THE *TAKHT* REQUIREMENTS BETWEEN TRADITION AND POPULAR DIFFUSION: SHIFTING VENUES

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1 INTRODUCTION

From the Roman Theatre of Carthage to the Municipal Theater of Tunis, Tunisian traditional, popular or religious music has evolved in different architectural contexts considered as milestones of its history.

We have tried to describe the acoustic quality of eight concert venues through their capacities to enhance the execution of the *takht* ensemble, constituted by five musicians until the first half of the XXth century. Put into new acoustic venues, the *takht* opened up within the *Rachidia* Institute[1,] thus extending the traditional Tunisian music commonly known as *mâlûf,* from their centre in Tunis throughout Tunisia[2]. While keeping trace of the original formation, it was gradually transformed into another type, with the multiplication of instruments and voices introduced for the Municipal Theatre and the Roman Theatre.

Accordingly, we compare the acoustical parameters of the typical places for musical research and exercises of the *takht*, from the Music Room of *Ennejma Ezzahra* Palace, over Café Mûrâbit, *Dâr Râchidia*, Zaouïa of Sidi Belhassen, the Music Room of the Bardo museum (Sadok Bey's Palace), Tunis Municipal Theatre, to Carthage Theatre and El-Jem Amphitheatre.

2 FROM ARABIC-ANDALUSIAN ARCHITECTURE TO LARGE VENUES

The Music Room of *Ennejma Ezzahra* Palace, a small square room of 4m side and a height of ca. 5m, opened on a bigger patio, was intended for musical research and the cantillation of the *mâlûf* during its learning. The Zaouia of Sidi Belhassen, with dimensions of 24x15x6.35m, is adequate for practicing the religious songs "mâlûf al Jid", the religious pendant of the secular " mâlûf al hazl ", usually called *mâlûf*. Café Mûrâbit, *Dâr Râchidia,* and the Music Room of Sadok Bey's Palace (Bardo Museum) are rooms that were built during the Arabic Islamic period, that is, the time when the different accents and characteristics of this type of Tunisian traditional music were defined and enriched.

In Café *Murâbit*, an 8m long, 12.5m wide and 5.6m high room with an 8.4m long and 2.8m wide entry corridor, the social context blurs the structure of the *takht*. The instrumental improvisations "*istikhbâr*" may not be well related to the rhythmic parts, regulated by established rules of compositions that determine the structures of the different forms[3]. The Tunisian *nawba,* an arabic - andalousian tradition commonly known as *mâlûf*[3], is formed by a succession of instrumentals and vocals pieces that arise out of each other. In the Café, they will be partly covered by the noise of the persons who assist to the entire suite. Indeed, a café is a place where relationships start and are nurtured.

In the Music Room of the Bardo Museum, a 24m long, 6.8 wide and 9m high rectangular room, the Masters of *mâlûf* (the sheiks) livened up the *beys* by presenting a blend between the Arabic-

Andalusian music and the western music in a specified manner. The mixture of sound components might have reached amplified the women tribune.

The *mâlûf* came to the forefront when the *beys* introduced musical notation and promoted the use of written Arabic language to clarify the structure of the music. This prevented sound rotation after its emission and before it reached the ears of women on the tribune opposite to the musicians' one.

In *Dâr Râchidia*, a 16.4m long, 13m wide and 8.4m high covered courtyard, the conventional *nawbat* (plural of *nawba*) was transcribed and Arabic poetry was used to make the sound clearer and more brilliant. Its structure is enriched and sublimated by rhymed verses. The different parts of Arabic poetry of *nawba* are clearly structured and used since the XXth century. The Tunisian dialectal language refines and reaches pinnacles when introduced into the metrics of the poetry and Arabic pronunciation[4]. The rhymes are emphasized and amplified in this environment, and the sound gets more presence.

These four venues do not emphasize the sound presence and are neither adapted nor conform to the loud sound of the *takht* in spite of the fact that they are the continuation of the Andalusian architecture that reached its highest degree of expression in the large mosque of Córdoba and the Palace of Alhambra in Spain.

