Chapter 5 - Veena playing: computer analysis

Brief description:

- Computer analysis of gamakas played on the veena
- Analysis of Veena Dhanammal’s Shankarabharanam
- Analysis of Karaikudi Sambasiva Iyer’s Shankarabharanam
- Analysis of Emani Sankara Sastry’s Shankarabharanam

Since the Sangita Sampradaya Pradarshini talks about the gamakas and the manner of playing them on the veena, a computer analysis of the veena playing has been done, to recognise and verify the notes and the gamakas in terms of the graphical picture, and correlate the various gamakams mentioned in the SSP with the various shapes obtained as the graphical output. The yellow line and the black waveform give a picture of the variation in the sound intensity. It also can be used to find out the meettus (plucking) used and the force in the meettu.

![Veena playing a raga phrase in ascent ‘pa da ni Sa’ in Mayamalavagowla](image)

Fig 5.1 Veena playing a raga phrase in ascent ‘pa da ni Sa’ in Mayamalavagowla

Next, we look at the Praat interpretation. It is also of importance to note that the Pitch settings in the File menu of the program have been suitably configured for all the artistes. The
The table below gives the modifications to the standard settings which have been used to obtain the results.

<table>
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<tr>
<th>Veena Artiste</th>
<th>Standards</th>
<th>Dhanammal</th>
<th>Karaikudi Samabasiva Iyer</th>
<th>Emani Sankara Sastry</th>
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<td>0.14</td>
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</tbody>
</table>

Fig 5.2 Praat settings used for different Veena artistes and volunteer.

It is important to note that the minimum and maximum pitch settings are set close to the actual values of the pitches, since this ensures that the analysis measures the pitch at closer intervals in time. The voicing threshold has also been reduced from the normal value in the case of noisy recordings. The Octave cost and Octave jump cost have also been modified in order to let the program focus on the Veena sound for the analysis. It should also be noted that the program fails to perceive the notes properly, when there is a second veena playing, especially in a lower octave, or the thalam strings are also sounded in addition to the melody. In spite of these constraints, a fairly accurate picture has been sought to be obtained.
A volunteer has played a few phrases to illustrate the use of the Praat program and the various frequencies are sought to be analysed. The tambura has also been played, to simulate a concert environment. The spectrum analysis as well as the analysis of formants and intensity patterns has been kept aside in order to obtain a clearer picture of the raga phrasing and its corresponding shape in the Praat program. This makes it easier to reconstruct what would have been the fingerings and the notations of the various artistes to be analysed. Note that the SSG grid (showing only the swara and shruthi values of Mayamalavagowla raga) has been superimposed on the Praat diagram, using the Photoshop program, taking care to note the lower and upper limits of the octave.

Fig 5.3 Veena playing a phrase in descent ‘ni da pa ma ga ri sa’ in Mayamalavagowla.

Another point of interest here is the presence of the intensity pattern. Every ‘meettu’ of plucking of the string is indicated by a sharp peak in the green sound intensity line, and can also be verified in the sharp face appearance of the black envelope in the waveform display in the upper half of the Praat diagram.

The usage of anuswaras in the various notes is thus clearly established: There is only a single pluck, but the oscillation of the note between the swara and the corresponding shruthi
value. It is also to be noted that when the sound intensity approaches its lowest value, the tambura sound also mixes with the veena sound, and as a consequence, the blue frequency line undergoes an octave jump. Next, some more phrases and gamakams are sought to be analysed in a similar manner.

Fig 5.4 Veena playing an arohanam phrase pdnS in Mayamalavagowla raga

Here we can see the complexity involved even in a relatively simple phrasing pdnS in one of the very first lessons that any student learns. Unless the complexity of the swaras d and n are understood well, it cannot be expected that beginners or even students with proficiency with other systems of music like Western classical music or Hindustani music will comprehend these gamakams and the use of the 22 sruthis. Just as children learn to first speak a language and then go on to learn the alphabet and the grammar, in Carnatic music it is seen often that some persons with family background (familiarity or genetic advantage) are able to sing well, but playing the very same gamakas on the veena or the violin or the flute is a different matter altogether. Hence, it is hoped that this methodology will prove to be a useful graphic teaching aid, as well as a good way to test proficiency in gamakams.

