

## An alternative electronic pickup system for the lute

A few years ago, I was asked to install an electronic pickup system in an 8-course lute owned by 'Lady Lovely Lute': Stephanie Feeney. The lute is an ebony-backed instrument from the esteemed Stephen Barber-Sandi Harris workshop.

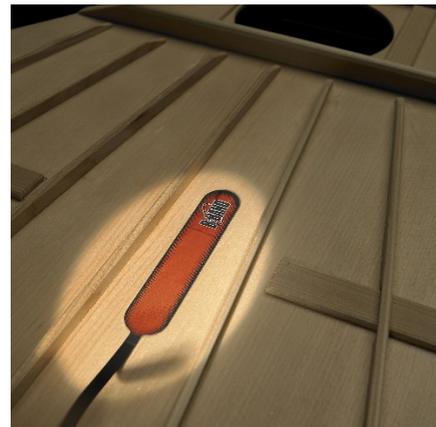
Lady Lovely Lute (Stephanie) uses her lute in a variety of situations. Notably live street performances, on-stage burlesque, historical costumed re-enactment, theatrical musical support as well as appearance on TV and her own early-music radio show. Her varied musical life is the subject of a documentary film by Laura Stratford, currently awaiting release (Statford, 2017). Performance on a noisy thoroughfare in London or onstage at Madame Jo-Jo's were just two typical situations when amplification was desirable.

Drastic modification of the fine instrument was inappropriate. I had discounted the use of bridge-saddle or piezo 'bug' type pickups as unsatisfactory. Some up-to-date systems are more versatile and more acoustically accurate.

The method I employed used a B-BAND™ pre-amp and Acoustic Soundboard Transducer (AST) system (B-Band Ltd, 2017).



Picture 1: pre-amp unit



(©B Band Ltd) Picture 2: AST soundboard transducer

The chosen pre-amp was designed for a ukulele and therefore small and lightweight. It is about the size of a matchbox, has small disc batteries and endpin jack-socket. It was fitted through an aperture cut through the end-clasp of the lute after strengthening the inner liner-clasp with a strip of spruce. That brought the local central thickness to about 15 mm. which was judged thick enough to accept the small fixing-screws and provide sufficient structural stability for the pre-amp unit. A standard angled-plug guitar lead was employed. A smaller 3.5 mm plug, although an option was judged too fragile for the robust use envisaged.

The AST transducer\* (Egerton, 2017) is an ultra-thin and lightweight layered polymer strip that can be permanently fixed to the underside of any part of a vibrating soundboard via a self-adhesive layer. It is placed on the inside soundboard beneath an instrument bridge or just in front. The strip is normally about 14mm x 70mm and approx. 70-80 microns thick plus the adhesive mounting strip.

This type of 'transducer' is made from Emfit™ film (Emfit Ltd, 2017), a proprietary patented product widely used in medical and some engineering and scientific applications. Emfit is a thin ferroelectret film sensor that responds to vibrations over a wide frequency and intensity range by

producing tiny electric currents. Minute changes in film thickness due to vibration are what generate the currents. This is usually described as a *quasi* piezo-electric effect. In the medical field Emfit is used in sensors to monitor life-signs, minute physical movements and fine motor changes of any kind in intensive care applications, epilepsy monitoring, cardiac management and the like. The tiny signals detected can be amplified and transduced for interpretation and appropriate therapeutic intervention. As an example a small portable 'Emfit QS' sensor, as supplied by the manufacturer, when installed beneath a mattress can detect the heart rate, breathing rate, blood pressure, sleep pattern/state and other physical attributes of the occupant.

When these sensors are applied to musical instruments as pickups the advantages are obvious: the very low mass, non self-resonance, very wide frequency response, sensitivity and signal integrity, non-critical placement and ease of fitting. Dedicated pre-amps are required and B-BAND™ pre-amps incorporate specific electronic technology to optimise signal-processing for sound amplification. The AST output can also be augmented with a small condenser microphone incorporated into the same pre-amp unit for even greater acoustic authenticity.

The overall cost of the components is reasonable at around 45 Euros for the AST and 66 Euros for the pre-amp (current online prices Oct 2017). The installation required minimum intervention without the need for drastic or unsightly structural alterations and the wide range of performance situations encountered by Lady Lovely Lute were well accommodated.

The unit was installed and functioned well with a portable 'buskers' type amplifier for outside performance as well as onstage work using a small wireless transmitter. The small generic transmitter unit plugs into the jack-socket and transmits to the local in-house powered amplifier system via its complimentary receiver. A church wedding aisle procession was one situation when a wireless transmitter was usefully employed by the ambulant player.

Emfit™ film AST pickup systems could be installed in new-build lutes at reasonable cost with only minor structural modifications to instruments. However, I would not recommend applying the same methods to very old or antique instruments. Although the AST strips are very low mass and might justifiably be installed inside an antique, the corresponding pre-amp unit would need to be deployed without interfering with or modifying the instrument structure. Externally fitted or non-fitted, fully removable systems would be more ethically acceptable in that case. Possibly in future a completely wireless system that requires no structural interventions will become available to regular musicians.

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*\* NOTE: The author has no sponsorship, connection, financial or otherwise with the companies, products or manufacturers mentioned. Other pickup systems are available.*

B-Band Ltd. (2017). *B-BAND Hear the Truth: Pickup technology systems*. Retrieved October 13, 2017, from <http://www.b-band.com/>

Egerton, C. (2017). The term 'transducer' although widely used is not strictly accurate. 'Accelerometer' is a more appropriate description.

Emfit Ltd. (2017). *EMFIT: Sensing what matters*. Retrieved Oct 13, 2017, from <https://www.emfit.com/>

Statford, L. (Director). (2017). *Lady Lovely Lute* [Documentary film]. United Kingdom.