During the installation of the French colonization, the formation of the *takht* was adapted in 1935 for the Tunis Municipal Theatre, one of the rare Art Nouveau monuments in Tunisia. This building, over 20m in height and with a capacity to accommodate up to 1350 people, is used for various kinds of music and poetry representations. In the Municipal Theatre, the *takht* formation widened out with 24 musicians, resulting in more brilliant and more fluid music.

In 1972, 3 ensembles joined together around the *Râchidia* to play for the first time in the Roman Theatre of Carthage, where it reached notoriety in an era where globalization turns down the Arabic literature to the benefit of low quality variety shows. Note that it was in the Theatre of Carthage that Winston Churchill pronounced his famous speech during the Second World War. To-day, the monument shelters the International Festival of Carthage and is mainly used for variety shows. In a very enthusiastic atmosphere and with the use of a sound reinforcement system, the *takht* enlarged and adapted itself to the standards of western Concerts. There, the *Râchidia* conjugated the traditional music repertory with the new standards of amplified music. This sound increase is necessary to reach the furthest seats of the theater in a *cavea* of 105m diameters and a height exceeding 25m.

In 2015, the *takht* moved into the third best-preserved amphitheatre in the word in El-Jem. It measures 36m in height with a 64.5m long and 38.8m large elliptic arena. Within the frame of a consumer representation, the mixed entertainment named " *hadhra*" of Fadhel El-Jeziri, *mâluf-al-jid* and some excerpts of *mâlûf-al-hazl* referred above, took over the stage of the monument. The arrangements, which were created for the occasion, display certain characteristics of *tubu*[3] and affected the core of the *takht* formation to the advantage of a tempting stenographic presentation. The sound was huger and tighter to the monument, but it damaged the musical fluidity of the original circle of *Hadhra* and altered the characteristics of the *takht*.

Note that the *Hadhra* is a ritual representation of Andalusia characterized by a loud sound. In Tunisia, it becomes a scenography presented in multicolored coverings and decreases the sound presence, which characterizes it.

Figure 1: Stuccos and arabesques of the Nasrid art

The Umayyads of Al-Andalus stacked columns and piles supporting polylobed arches. We find the same series of columns, the same corridors leading to polylobed arches, the same arabesques on abacuses on the top of the capitals of columns, and the same ornamentations on the ceilings of the five rooms: *Ennejma Ezzahra* Palace, Café *Murabit*, the Zaouia of Sidi Belhassen, *Dâr Râchidia* and the Music Room of the Bardo Musum. Figures 3 and 4 display the Islamic architecture of the Music Room of Bardo Museum and *Ennejma Ezzahra* where the *muqarnas*[5], a three-dimensional decoration looking like pending "honeycomb", remind those of the Alhambra Palace[6] and Masjid-i-Cheikh in Iran[5].

Figure 2: The arabesques of the arch interiors and the paralleled consoles of the ceiling of the patio of *Ennejma Ezzahra* Palace strengthen the sound of the traditional *takht* formation by casting it backward and are at the same time an essential component of the architectural language of Andalusia.

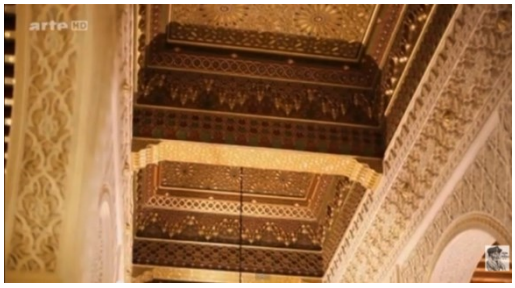

Figure 3: The minaret style of the arched *muqarnas* In Bardo Museum. The open door under the women tribune contributes to reducing the level of the sound of the *takht*.

Figure 4: The spherical geometry of *muqarnas* in the arches in the entrence to the patio of *Ennejma Ezzahra* Palace. The sound received from the hidden source in the music room is further diffused and gains in clarity.

3 THE EIGHT ROOMS: OBJECTIVE PARAMETERS VS. *TAKHT* REQUIREMENTS

We compare the parameters acoustics of the music room of *Ennejma Ezzahra* Palace with the seven other spaces. Indeed, it was *the* place for musical research and exercises for the *takht* musicians which participated to the first Congress of Arabic Music in 1932 in Cairo.