The process continues with the analysis of various gamakams like kampitham, Jaru, prathyahatam, orikkai, odukkal etc.
It is interesting to note the influence of the tambura volume in the production of the Praat diagram. Hence, the lack of a proper result as expected is a pointer to the necessity for caution while analysing noisy recordings or recordings where the Tambura sound is too loud, compared to the individual instrument volume.
Fig 5.7 Erakka Jaru (downward slide in the phrases Sn, Sd, Sp played sequentially)

Jaru and khandippu are explained in the SSP with respect to the fingerings and pluckings involved. Here the same is visually represented.

Fig 5.8 Veena playing khandippu gamakam in the phrase ‘Snd..’ in Kalyani.
Odukkal and orikkai are some other graces which occur often in veena play. They involve a lot of pulling ability and precision, as these gamakams are played on a single fret. Odukkal can be seen as more demanding and of faster occurrence.

Fig 5.10 Veena playing orikkai gamaka in Shankarabharanam for the phrase ‘gm,p d. p ..‘
Fig 5.11 Veena playing pratyahata gamaka in Mayamalavagowla for the phrase ‘SS nn dd pp mm gg rr ss’.

Fig 5.12 Veena playing ravai gamaka in Mayamalava gowla raga for the same phrase ‘SS nn dd pp mm gg rr ss’.

The 2 pictures above show how the gamakams look so similar when written purely as alphabetical notation, but the second note in the ravai case shows how it originates powerfully from the lower note. Also note how the final ss in the pratyahata example is faulty in that the second r is played as s. The similarity in size in the second waveform indicates the powerful nature of the ravai gamakam.
Fig 5.13 Veena playing the sphuritham gamakam in the phrase “ss rr gg mm pp dd nn SS” in Mayamalavagowla.

Note the equality in the intensity patterns in the case of spuritham gamakam.

Fig 5.14 Veena playing the vali gamakam for the phrase “grrs” in Punnagavarali raga.

The vali gamakam occurs in not so common cases of ragas like Punnagavarali. Note that the madhyama shruthi has been adopted, by shifting the SSG to coincide the s with the basic note. The occurrence of the 2 rishabhams is also to be noted.
This rarely occurring gamakam is described as the ‘tirubam’ gamakam in the SSP, and it involves the occurrence of notes in a fast manner, usually in threes. Thus, the usage of the Praat program, combined with the superimposition of the SS grid on it is a useful and practical way of looking at gamakams, especially in the analysis of old recordings. These can also serve as useful educational aids, as has been shown elsewhere in the thesis.

Computer Analysis of Dhanammal’s veena.

First, a brief sketch: Veena Dhanammal (1867–1938) was an expert Veena artiste, and she was able to sing and play at the same time, with nuances and high degree of perfection. Her ‘bani’ or style is called as Dhanammal bani, and she was held in high regard, as indicated by the presence of top musicians frequently at her weekly recitals at her house on Fridays. Her music influenced her disciples and many musicians in later years. Essence, brevity and finesse are the key words often used to describe her music.

“Regarding the veenas as an instrument complete and perfect in itself, she played it without plectrum, and often accompanied by her own singing. Her music is documented in a set of historical recordings. Her personal style, known as the Veena Dhanammal bani, is still regarded as a yardstick in terms of adherence to traditional values and profundity of music.
expression. Musicians, critics and composers attended her private recitals in Chennai. Her continuing impact is ascribed to the scope of her repertoire, knowledge and refinement. Many songs by leading composers like Narasimhacarlu, Muthialpet Ponnusvami, Tiruvottiyur Tyagayyar, and especially Dharmapuri Subbarayar were composed for, or inspired by, Dhanammal. These compositions, mainly javali and padam, have been preserved, taught, and published by her grandchildren, T. Sankaran, dancer T. Balasaraswati, T. Muktha, T. Brinda, and T. Viswanathan.59

Very few recordings (mostly from 3 minute records) are available of her music. A sample of her recording is analysed. It should also be taken into account that the research has been done on the digital copy of the recording, and that some of the nuances and the quality might have been lost in the conversion from the gramophone records to digital format.

