

NEW!

BIAS⁷

**INSTALLATION GUIDE
FOR WINDOWS 7/8/10/11
AND FIRST START UP**



© COPYRIGHT 2016 BY ARTIM GMBH

BIAS IS A PRODUCT BASED ON RESEARCH PROJECTS DONE AT THE INSTITUTE OF MUSIC ACOUSTICS
AT THE UNIVERSITY OF MUSIC AND PERFORMING ARTS VIENNA

CONTENT

INTRODUCTION	3
What you should know	4
Packing list	5
Rubber mats and centering devices	6
 SOFTWARE INSTALLATION	
Software installation	7
Creating a User Account	8
Creating Accounts for the staff	9
Personalized password by staff members	9
 HARDWARE - FIRST USE	
Measurement head first use - Windows settings (NEW)	11
Starting the Diagnostic-Program (NEW)	11
Mounting the mouthpiece / Changing the mouthpiece	12
 IMPORTANT HINTS	
Hints for measuring	15
Air temperature and intonation	19
 RECALIBRATION OF YOUR BIAS SYSTEM (NEW)	21
 INSTRUCTION MANUAL "TRANSIENT WINDOW"	25
What does it show?	26
Elements of the window	27
Frequently asked questions	28
Displaying the starting phase	31
Important Hint	32
Background information	33
Making notes audible	35
 Contact	37



BIAS 7
Brass Instrument Analysis System

BIAS 7 consists of hard- and software and offers the user modern computer tools for the diagnosis and therapy of wind instruments.

BIAS 7 helps with its diagnosis tools of the „**Basic Edition**“ in a simple and comfortable way with the evaluation and improvement of the intonation and response of the instrument..

The "Physical Modeling Tool" of the „**Extended Edition**“ enables you to create a computer model of the instrument. With such a model you can forecast the consequences of intended modifications -for example at the leadpipe- on the intonation and response of the entire instrument without the need to execute these modifications in reality.

With the "Optimizer" of the „**Professional Edition**“ you can improve the intonation and response of instruments, or modify all its properties according to the demands of an individual player, or even design a complete new instrument. BIAS is suitable for the new design of an instrument as well as for reparation and quality control.

With the software package „VIAS“ of the „**Enterprise Edition**“ the user is completely free concerning the kind, frequency range and duration of the excitation signal and the data processing of the results. Additionally VIAS provides the option for quality control measurements for the evaluation of **stringed instruments**.

BIAS 7 is able to measure also **woodwind instruments**. The necessary software extension pack for this feature is already included in the Professional Edition and Enterprise Edition. Other editions can be upgraded.

BIAS was developed in cooperation with the Institute of Music Acoustics (Wiener Klangstil) of the University of Music and Performing Arts Vienna and is the worldwide leading computer tool for the evaluation and improvement of the quality of musical instruments. It is used by instrument makers, instrument making schools, retailer, museums, universities and research institutes in **Austria, Germany, Switzerland, Italy, Czech Republic, France, Belgium, Netherlands, Great Britain, Scotland, Norway, USA, Chile, Brazil, Japan, Taiwan, Korea, Hongkong und China**.

BIAS 7 continuously gets enhanced and maintained. For the case of problems you can be sure to get an eligible help.

Thank you for the decision to use BIAS!

WHAT YOU SHOULD KNOW...

- Your BIAS software is calibrated to the individual electric and acoustic properties of your BIAS measurement head.
- With the purchase of BIAS you are authorized to download any time without any charge updates of your software version from our server at www.artim.at
- After the first BIAS installation all features of BIAS (also those you didn't buy) can be used 60 days for free. This means, for the first two month you own an **Enterprise Edition**.
- BIAS 7 has a presetting which causes a shutdown after 2 years with 31st January. Download than your newest individual version from our server www.artim.at and install it. This only needs about 3 minutes.
- For the download you need your "product number" and your email address. The product number you find at a sticker on the second page of the printed handbook.

We implemented this function:

1. to ensure that you always use the newest BIAS version
 2. to prevent illegal use by non operating people from outside
- You can upgrade to a higher Edition any time by payment the difference to the next higher edition.

- BIAS 7 runs with:

WINDOWS 7, WINDOWS 8, 10 and 11.

New: BIAS 7 also runs with Apple Mac OS X with the help of Apple BootCamp, Parallels Desktop or VMware Fusion.

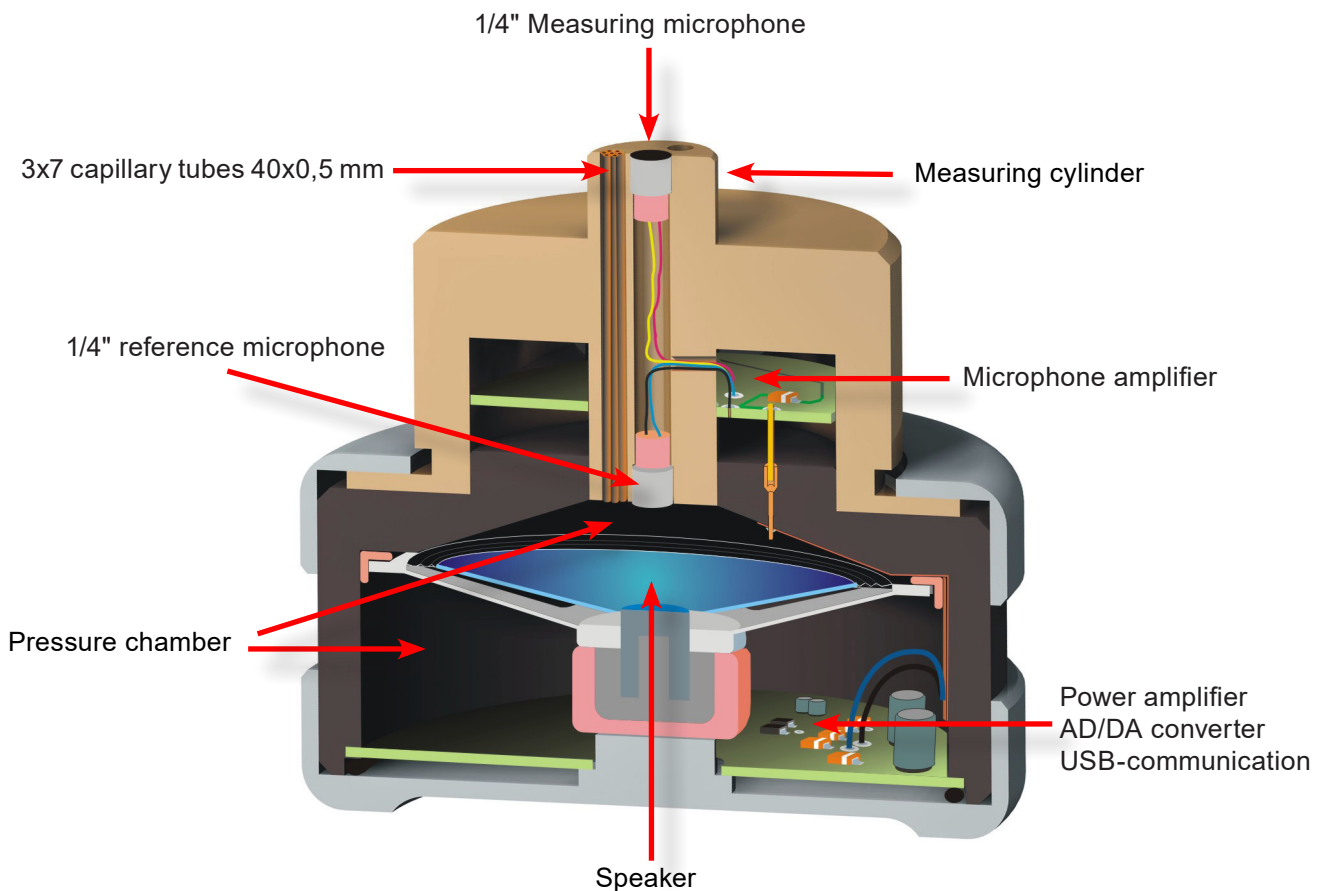
PACKING LIST

The following items are included in your BIAS package:

- 1 USB stick with the software
- 1 measuring head
- 3 polyamide centering devices for fixing mouthpieces of different sizes and shapes.
- 6 rubber discs with 1, 1.5, 2, 4 and 8 mm thickness, one of them with hemisphere. Needed to simulate the volume reduction by the player's lips in the mouthpiece cup.
- 1 USB-C to USB-A connector cable
- 4 handbooks

- 1 calibration tube (300 mm, \varnothing 15 mm) with adapter

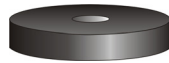
- 1 Polyamid calibration device with 2 calibration volumes

THE MEASURING HEAD

RUBBER MATS - CENTRING DEVICES

6 rubber mats are included to adapt mouthpieces of different sizes.

1x 8 mm



Trumpet, horn,
cornetto, etc.

