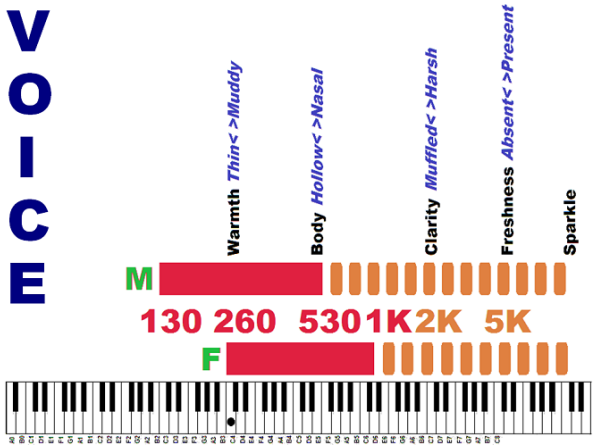

Equalising Instruments
✝ Church Audio ✝
PICCOLO
OBOE
FLUTE
SOPRANO VOCAL
VIOLIN
ALTO VOCAL
TRUMPET
CLARINET
TENOR VOCAL
FRENCH HORN
BASSOON
TUBA
STANDUP BASS
BASS GUITAR
ORGAN & SYNTHESIZERS
Hertz
Harmonics
Kick Drum
Bass
Guitar
Vocal
60hz
120hz
250hz
500hz
1Khz
2Khz
4Khz
6Khz



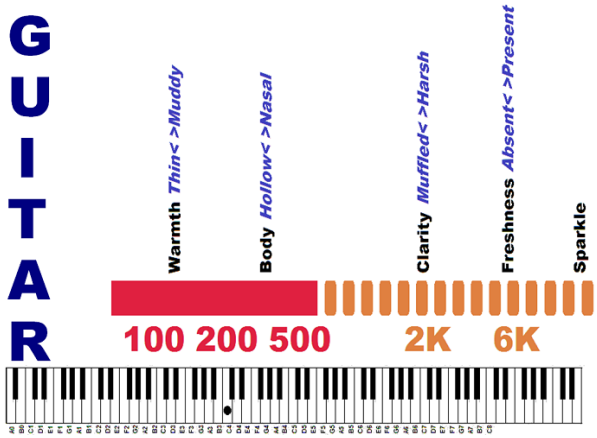
	Note Range	Fundamentals	Harmonics up to
Soprano	C4 – C6	261 – 1046 Hz	12 kHz
Alto (contralto)	F3 – F5	175 - 698 Hz	12 kHz
Tenor	C3 –C5	131 - 523 Hz	12 kHz
Bass	F2 – G4	87 - 391 Hz	12 kHz

Frequency Curve of the Female Voice: Peak at 200Hz then Plateau to 1kHz, then nothing till sibilance at 8kHz.
Frequency Curve of the Male Voice: Peak at 100 Hz then Plateau to 500 Hz, then nothing till sibilance at 6kHz.

Harmonics	10-12kHz for sparkle. 6-8kHz Sibilant 'ess' (S) sound –this gives intelligibility to a voice, just don't turn it up till the ess is annoying. 5kHz for fresh breath and vocal presence. 2-3kHz Clarity. If Female Singer's high notes are piercing, reduce 2-3kHz.
Fundamental	900 If Male Singer's high notes are piercing, reduce here. 500-900 Nasal. 600 boost for the Soprano (body) 2-400 Body, Warmth. Too much and it will sound muddy. 40, 80, 100. Explosive Consonants (P, B, T, D).

If you intend to compress, do that first as the sound changes. When you 'lightly' compress, the vocals usually sound better immediately.

Lapel-Microphone (Lavaliere)
Because of it's small electret diaphragm there is often an increase at 8 kHz which can increase the ESS sound in some people. It may be necessary to lower their SSS slightly (6 or 7kHz). The notorious mid-range (squeal) of a Lapel mic is centred 315 to 630 Hz (it can be two to three octaves wide). The user should drop their chin to their chest, and then you place the microphone directly below that point. A 1/3 Octave Graphic Equaliser is really the only thing to successfully clean a squealy Lapel microphone sound and still leave a decent result (regular mixer equalisers struggle here). The human chest cavity may cause a boost around 700Hz giving a chesty sound.



