arranged instrumental accompaniment.

The track begins with a relatively intimate musical introduction by the singer in a deep voice. The opening sequence should appear clean and natural, with no noticeable coloration or exaggerated frequency ranges.

The voice should appear clearly centered in the soundstage and positioned slightly forward relative to the accompanying instruments. The background singers appear left and right next to the singer. The choir is in the background. Judges should pay close attention to the natural character of the vocal timbre, including subtle articulation and breath details. A well-tuned system will reproduce the voice with clarity and warmth while maintaining controlled sibilance and a stable center image.

The supporting instruments provide harmonic structure and rhythmic support while remaining well separated from the vocals. Bass and percussion elements should form a controlled low-frequency foundation without masking the midrange. Instruments positioned across the stereo field contribute to the perception of stage width and spatial depth.

Overall, this track provides a useful reference for evaluating vocal reproduction and midrange accuracy.

Track 16: Should Have Done it Like This

Instruments:

male & female voices, Drums, tambourine, cowbell, handclaps, different electric guitars, acoustic guitar, electric bass, Hammond organ, trumpets, tenor sax, alto sax, trombone

The song has a steady rhythmic foundation with dynamic bass, allowing listeners to evaluate low-frequency performance and kick-drum impact.

The track opens with the deep singer's voice soon joined by electric guitars and the female voice. As additional synth layers and percussion are introduced, the mix becomes denser, which helps reveal how well an audio system maintains instrument separation and detail without sounding compressed or muddy. High-quality systems should reproduce these layers clearly while preserving the balance between bass, midrange, and treble.

The vocal performance remains central throughout the song. This makes the track effective for judging midrange accuracy and vocal presence, as the lead vocalist should sound natural, well-defined, and stable within the stereo image. During the chorus sections (2:03), the arrangement expands with brighter synths and stronger dynamics, offering a good test for soundstage width and high-frequency clarity. From 2:23 the trumpet (left center) and guitar solo (right center) should stay clearly separate from the other instruments.

Because the song maintains high energy while introducing subtle changes in arrangement and intensity, it allows listeners to evaluate how well a system handles dynamic range and transient response

4.4 Tonal accuracy (0 - 120 points) Suggested Tracks: 13, 14, 15 and 16

Sub-bass - 10 to 60 Hz (0 - 30 points)

Instruments: Double Brass, Tuba, Trombone, French Horn, Woodwinds, Electric Bass, Bass Clarinet, Contrabass, Bass Violin, Cello, Harp, Big Drums, Piano, Organ, Viola, Harp

Mid bass - 60 to 200 Hz (0 - 30 points)

Instruments: Voices, Bass, Brass, Tuba, Trombone, French Horn, Trumpet, Woodwinds, Clarinet, Oboe, English Horn, Alto Sax, Bass, Bass Clarinet, Contrabass, Tympani, Bass Violin, Cello, Guitar, Viola, Violin, Harp, Piano, Organ, Tambourine, Drums, Floor Tom, Harp

Midrange - 200 to 3000 Hz (0 - 30 points)

Instruments: Voices, Bass, Brass, Tuba, Trombone, French Horn, Trumpet, Woodwinds, Flute, Clarinet, Oboe, English Horn, Alto Saxophone, Bass, Strings, Cello, Guitar, Viola, Violin, Harp, Piano, Organ, Piccolo, Bells, Drums, Tambourine, Cymbals, High Hat, Ride, Shaker, Rattle Snake, Tom Tom, Floor Tom, Harp

High Frequencies - 3000 Hz to inaudibility (0 - 30 points)

Instruments: Voices, Woodwinds, Piccolo, Flute, Clarinet, Strings, Violin, Triangle, Brushes, Harp, Piano, Organ, Bells, Tom Tom, Cymbals, High Hat, Ride, Shaker, Rattle Snake, Harp

Use the following scoring guide to score Sub-Bass, Mid-Bass, Midrange, Highs, & Overall Spectral Balance.

