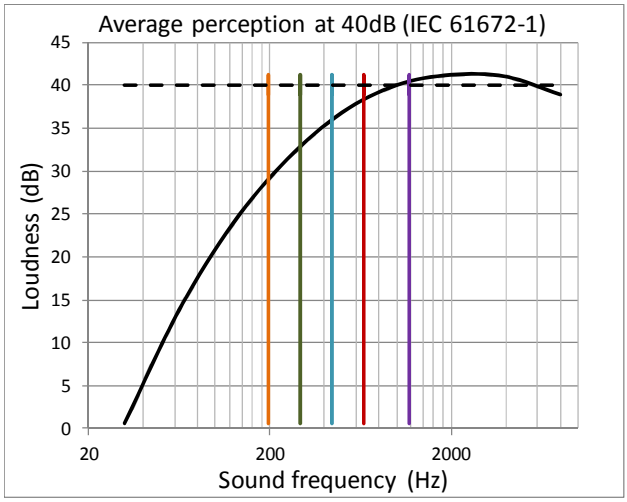
Violin settings

1 – About acoustics

1.1 Perception of the human ear



Frequency range of the violin :
G : 196 Hz
D : 294 Hz
A : 440 Hz
E : 659 Hz
4th finger on E in 1st position : **D 987.77** Hz
4th finger on E in 3rd position : **D 1174.66 Hz**

Example: a G note played at 40 dB will be heard at 30 dBa only.

1.2. Sound Evaluation

Describing and evaluating the sound of an instrument is a tough job. Let's focus on 4 easy-to-understand criteria:

Projection	Ability to convert the mechanical power provided by the musician into acoustic power.
	Evaluation: play at varying power, the acoustic power should continue increasing notably with your playing power, up to your maximum power.
Weak apathetic sound ← →	Loud deafening sound

Clarity	The way the notes are distinguished from each other in a musical phrase.
	Evaluation: Play a sequence of quick slurred notes up and down.
Blur and muddy sound ← →	Clear contrasted sound

Tone	Sensation of sweetness or hardness provided by the sound.
	Evaluation: play a variety of musical phrases in different styles, from slow and languishing to fast and aggressive.
Fat basses and nasal trebles ← →	Dry basses and shrilly trebles

Sustain	Absolute duration of a picked note (pizzicato). This criterion is not a focus for the sounding qualities but it gives precious indications on some mechanical aspects.
	Evaluation: pick the string with an even force and measure the sounding time.
Short sounding time ← →	Long sounding time

1.3. Our goal

Due to its design and like any music instrument, the violin has its strengths and weaknesses along the tonal range.
The evaluation is done string by string:

G string :
The focus is clarity. Most violins have muddy basses with a lot of bow friction noise.
Projection is also important but secondary because the access to the G string is easy, which makes it possible to play loud in order to compensate.

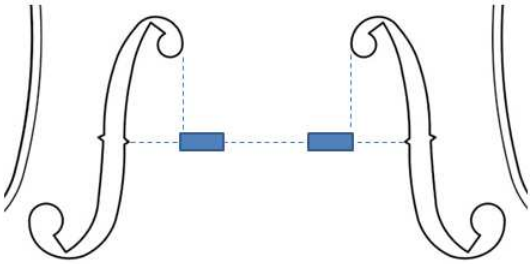
D string :
The focus is projection. The access to the G string is fastidious if you don't want to touch the neighboring strings, which makes it difficult to play loud.
Clarity is also critical but it is rarely a problem on D.

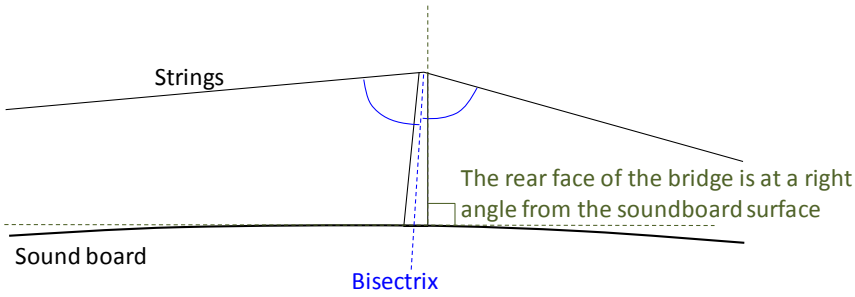
A string :
The focus is tone. This string is mostly powerful. If it is too much unbridled, it can become shrilly. You want to get a nice nasal sound but not too squeaky.
Caution: if projection is much higher on the A string compared to G and D, it may be a good idea to bridle it a little bit in order to get a better balance.