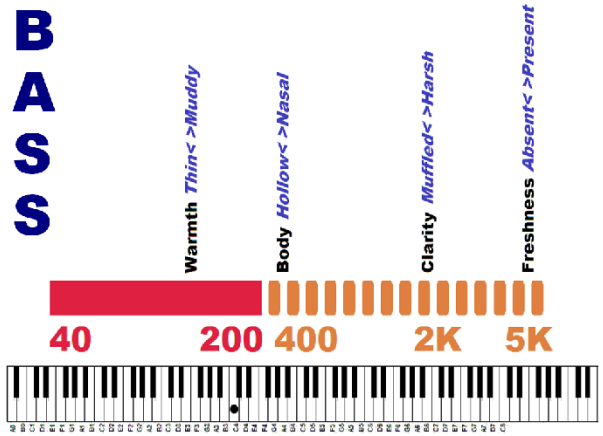
Guitar	Note Range E2 – E5	Fundamentals 82 - 659 Hz	Harmonics up to 15 kHz

Acoustic Guitar	
Harmonics	10kHz raise for more sparkle. 5-8kHz raise for more modern string sound (clarity). 1-3kHz raise for Spanish nylon string sound. Also increases bite (attack). 1kHz lower if thin metallic (tinny) sounding
Fundamental	Body: 200-600 adjust (+/-) to suit. Warmth: 125 (cut below 50Hz)

For a real 'Spanish' nylon sound raise 2400 Hz. Cut all above 4500 Hz. Balance Mids & Basses to suit the 2400 Hz peak.

Electric Guitar	
Harmonics	10kHz raise for more clarity or splash. 5-8kHz raise (careful) for more string sound. 3kHz raise for more bite (attack). Distinct 'String' sound 2.5 kHz. A pinch of 1kHz or 1000Hz will give the guitar more edge.
Fundamental	adding a touch of 700Hz will create a throaty or woody sound, 400 Body and warmth adjust (+/-) to suit (lower if it sounds nasal) 125-250 low end warmth and grunt. adjust (+/-) to suit. Cut below 100 to decrease boom

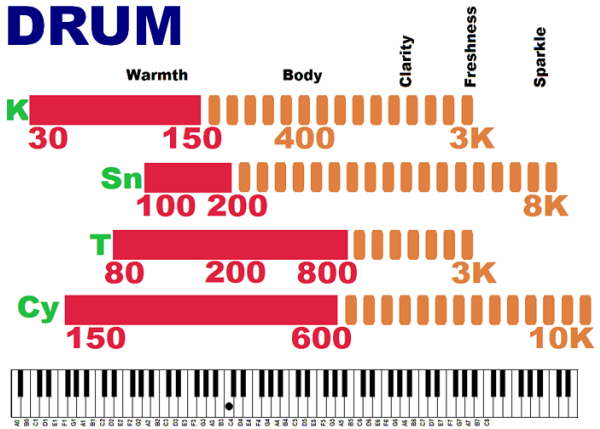
Rock Guitar Sound…. Narrow peak in Bass (100Hz). Cut all Mids. Raise all Highs (1k-10kHz).
Jazz, Night Club, Warm 'Gibson' sound… wide peak at 1kHz…weak in Basses & Highs.
Picked (arpeggiated) 'Stratocaster' sound…. Bass & Mids Plateau to 900. Cut 1-3kHz. Raise 5kHz.
To make an Electric Guitar sound more 'Acoustic'… raise all above 1kHz and leave dry (no reverb).
Heavy Rock 'Power-Chords' sound… Bass & Mids Plateau to 900. Cut 1-3kHz. Raise 5kHz.
'Guitar Solos' are often nice with weaker high frequencies (keep it warm) but raise 3-5kHz if you need more attack.



Electric Bass	Note Range E1 – G3	Fundamentals 41 - 195 Hz	Harmonics up to 7 kHz

Harmonics	5kHz raise 2kHz= touch of the string. 1kHz= power (clarity), though too much is tinny.
Fundamental	Growl at 600Hz. 3-400= body, boom. (Rolling off from 100Hz on down, and boosting 300 will give a full, but clean, Bass sound) 100= natural peak (it's true fundamentals) often better lowered slightly Start rolling off basses (cutting) below 40

'Funky bass' sound – raise the finger squeak at 2kHz considerably.
When 'slapping' a Bass guitar it will give a spikey volume (very high electrical peaks) that can easily distort. A compressor or limiter will contain the spikes.