The 3 minute gramophone record was a technology available at her times and so the entire analysis looks for pointers at the style of Veena Dhanammal and for samples of her approach to the various phrasings in Shankarabharanam. It should also be noted that the recording is not of raga rendition, but of the rendering of the composition of Anai – Ayya brothers in praise of Goddess Dharmasamvardhani of Tiruvaiyar. First, the sample file was opened in Wavelab program, and the comprehensive waveform is looked at.

![Fig 5.16 Wavelab interpretation of “mahima teliya tarama” as rendered by Dhanammal](http://en.wikipedia.org/wiki/Veenai_Dhanammal)

At first look, we can easily identify that the composition has 5 places, indicated by the markers where Dhanammal has supplemented her Veena playing with her singing. The final 2 markers indicate where the kalpana swaras have been rendered. The pallavi of the krithis is “Mahima teliya tarama (nee) mahini nee krupavisesha” and has been first played and then sung along with. The anupallavi and charanam lines have also been sung along. A few rounds of swarakalpana have also been made to give a finish to the song.

The phrase “pa da ni Sa” from Shankarabharanam, occurring at the 63\textsuperscript{rd} second is shown in the above Praat picture. From the amplitude diagram, the meettu (plucking) can be inferred at 4 distinct points. We can also infer that the note pa is played plainly. The second note da is played as a curved note as paSadaSa. The third note is SadaSa…ni … here the Sada portion occurs very fast and the second Tara shadjam is elongated, and the anuswaram for the note ni is seen. Finally the last note Sa is played in a plain manner.
The above picture gives a clear picture of the phrase pa da ni Sa (abbreviated hereafter as pdnS (with capital letter S to indicate the upper octave). The phrase is followed by an eitra Jaru of sS, which is both sung and played, and then the phrase Sndp is played. We can note the correspondences in the figure (blue line) with the text of the swara written above it.

Next, we superimpose the SSG grid on the Praat screenshot, using the Photoshop program, so that we can get an idea of the location of the sruthis and anuswaras and the contours of the various gamakas. This has been done in the anupallavi section of the song. Another point of note is that the thalam strings, which are almost imperceptible, do also affect the graphics as the notes s and p are sounded together with the notes played on the main strings. Formants have not been displayed as their relevance is low for this analysis.
Here, a portion of the penultimate kalpanaswaram section of the song has been analysed using the Praat program in conjunction with the SSG grid.

The corresponding swaras for each of the black sound events (which denote the plucking) are delineated above the blue line. The pallavi line is played at the conclusion, and we can have an idea of the swaras and the corresponding gamakams. The intricacy involved in the phrase “mgmdp” can be seen. We also look at the intensity distribution for the Praat analysis of the same interval, first plainly and then with the Praat intensity patterns as seen below:

![Fig 5.20 Praat interpretation of a kalpana swara sequence – plain.](image)

![Fig 5.21 Praat interpretation of the same kalpana swara sequence – with the intensity pattern.](image)
The intensity patterns offer an important insight into the music of Dhanammal. Normally, in the phrase ‘mgmdpm’, it would be natural to expect that the highest note would have the brightest intensity, but the green intensity pattern shows the lowest intensity, indicating a very high degree of control over the fingering and the plucking simultaneously. Another proof of the control and the complexity can be seen in the fast and intricate ‘mgr’ in the portion ‘teliya’. The ‘te’ syllable has been plucked so softly, yet the phrase occurs so fast and the swaras are so accurate, as can be seen by the SSG grid.

**Analysis of Karaikudi Sambasiva Iyer’s veena:**

Another noted school or bani of veena playing is the ‘Karaikudi’ bani of the brothers Karaikudi Subburama Iyer and Karaikudi Sambasiva Iyer (KSI).