1x



Trombone, Tuba

4x



Various thickness
1, 1.5, 2 and 4 mm

The effective volume of the mouthpiece cup influences the overall intonation of the instrument:

Smaller volume = higher overall intonation

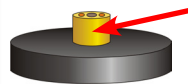
Bigger volume = lower over-all intonation

The effective volume of the mouthpiece is reduced whenever the player introduces his/her lips into the mouthpiece.

This effect is simulated by extending the measuring cylinder inside the mouthpiece.

This effect depends on the individual form of the lips. The rubber mats can only approximate this effect.

The rubber mat serves as contact surface for the mouthpiece. It has two purposes: 1) It prevents damage to the surface of the mouthpiece rim, and 2) It ensures that the connection between the mouthpiece and the measuring head is air tight. The mats are made in such a way, that depending on which mat is being used, it produces a specific volume reduction of the mouthpiece cup. It **simulates** the **volume reduction** of the mouthpiece cup caused the player's lips inside the mouthpiece.



Portion of the measuring cylinder that extends into the mouthpiece: It roughly compensates for the volume reduction effect caused by the the player's lips inside the mouthpiece cup.

The four mats with a thickness of 1, 1.5, 2 and 4 mm, can be placed additionally under the other mats, to decrease the compensation effect, up to the point where there is no volume compensation (flat surface between the measuring cylinder upper edge and the rubber mat surface).

Centring devices

The provided centring devices made of Polyamid are used to fix the mouthpiece into the measuring head. With exception of mouthpieces with extreme shapes (e.g. baroque mouthpieces with decorated shaft), these should be sufficient enough. They can be used in both ways (top and bottom interchangeable), or scooped bigger if needed.



SOFTWARE INSTALLATION

- Connect the USB stick to your computer

If that is not the case because e.g. this Windows autostart feature is disabled double click the following file on the USB stick and follow the instructions:

- **BIAS_V7.0.1_Build.334_ABC1234.exe**

(the grey capitals mark your individual product and version number)

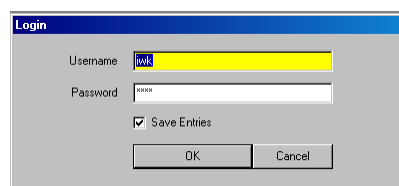
For the case that an already validated BIAS version was installed on this computer before, the request for a username and serial number is skipped.

- If you install BIAS the first time on your computer you are asked to enter the "user name" and the "licence code" (serial number). You find both on page 2 of the printed version of your handbook "INSTALLATION GUIDE FOR WINDOWS 7/8/10 and first start up" and additionally on the USB stick in the file:

- **BIAS_V7.0.1_Build.334_ABC1234-Licence.txt**

With this action the installation process is finished!

For the case that the box "Start BIAS" was marked, the Login window appears. Simply click on "OK"



- For the present simply click on "OK". Don't enter your name or any new password now because a default username "**iwk**" and the default password "**bias**" is already provided. On the following pages you will learn how to easily and quickly create your own account and accounts for employees / students.
- To continue **close now the BIAS software!!**

CREATING A NEW ACCOUNT

- First of all we recommend to create your own account and password. Although if you are the only one who use this computer and therefore it seems no need to use an own password instead of the default password, it makes sense to have your own BIAS account, because BIAS records who is logged in and enters its name (user name) into the comment field of the measurements and adds the name to possible print outs.



- For the case BIAS is still running, **close now the BIAS program!** Use the Windows Start button to start the "ADMIN-Software"

- Enter the administrator-name "**admin**" and the administrator-password "**0000**" ("Cero" not "O").

- If this window appears, simply click on OK.

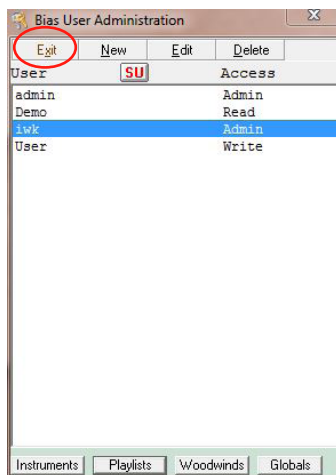
User	Access
admin	Admin
Demo	Read
iwk	Admin
User	Write

- To create a new account click on "**New**" and a new window appears, where you can enter the user name and password.

CREATING A NEW ACCOUNT

Enter the new user name
 Enter the new password
 Retype the new password

Important! Don't forget to mark the checkbox "Admin"! Thereby you get administrator rights. This is necessary if you want to change settings.



Read: The user can access instruments, display, analyse and measure, but cannot save the measurements. The same situation applies for the simulation: the user can simulate, but cannot save the result of the simulation. The user cannot delete any existing measurements, simulations or instruments.

Write: The user can use all features from BIAS, but cannot start the Administrator program.

Admin: This user has all user rights from BIAS and from the Administrator program.

- When you have finished, click on the "OK" button. Clicking the "Cancel" button will abort the action. Nothing will be saved.
- To close the Administrator program click on "Exit".

● CREATING AN ACCOUNT FOR MEMBERS OF YOUR STAFF (PASSWORD SECURITY - PASSWORD PROTECTION)

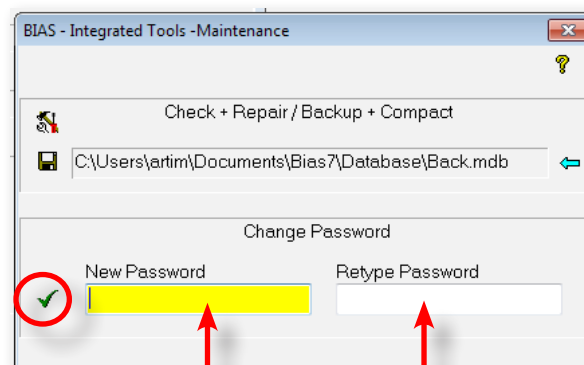
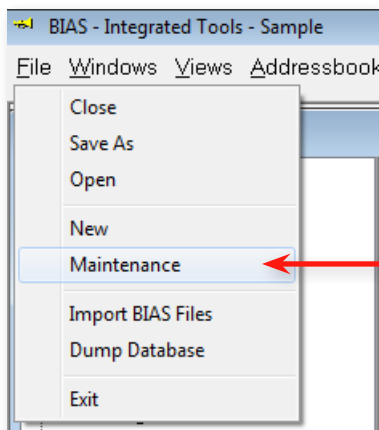
- After a new user account has been created, the administrator notifies the password to the new user.
- The new user has the possibility to change his password **after accessing BIAS for the first time**, so that nobody apart from himself knows it.

CREATING A STAFF ACCOUNT

TO CHANGE A PASSWORD (FOR STAFF USERS):

- Start BIAS with the new password told by the administrator

- Click on the command: File -> Maintenance



- Type the new password and retype it
- Click on the green tickmark


DONE!

This procedure guarantees that nobody knows other people's passwords.

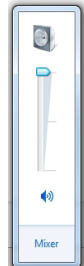
The administrator nevertheless can withdraw a user's right to work with BIAS, by simply deleting his user account.

MEASUREMENT HEAD - FIRST USE

1 After the installation of the BIAS 7 software **close the BIAS program!**
At this point the measurement head **should not be connected** to the computer.

 Click with the **left mouse button** on the loudspeaker symbol at the right end of the Windows task bar. Check if the slider is at the 100% position. If not, set it to 100%.

2 Connect the measurement head to an USB port of your computer (You don't need the BIAS Software because the identification of external devices is a task of the Windows 7/8/10 and 11 operating system). Give the operating system some seconds to identify the device.



Now start the BIAS Software. BIAS is ready to measure.

Note that Windows 10/11 no longer centrally manages USB ports for security reasons. The next time you plug the measuring head into another USB port of your PC, the measuring head will be regarded as a "new device". To save time, it is easier to always use the same USB port.

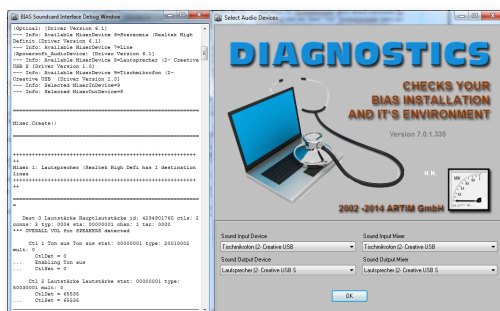
TROUBLESHOOTING

If problems arise, contact Gregor Widholm widholm@mdw.ac.at or Wilfried Kausel kausel@artim.at.



With the BIAS DIAGNOSTICS-Software we can check your BIAS installation and its software environment. "Diagnostics" sends the results by email automatically to us. DIAGNOSTICS transmits 2 log-files with the commands performed by BIAS, the current active BIAS-INI file, the output- and recorded response signal and the calibration data. DIAGNOSTICS runs with most of the common email clients..