	Kick Drum (Bass Drum)
Harmonics up to 4 kHz	LPF to reduce cymbal sounds in the kick drum (optional). The Beater: 7 kHz - boost for a 'metal beater' sound. 5 kHz - boost for a 'wood beater' sound. 2.5kHz - boost for a 'felt beater' sound.
Fundamentals 30-147 Hz	The Body: 300-400 usually reduced (or it sounds like an empty cardboard container). The Boom: 80 -125 (the bass peak) adjust (+/-) to suit the full sound, without making it muddy.
	Snare Drum
Harmonics up to 8 kHz	10-12kHz brilliance. The Snare Wires: 5-6kHz adjust for freshness. 3kHz gives it more bite (attack), but careful, a snare can easily dominate a mix.
Fundamentals 100-200 Hz	The Body: 400-900 reduce (a tin-can sound). The Boom (the hit): 100-250 adjust (+/-) to suit the depth of the drum-sound. Boost it to get a deep rock sound, cut it to get a lighter for a more delicate sound.
	Hi-Hat cymbals
Harmonics up to 15 kHz	12kHz Shimmer, Sparkle, Sizzle. The Sibilance: 7kHz (the 'SSS' sound)
Fundamentals 150-587 Hz	The Body: Roll off (HPF) below 900 or lower if you want a delicate, thin hi-hat sound. Cutting the basses also eliminates the spillage of the other drums, especially the snare. If you want a rude 'basher' sound: 200 raised, then lower the mids.
	Tom Toms
Harmonics up to 3.5 kHz	Raise everything above 5kHz (unless there is excess spillage from neighbouring instruments)
Fundamentals 80-800 Hz	The Body: 300 to 900 lower (it is usually too boomy). Create a Narrow Bass Peak: adjust (+/-) to suit. 250 Rack Toms. 100 Floor Toms
	Overheads - Cymbals
Harmonics up to 15 kHz	10-12kHz Air and Breath. 5kHz on up- Clarity and Sparkle. Jangling at 1kHz
Fundamentals 150-587 Hz	The Hit (the stick): 150 boost . The Body: 400 lower. The Bell (the bump in the middle): 220 ... some drummers play the bell part.

PIANO

Piano	Note Range A1 – A7	Fundamentals 55 – 3520 Hz	Harmonics up to 13 kHz

Piano	
Harmonics	8-10kHz for attack and sparkle. 5kHz Raise for the classical 'twinkling of the ivories' sound. Clarity. 3-4kHz modern rock 'bite' 'string growl' Nasal at 1-2kHz.
Fundamental	3-600 Lower slightly if it sounds too full, or even Boomy. 125-150 Bass sound, Warmth. Adds strength, but too much and it will sound muddy. Lower basses slightly if there is a Bass player playing (pianists often muddy the Bass sound by playing in the zone where the Bass plays)

Organ	Note Range A0 – A8	Fundamentals 27 - 7040 Hz	Harmonics up to 20 kHz

STRINGS

	Note Range	Fundamentals	Harmonics up to
Violin	G3 – A7	195 - 3520 Hz	15 kHz
Viola	C3 – E6	130 - 1318 Hz	8.5 kHz
Cello	C2 – C6	65 - 1046 Hz	6.5 kHz
Bass	E1 – G3	41 - 195 Hz	7 kHz

If you use condenser microphones you usually don't have to equalise the '**Viol** family' very much. Reverb will smooth over any dry, harsh string sounds.

Violin	
Harmonics	Top-cut (roll off the highs) if you want a Classical Music 'Pure' sound. For a modern violin sound raise the highs 10-12kHz carefully (or it will sound coarse). 7-10 kHz Attack. 2.5 kHz String sound
Fundamental	250 warmth

Viola	
Harmonics	Top-cut (roll off the highs) if you want a Classical Music 'Pure' sound. 4 kHz Coarse. 2.5 kHz String sound
Fundamental	200 warmth

Cello	**(violoncello)**
Harmonics	Top-cut slightly if you mic very close, and it sounds harsh. The Cello is the most 'present, in-your-face' sounding instrument.
Fundamental	150 Bass-boost for warmth.