- A 29 to 30 points. 98% to 99%** Joyful, amazing, wonderful, shuddering, unbelievable tuneful, substantial, sexy, full of emotion
Life Like - Completely Natural & Clear, Generate full feelings, emotions, shuddering, warm, inviting, relaxing sound, Voices/instruments breath, with space around them, 99% Harmonically & Musical,
All details are there, All Instrument tones are 100% Distinct & Separate, The s,x,f,c sound perfect,
The hardware disappears; nothing comes between you & the music, completely effortless sound
Full of endless Energy & Dynamics, All tones start & stop with great precision & energy.
Perfect Instrument Size, Real Vocals in full body with flesh and blood
- B 27 to 28 points. 95% to 97%** it feels extremely close to, but just a little bit less than the above
Very Close to Completely Natural & Clear, Generate almost full feeling, shuddering,
Extremely close to the above, Almost 99% Harmony & Musicality
Almost all details are there, All Instrument tones are almost 100% Distinct & Separate, The s,x,f,c sound almost perfect
The hardware almost disappears, Almost Effortless,
Almost full of Energy & Dynamics, Almost all tones start & stop with great precision & energy.
Very close to Perfect Instrument size, Real vocals with almost full body
- C 24 to 26 points. 90% to 94%** Everything is there in very good proportion, but just not good enough
A great deal of Naturalness & Clarity, generate a lot of feelings, no shuddering, a lot of space & atmosphere, but not enough, a great deal of Harmony & Musicality.
Most of the details are there, Most tones are very Distinct & Separate, The s,x,f,c sounds a little bit thicker or thinner than normal,
Wide open window to the sound, the hardware adds tiny coloration, little effort in a few tones,
A great deal of Energy & Dynamics, Most tones starts & stop with great precision & energy,
A little smaller or bigger Instrument size, Close to real vocals with close to full body
- D 21 to 23 points. 85% to 89%.** Almost everything is there in good proportion, but something is obviously missing, or is too much.
Fair Naturalness & Clarity, Generate fair feelings, Space is medium or little larger than normal, Fair Harmony & / or Musicality
A few details are missing, Most tones are almost very Distinct & Separate, The s,x,f,c sound thicker or thinner than normal
Almost open window to the sound, the hardware adds little color, Little Effort in a lot of tones.
Fair Energy & Dynamics, Some tones start & stop with great precision & energy
Fairly smaller or bigger instrument size, Close to real vocals with little less body.
- E 18 to 20 points. 80% to 84%** Sounds correct, but there are missing things or does not give much music feeling
Little Naturalness & Clarity, Generate little feelings, little space & atmosphere, little Harmony & / or Musicality,
A few details are there, a lot of tones are very Distinct & Separate, the s, x,f,c sound a lot thicker or thinner than normal.

A couple of tones behind a curtain, colorations more obvious, Fair Effort in a few tones, Little Energy & / or Dynamics, only a couple of tones start & stop with great precision & energy.
A few Instruments smaller or bigger size, Good vocals with half size body.