- Shut down BIAS and ensure that the measurement head is connected to the computer!
- Use the Windows Start Button (-> all programs -> BIAS 7 -> "**Diagnostic**")



- When the Start screen appears check the 4 selection boxes if the correct sound device is selected and click on "OK". **The measuring head should show up as "USB Audio Codec".** Input: "Line [USB Audio Codec]", Output: **Speaker [USB Audio Codec]**". The exact name may be slightly different depending on your Windows version.

The program starts a test run and collects all relevant data. Only the BIAS and VIAS related function data are sent **and nothing else!**

- afterwards click on the button "Send by Mail"

-Your email client starts and sends an email to Dr. Kausel with all the relevant files already attached.

MOUNTING THE MOUTHPIECE

● To mount a mouthpiece into the measuring head:



Insert a rubber mat on the measuring cylinder.



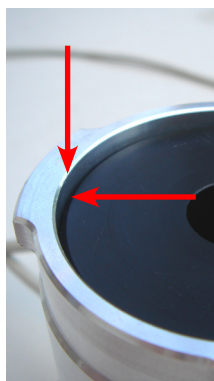
Place the clamping sleeve on the brass piece and screw clockwise. You do **not** need to screw **all the way down**.



Place the mouthpiece on the rubber mat.

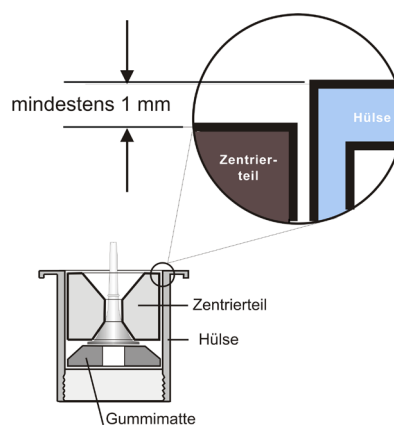


Put the centring device over the mouthpiece



Before placing the bayonet cover on the clamping sleeve, make sure that the top edge of the clamping sleeve is **approximately 1 mm or more** over the top edge of the centring device (see pictures).

This ensures that the bayonet cover will **grab** the mouthpiece **properly** when the clamping sleeve is screwed.



MOUNTING THE MOUTHPIECE



Hold the clamping sleeve with the left hand, and place the bayonet cover on the clamping sleeve. Turn clockwise slightly **until it stops**.



Now hold the **bottom of the measuring head** with the left hand, and turn the bayonet cover clockwise, until the mouthpiece is firmly pressed on top of the rubber mat.

CHANGING THE MOUTHPIECE

Changing the mouthpiece

Opening the measuring head is easy:



- Hold the **clamping sleeve** with your left hand (**not the bottom end of the measuring head!!!**) and turn the bayonet cover with the right hand counter clockwise.



- When you hear a clear "click" you can take the cover off.



- Now pull out the **mouthpiece together with the centring device**. You can now insert the new mouthpiece together with the centring device.

HINTS FOR MEASURING

Centring devices:

You have received three centring devices with different diameters.

The piece with the smallest diameter can be used for horns, trumpets, and small trombone mouthpieces. You can use this piece with the smallest diameter facing downwards to connect horn and trumpet mouthpieces, but for trombones, simply turn the piece up side down.

With some tuba mouthpieces (because of the bulging shaft), and particularly the **"Heavy" models** of trumpet mouthpieces, this centring piece is too small. The other two centring pieces with bigger diameter are included for this purpose.



Concerning mouthpieces having a detachable rim, take care of the following:

If the mouthpiece stays attached to the measuring head, and you only need to change instrument, the mouthpieces (together with the measuring head) are usually fixed by turning them slightly, so that the mouthpiece shaft is secured in the bore of the instrument.

The rim of the mouthpiece can loosen in this way, depending on the turning direction of the mouthpiece shaft!

Hence, you unintentionally screw the rim of the mouthpiece from the mouth piece cup!

When changing instruments repeatedly, it can happen that you introduce measuring errors due to a loosen mouthpiece rim and therefore a volume alteration of the mouthpiece cup.

HINTS FOR MEASURING

Some tips for positioning the instrument, and about the measuring environment.

- Basically, you should place the instrument to be measured on a soft mat, to avoid vibration and disturbing body noise.
- Or you can hold it roughly in playing position.
- Measurements can be done in normal rooms. But please make sure that there are no **plain, reflecting surfaces** near the bell of the instrument. Plain walls reflect the sound waves back into the instrument, and since the standing waves inside the instrument have a relatively small amplitude, additional reflections (or also background noise!) can affect the measurement.
- If you cannot avoid having such plain walls near the bell of the instrument, you have to measure the instrument always in **exactly the same position**, to make sure that the measurements are comparable.
- The bigger the bell, the stronger the influence of noise in the room. While the influence of background noise with trumpets is rather small, background noise can influence measurements with tubas considerably. A variation of intonation of up to +/- 5 cents can be found when repeating measurements with tubas.
- It is recommended to measure tubas with **VIAS**, as with this program it is possible to correct measuring errors.



Make sure that there is no water inside the instrument!

Water flowing through the mouthpiece inside the measurement head can destroy it!

HINTS FOR MEASURING

HORNS

can be measured either in "playing position or placed on a soft mat.

Place the mouthpiece in the measuring head. Then connect the mouthpiece (already attached to the measuring head) to the instrument.



It makes a difference if you measure the horn with a hand in the bell (that is, as it is usually played) than without hand.

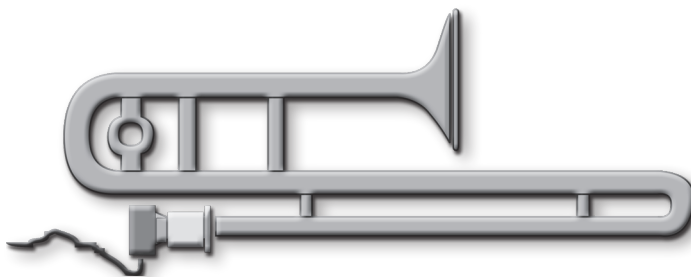
Whenever the hand is inserted in the bell during a measurement, the pitch will be lower, and the impedance peaks in the range above 500 Hz will be higher (which proves the importance of the hand to the playing precision in the high register). In this case, the reflecting walls near the bell are irrelevant. When the measurement is done without a hand, the distance between neighbouring walls should be at least 3 to 4 meters.

Measurement without hand: gives the objective intonation that the instrument itself "offers".

Measurement with hand: corresponds more closely to the way the instrument is played, as well as the intonation that the musician perceives.

TROMBONES, TUBAS

Either hold the instrument in normal playing position, or place over a foam mat.



Minimum distance
to nearest wall: 3 to 4 m



Minimum distance: 4 to 5 m

Whenever possible, make sure that the bell is not parallel to a reflecting plain wall!

HINTS FOR MEASURING

TRUMPETS:



Trumpets can be measured simply inserted into the measuring head, or held in playing position.

Minimum distance from the bell to a plain reflecting wall (or ceiling): 2.5 to 3 meters.



Condensed water inside the instrument inevitably produces measuring errors, and can damage the measuring head.

The capillary tubes are particularly sensitive! If water gets in them, you will have to wait until it evaporates (usually **one week**) before measuring again.

Blowing out with air pressure will push the water towards the pressure chamber and speaker membrane. We discourage you from doing this!

TRUMPETS and FLUGELHORNS:

Please make sure that there is **no water in the slides**! Due to the position of the instrument while measuring, also water from the slides can get into the mouthpiece!

HORNS, TROMBONES and TUBAS:

With these instrument, condensed water in the slides is not dangerous. Due to the position of the instrument while measuring, the water can usually not get to the mouthpiece area.

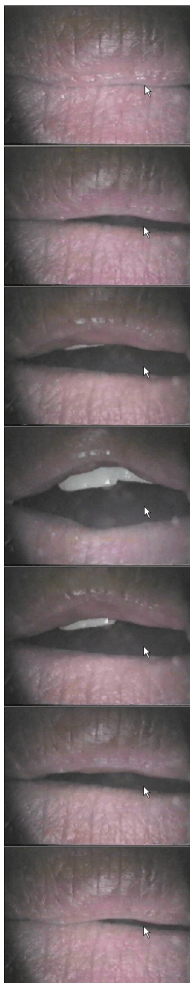


When measuring instruments with large bells, avoid placing the instrument near a ventilator or air conditioning device, as the noises and regular air movement produced by such appliances can cause measuring errors.

INFLUENCE OF THE ROOM TEMPERATURE

Playing a note, the lips of the musician open and close like a valve. For an $a=440$ Hz they open and close 440 times per second, in the case of a high C even 1000 times per second! With each "opening" additional air is pushed into the mouthpiece and causes there an (over) pressure pulse. This pressure pulse forms together with the subsequent pulses a (sound) wave which travels along the tube to the end of the bell with a speed of about 345 m/sec (depends on the temperature). At the end of the bell about 90-85% of the sound wave (energy) is reflected and travels back to the mouthpiece. In this manner a "standing wave" is established and a "note" can be produced (natural tone or harmonic).