E string :
Projection vs tone is always a challenge on the E string: increasing and balancing the projection of the 4 strings is always done with the concern of not getting too much a shrilly E string. Generally, one can live with too powerful an E string by playing it more gently but it is mandatory to have a nice E string tone, as sweet as possible.

2 – Settings

2.1. – Bridge





The string length of a 4/4 violin varies from 325 to 335 mm. Most strings are designed for a **328 mm** length.
- Be careful, the string tension increases significantly with the length → Compensate by an adequate string gauge.
Taylor equation: $\mathbf{T = m \cdot F^2 \cdot 4 \cdot L^2}$ (T = tension ; m = linear mass ; F = frequency ; L = length)
- Be aware of the string length in relation to your size when choosing a new violin.

2.2. – Tailpiece

Starting point: set the base of the tailpiece tangential to the sound board outline. If the tailpiece has a proper size, the string length behind the bridge should then be roughly $1/7^{th}$ of the main string length (~47 mm if string length is 328 mm). Shorter tailpiece = more flexibility, more projection but higher risk of resonance, wolf tones and rolls.
Practically, you should tune the short string portion to sound slightly below the 3rd harmonic of the main portion.

Beware of the tailpiece weight:

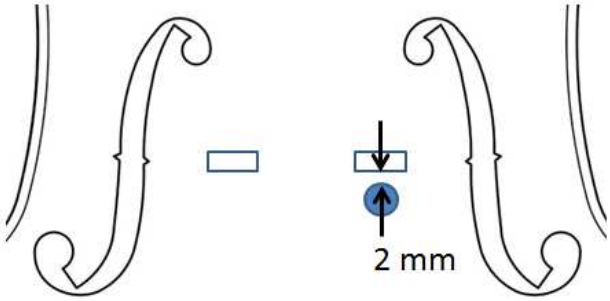
Classical setting (1 tuner on E):
10 grams

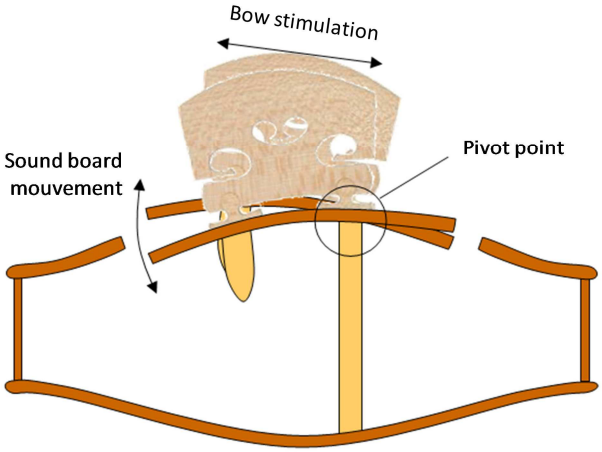
Integrated composite tuners:
18 grams

Outfitted metal tuners:
> 25 grams. To avoid !!

As a comparison, a sound mute weights 20 grams!!
Ideal setting: no tuner + geared pegs (refer to chapter 3.3)

2.3. – Sound post





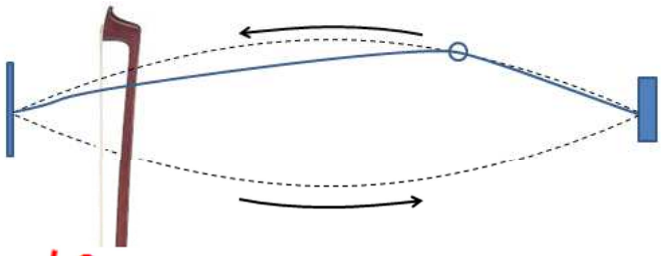
Starting point: 2 mm behind the treble foot of the bridge and centered on it sideward. Then move it slightly until you find the right compromise.