- F 15 to 17 points. 75% to 79%** Sounds nice but some tracks sound nicer than others.
Only some tones Natural & / or Clear, Generate feeling only in a few tones, Space & atmosphere only in some notes & / or instruments, Harmony & / or M in a few tones
Details only in few tones, a lot of tones are almost very Distinct & Separate, the s,x,f,c sound a little blur or whistling.
Some tones behind a curtain, colorations quite obvious, Fair Effort in a lot of tones
Energy & / or Dynamics in only a few tones, Acceptable transients.
A lot of Instruments smaller or bigger size, good vocals with very small or very big body.
- G 12 to 14 points. 70% to 74%** Sounds acceptable, nothing annoying but not so clear.
Not Natural but clean, generate feeling only in little tones, too much space, Harmony & / or M musicality in little tones,
Very little details, A few tones are Distinct & / or Separate, the s,x,f,c sound blur or whistling.
A lot of tones behind a curtain, many colorations, a lot of effort in a few tones
Energy & / or Dynamics only in a couple of tones, acceptable transients only in a specific range.
Quite smaller or bigger Instrument size, Acceptable vocals with no body.
- H 9 to 11 points. 50% to 69%** Sounds acceptable, almost nothing annoying
Not Natural but almost clean, no Feelings, no Space, or enormous Space, Almost No Harmony & / or Musicality
Almost no details, Little tones are Distinct & / or Separate, The s,x,f,c sound blur or whistling a lot.
The curtain is quite obvious, A lot of effort in a lot of tones,
Almost no Energy & / or Dynamics, Poor transients.
Half or Double size Instruments, almost acceptable vocals with no body.
- I 5 to 8 points. 30% to 49%** Sounds annoying in only some tones or tunes
Not Natural, some tones clean, some opposite feelings, Space & Atmosphere not easy to detect, No Harmony & / or Musicality
Hard to detect details, Almost no Distinction & / or Separation, the s,x,f,c sound harsh,
The curtain is heavy, Big effort in a few tones,
No Energy or Dynamics, Very poor transients,
Very big differences in instrument size, poor vocals with no or enormous body
- K 1 to 4 points. 1% to 29%** Sounds annoying in almost all tunes and tracks
Not Natural, bad feelings, Space not detectable, No Harmony & / or Musicality
No details, no distinction & separation, Hard to listen to,
The curtain is very thick & heavy, Big effort in a lot of tones,
No Energy & Dynamics, No transients,
Cannot detect instrument size, cannot detect vocal size.
- L 0 points. No Sound 0%**

Additional hints:

Mistakes or miss-adjustments in the crossover area should result to lower score on both e.g. Midrange and High Frequency sections
Never score 0 if there is a sound, and avoid going lower than (5 to 8) unless it is absolutely necessary.

4.5 Overall Spectral Balance (0 - 30 points)

Here we judge all the above (Sub, Mid-Bass, Midrange, & Highs) as a whole - as one thing. How all the frequencies - the entire bandwidth - are blended/combined together. How is the sound as a total? Are they well linked together, or not?

Overall Spectral Balance at higher volume (0 - 30 points)

The same as the above, but at 6db louder volume level.

If the sound is better than SB in normal volume, add 1 to 3 points, if not deduct 1 to 3 points. In case of bigger difference contact the head judge.

The suggestion to the judges is to step up the volume by at least 2 to 3 steps. This may vary from head unit to head unit.

Additional hints:

Although it appears so, Overall Spectral Balance is not a point average, given to Sub-bass, Mid-Bass, Midrange & High frequencies

Small point differences between Sub-bass, Mid-Bass, Midrange & Highs, gives a point result in Overall SB that looks like a point average of the above.

Big point differences between Sub-bass, Mid-Bass, Midrange & High frequencies can give a lot lower points in Overall Spectral Balance

Overall Spectral Balance scoring can never be higher than the highest point in Tonal Accuracy

Overall Spectral Balance scoring can be lower than the lowest point in Tonal Accuracy

Never score 0 if there is a sound, and avoid going lower than (5 to 8) unless it is absolutely necessary.

4.6 Listening pleasure (0 - 30 points)

It's the pleasure and joy that music can generate to the listeners.

Considering all musical tracks, score the following:

Naturalness	0 to 3 points
Harmony & Musicality	0 to 3 points
Atmosphere & Emotions	0 to 3 points
Clarity	0 to 3 points
Effortless sound	0 to 3 points
Dynamics & Energy	0 to 3 points
Distinction & Separation	0 to 3 points
Body of Voice & Instruments	0 to 3 points
Transparency	0 to 3 points
Details	0 to 3 points

How to score:

0 points for no Naturalness at all

- 1 points for little Naturalness
- 2 points for fair Naturalness
- 3 points for perfect Naturalness

Hints:

The scoring here seems to have a connection with the Overall Spectral Balance scoring. These 2 scorings are not directly connected, but the actual scorings cannot be far away from OSB under normal circumstances.

You must score listening pleasure from a different point of view.

