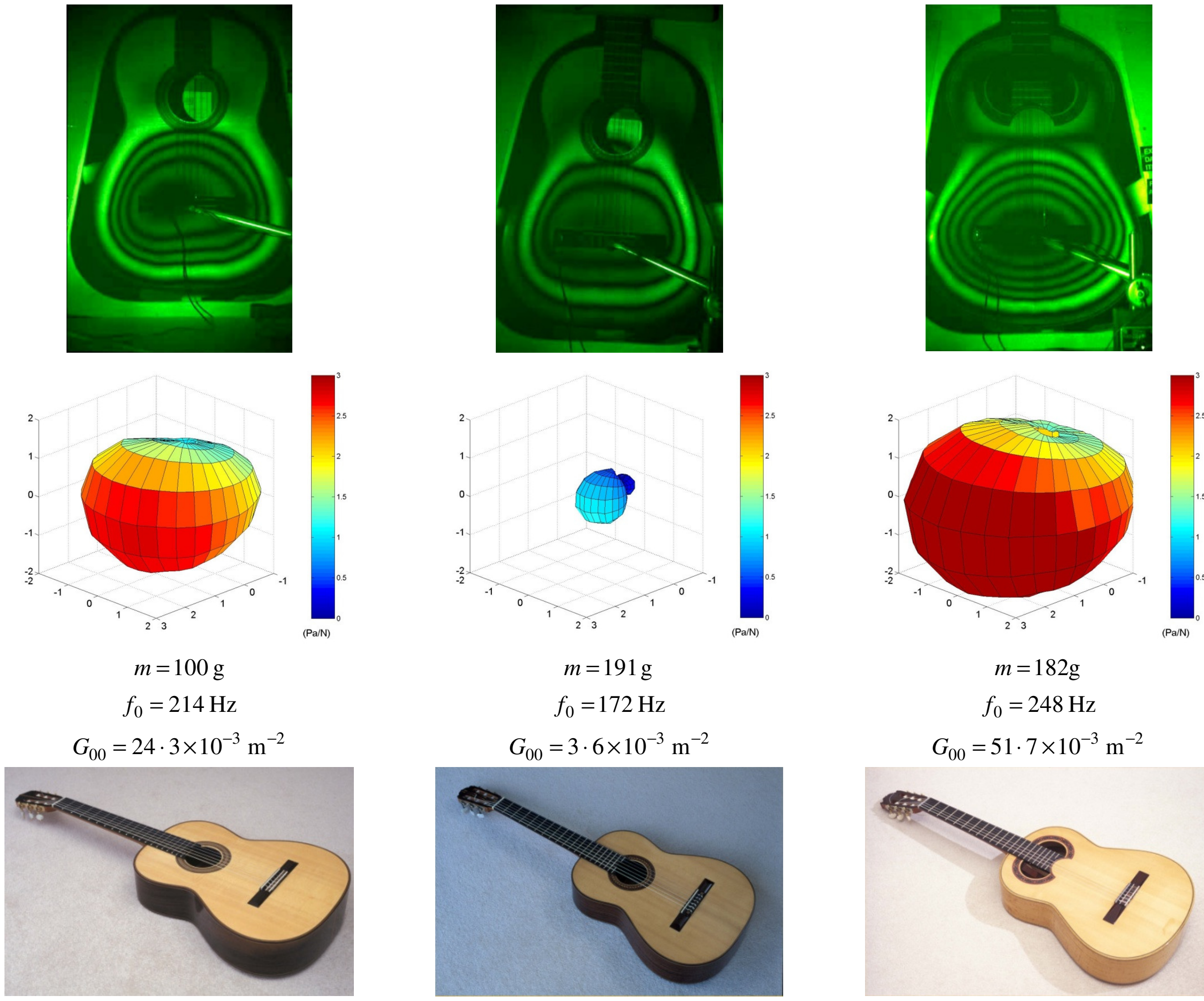

$m = 100$ g, $f_0 = 214$ Hz, $G_{00} = 24 \cdot 3 \times 10^{-3}$ m^{-2} — (a) Ambridge SA121

$m = 191$ g, $f_0 = 172$ Hz, $G_{00} = 3 \cdot 6 \times 10^{-3}$ m^{-2} — (b) Romanillos JLR677

$m = 182$g, $f_0 = 248$ Hz, $G_{00} = 51 \cdot 7 \times 10^{-3}$ m^{-2} — (c) Fischer PF952

Figure 4: Comparative measurements of modes and radiation fields for three guitars of different construction (makers Simon Ambridge, José Romanillos and Paul Fischer).

sound radiation plots use the same scaling. The latter show an equal pressure surface in space. It's clear in each case that the sound radiation is largely monopole, though the techniques used also extract the higher-order-pole radiation which is responsible for the directivity, which is especially observed at progressively higher frequencies.

The acoustic merit in this case is given by the ratio of the monopole radiativity (G_{00}) to the effective mass. An interesting comparison can be made between the Ambridge and Fischer instruments. The former is a "traditional" Torres-style fan-braced instrument, whereas the latter employs a "lattice bracing" system with some clear unconventional design. The increased stiffness of the soundboard towards the periphery of the edge of the plate in this lattice-braced guitar shows the sort of "mode confinement" evident in Figure 2 compared with Figure 3. (The confinement is even more evident in higher-order modes.) The acoustic merit of this instrument is a little higher than the traditionally-braced instrument. The Romanillos instrument shows a much lower value of acoustic merit (for this mode), but this is because of over-coupling between the soundboard and back plate. The out-of-phase radiation from the back tends to reduce the monopole contribution. Further details of these instruments and the other acoustical parameters are given by Richardson *et. al* [2].

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4. REFERENCES

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