This only works if the time span of one period of the lip-valve (= opening and closing) exactly matches the time span needed by the sound wave for travelling from the mouthpiece to the bell and back! Or the period of the lip movement is an integer part of the travelling time of the wave. To produce a note, the lip valve always has to adjust the speed of its movement according to the travelling time span given by the sound wave. If the room temperature is higher, the sound speed rises and the wave is earlier back again at the mouthpiece. The travelling time is shorter, therefore the lips have to move faster which means a higher frequency and this results in a higher note! One also could state: at a higher temperature the instrument seems to be shorter. Therefore the room temperature influences the "effective acoustic length" of the instrument.



One period of opening and closing of the lips playing a tuba.

Influence of room temperature on the measurement

The temperature affects the "effective acoustic length" of the instrument. When it is warmer, the speed of sound increases, and the instrument **will appear shorter**, therefore the overall intonation will increase, and vice versa.

When measuring the same instrument at very different room temperatures, it is normal that the impedance peaks are shifted left and right on the frequency axis, and that therefore the overall intonation (pitch) of an instrument differs from one measurement to the next.

Theoretically, the intonation of an instrument varies 3 cents per degree Celsius (independent from its length!).

This is not the case in practice, because during playing there is a temperature gradient between the mouthpiece and the bell, which is strongly dependant on the length of the instrument and the amount of air blown into it.

The breath of the player enters the instrument at a temperature of approximately 36 °C. Depending on the ambient temperature and on the heat conductivity of the material, the air will cool down (which is why condensed water appears on the leadpipe area!).

As during a measurement with BIAS, the effective temperature is that of the room, and not the approximately 36°C from the breath of the player, the overall intonation of the instrument appears always **somewhat flatter** than when it is continually excited by a human player.

Examples for intonation alteration per °C:

Trumpets	1,2 - 1,5 cents per ° Celsius
Horns, trombones	1,5 - 2,0 cents per ° Celsius
Tubas	3,0 - 3,5 cents per ° Celsius

AIR TEMPERATURE AND INTONATION

What affects the intonation of an instrument?

- **1. The individual constitution/shape of the player's lips.**

Depending on how deep the lips of the player enter into the instrument, the effective volume of mouthpiece cup will change.

Smaller effective volume = higher over all intonation = pitch more sharp!

The BIAS measuring head is designed in such a way, that the measuring cylinder enters into the mouthpiece, diminishing the effective volume of the mouthpiece cup. You can choose how deep the measuring cylinder will enter into the mouthpiece cup, by selecting different rubber mats (see page 6).

Because of the individual lip shape an instrument can show a different pitch with different players (a difference up to 50 cents!). Therefore, a measurement can only simulate the playing conditions approximatively.

- **2. The air temperature.**

The air temperature inside the instrument determines the speed at which the sound propagates, which in turn affects the intonation of the instrument.

But the room temperature also plays a role: It is usually lower as the temperature coming from the breath of the player, therefore it cools down the air inside the instrument.

- **3. The heat conductivity of the instrument walls.**

With a thin wall (e.g. 0.25 to 0.3 mm for a Horn), the air inside the instrument will be cooled down more than with a thick wall.

- **4. The length of the tube and it's cross section.**

In principle the length of the tube determines the pitch of the instrument and the frequency of the playable notes.

The cross section (the inner diameter of the tube) has an influence on the pitch too. An instrument with a wide diameter has - compared with an instrument of the same length but with a narrow cross section - a higher pitch.



Because for better comparison, BIAS converts for a certificate print out the current intonation values for a notional room temperature of 21°C. Regardless of the actual room temperature during the measurement!

CALIBRATION PROCEDURE

RECALIBRATE BIAS IN 2 MINUTES!

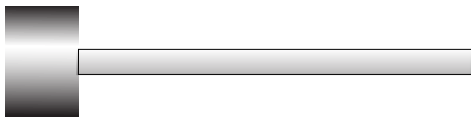
BIAS 7 includes a software module that allows you to recalibrate the system in just 2 minutes. Why did we create this feature?

The 1/4 or 1/8 inch microphones used in BIAS have the advantage of being quite insensitive to overload, in addition to their small size. The disadvantage is that, compared to microphones with a larger diaphragm, they sometimes react a little more strongly to changes in air pressure caused by the weather than the larger versions. In some cases, this can lead to a slight deviation in frequency and/or amplitude compared to earlier measurements in perhaps other weather conditions.

Therefore, if you want to be 100% sure that the measured values are "absolute values", it is recommended to perform the calibration described below.



Calibration device (Polyamid) with 2 air volumes:
 - top: 3 mm depth and \varnothing 15 mm.
 - bottom: 1 mm depth \varnothing and 15 mm.



Tube for extended calibration. Length: 300 mm, \varnothing 15 mm.
[OPTIONAL]

Polyamid adapter as centering device with steel tube for control purposes.

1 Place the 2 mm and the 8 mm rubber mat on the measuring cylinder to create a flat surface.

Place the calibration device on top with the **smaller volume facing down** and close the measurement head tightly.

2 Connect the measurement head with the PC.
 Start BIAS 7 and open the Acquisition-Window (Measurement-Window).



Click on the "Calibration-Icon" of the icon-bar on top left of the Acquisition-Window.

CALIBRATION PROCEDURE

3 You now take 2 measurements: **first the small volume**, then you turn the calibration device around and measure **the larger volume**. With a click on the "Close" button you have successfully completed the calibration procedure!

- Use the **default values**, only enter the current **room temperature in °C** . in the "Temp input" field.
- Click on the "Measure" button.
- Now turn the calibration device around and do the same with the larger volume.
- Complete the procedure by clicking the "Close" button.

BIAS takes the measurements of the two volumes, relates them to the two simulated impedance curves and calculates the corresponding calibration matrix.

[OPTIONAL]: You can check the result of this kind of quick calibration by measuring the enclosed calibration tube and comparing it with a simulation of that tube. This is also possible within the Acquisition window. To do this, you must first create an instrument in the database in the "Tube" category and enter the following data by clicking on the button "Geometry"



[^]X	[^]Y	Loss	°C
0	15	1	20 (current room temperature)
300	15		

CALIBRATION PROCEDURE

From now on you measure with the new calibration.

If you want to return to the original calibration - for whatever reason - there is only one way: Click on your last BIAS installation file and simply install BIAS over the current version.

If you have been working with a database you created yourself (see BIAS7 software manual page 54), you do not need to do anything else.

However, if you have previously worked with the "sample" database supplied with BIAS when it was installed, this would be overwritten during installation and your measurements saved up to that point would be lost. To prevent this, the installation software saves the "Sample" database under the current date as Database name and you can call it up again with 2 mouse clicks (command "File" -> "Open").

We recommend after the first start, trying out and finding your way around, to simply rename the sample database! This is only 2(!) mouse clicks (command "File" -> "Save as") and you have both, the samples and your own measurements available and avoid this way problems with updates or new installations.

Info on the additional options of the calibration window that have not yet been discussed:

Gradient: indicates the temperature decrease starting from the warm breathing air at the mouthpiece to the end of the bell (ambient temperature).

Expert Mode: allows to create individual geometries (e.g. various adapters) for the simulation.

Range: allows to define a low (or high) frequency band for special calibration.

Simulation Model: offers various models up to multimodal simulation including 23 partials.

Bore grid: sets grid points where the diameter modifications are made during the simulation.

No cones: not relevant for calibration purposes

Material: offers various materials with different damping properties. Under "Custom" individual materials can be created - if the corresponding data is known.