Do you get pleasure from the music you are listening to? Or you do not?

Under most cases listening pleasure will score proportional to Overall Spectral Balance points at higher level. E.g. SB=20 points LP=18 to 20 points

It can be that a system not so good in SB gives some listening pleasure & can score proportionally a little higher. E.g. SB=18 points, LP=20 to 22 points

It is not realistic to score 18 on the Overall Spectral Balance and score 25 on listening pleasure.

It is not realistic to score 28 on the Overall Spectral Balance, and score 12 on listening pleasure.

A sound system that sounds very good or excellent, should be able to show it throughout the whole score sheet.

On a sound system that does not sound so good, you have to point this out in detail throughout the score sheet.

Never score 0 and avoid scoring below 5, unless it is absolutely necessary.

Even a bad (not a very bad) sounding car should score around 10 points.

4.7 Adjustments

Track 17: Zero Bit Track

Engine-off Testing - Switching Noise (-6 - 0 points)

Potential noises can be:

Turn-on / turn-off noise, switching pops -- a popping, thumping or clicking noise, that is heard through the system's speakers when the system is powered up by the source unit's on/off switch or switching pops - a clicking or popping noise that comes through the speakers when adjustments are made to the audio system's volume or track selection controls. Zipper, digital search, or stepper noises, which are inherent in some digital volume control designs, are beyond the scope of being corrected by proper installation techniques, but are not considered acceptable and will result in point deduction.

A noise that is emulated from or by the audio system, the vehicle or the vehicle environment and that is not recorded on the EMMA Sound Quality CD.

Potential noises can be:

Rush, hum, hiss, cracks, floor noise, rattling panels, loud fans, mechanical noise etc.

Points are not to be deducted for mechanical noises such as relay clicks or automatic motorized covers being activated.

How to score:

0 points	No audible noise
1 to -2 points	Barely audible noise
3 to -4 points	Audible noise
5 to -6 points	Disturbingly audible noise

Engine-on Testing (-6 - 0 points)

Turn off system. Turn on engine. Turn on system.

Noise that is generated by the mechanical/electrical system of the vehicle that is reproduced through the speakers with the audio system turned on / off.

Track 14 is used. The judges will adjust the volume level from medium to maximum. If the noise increases the judges may deduct maximum 6 points.

Possible noises are:

Alternator whine, ignition noise, PWM-noise created by control boxes, etc.

How to judge:

1. Turn off the system
2. Turn on the engine
3. Turn on the system
4. Turn on and off the lights, alarm lights, air condition, brakes, electric windows, etc.
5. Accelerate the engine

How to score:

0 points	No audible noise
1 to -2 points	Barely audible noise
3 to -4 points	Audible noise
5 to -6 points	Disturbingly audible noise

If noises are audible in some listening tracks (such as Track 7) but not in the zero-bit-track (noise gate), these other tracks can be considered for judging.

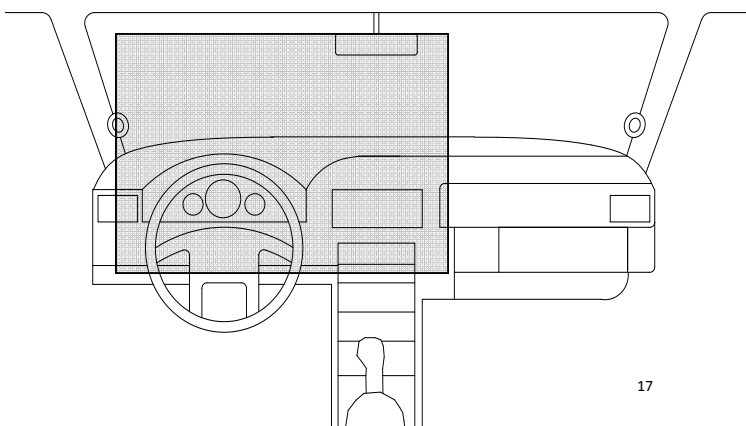
4.8 Ergonomics

System Handling (0 - 6 points)