The measuring equipment consists of a dodecahedral sound source (Outline GSR), and a subwoofer (Tannoy Power VS10) connected to the source, both supplied with their amplifiers. All measurements were carried out an Ambisonics SoundField ST 250 microphone, connected to a multichannel soundcard driven by a laptop. An exponential sweep-sine signal was used as original signal, because it allows a posteriori elimination of harmonic distortions from the sound source, as well as efficient signal-to-noise ratio. It was recorded and processed with the Aurora plug-ins, developed by Angelo Farina from Parma University[7]. The output is the traditional room-acoustical indices[8,9], as standardized by ISO[10].

3.1 Reverberation time RT30

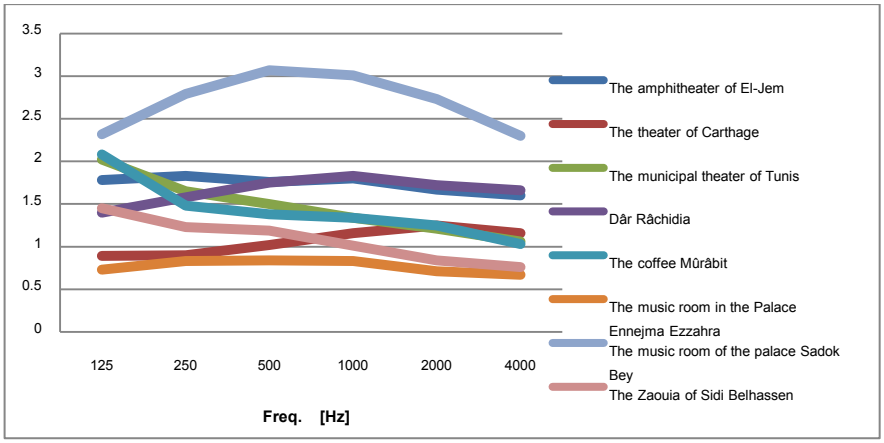

Figure 5: Average RT30 for the eight spaces by octave bands

The reverberation times (RT30) of the Zaouia of Sidi Belhassen and of Carthage Theatre are closest to that of the music room of *Ennejma Ezzahra* Palace. Reverberation in Carthage Theatre has a profile almost symmetrical to that of the Zaouia. All three have reverberation times in the range recommended for lecture halls or small theatres. Due to its smaller size, the Zaouia of Sidi Belhassen will display a more intimate music than the Roman Theatre of Carthage. The reverberation times in the other venues differ even more from the RT30 of the music room of *Ennejma Ezzahra* Palace.
RT30 in Tunis Municipal Theatre and Café Mûrâbit takes similar shapes that decline from 2.1s to 1s with frequency. The increase of reverberation time in the bass frequencies compared to the middle ones is desirable in a hall of the size of Tunis Municipal Theatre, The reduction of the reverberation time in the 2kHz octave band avoids sharp and aggressive sound in the theatre. Mûrâbit Café is very reverberant for traditional Tunisian music interpreted by the *takht*, but measurements were taken in empty state

The reverberation time of *Dâr Râchidia* is close to that of El-Jem amphitheatre, despite that the first is a small covered courtyard, whereas the second is a very large amphitheatre. The latter shows a constant reverberation time throughout frequencies, thanks to its highly reflective freestone construction.

The RT30 of the music room of Sadok Bey's Palace is very high, but it certainly does not correspond to what it was at the time of beys, because of the absence of carpets and the presence of numerous Roman mosaics on the walls and floor.

