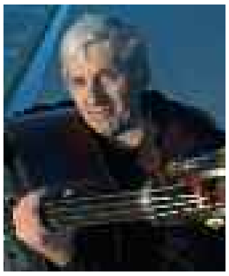
DOUBLE BASS HARMONICS

MARK DRESSER gives some tips on how to explore the rich potential of pitch and timbre offered by extended harmonics on the double bass

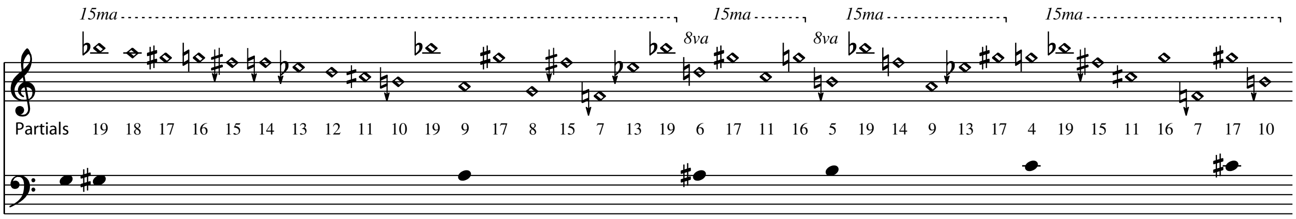


Mark Dresser is a double bassist and composer who specialises in contemporary music and free jazz

The joy of uncovering the sound potential of the double bass is surely its own reward. Exploring extended techniques expands the timbre range of the instrument, gives access to rich musical possibilities, and informs traditional playing by allowing the player to develop an aural and technical awareness of the components of tone. Whether one is an improviser or an interpreter, having an understanding of the implications of the harmonic series has multiple benefits.

You can develop a sense of harmonic possibilities by comparing equal temperament – the dominant tuning system of Western music – with just intonation, the pitch system inherent in natural harmonics. Acquiring this sense can help in the development of strength, flexibility and new levels of left- and right-hand placement. Practising the alternation of stopped fundamentals and natural harmonics reveals a parallel reality of pitch and harmonic possibilities. A digital tuner is a useful tool for comparing equal-tempered chromatic semitones with the natural harmonics that are located in parallel with those semitones. The harmonics are expressed in just intonation and identified by partial numbers.

[1] G-string harmonics available near to the stopping points for equal-tempered semitones



example 1 >

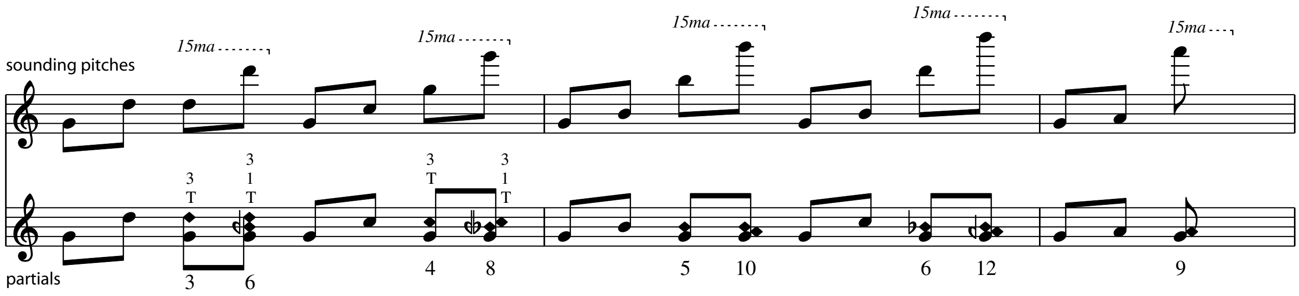
Example 1 is an excerpt of the G-string chart showing all the harmonics (upper staff) available near to the stopping points for the equal-tempered semitones (lower staff). All notated examples sound one octave lower than written. Regarding the notation symbols, arrows pointing down (in the 14th, 13th and 10th partials, for example) signify that the sound for those partials is lower in pitch than in equal temperament. The symbol that resembles a sharp sign with one vertical line (11th partial) means that the pitch is a quarter sharp, which is lower in pitch than a normal sharp.

I highly recommend that all players make a simplified but expanded version of this chart, using a digital tuner as explained above. Continue the chart up to the end of the fingerboard. Once completed, transpose the results to all four strings and then carefully double-check the mapped results.