Sambasiva Iyer was born in 1888 in Tirugokarnam, Pudukottai district as the second son to Veena Vidwan Subbiah Iyer. Sambasiva Iyer learnt Veena from his father along with his elder brother Subburama Iyer. The duo belonged to the eighth generation to carry the family’s high unbroken Veena tradition. The two brothers played together as “Karaikudi brothers” and enjoyed a unbroken career from their debut in their teens to the year 1938. Sambasiva Iyer was known for his tremendous hard work or “Asura Sadhaka”. His mastery over the instrument was perfect and he constantly toiled to preserve the purity of knowledge he obtained from his ancestors. Sambasiva Iyer and Subburama Iyer received numerous awards and honours. He was the first instrumentalist to receive the National award from the President of India.60

The available recordings of Sambasiva Iyer are very few, and this Shankarabharanam alapana was studied, as a pointer to the techniques and style of Sambasiva Iyer. The presence of a second accompanying veena can be seen very subtly as for example at the time of 3min 20 secs into the alapana. The various stages in the alapana can be seen in the following Wavelab figure. The various stages like akshipthika, raga vardhanis and their vidaris and the concluding sthayi can be seen in this 5 min alapana.

60 Source: http://vainika.wikispaces.com/Sambasivasubbaramalyer
Fig 5.22 Wavelab interpretation of Shankarabharanam alapana as rendered by KSI.

The “listening and analysing” method, with time stretched listening feature was adopted in this case and the entire alapana written out:

**Alapana of Shankarabharanam – Karaikudi Samabasiva Iyer**

**Stage 1 – Introduction - Akshipthika**

mdp dp mg m.....
p......p....d...
p......p..d......n....S..d dnSnS...d
p...ndnd. n ...S.... d....n.. p...
p...ndndd. n ...S.... d....n.. p...
g...m..p.g.m.r..g.m.p. p..d..n....S...
m....p.S...n d p...
g pm gm r...
g...pm g.
g...p...m...r
g...m..p...
p d.......n.... dn...d d ...p.d n...d
p.d pmmg g....
m... p ... d... n S.....
Stage 2 - Ragavardhani 1 - amsam on pa

S..... n.. dp...
g...mp g....r..s...
S..... n.. dp...
S ....r..... g m dppp... gr... s...
S..... n.. dp...
p..d..n... s... r.. g.. m..p gr...s....

Vidari 1

s....r....g....m....p...d...n...S..R...RGRS..nS..d n..p...p..d..n..... S...S....
g..m.p... d..n.... S..S....
g..m.p... d..n.... S..S....

Stage 3 - Ragavardhani 2 – Further sangathis and amsam on Sa

p..d.n... S...RGRS...
n...S...R...S.n.S.R.....S..
n..RSnS...d..n...p...d...
p...d...dnSN... n..SRSSn..S...d...n..p...
p.dndnS.n...d...p...d..n...d...
p...d p...d pmg ..m....
g.m.p.d.nS...d... nS....
g.m.p.S...n dpmg.. Gm
g.m.p.d.nS.R.SnS.d.n.p.
p.dn..S...S....

Vidari 2

S... n .. S.GRSnSR...S... nS...nSR....
d.n.S...R.n.d.p... d.n.S.R...
G.R...Snd.p...
pdnS.SRGM..G...
Stage 4 - Ragavardhani 3 – sangathis with amsam on Tara Shadjam – Sa

G.G.G…MG..RGMG.R.S.n.
S…R…R…G…M…R…M…G.. RSS..n…
GMPMM. G… GMPMM. G…. RSS… n.
R……RGMGGRRSSG… R…. PMMG..R S…n…
SR… GMP…G.R.S..n…
S.R…G.M.P G. R… S… pdnSRGMP…GR..S.,n…
M.G.RG. nRp.. n.R… GPMMG..R.S…n…
G…S…SRGR…S..n…

Vidari 3

S.nSRGRS.nSR.S.nS.nSR…
nS..Rn.d.p… pGR…
pdnSRGR…Snd..p.
pdnSRGMG…
M.G..G.MG.MGRS.G….
M.G.M.G.M GR…
pdnSRGMG.MGRS.