3.2 Early decay time EDT

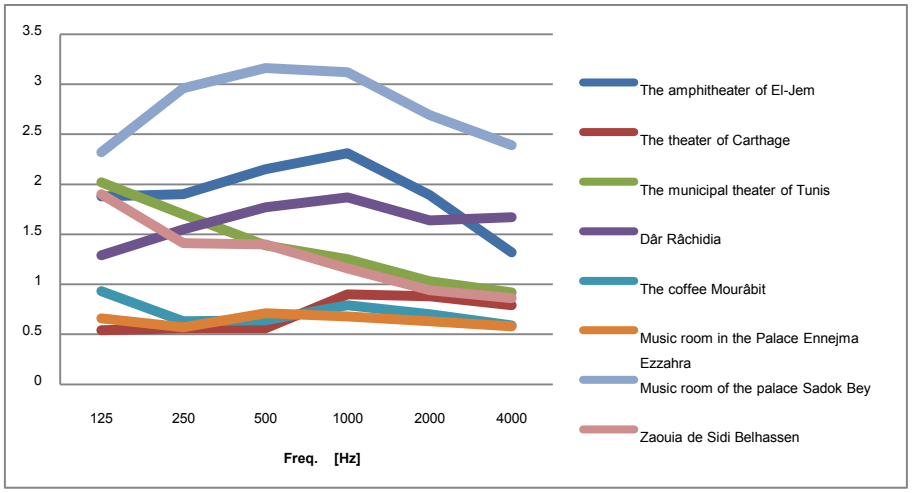

Figure 6: Average EDT for the eight spaces by octave bands

The Café is very similar to the music room in *Ennejma Ezzahra* Palace regarding the early decay time EDT, which corresponds to the perceived reverberation. However, the sound in the Café is louder than in *Ennejma Ezzahra* Palace, as will be shown below. These two venues allow *a priori* to appreciate the dynamics and the attacks on the traditional instruments that form the *takht*.

3.3 Centre Time Tc

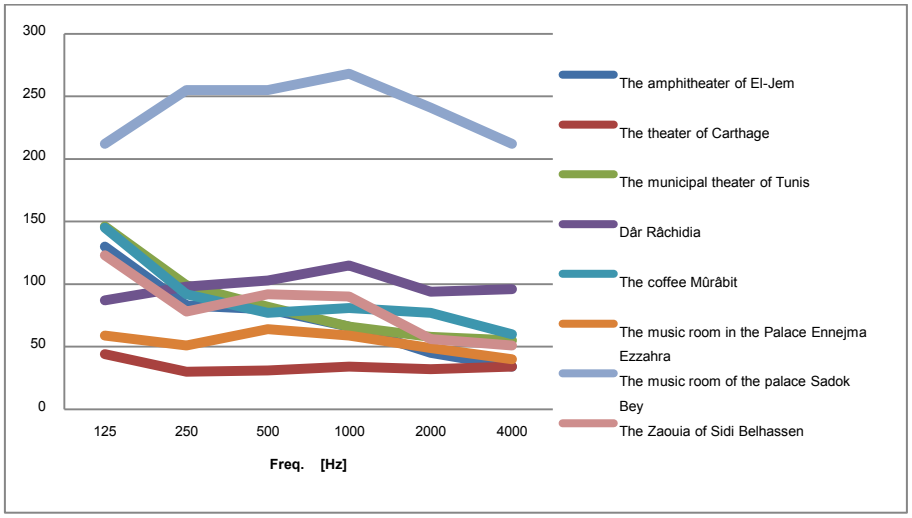

Figure 7: Average of Tc for the eight spaces by octave bands

Tc in Carthage Theatre is the closest to that of the music room of *Ennejma Ezzahra* Palace. In this small volume, Tc is suitable but it is low for the large Carthage Theatre. Tc is also very long for Tunis Municipal Theatre, the Zaouia of Sidi Belhassen and Café Mûrâbit. It is much too long in El-Jem Amphitheatre and Dâr *Râchidia*, where we cannot therefore expect good appreciation of a *nawba* interpreted by the traditional *takht*.

3.4 Clarity C80

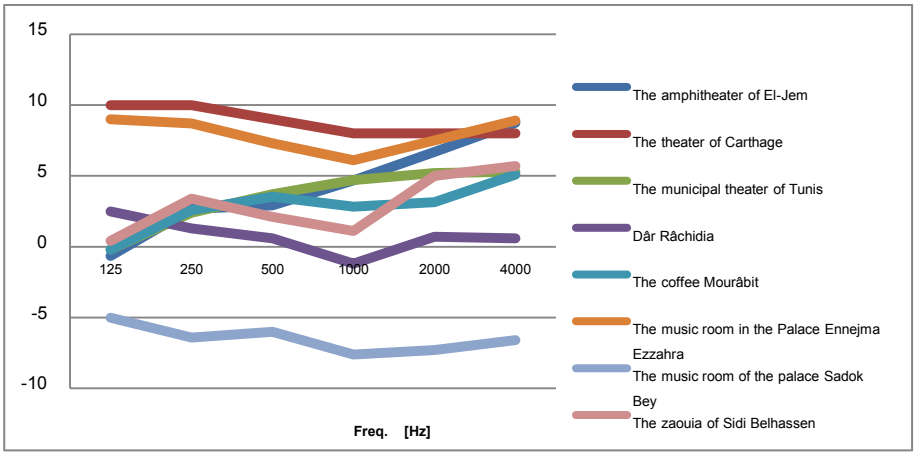

Figure 8: Average of C80 for the eight spaces by octave bands

The values of clarity C80 at middle frequency allow the following grouping of the 8 venues:

