

# Accuracy of 'Swaras' of Indian Classical Music

Submitted by : Pushpak Patil.

## Accuracy analysis:

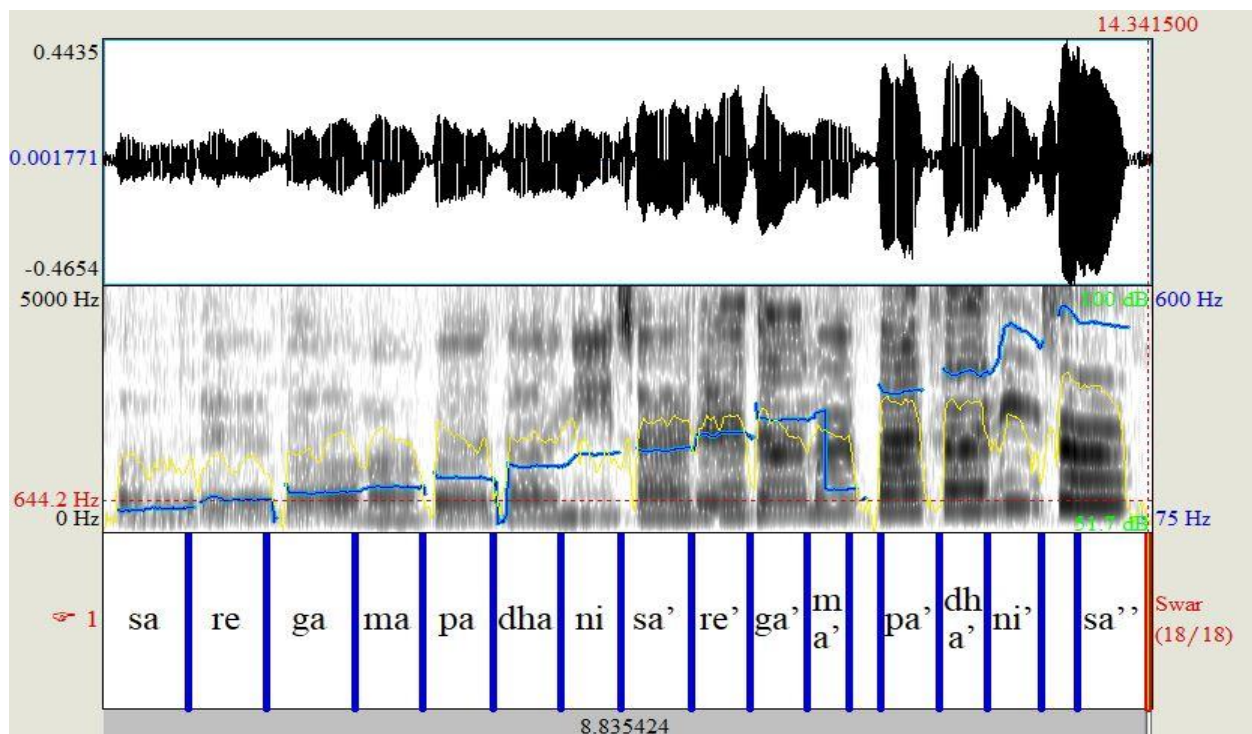
Amplitude of the song depends on the volume. When the singer sings softly or uses microphone, its amplitude varies but frequency remains same.

Let us consider the frequency of 'Sa' (Tivra)' as **f Hz**. Then the frequency of 'Sa (komal)' will be **f/2 Hz**. Between f/2 and 2f notes there are 11 more notes. Each of these notes are in geometric progression with common difference as  $2^{\frac{1}{12}}$ .

Following table shows the relation between 'Swaras'.

Swar name	Frequency ( in Hz )
Sa	f
Komal Re	$f * 2^{\frac{1}{12}}$
Suddha Re	$f * 2^{\frac{2}{12}}$
Komal Ga	$f * 2^{\frac{3}{12}}$
Suddha Ga	$f * 2^{\frac{4}{12}}$
Suddha Ma	$f * 2^{\frac{5}{12}}$
Tivra Ma	$f * 2^{\frac{6}{12}}$
Pa	$f * 2^{\frac{7}{12}}$
Komal Dha	$f * 2^{\frac{8}{12}}$
Suddha Dha	$f * 2^{\frac{9}{12}}$
Komal Ni	$f * 2^{\frac{10}{12}}$
Suddha Ni	$f * 2^{\frac{11}{12}}$
Sa'	$f * 2^{\frac{12}{12}}$

Swar Name	Expected freq.(in Hz)	Observed freq.(in Hz)	Absolute Error (%)
Sa	124.100	124.6	0.354
Re	139.298	141.6	1.653
Ga	156.356	156.8	0.284
Ma	165.654	171.6	3.589
Pa	185.940	191.6	3.044
Dha	208.711	212.3	1.719
Ni	234.270	240.3	2.574
Sa'	248.200	248.2	0.000
Re'	278.595	279.9	0.468
Ga'	312.712	313.5	0.252
Ma'	331.307	332.0	0.209
Pa'	371.880	370.9	0.264
Dha'	417.421	413.7	0.891
Ni'	468.539	478.0	2.019
Sa''	496.400	518.6	4.472



Seven sur of Indian classical music was analyzed over 2 octaves.

The vocalist had an error of 1.453% in his Sargam.