Stage 5 – Conclusion - Sanchara in Tara sthayi, and conclusion (Nyasam)

nSR.GMP…
R..PMG..MMGRS.n.. 
S.RMGR.SnSR.SnSR.Sn.
dnp.d… dnS…
pdnS.d.p.g.m….
gmpdnSR..Snd.pmgm..
gmpdnSRndp..
sgmdp.pmgr.s.. 
sgmpdnSR.SnS.dn.p.
pdnS..gmp.RSS….
rss. R..gmdpp. gr.s ns..dnnp.
gmpdns..n.s…

The duration of the sections of the alapana are as 56”, 1’36”, 2’22”, 2’58”, 3’28”, 4’10”, 4’39” in an alapana of under just under 5 minutes, indicating a slow and steady start as well as equal importance for the Vidaris – the section connectors.
This alapana, when divided and looked at as sections, clearly shows how the individual themes, like “p.mgmpdnS.” has been elaborated over a dozen lines in the akshipthika, or how another theme “pdnS nSR.S” has been elaborated over 10 lines in Ragavardhani 2. Next, we look at the Praat interpretation. It is also of importance to note that the Pitch settings in the File menu of the program are suitably re-configured for this artiste.

Fig 5.23 Praat interpretation of a raga phrasing as rendered by KSI.

The following can be inferred from the picture above:

- Formants are clear and uniformly seen across the whole range.
- 5 formants are seen, indicating a very good tonality.
- The frequency of basic note sa is around 167 Hz.

Fig 5.24 Praat interpretation of a phrasing using nishadam as rendered by KSI.
This above Praat picture shows how a shruthi value of the nishadam is played for a fleeting period of around quarter of a second, and again how the nishadam is played as a continuous deflection from the Tara shadjam.

Next, the SSG, suitably altered so as to show the swara values for Shankarabharanam, with another grid added for the upper octave, is added, and shows the purity of the notes. The intensity is also looked at, and we can omit the formants to get the patterns as seen below:

Fig 5.25 Praat interpretation combined with SSG to show the purity of notes as rendered by KSI.

A few more phrases, with the swara notation also integrated with the graphics, are shown below:

Fig 5.26 Praat – SSG representation of swara and gamaka purity as rendered by KSI.
Fig 5.27 Another Praat – SSG representation of swara and gamaka purity as rendered by KSI.

Another sangathi in the ragam, replete with perfection can be verified in this picture. Uniformity in the plucking, and unhurried and bold approach can be inferred from the almost equal spacing within the 2 sangathis dnS..S….. and S…nSR…S….

Fig 5.28 Praat – SSG interpretation of sangathi purity as rendered by KSI.
Yet another sophisticated sangathi with many fast and intricate fingerings is presented in this Praat picture. The presence of so many notes occurring with such speed and clarity can be verified.

Fig 5.29 Another interpretation of purity in raga phrasing as rendered by KSI.

Here we can see a special feature clearly: the use of both types of nishadam, first as the anuswaram approximating to the n4 value in the fast phrase “dSnS”, and immediately later as the n3 swara in the ‘dp.dn.d’ phrase. Also seen are two varieties of m, once as the gamakam “g p gpgp” and also as the straightforward m1 in the “gmp” phrase.

Fig 5.30 Praat – SSG verification of anuswaras, and orikai and odukkal raga phrasings as rendered by KSI.
Here the sophistication can be seen in the purity of the notes with respect to the SSG, as well as the use of anuswaras and the use of the orikkai and the odukkal gamakams, and the ability to slide across the frets on a single pluck, while maintaining the swara and anuswara accuracy.