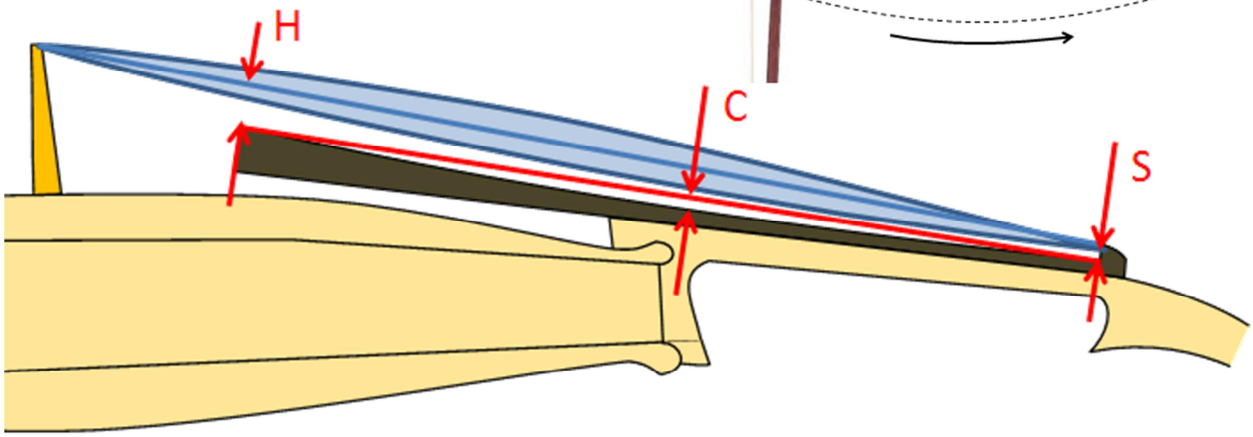
↑	+	G D A E	Stiffer touch, Harder sound triggering	Drier basses, shriller trebles	+
	Projection	**Balance**	**Bow touch**	**Tone**	**Sustain**
↓	-	G D A E	Softer touch, Easier sound production	Fatter basses, more nasal trebles	-

←		→
G D A E	**Balance**	G D A E
More distinct basses	**Clarity**	Muddy basses
Stiffer G and D, softer A and E	**Bow touch**	Softer G and D, stiffer A and E
Drier basses, more nasal trebles	**Tone**	Fatter basses, shriller trebles
Longer basses	**Sustain**	Longer trebles

2.4. – Fingerboard and nut

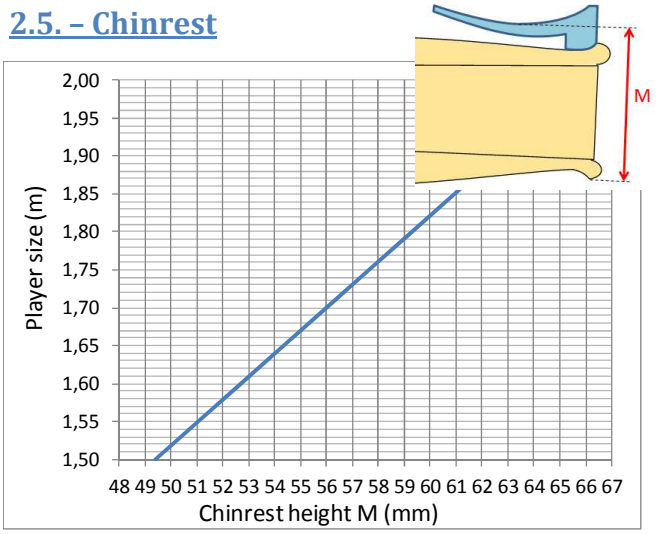
Helmholtz movement
(www.youtube.com/watch?v=6JeyiM0YNo4) :





		Synthetic strings	Metal strings
Space under the strings at fingerboard edge (H)	Under G	4.75 mm	4.25 mm
	Under E	3.75 mm	3.25 mm
Space under strings at nut (S)	Under G	0.5 mm	
	Under E	0.3 mm	
Fingerboard beam (C)	Under G	1 mm	
	Under E	0.5 mm	

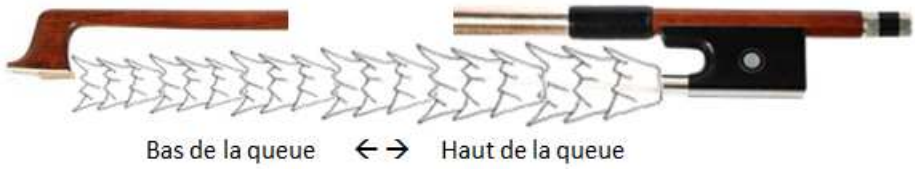
2.5. – Chinrest



Violin high on the shoulder,
head tilted over it:
M minus 1 or 2 mm.
Chinrest highly side shifted.