Standard (Levine): best suited for conventional wind instruments

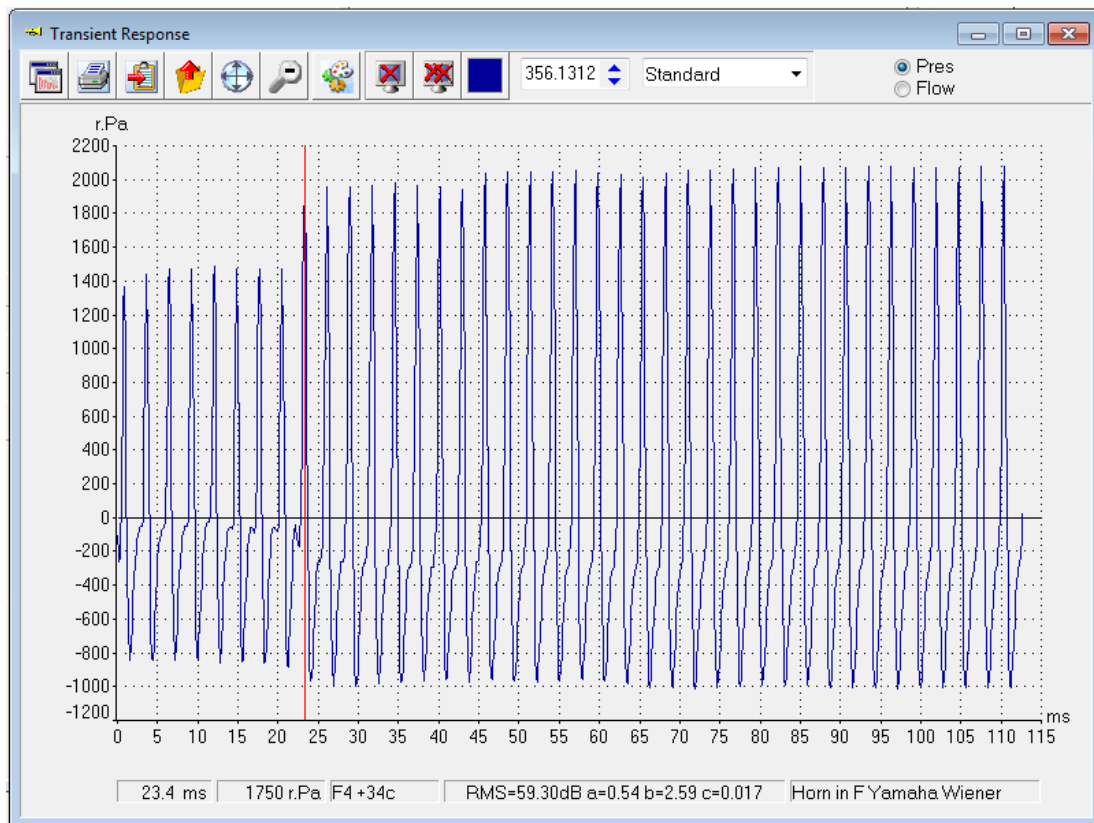
Baffle (Zorumski): recommended for multimodal simulations

Pulsating sphere: especially recommended for bell simulations

Control: opens the window for the sound card settings and the selection of the calibration matrix and the WAV file with which the excitation is performed during the measurements.



TRANSIENT RESPONSE WINDOW

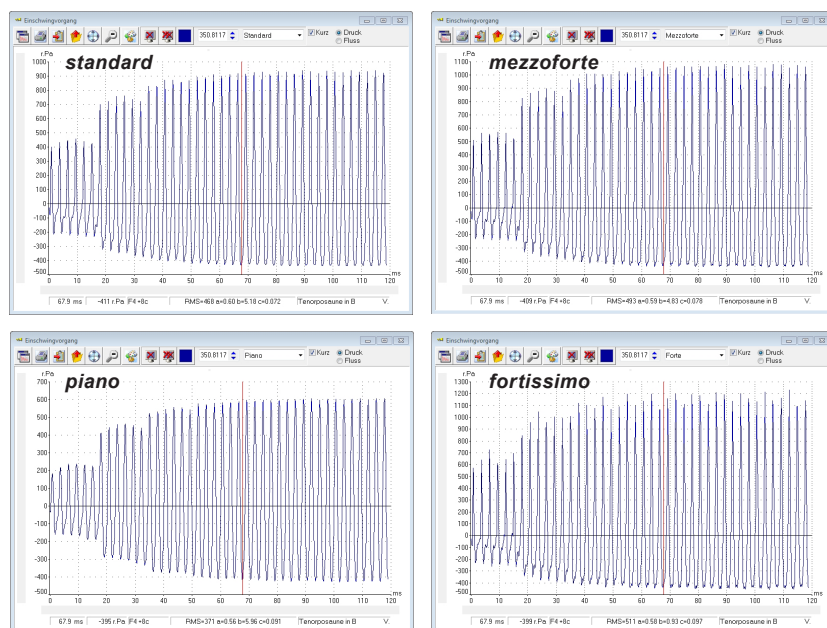


What does the window show?

- the **beginning of the note** (=starting transients) of any selected note (here it's an f^{\sharp} of a trombone in Bb). It shows the evolution of the sound-wave (standing wave) over time, if such a note is played on this instrument with given intonation. Four different dynamic levels are selectable: *standard*, *piano*, *mezzoforte* und *forte*.
- the **rise time**
- the **steady state sound level** (RMS-level)
- the **shape of the excitation signal** which depends on the amount of air reaching the mouthpiece cup (air flow).

Additional features

- **Making the sound of the instrument audible.** By a click on the "Export" symbol the currently displayed note (or all displayed notes of the active window) are exported as "wav-files" which can be played-back by any software player. Again the four options *standard*, *piano*, *mezzoforte* und *forte* can be selected.
- **Transfer Function:** if you additionally open the "Acquisition Window" and drag the current displayed curve of the Transient Response Window into the Acquisition Window, then BIAS calculates the Transfer Function of the instrument.
- General information on the **response quality**.
- What happens if I have to **lip UP or lip Down** the note.



The figure shows the slightly different onset of a note depending on the played dynamic level.

ELEMENTS OF THE WINDOW

Like all BIAS-windows the Transient Response Window offers a set of control elements. Here only those control elements, buttons and features will be described which have a particular or dissenting meaning compared to the other windows.

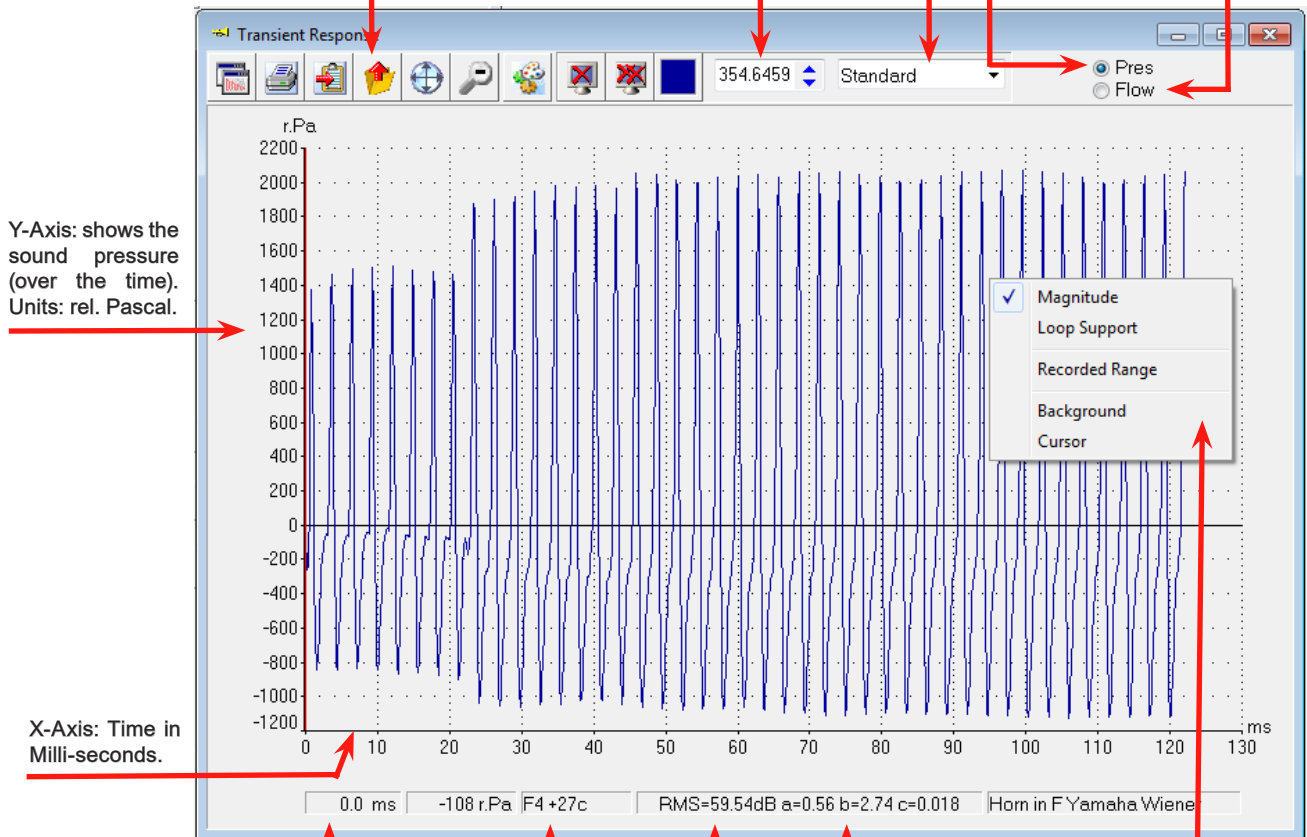
Selection box for the dynamic level of the note to be displayed or to be exported as wav-file.

EXPORT: creates a "wav-file" of the content of the window which can be played back by any sound player. Makes the data audible.

Shows the frequency of the current note. Shifting the frequency down- or upwards by clicking on the small arrows, the effect on the virtually played note is shown. Gives information about what happens during liping up or down a note.