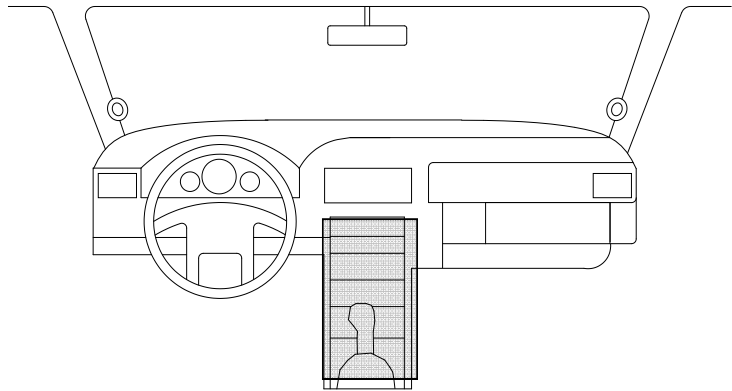
System Handling – Visibility (0 - 3 points)

All relevant information about the music track must be in the same area. Even if it is more than one display all Informations like, Track Title, Volume etc. have to be clearly visible for the judge.

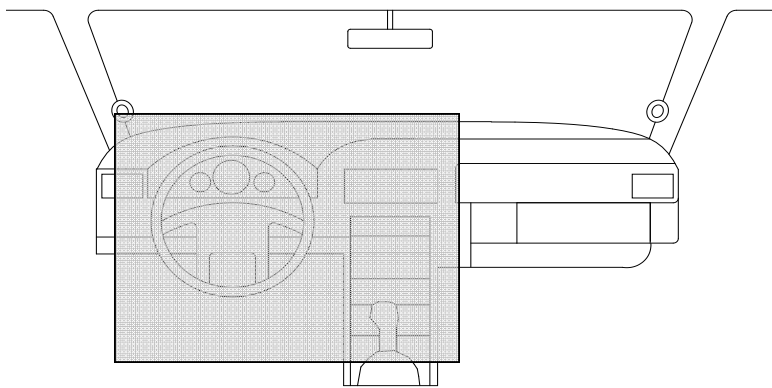
3 points when in this grey area



2 points when in this grey area



1 point when outside of this grey area



0 point for very bad visibility or NO display

System Handling - Control (0 - 3 points)

3 Points - Very easy to access and operate the system. (Extra Remote) Controls can be adjusted with hands on the steering wheel. (Extra Remote) control unit should be proper mounted (should not move when adjusting).

2 Points - Easy to access and operate the system. (Extra remote) control is installed and properly mounted (should not move when adjusting). A loose handheld remote control is not accepted.

1 Point - Easy to access and operate the system. No remote control

0 Points - Hard to access and operate the system. Source unit out of reach

LAST BUT NOT LEAST EXPLANATIONS TO THE COMPETITORS

The competitor will always receive a realistic description of the quality of his/her sound by the judges

Your conversation with the competitor should be done in a very kind & polite way.

Please choose your words in such a way that are not offensive for the competitor or his equipment.

The Judges should explain in a simple & fast way, the points that you gave for his system.

Your explanations should be done in a way that the competitor is able to understand the meaning.

The competitor may not know what a phase difference is and how many points deductions that causes. Never use brand names or installer's names while explaining.

Picture of the Instruments used:



Cabasa



Trumpet



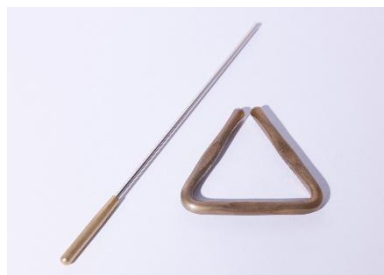
Conga



Sax



Tubular Bells



Triangle



Hammond organ



Alpenhorn



Tuba



Cowbell-big



Tongue Drum Wooden



Tambourines



Grand Piano



Drumset



Acoustic Bass



Flex-a-tone



Electric Guitar



Electric Bass



Flute



Shaker



Koshi



Deep Gong



cymbals



Wooden Agogo



Ocean Drum



Dobro



Hang Drum



African Djembe



Double bass



UDU Drums



cajon



vibraphone



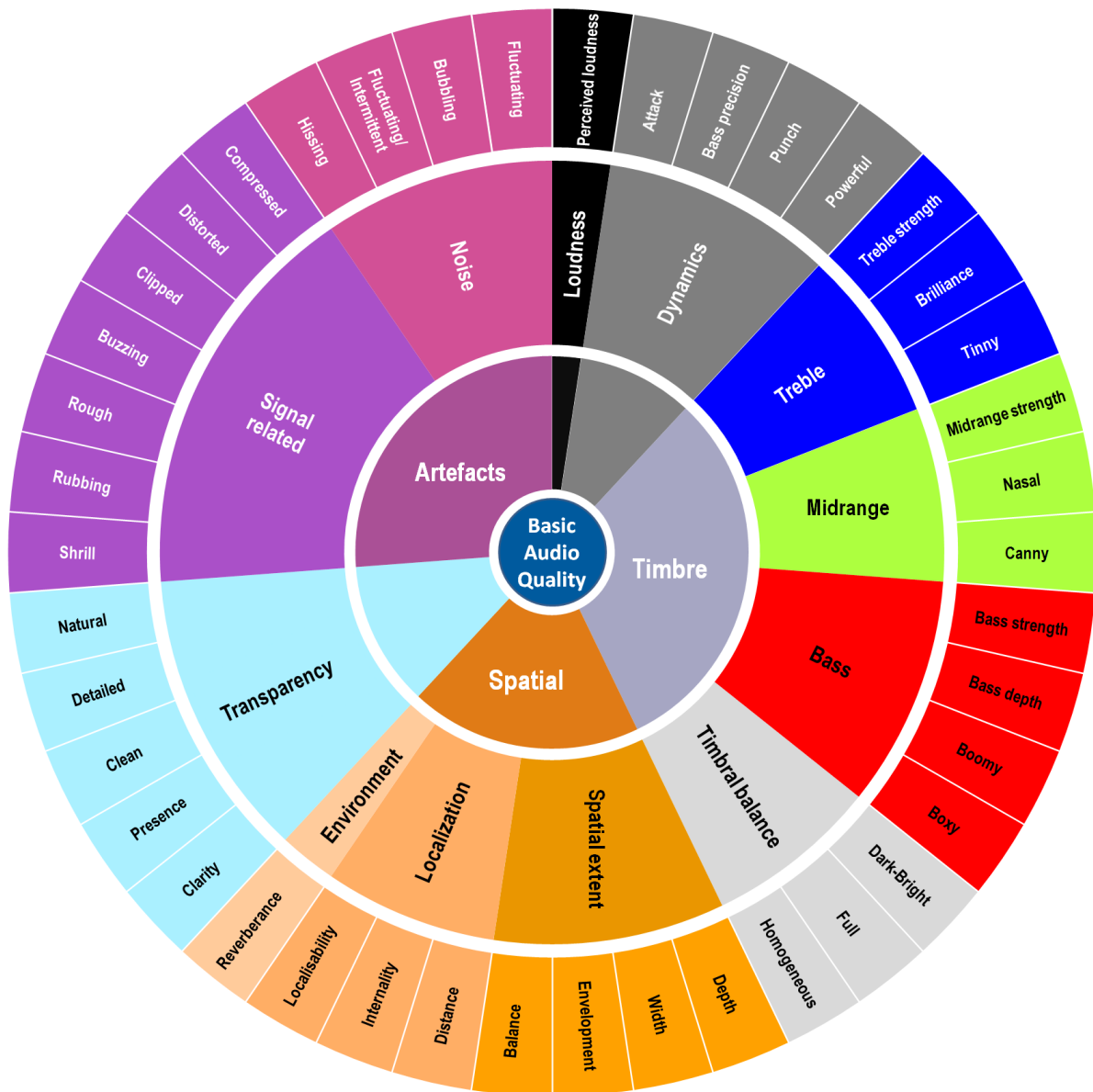
guiro

Thoughts about Music Reproduction

Reference: ITU-R Report ITU-R BS.2399-0

The complete paper can be found at the following link

<https://www.itu.int/pub/R-REP-BS.2399-2017>



Explanations of the terms for the judge to the participant

Attack	<p>Transient response. Specifies whether the drum beats and percussion, etc. are accurate and clear i.e. if you can hear the actual strokes from drumstick, the plucking of the strings etc. it is also expressed as the ability to reproduce each audio source transients cleanly and separated from the rest of the sound image. Imprecise Attack is understood as unclear or a muted impact. Scale: Imprecise – Precise</p>
Bass Precision	<p>Are instrument impacts from the bass drum and bass precise, crisp and without distortion, are the impacts tight and well defined? Bass precision may be defined as Attack in the bass region. Imprecise means that the attack speeds in time and the peak of the impact is softened. Scale: Imprecise – Precise</p>
Punch	<p>Specifies whether the strokes on drums and bass are reproduced with clout, almost as if you can feel the blow. The ability to effortlessly handle large volume excursions without compression (compression is heard as level variations that are smaller than one would expect from the perceived original sound). Scale: A little – A lot</p>
Powerful	<p>The ability to handle high sound levels, especially when striking the drums and bass. Indicates whether the Punch, Attack and Bass precision are maintained at high volume. Scale: A little – A lot</p>
Localisability	<p>The degree of precision to which the position and extent of a source or ensemble can be identified. This attribute is typically associated with sources or ensembles, rather than scenes. For a spatially imprecise sound the listener may be unable to identify the position (and extend) of the source or ensemble For a spatially precise sound, the listener can confidently state the position and extend of the source or ensemble. Scale: Imprecise – Precise A clap in a dry environment may be spatially precise. Listening to rain fall in a forest maybe spatially imprecise.</p>