This Praat picture captures in part the brilliance of Karaikudi Samabasiva Iyer’s sophisticated conception of the phrasing in the Tara sthayi. The plucking of the thalam strings has to some extent, interfered with the drawing of the graph. Hence the researcher had to depend on careful and repeated hearing (played back with time stretch) in the Wavelab program, in order to be able to capture the minute intricacies. The swara notation shows a rapid sequence of movement among approximately 20 notes, with various speeds occurring with precision, in the highlighted time interval of around 2.5 seconds. Usually, swaras that are higher in the octave are played more intensely. Here, the control of this Master artiste is evident, when in the middle of this sophisticated and fast phrase, the lower and higher notes are played with equal intensity.
Analysis of Emani Sankara Sastry’s veena:

A short note about Emani Sankara Sastry (ESS) (1922 - 1987):

Hailing from a family of celebrated classical musicians. His father Vainika Bhooshana Emani Achuta Rama Sastry, a famed vainika and sastragna was said to be a contemporary of other famous vidwans of their era like Sangameshwara Sastry and Veena Venkata Ramainiah Das. He had prodigious and strict training under his father. His playing was tuneful, melodious and in strictly traditional style. It reflected his passion for technique perfect concerts. His graceful playing on the veena evoked a reverential listening. Emani gave concerts throughout the length and breadth of India. His participation in East-West music festivals, Tansen festival, Vishnu Digambar festival, and other prestigious music conferences won him distinction in the field of music.61

Fig 5.32 Wavelab interpretation of Shankarabharanam alapana as rendered by ESS.

First, the Wavelab analysis shows that the raga alapana can be divided into 6 sections, and the notation is made by careful listening. The basic sruthi is also noted by comparing the sa at 3 or 4 places to the pitch pipe. It can also be done using the Pitch analysis tool in the Wavelab program itself. It is noteworthy that in his early career, this celebrated Vidwan

served as a music director (working in films), and also as a music arranger and composer in All India Radio, a premier institution, and that these influences, other than his association with Hindustani and later in East – West music festivals has shaped his playing style. It should also be noted that the website notes: “The raga Sankarabharanam played by him on the veena won him the ASIAN ROSTRUM AWARD for the most outstanding number for the year 1973. The rostrum was held under the patronage of UNESCO, at Alam Atta, Soviet Union wherein eminent artists from thirty nations took part.”

This particular alapana was played at an international forum, showcasing the veena style and so has been studied in some detail.

**Alapana of Shankarabharanam – Emani Sankara Sastry**

**Stage 1 – Introduction – Akshipthika**

p.p..... ppmgmg...
pdnS...S.S....
S...n.d.p... ppmgmg...
g....dp...ppmg.
g.mpmgrg.pmgr.s.n.
s.srgmpp.g.g.m.p.....
m....S.n.d.p. pmgm...
d.p...
pmpdpmpd..p..pmp dp.dpmmp.g
g.g.m.pbmpmpd.mpdp.dpmmp.g
g.m.p d pd m.g.

**Vidari 1**

g.m.S.n.d dS.n_ dp mg.m.p. Sn dp. mgm.pMGMGR S. n. dp_ mgm. pdnSRGMP. GR. n
dnSRGMP. GR. Sn dp.m gmp.grsn srgmpdnSR.S.n dp .mg.m. p.....

**Stage 2 – Ragavardhani 1 - Amsam on mandhra pa** (brown ink - indicates manda sthayi)

p.p. ppmgmp..
p.p.p. pdpdpmm.mp.mpdp.g gpm gmr. gm.p
pmpdpd mpdp mdp mdp mdp pmgr srgmp ..
ppmmgrsrgmp...
ppm p.m p.m p. p.m p.m pdppmm. mp. dppmgrg. gm.pmmgrsrgmp...
pmpdpdppmmpgrsrgmp...

62 http://www.emanishankarasastri.com/honors-n-awards.php
Stage 3 – Ragavardhani - Alternate amsam on Mandra / Madhya pa

pmgmp. mgrsngsrngmp. mgrsngsrngmp. Sn. dp. mgmp.
pmdpd mdp mdp mdp mdp mdp gpm gpm gpm gr gpmgr srgmp.
snsrgmp. mgrsn srgm...
pmpmgmp... srgmp... ppmmp.mp...
pmm.md.pmgmp...
gmgmp mmmpmgr m.pmd. p.mg.m.p...
m.g.rnsrg.m.p....
p. pmgr... srg.m.p...
pSndp. mgr srg.m.p.
pdpdp mg.m.p. mgm.p... mgmd.p... mgmp....
pnpmgmsns.p..
mgmdp.m.g...
g...pmgr..
gmgmgr.s.....