Shows the sound pressure over time = sound wave inside the mouth piece during the onset.

Shows air flow into mouth-piece over time = excitation signal.



Y-Axis: shows the sound pressure (over the time). Units: rel. Pascal.

X-Axis: Time in Milli-seconds.

Current cursor position on the time-line.

Current note and its deviation in "cent" to the equally tempered scale.

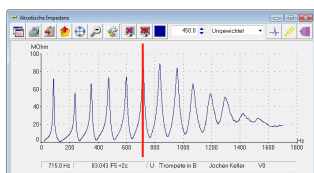
RMS = sound level of the note after having reached steady state. (Unit:: relative Pascal)

b = Step Height in dB
Specifies the height of the step of the standing wave (the increase) after each complete round trip of the signal (time until a transmitted pulse returns to the mouthpiece after having been reflected by the bell). The higher the value - the better. It's a measure for the efficiency of an instrument.

Context menu. (Click with the right mouse button anywhere inside the window).
Siehe Seite 42.

FREQUENTLY ASKED QUESTIONS

- **If I want to see the beginning of a note why do I have to open the Impedance Window first?**



It's because you want to see the beginning of a particular note and therefore you have to tell BIAS which note you want to see. You can do this by selecting a specific peak of the impedance curve with the cursor, representing the playing frequency of the note you want to analyse at.

In case of a valved instrument you must specify the valve combination, that note is played with and load the corresponding curve into the Impedance Window before selecting the specific peak/frequency with the cursor.

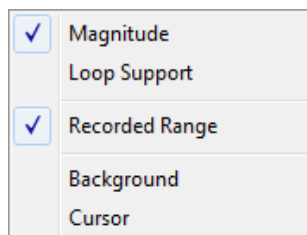


Next you only have to click at the "Transient symbol" of the Impedance Window and the onset of the note is displayed.

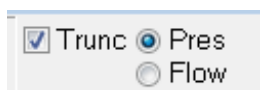
- **Why is only a time span between 80 ms and 130 ms displayed?**

This is the default setting which should be enough to show the signal until the standing wave has been settled and its amplitude doesn't increase any more.

The length of this time-span depends on the general properties of the instrument and the frequency which the instrument is being analysed at..



You get the whole length of the calculated signal by a right click anywhere inside the Window and checking "Recorded Range" and then unchecking the checkbox "Truncate" in the right upper corner of the window.



The whole range is usually between 1.2 - 1.5 sec depending on the instrument and the played note.

- **Why starts the note so fast?**

This is because -in contrary to the reality- the lips of the virtual player have no "mass". Real human lips need some time to get into movement which adds a player related attack time to the instrument related rise time (attack) shown by BIAS.

Additionally the beginning of a note (shape of the envelope of the time function) has to be in accordance with the musical context. A note played in "*Andante*" requires a longer attack time than a note played in "*Presto*" to "sound good".

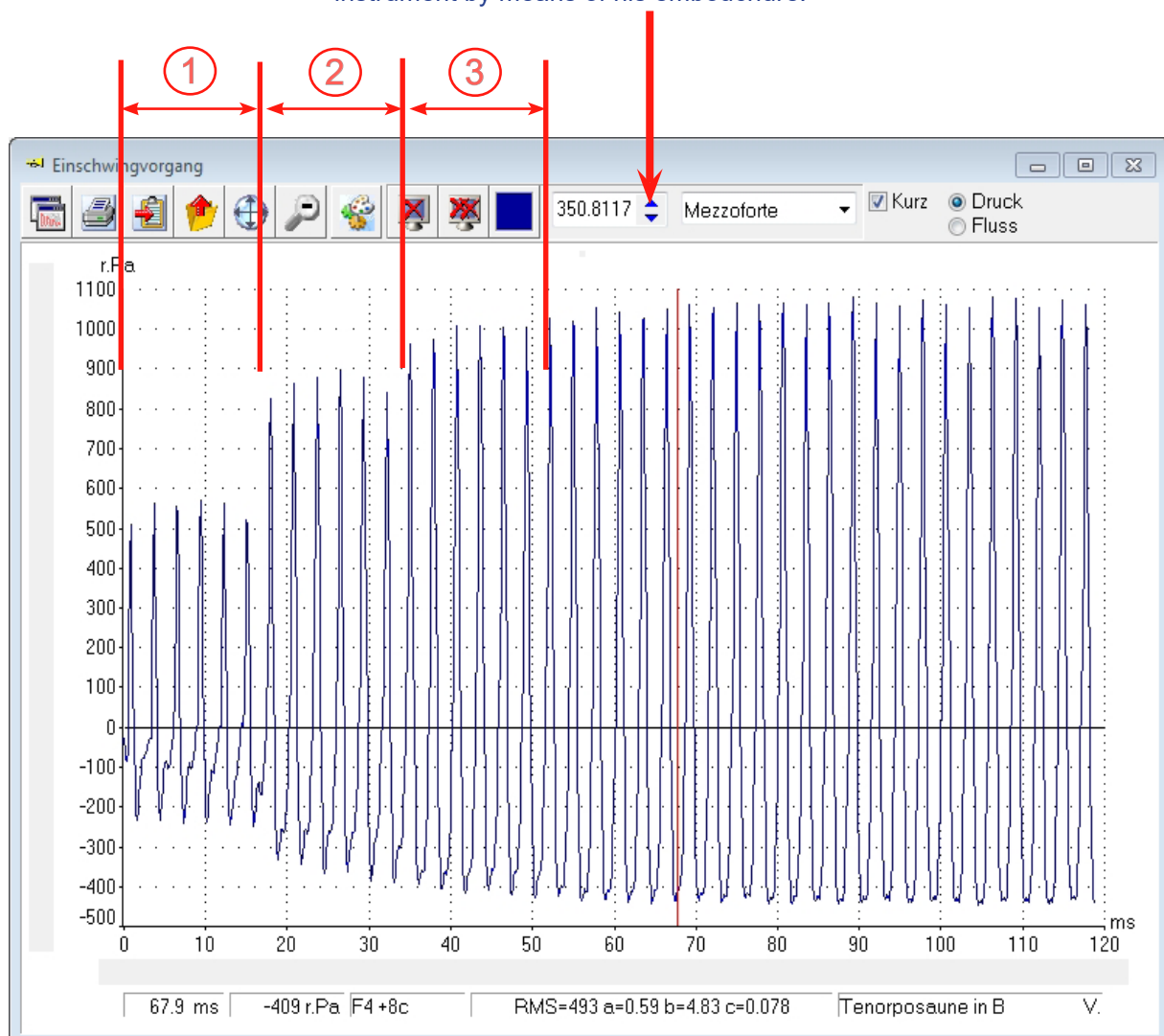
FREQUENTLY ASKED QUESTIONS

- **What do I see at the first glance?**

For the displayed note (here an $f^{\#}$ played on a trombone in B \flat) you see that it takes about 18 milli seconds until the first reflection from the end of the bell returns at the mouthpiece (phase 1) and amplifies the amplitude of the standing wave immediately from about 300 to 600 rel Pascal (phase 2). After the second cycle the increase continues - but with decaying step size (phase 3).

In the meantime the lips open and close 6 times in order to transmit an air flow pulse into the mouthpiece.

Lipping the note up or down by clicking with the mouse on the small spin-buttons of the frequency panel shows how the standing wave amplitude varies with frequency and particularly how quickly it builds up. This allows you to forecast the effect on sound level, timbre and attack time in case that the player has to compensate for poor intonation of the instrument by means of his embouchure.



FREQUENTLY ASKED QUESTIONS

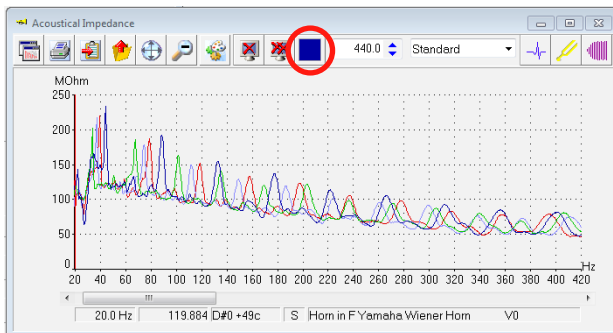
● **What's if I want to display 2 or more notes and I need different impedance curves?**

This is no problem, you can load impedance curves into the Impedance Window as many as you want!



You only have to keep in mind, that selecting the desired note by the cursor is valid only for the currently "active" curve!

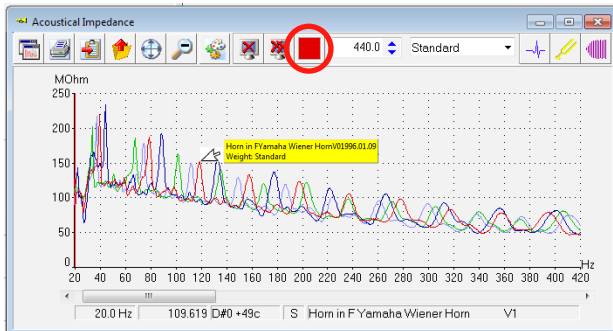
How to change the status respectively how to make a different curve "active"?