Clarity	<p>The impression of how clearly different elements in a scene can be spatially distinguished from each other. Scale: Unclear-clear A singer and a piano performing a duet in a dry acoustic, may be perceived as clear. When listening to a choir from the rear of the church, the sound of the individual signers maybe unclear.</p>

Presence	Does it sound as if the sound sources are present and not distant or absent? Scale: A little – A lot
Clean	It is easy to listen into the music, which is timbral clear and distinct. Instruments and vocals are reproduced accurately and distinctly. The opposite of clean: dull, muddy. Scale: A little – A lot
Detailed	A well-resolved sound rich in detail. Instruments, voices etc. can easily be separated. The music has many details, details that cannot be measured, details that give the music "soul". It may be small audible nuances: Breathing from a singer, fingers wandering across the guitar strings, the flaps from the clarinet, embouchure sound of the saxophone, the impact from the piano's hammers when they hit the strings. Scale: A little – A lot
Natural	Sounds reproduced with high fidelity. Acoustic instruments, voices and sounds, sounds like in reality. The sound is similar to the listener's expectation to the original sound without any timbral or spatial coloration or distortion, "Nothing added – nothing missing." The soundstage is clear in space and brings you close to the perceived original sound experience. Scale: A little – A lot
Shrill	Treble Distortion. Very sharp s-sounds, cymbals etc. Scale: A little – A lot
Rubbing	As the sound of something scraping on a (rough) surface. Scale: A little – A lot
Rough	A hoarse off-sound unintentionally accompanying the reproduced sound. Bass distortion. Scale: A little – A lot
Buzzing	A zzz-like, undesirable sound typically in the low and midrange frequencies. Scale: A little – A lot
Clipped	The harmonics are too pronounced and sharp. Scale: A little – A lot
Distorted	Additional and undesired sounds that add a sharpness to the reproduction. Scale: A little – A lot
Compressed	Limited dynamic range leading to a lack of natural peaks. Dynamic compression may be heard as a pumping effect. Scale: A little – A lot