Partial numbers have multiple implications. They explain the location of the harmonic nodes. In example 1, the ninth partial coincides with the pitch A, one equal-tempered whole tone (plus octave displacements) above the open G string. This same ninth partial can be activated at eight different nodes, equidistantly spaced along the length of the string. From the nut to the bridge, those locations can be measured in fractions: 1/9, 2/9, 3/9, etc. The equidistant placement of partials not only shows their harmonic location but is also a window on to addressing just intonation as a microtonal tuning system.

Partial numbers also demonstrate frequency relationships. The open G string, for example, vibrates at 100Hz. The second partial, an octave above, vibrates at 200Hz, and the third partial vibrates at 300Hz at the interval of an octave and a 5th above the fundamental. It is useful to know that a doubling of any partial is a doubling of frequency.

[2] Broken intervals on the G string (upper stave), and the same intervals produced by simple and compound artifical harmonics



Begin experimenting by alternating harmonics with fundamentals, observing the musical and instrumental potentials. Creating your own exercises will reveal many harmonic possibilities. Consider alternating stopped fundamentals and harmonics on adjacent strings. Also consider alternative fingering possibilities for equivalent harmonics on the same string. Note the following points:

- Higher harmonic partials are easier to access if the node is lightly touched with the fingertips, as opposed to the full pads, directly on the top or to the side of the string.
- Higher harmonic partials require a faster bow speed to achieve the same volume as lower partials.
- Higher harmonic partials require the bow to travel closer to the bridge than lower partials do.
- Memorising the chart of equal-tempered semitones and the harmonics available at adjacent positions will maximise musical benefits.
- Equal-tempered pitches when transposed up an octave on the same string will generally render the same harmonic partial, or the partial an octave higher.

BOWED ARTIFICIAL HARMONICS

Bowed artificial harmonics can be very effective when improvising and performing very high melodies, as well as when affecting quick register and interval contrasts. They are usually executed by stopping the fundamental with the left thumb while lightly touching an interval above the fundamental with another finger. The most common artificial harmonics are the (stopped) perfect 5th, which activates the third partial, and the (stopped) perfect 4th, which activates the fourth partial. The same technique at the major 3rd activates the fifth partial. Similarly the minor 3rd activates the sixth partial and a major 2nd activates the ninth partial. These harmonics correlate with the same touching intervals on the open strings.

COMPOUND ARTIFICIAL HARMONICS

It is possible to activate multi-nodal harmonics. If you simultaneously touch the artificial harmonic node and another node at the midpoint between the thumb-stopped fundamental and the artificial harmonic node, the resulting frequency is doubled. Thus the fourth partial at the perfect 4th becomes the eighth partial, the fifth partial at the major 3rd becomes the tenth partial, and the sixth partial at the minor 3rd becomes the twelfth partial. Good ear training is crucial: you will achieve better results if you know the pitch (and its intervallic relationship to the fundamental) that you are aiming to produce.

example 2 >

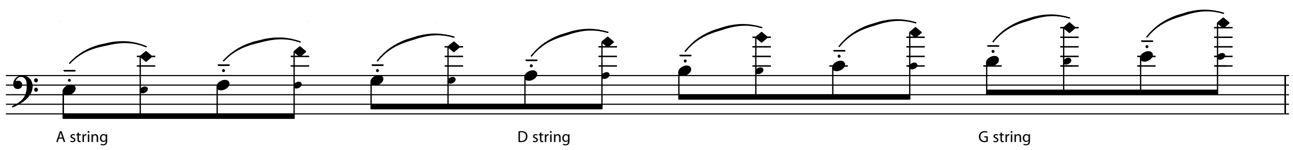
Example 2 illustrates a sequence of broken intervals on the G string, followed by the same intervals played together with the thumb stopping the lower pitch and upper finger lightly touching the upper pitch creating a artificial harmonic, and then adding the midpoint node for a compound artificial harmonic. Here, a backwards flat sign indicates that the pitch is a quarter flat, a pair of reverse facing flats signifies a pitch that is three-quarters flat, and T indicates a thumb-stop.

PIZZICATO ARTIFICIAL HARMONICS

Commonly known as harp harmonics, pizzicato artificial harmonics are produced by lightly touching the string at a harmonic node with the right or left thumb while simultaneously plucking the string below the thumb with any convenient finger. The locations of the nodes are proportional to the length of the string. On an open string if the thumb is placed on the second partial, at the midpoint node, the octave will sound. If the octave-and-a-5th is desired, then place the thumb at the third partial.