Vidari 2

n.n. srgmggrr.rg.rsn...
s...rp..mmmgrsns..snrss...d n..s.....
mgrsngsrng.m.g............

Stage 4 – Ragavardhani - Amsam on Madhya Sthayi ga

g. g. g. g. g. g. g. g. g. g... gmpmmggr

g. g. g. g. g. g. g. g. g. g....mgm gmr gnr r.m.g......
g...rsnr..r.m.g....
g...rsnr. p.m n.r.m.g.rsn. r.m.g....
mgrsngs...
mgrsngsrngmsns...
mgrsngpmg...

Vidari 3

mgrsn sgrsn smgrsn sp.. ppmgrsnn smgm rgm rg.. sgrg srgmp..mgrsn.
srgm....d....n....R....G....M....G RSn dp....gmp... gr.s ...

Stage 5 – Amsam on Tara Shadja and Ga

g.mp. dnS........S. S>S........SnS r.S...
S.n.S... R... RGMG.....GMPMMGR SRGM... RG..S. RPMMGRS.n..

n. n. R...G.. RSS...
n.n. R...RGM.G RSS...
The following initial findings can be made from the Wavelab diagram and the notation analysis:

1. At first glance, the departure from the accepted Akshipthika – Ragavardhanis (with Vidaris) - Nyasa (conclusion) path can be seen in the inclusion of the alternate amsam (Mandra pa and Madhya type of Ragavardhani).

2. Another feature that can been seen is the Vidaris that are relatively long and continuous and softly played (in terms of total volume).

3. Equally spaced intervals of the alapana sections are indicated by the timings at which they occur: 1’36”, 2’20”, 3’40”, 4’40”, 6’55’ are the timings for each of them, in an approximately 8 min raga alapana. This indicates careful planning and control, to be able to control the alapana sub- sections duration, and the total duration.
Next, the Praat diagrams are looked at:

Fig 5.33 Praat interpretation of tone as formants in the Shankarabharanam alapana as rendered by ESS.

The length and purity (steadiness) of the note can be seen in the phrase beginning “d.p…p…” The recording has been sourced from internet as an mp3 file, and the original recording seems to have been done in a large hall with some background noise (note the birds shrieking in the background at from around 4 min to the end of the recording). Hence the clarity is lost, and the 5 formants indicating a bold tone are a bit unclear in appearance.

The basic sruthi is around 153 Hz for this artiste.

Fig 5.34 Praat – SSG interpretation of sruthi shuddham and etra jaru in the Shankarabharanam alapana as rendered by ESS.
The sruthi shuddha and the precise etra jaru from g to S and the elongated kampitam for d can all be seen in this Praat picture. Note should also be made of the softness and the sustain of the plucking, enabling the long kampitham on d.

Continuing with the analysis using Praat, we get the following diagrams:

![Fig 5.35 Praat – SSG interpretation of elongated kampitham and complex phrasing in the Shankarabharanam alapana as rendered by ESS.](image1)

The long kampitham (about 3 seconds) on m and the subsequent pause, and the complex phrasing with the next 2 seconds can be seen from this diagram, and so also the high fidelity (sruthi shuddha) of the swaras can be inferred.

![Fig 5.36 Praat – SSG interpretation of contrasts – plain vs nuanced notes in the Shankarabharanam alapana as rendered by ESS.](image2)

This Praat – SSG picture, along with the intensity patterns, reveals the control and the musical acumen of this artiste.
The first phrase d – p has a nuanced kampitham at the beginning and then p is played twice as shuddha swaras with very good accuracy, and this phrase is approximately as long as the second and sophisticated raga sangathi.