Violin low on the chest,
Head upright:
M more 1 or 2 mm.
Chinrest more centered.

2.6. – Bow



Have your hair changed once a year and make sure it is mounted in the right direction: hair scales opening frontward so that you go against the grain when pushing, hair base toward the frog, the bigger diameter helping to resist to the “chaps”.

3 – Optimizing your fiddle for folk music

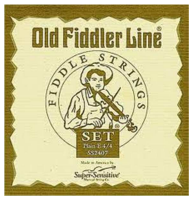
3.1. – String types

3.1.1. – Synthetic strings

Modern version of the gut strings but much more robust, more stable in tune and with more projection. Slightly more sensible to moisture variation than metal strings, they also have a much shorter life: they start losing brightness after just a few months. Any exotic tuning other than the conventional GDAE tuning may damage them severely. The aluminum winding of the A string (and sometimes D) is fragile and blackens the fingers. Their flexibility is pleasant to the left hand but it requires accuracy in the fingers placement. The bow must have the right amount of pressure and speed otherwise it may screech, but, on the other hand, these strings allow a soulful sound with plenty of shades, that is why they are the favorite choice of most soloists.

3.1.2. – Metal strings

They have great tune stability and a very long life, up to 2 - 4 years. They die by the wear of their plating or winding without any noticeable sound loss. They can resist to the alternative tunings often used in Old Time music, such as AEAE or GDGD. They allow a fast yet clean playing at high power with a good clarity, which makes them a good choice for wild jam sessions. The touch of the bow is generally more pleasant than with synthetic strings due to the higher tension and to their specific winding or plating materials. Their high traction stiffness makes it mandatory to use adequate tuning devices, the traditional friction pegs will not suffice. Some models have a multi-strand twisted core which makes them a bit more stretchy.



3.3. – Solutions for easy tuning

<table>
<tr><th>Pegs</th><th>Reduction ratio</th><th>Pulling ratio</th><th>Preferred tailpiece</th><th>With synthetic strings</th><th>With metal strings</th></tr>
<tr><td rowspan="2">Classical friction pegs
  </td><td rowspan="2">1 : 1</td><td>24 mm/revo</td><td>1 tuner on E
  </td><td>Classical setting. Favorable to the sound but tuning is fastidious</td><td>Impossible to tune</td></tr>
<tr><td>Around 0.3 mm/revo depending on models</td><td>4 integrated tuners
  </td><td colspan="2">Very easy tuning but:
- The high weight of the tailpiece reduces projection.
- Limited tuning range: cannot replace the pegs completely and it is necessary to reset the tuners from time to time.</td></tr>
<tr><td>Perfection Pegs
  </td><td>4 : 1</td><td>4,9 mm/revo</td><td rowspan="4">No tuner
  </td><td colspan="2">- Perfect for the sound
- Installation is more or less reversible
- Available with wood finish</td></tr>
<tr><td>Wittner Finetune
  </td><td>8,5 : 1</td><td>2,8 mm/revo</td><td colspan="2">- Perfect for the sound
- Installation is reversible</td></tr>
<tr><td>Right angle tuners
  </td><td>15 : 1</td><td>1,4 mm/revo</td><td colspan="2">- Perfect for the sound
- Very easy tuning
- Very robust
- Make the violin head heavier
- Installation is difficult and irreversible.</td></tr>
<tr><td>Gotoh ST31
  </td><td>18 : 1</td><td>1,2 mm/revo</td><td colspan="2">- Perfect for the sound
- Very easy tuning
- Quite robust
- Quite light
- Installation is difficult and irreversible.</td></tr>
<tr><td colspan="3"></td><td>Easy tuning, although a bit tricky on E.</td><td>A bit fastidious tuning but still usable.</td></tr>
<tr><td colspan="3"></td><td>Very easy tuning</td><td>Quite easy tuning</td></tr>
</table>