This figure shows 4 different impedance curves (all standard weighted). Currently the dark blue curve is the "active curve"

This is displayed by the dark blue color of the color panel.

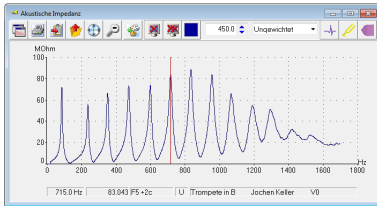
By a simple mouse click on another curve, this curve gets the "active" status. It's the red curve in the figure below.



If the lines of the curves are close together use the zoom function.

Check the yellow label with information on the currently active curve which appears as soon as you are close enough to a selectable curve.

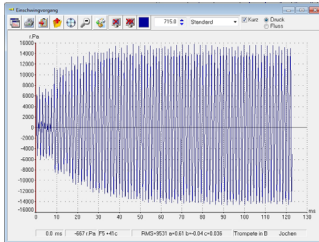
● DISPLAYING THE STARTING PHASE



- Load the appropriate curve into the Impedance Window.
- move the cursor to the peak of the desired note.

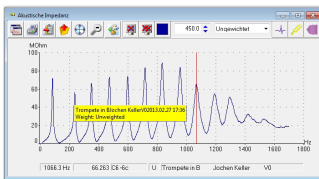


- Click on the symbol in the right upper corner, the Transient Response Window opens and displays the first 80-130 ms of the soundwave for the selected note.



Example, trumpet in Bb, note: f[♯]

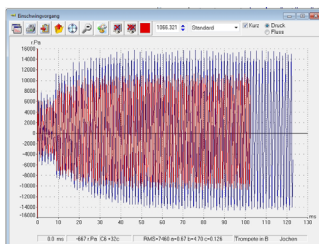
● Show more than one note in the same Transient Window



- move the cursor to the peak related to **another** note
- click anywhere at the impedance curve and "drag" it into the already open Transient Window.



Hint: A yellow flag with the name and data of the impedance curve appears if you successfully hit the curve by the mouse pointer.



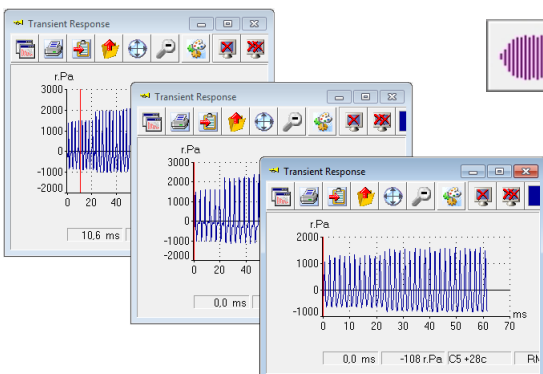
- The new note is displayed in a different color. In this manner you can display as many notes as you like in one Window, also of different instruments.



This makes sense if you want to create a soundfile with several notes for comparison. A click on the "Export" button of the Transient Window always exports **all** loaded notes.

The chronological order of the exported notes inside the soundfile corresponds to the order of the curves being dragged into the Transient Response Window.

● Display each note in a separate Window



- Having marked the peak of the first note by the cursor, simply click on the "Transient" symbol.

- For the next selected note again click on the "Transient" symbol but **press simultaneously the "Shift Button"**. Thereby a new Transient Window opens. This can be done as often as you want.

IMPORTANT HINT!



For the selection of a note always use a "weighted" impedance curve! Preferably "Standard Weighted".

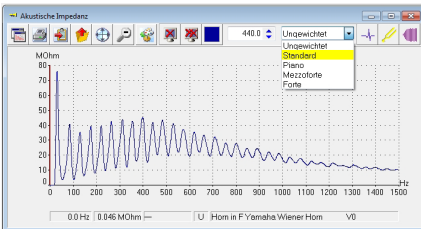
Why this?

The default setting for displaying impedance curves is "unweighted". This makes sense, because the curve includes all acoustic properties of the instrument - id est: you see what the instrument offers.

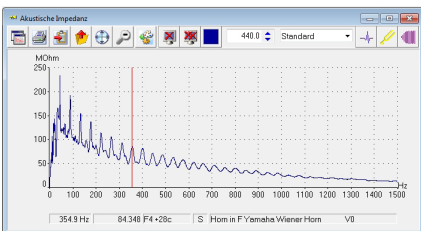
But you don't see what happens if this instrument is played by a human player. In reality the player with his broad-band excitation signal changes the intonation related properties and also the response properties of the instrument! See the chapter "The Weighting" at page 119 of the BIAS 7 Software Manual.

Therefore it's necessary to use a weighted impedance curve for selecting the note to get realistic values (for the intonation window we do the same).

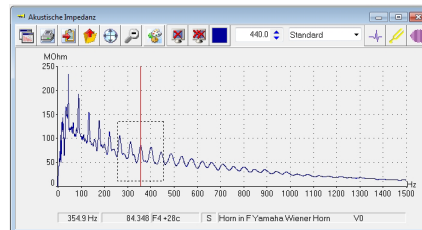
- select any weighting



- select the peak of desired note

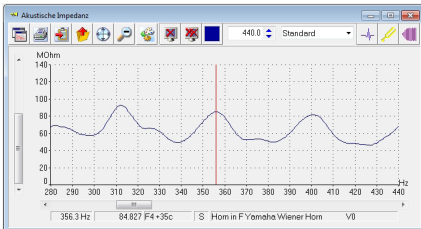


- if necessary use the zoom function (draw a rectangle with the left mouse button)



(With a double click anywhere inside the display area of the window you get back to the overall view)..

- Click on the transient symbol



Which weight should I use?

We recommend "Standard Weighted".

Our experience is, that instruments with a poor intonation tend to a different behaviour depending on the played dynamic level. In such cases it makes sense to look also at the starting behaviour for *piano* and *forte* notes.

BACKGROUND INFORMATION

Usually the impedance curves are displayed "unweighted" which means: the reaction of the instrument on a sinusoidal excitation signal.

But a human player excites the instrument with many frequencies simultaneously. The amount and magnitude of these frequencies enclosed in such a signal depend on the individual properties of the players lips and on the played dynamic level. (e.g. a *piano* note contains less harmonics, *fortissimo* many harmonics, up to 50 where such of higher order have an increased magnitude).

For the calculation of an impedance curve which matches the reality, all frequencies of an excitation signal have to be taken into account. This is done by the use of a "weighted sum function" (mathematically: a weighted convolution). We use standardized spectra for the "Standard", "*piano*", "*mezzoforte*" und "*forte*" weighting.

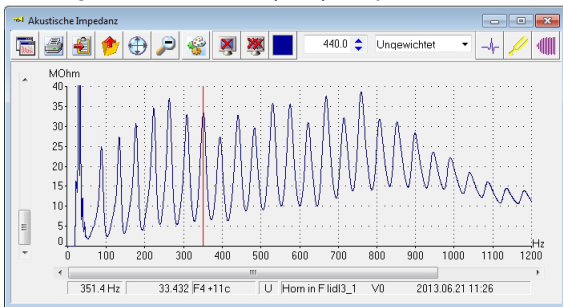
Because of the values of many frequencies are taken into account it can happen (but not mandatory) that the peaks for a note are shifted to a higher or lower frequency compared to the unweighted impedance curve.

The example below shows this effect quite clearly:

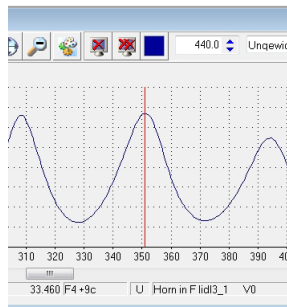
With a sinusoidal excitation ("unweighted") the c^5 is at 351 Hz. This is the intonation offered by the instrument.

In cooperation with the human player and therefore with a complex signal containing many frequencies, the peak of the "written" c^5 is shifted 26 Cent upwards and is now located at 356,5 Hz.

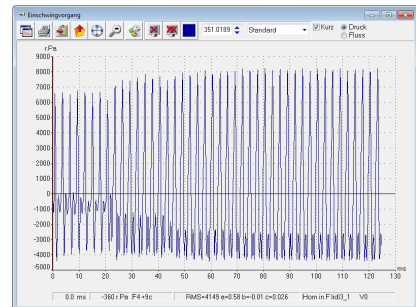
Example: Horn in Fa (Lidl), 8. peak, written c^5 , ca. 350 Hz.