Also can be noted that the intensity of the first phrase is a two – pluck constant value with sruthi perfection and steadiness, whereas the more complex second phrase actually has 4 pluckings of decreasing intensity, with each of the 4 individual phrasings in the second phrase clearly decipherable.

![Fig 5.37 Praat – SSG interpretation of plucking control and sruthi shudham in complex phrases in the Shankarabharanam alapana as rendered by ESS.](image)

This picture shows a very slight increase in intensity due to the natural loudness of the Tara Sthayi, but the gradual decrease of intensity in the second phrasing and further decrease in the 3rd complex phrasing indicates a very high level of control and competence of this artiste.
Summary and comparisons of the Veena playing styles

The important aspects to note about the playing of Veena Dhanammal are:

- High basic sruthi of around 188 Hz, slightly higher than the note F.
- Purity of notes, both as plain swaras and as gamakas. Note how, especially in the last Praat picture, the swaras are literally ‘on the dot’.
- Accuracy of the swaras can be inferred by the near exact correspondences of the swaras on the SSG grid.
- Timing in the gamaka patterns can be seen in the very fast expression of “mgmg….r” …. The note ga is expressed as “mgmg” with high degree of precision in both speed and gamakam. These patterns point to a very deep understanding of the phrasings to be used in complex and vast ragas like Shankarabharanam.
- Control over the plucking is of very high order, as discussed earlier, by studying the intensity patterns.
- The recording also can be played at various places to see how the voice and the veena blend as one, in the graceful expression. A very good illustration of what Muthuswami Dikshithar means when he sings “vainika gayaka guruguha nuta” in the song Balagopala\textsuperscript{63} in Bhairavi ragam.

The important aspects to note about the playing of Karaikudi Samabasiva Iyer are:

- Slightly lower basic sruthi of around 166 Hz around the note E.
- Purity of notes: can be inferred by the correspondences with the SSG.
- Tonality: 5 Formants can be seen, as a good indicator of the depth of the tone.
- Even when intricate phrases are being played, formants are still perceptible. This indicates excellent playing technique.

\textsuperscript{63} Padma Varadan, Sri Mudduswami Dikshitar’s Compositions, Vipanchee Charitable trust, 2009
This most dedicated maestro is reputed to have been inseparable from his instrument, and a perfectionist, as is borne out by the choice of phrases in the alapana, and the calm and unhurried approach to the various complex phrases. It can be noted that the intensity patterns show a more gradual decline, indicating a continuity of tone.

The important aspects to note about the playing of Emani Sankara Sastry are:

- Low basic sruthi of around 160 Hz, around the note D#.
- Purity of notes, both as plain swaras and as gamakas. Accuracy of the swaras can be inferred by the near exact correspondences of the swaras on the SSG grid.
- Control over plucking, as explained in the analysis of intensity patterns.
- Timing in the gamaka patterns can be seen in the very fast expression of swaras, as well as simultaneous slow notes, as can be seen in Fig 5.34. These patterns point to a very deep understanding of the phrasings to be used in complex and vast ragas like Shankarabharanam.
- Good depth of tone, but only 4 formants are very prominent. Probably due to the low adhara sruthi of D#. The lower sruthi offers lesser string tension and more control, and maybe that is why, with the increasing use of the regular microphones, Emani Sankara Sastry preferred a slightly lower adhara sruthi.
Summing up of the style analysis can be done thus for the 3 Veena artistes:

1. Limitations of the Praat software – on occasions where the tala strings are plucked in conjunction with the main note being played, the frequency is shown with an octave change. Also, the available recordings, even after hiss filtering and noise reduction, still have disturbances which distort the graphical picture (the blue line)

2. All 3 veena instruments have a very sweet tone, as indicated by the presence of 4 formant frequencies, (or in some regions, 5)

3. The styles are distinctly different, indicating an independent approach, but at the same time, all the 3 artistes are found to have very high degree of precision and are punctuated with clearly defined gamakas

4. This methodology serves as a good tool to study the individual styles.