If a string is stopped with a left-hand finger – for example, a B flat on the D string – you can obtain the second partial by visually assessing the midpoint of the string, touching it with the right-hand thumb and simultaneously plucking the string with the right-hand first or second finger. If you visually divide the string in half again, you can obtain the fourth partial, which is located at the three-quarter-point from the fundamental, and a two-octave transposition will sound. ▹

[3] Alternating fundamentals and falsetto flautando: the bow is placed on the 4th partials, producing two-octave harmonics



FALSETTO FLAUTANDO

Another type of artificial harmonic technique is known as falsetto flautando or flautando harmonic bowing. It is activated not by the left hand, but rather by the bow, which is placed at a precise nodal point on the string. It is important to use a fast bow speed and no bow pressure. This technique is not difficult to learn, yet it is reliable to execute and possesses a rich timbre that is particularly vocal. It is the only arco technique that creates transposable artificial harmonics at the octave. Several composers have included this technique in their works in recent years, including Osvaldo Golijov in *Ayre* (2004), Anthony Davis in his opera *Wakonda's Dream* (2007), and Roger Reynolds in *ImagE/Contrabass* (2007).

The stroke itself is the unorthodox application of the traditional flautando (or flautato) technique, which the *Harvard Dictionary of Music* defines as 'a fast bow stroke with no bow pressure usually performed tasto'. Falsetto flautando requires the bow to maintain its position at a specific harmonic node through a series of changing fundamentals. As the left hand moves from pitch to pitch it changes the sounding-length of the string. This changes the location of the harmonics and the bow has to change its position on the string accordingly. Thus the bow moves up and down the string in parallel with the left hand.

Flautando harmonics are similar to pizzicato artificial harmonics in that there is a proportional relationship between the left and right hands. However, in flautando the resulting sound is one octave lower because the bow is placed on the nodal contact point, blocking it.

Here's how to produce flautando harmonics. Stop any pitch with the left hand and visually assess the midpoint of the string. Divide the lower half of the string in half again, ascertaining the fourth partial node, which is located three-quarters of the distance from the left hand. While still stopping the string with full left-hand pressure, use the 'artificial pizzicato harmonic' technique to double-check the correct node and the expected pitch (sounding two octaves above the stopped pitch). Place the bow exactly on the node and draw the bow with a fast, weightless stroke that maintains the same contact point throughout the stroke. The bowed harmonic will sound one octave lower than the bow-stroke position. Vibrato helps sustain flautando harmonics as well as enlivening the technique with an inherent expressive potential. Experiment using vibrato and non-vibrato approaches. A horizontal fingering sequence that moves across the fingerboard is particularly advantageous for practising this technique. Experiment with playing flautando scales and melodies.

Higher harmonic partials can also be activated in flautando. For example, to sound the third partial, the bow must be placed on the sixth partial node, 5/6ths of the distance from the left hand. Flautando harmonics at higher partial nodes behave more like multiphonics with a specific frequency band focus. The bow speed of flautando can eventually be slowed down, resulting in nuanced dynamics.

example 3 >

Example 3 shows a passage alternating between stopped fundamentals and flautando harmonics. Once the correct node is identified, as described in the previous paragraphs, articulate the fundamental using very little bow. From a stopped bow, quickly accelerate the bow speed to excite the harmonic for the rest of the bow length. Repeat in the opposite direction. Transpose at various pitches, beginning chromatically, and expand into scales and melodies that move across the fingerboard in a horizontal approach.

If the flautando harmonic at the octave does not sound, there are three probable reasons. First, the bow may not be placed on the proper node. Double-check the correct location with the pizzicato artificial harmonic reference. Second, the bow stroke may not be maintaining a consistent horizontal plane at the node. Make sure visually that the bow transverses the string in the same perpendicular plane as the nodal contact point. Lastly, there may be too much bow pressure on the string. Remove any extra bow weight. If you use a German bow, try removing the thumb and cradle the frog in the palm during the bow trajectory.

The principles implemented in producing flautando harmonics extend beyond the technique itself. A keen sense of bow location, a variety of different bow speeds, and rapidly changing bow weight are all nuanced qualities that can also inform traditional playing. Another spin-off benefit from playing flautando harmonics and delving into the overtones series is a spectral sense of hearing. Timbre and pitch become a continuum of fundamentals, harmonics and transients, which can be extracted, deconstructed and morphed into new sounds. ■