- The music room of Sadok Bey's Palace (Bardo Museum), with its clarity C80 lower than 6 dB, is a very reverberant and, in a way, confusing room because the direct sound and the first reflections will be drowned in the late reflections. The Zaouia of Sidi Belhassen and *Dâr Râchidia* have a clarity in the range 1.2 - 2.1 dB, close to what is recommended for chamber music.
- Café Mûrâbit, Tunis Municipal Theatre and El-Jem Amphitheatre have clarity in the range 2.9 - 4.7 dB. Generally, this range allows the appreciation of the sound attacks and dynamics. It is also recommended for the appreciation of pop or rock music.
- Clarity in the music room of *Ennejma Ezzahra* Palace and Carthage Theatre in the octave bands centred on 500 and 1000 Hz are between 6.1 and 9 dB. These values are usually considered as detrimental to the appreciation of music because they correspond to very few reflections and to a very dry sound will. But it allows hearing all the subtleties of the music and dry environments enhance the *takht*.

We deduce from this analysis of clarity that Café Mûrâbit would second best suit the *takht*, due to the fact that it has the second smallest volume after the music room of the *Ennejma Ezzahra* Palace. Optimal C80 would be in the range 2.8 - 3.5 dB.

3.5 Strength G

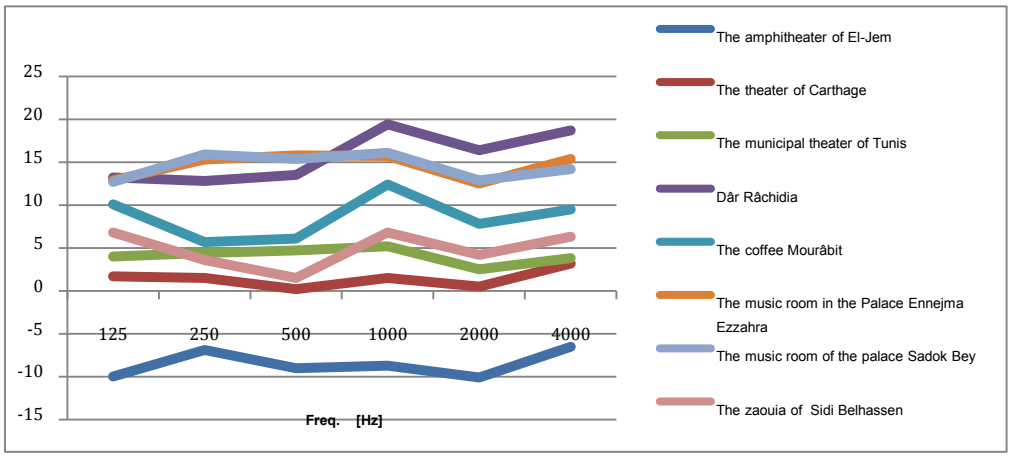

Figure 9: Average of G for the eight spaces by octave bands

As expected, the strength G is small in large open-air Roman (amphi)theatres, and very large in small intimate or very reverberant rooms, like the music rooms of *Ennejma Ezzahra* Palace and Sadok Bey's Palace. In El-Jem Amphitheatre, the curve G is flat in the middle frequency range and takes values between -9 and - 8.7dB, corresponding to a very weak sound that must be amplified if the traditional *takht* formation is to be heard. In comparison, the music room of *Ennejma Ezzahra* Palace has a very loud sound, just like the music room of the Bardo Museum, with G between 15.4 and 16.1dB. *Dâr Râchidia*, similar to the two music rooms up to 500 Hz, is even louder at high frequencies, peaking at almost 20dB, the highest strength, in the 1000 Hz octave. However, in parallel the one of *Dâr Râchidia* is therefore the closer in loudness to the music room of *Ennejma Ezzahra* Palace than Café Mûrâbit, almost 8dB below.