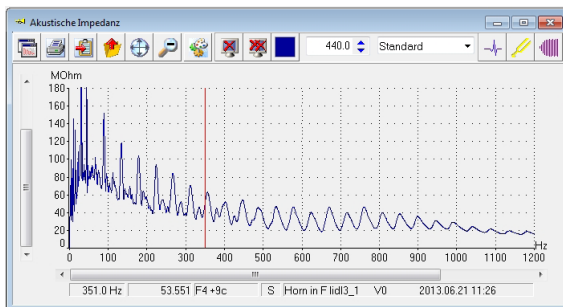
Impedance curve "unweighted", Cursor at the 8th peak.



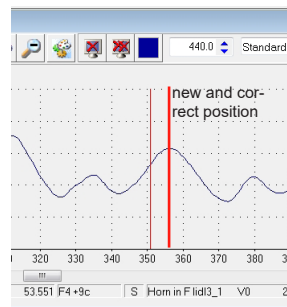
Zoom



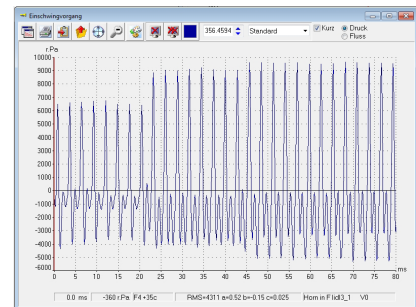
Onset time 120ms



Impedance curve "Standard", the cursor is shown at the "unweighted" position



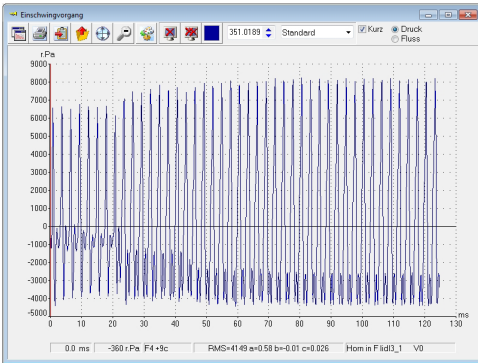
Zoom, cursor 26c too low



With correct cursor position: onset time only 80ms

BACKGROUND INFORMATION

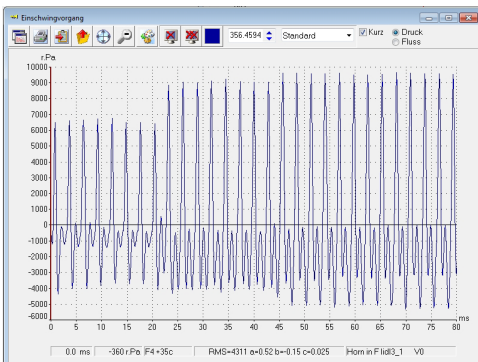
The consequences on the sound volume and the efficiency can be clearly seen comparing the two figures:



In the figure left where the peak of the note was selected on the basis of the "unweighted" impedance curve and therefore at the "wrong" frequency (351 Hz) for the combination "instrument+player", we can see only a marginal amplification after the first 23 ms (this is the time span needed by the sound wave for traveling to the bell and back to the mouthpiece).

In this case the lips move a little bit to slow, the reflected wave from the bell arrives too early (= wrong phase) and partly energy gets destroyed. After 46 ms, the second round trip of the sound wave, nearly no amplification can be observed at all.

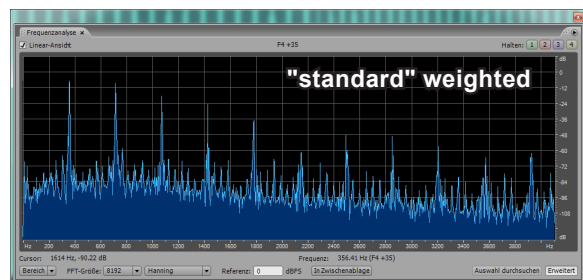
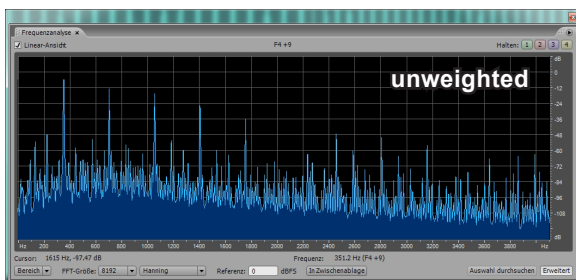
In fact, a musician can play this note - but it's the same effect like playing a note which is 26 cent too flat and getting forced to lip it up. This causes a lot of additional energy (=air) and additional concentration to keep the standing wave stable.



A completely different situation shows this figure where the peak was selected on the basis of the "standard weighted" impedance curve: after the arrival of the first reflected sound waves from the bell (now correctly in phase) a significant amplification can be observed. Also after the 2nd roundtrip an amplification of the standing wave can be seen.

SUMMARY:

- The note starts much quicker if the frequency is correctly selected. In the figure left: 80 ms, whereas the onset time of the upper figure shows 130 ms.
- A difference can be detected for the sound level (RMS) too: at the correctly selected frequency it is 4.311 rel. Pascal and for the note selected on the basis of the unweighted curve only 4.199 rel. Pascal.
- Sound spectrum: At the "wrong" (on basis of the unweighted curve) selected note we see besides a strong fundamental, that the 6th and 7th harmonic is completely missing and from the 9th harmonic on only inharmonics and noise can be found. In contrary the sound spectrum of the note selected on basis of the standard weighted curve shows a regularly structure of a brass instrument sound.

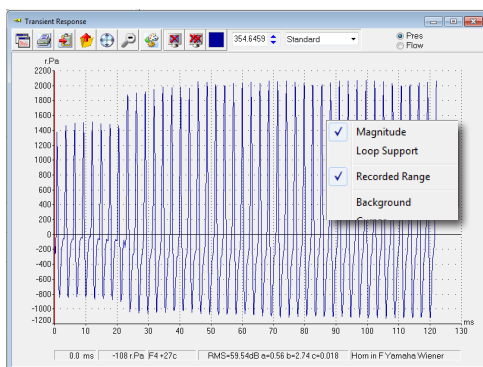


● MAKING NOTES AUDIBLE

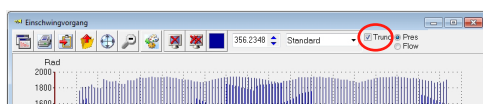
1. Use the cursor to select the peak of the desired note of the **standard weighted** impedance curve.



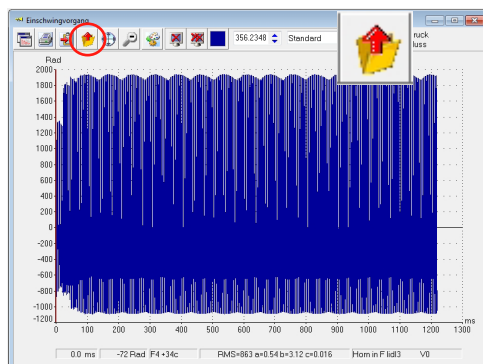
2. Click at the "Transient" symbol to display the sound wave of the note.



3. Click with the **right mouse button** anywhere inside the display range and select by a click with the **left mouse button** "Recorded Range". After this the first 0.3 seconds are displayed.



4. Now disable the check box "Trunc" and the full recorded range of about 1.2 - 1.3 seconds is displayed.



5. Click at the "Export"-symbol

6. Select a name for the WAV-file.

7. Select where to store the sound file and click on "Save". Now the file can be played back by any player.

● Creating a sound file with more than one note

If you click on the "export" symbol the complete content of the Transient Window gets converted into sound. Therefore you can make many notes audible by selecting them in the "Impedance Window" and dragging them one after another into the "Transient Window". The play back order of the notes is defined by the order of being dragged into The Transient Window.



Important: Keep in mind that you have to select "Recorded Range" and uncheck the "Trunc" check box for each note you have dragged into the Transient Window separately!

MAKING NOTES AUDIBLE

**How to create a sound file with more than one note**

1. select your first note from a "weighted" impedance curve and proceed as described at the previous page in **1. - 4.**

2. Select the next note you want to hear from the same or an other impedance curve you additionally have dragged into the Impedance Window.

Keep in mind that if there are more than one impedance curves loaded, the curve you want to select your note from have to be the "active" curve! See page 30 of this manual how to give a curve the status "active".

3. After the selection of the desired peak simply click anywhere at this (active) curve and drag it into the "Transient Window"

Hint: A yellow flag with the name and data of the impedance curve appears if you successfully hit the curve by the mouse pointer.

4. Don't forget to open immediately the context menu and select "Recorded Range" and uncheck the "Trunc" checkbox!

5. For further notes repeat the steps **2. - 4.**

6. If the procedure is completed and the Transient Window shows all notes finalize the action with the steps **5. - 7.** described at the previous page.

Contact:

www.artim.at

widholm@artim.at

Tel.: 0043 (0) 676 72 15 130

Support: by Email, phone, ZOOM

Support: by "TeamViewer"

The TeamViewer program is free of charge for private use and has more than 200 Million user. It's installation needs only 1 minute.

You don't have to install Zoom at all, if you click the link sent to you, the necessary components will be installed on your PC automatically.