Double Bass	**(contra basso) (acoustic bass)**
Harmonics	2.5kHz String Noise – a little sounds good, it adds clarity and intelligibility to the bass-line.
Fundamental	5-700 hollow wooden container. 2-300 Body – check for balance. 80-100 Fat bottom ☹ Slight Bass-Cut below 40 for cleanness

BRASS

	Note Range	Fundamentals	Harmonics up to	Notes
Trumpet Bb	E3 – D6	164 - 1174 Hz	7.5 kHz	Bb Flugelhorn. C Cornet are also available.
French horn F	B1 – F5	61 - 698 Hz	6 kHz	
Trombone (tenor) Bb	E2 – Bb4	82 - 466 Hz	7.5 kHz	
Tuba F	F1 – G4	43 - 391 Hz	4 kHz	
Saxophone(tenor) Bb	Bb3 - G6	233 - 1567 Hz	12 kHz	Bb Soprano. Eb Alto. Bb Tenor. Eb Baritone. Bb Bass

Brass-metal (*in general*)	
Harmonics	8-12kHz you can add just a touch to increase brass sparkle (though for a warm brass instrument sound it's better to top-cut slightly). 2kHz controls clarity. 1kHz has a nasal sound.
Fundamental	600 raised for a classic 'horn' sound. 300-400 warm. 125 Muddy. 100Hz warmth.

Trumpet	
Harmonics	8-10kHz Attack. 5kHz Brass 'Bell' stands out
Fundamental	120-240 Body, Fullness

Saxophone	
Harmonics	1-3 kHz best lowered
Fundamental	

WOODWIND

	Note Range	Fundamentals	Harmonics up to	Notes
Piccolo	D5 - Bb8	587 - 7458 Hz	15 kHz	
Flute C	C4 - C7	261 - 2093 Hz	8 kHz	
Oboe Bb	Bb3 – A6	233 - 1760 Hz	12 kHz	
English Horn F	E3 – A5	164 - 880 Hz	8 kHz	This is also called a Cor Anglais
Clarinet Bb	D3 – Bb6	146 - 1864 Hz	4 kHz	Clarinets in A. D. Eb. are also available.
Bassoon Bb	Bb2 – Eb5	116 - 622 Hz	7 kHz	
Contra-Bassoon	Bb1 – Eb4	58 - 311 Hz	5 kHz	

Flute	
Harmonics	Hi-cut if too shrill and piercing. 6kHz Atmosphere. 3kHz Breath. 1kHz boosted is nice… "Magic Flute" sound.
Fundamental	5 - 700 Body. 600 (exactly) boost

The beautiful flute sound has a 'tube' sound with slight breaths heard when flautist puffs hard. Low notes= puffy. High notes= pure.

Clarinet	
Harmonics	Top-cut might be needed if working with the classical sounds. Slight high frequency boost for a modern sound but be careful it doesn't get squeaky. 5.2 kHz Atmosphere. 2.5 kHz is the sound of the wood
Fundamental	700Hz boost for a stronger melody line. 300 Bell sound

Oboe	
Harmonics	Top-cut might be needed for that haunting classical sound. 4.5kHz Attack. 1.2 kHz Resonance
Fundamental	700Hz boost for a stronger melody line. 300 Body

Bassoon	
Harmonics	Top-cut might be needed for that warm classical sound.
Fundamental	

CREDITS

This material is offered freely to the Christian Churches; downloadable at Pietango.com

Text: *Original, by the Author, a Christian Recording Engineer.*
Images: *Designed by the Author. Some photographs were sourced from the Internet, then re-worked.*

Ever since the creation of the world, God's invisible attributes and divine nature have been evident. They are clearly understood through his workmanship, and all the wonderful things that he has made. Therefore, those who fail to believe and trust in him are without excuse, or defence. **Romans 1:20**

All of us have sinned and fallen short of God's glory, but God treats us much better than we deserve.
Because of Christ Jesus, he freely accepts us and sets us free from our sins. God sent Christ to be our sacrifice. Christ offered his life's blood, so that by faith in him we could come to God. **Romans 3:23**

If you declare with your mouth, "Jesus is lord," and believe in your heart that God raised him from the dead, you will be saved. For it is with your heart that you believe and are justified, and it is with your mouth that you profess your faith and are saved. **Romans 10:9**

For the Scripture (*Isaiah 28:16*) says, "Whoever believes in Him will not be disappointed." **Romans 10:11**

These things have been written so that you may believe that Jesus is the Christ, the son of God; and that by believing, and relying on him, you may have new life in his name. **John 20:31**