The next group is composed of the Zaouia of Sidi Belhassen, Tunis Municipal Theatre and Carthage Theatre. However, the strength profile of the Zaouia is similar to that of Dâr Râchidia some more 8dB below. Carthage and Tunis Municipal Theatres have more flat strength profiles that range between 0 and 5dB, a range optimal for classical European music, but on the low side for a small ensemble such as the *takht*: it must be strengthened either by increasing the number of instruments, or amplifying the sound. The first solution is attested for the Municipal Theatre, and the second for Carthage Theatre.

All venues were measured in empty conditions. We therefore expect the strength to reduce with public. This reduction is likely to be stronger in small spaces such as the music room of *Ennejma Ezzahra* Palace or Zaouia of Sidi Belhassen where strength will decrease to more suitable values and reinforce the sound of *takht* similarly due to the same architectural layout. There will also be a large reduction in Carthage Theatre, where all reflections come from the *cavea* where the public sits. The reduction will be less pronounced in large rooms like Tunis Municipal Theatre, and negligible in El-Jem Amphitheatre, where the high superstructure is responsible for most of the reflections. The music room of Sadok Bey's Palace is a special case, as no public can sit on the Roman mosaics that cover most of the floor.

It should be noted, however, that calibrating strength measurements is a difficult task, due to many changes that can appear between measurements[11]. As a consequence, absolute values should be taken with caution, but the rank ordering of the venues with respect to strength should be correct.

3.6 Lateral Energy LF

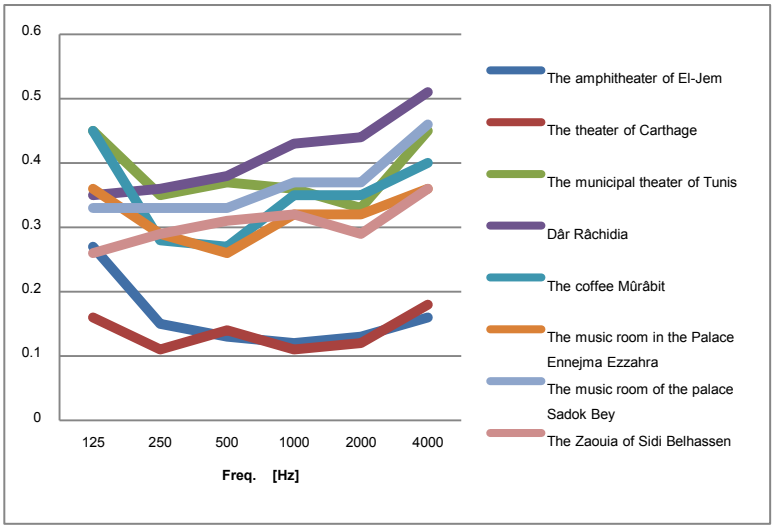

Figure 10: Average of LF for eight spaces by octave bands

The Zaouia of Sidi Belhassen has LF closest to the music room of *Ennejma Ezzahra* Palace. All the

values of LF are lower than 0.36, within the range 0.26-0.36 that attest the presence of good lateral reflections for the *takht.* El-Jem Amphitheatre and Carthage Theatre have average LF lower than all the other spaces, in the range 0.12 - 0.18 except for the 125 Hz octave band in El-Jem. All these values fall within the range of 0.05 - 0.35 recommended in the ISO 3382 standard[10].
These ranges will result in a broad sound in the former venues, but a narrow one in El-Jem and Carthage.

4 CONCLUSION

The Music Room of *Ennejma Ezzahra* Palace, by its acoustical properties, enriches and animates best the sound of the *takht*. It strengthens and lifts the sound. Café Mûrâbi*t*, Dâr *Rachidia*, the Zaouia of Sidi Belhassen and the Music Room of Sadok Bey's Palace were used for this music in different contexts and present, in decreasing order, some quality for listening to the *takht*. The new acoustic environments represented by Tunis Municipal Theatre, Carthage Theatre and El-Jem Amphitheatre, are probably not adapted to the representation of the *takht.*

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