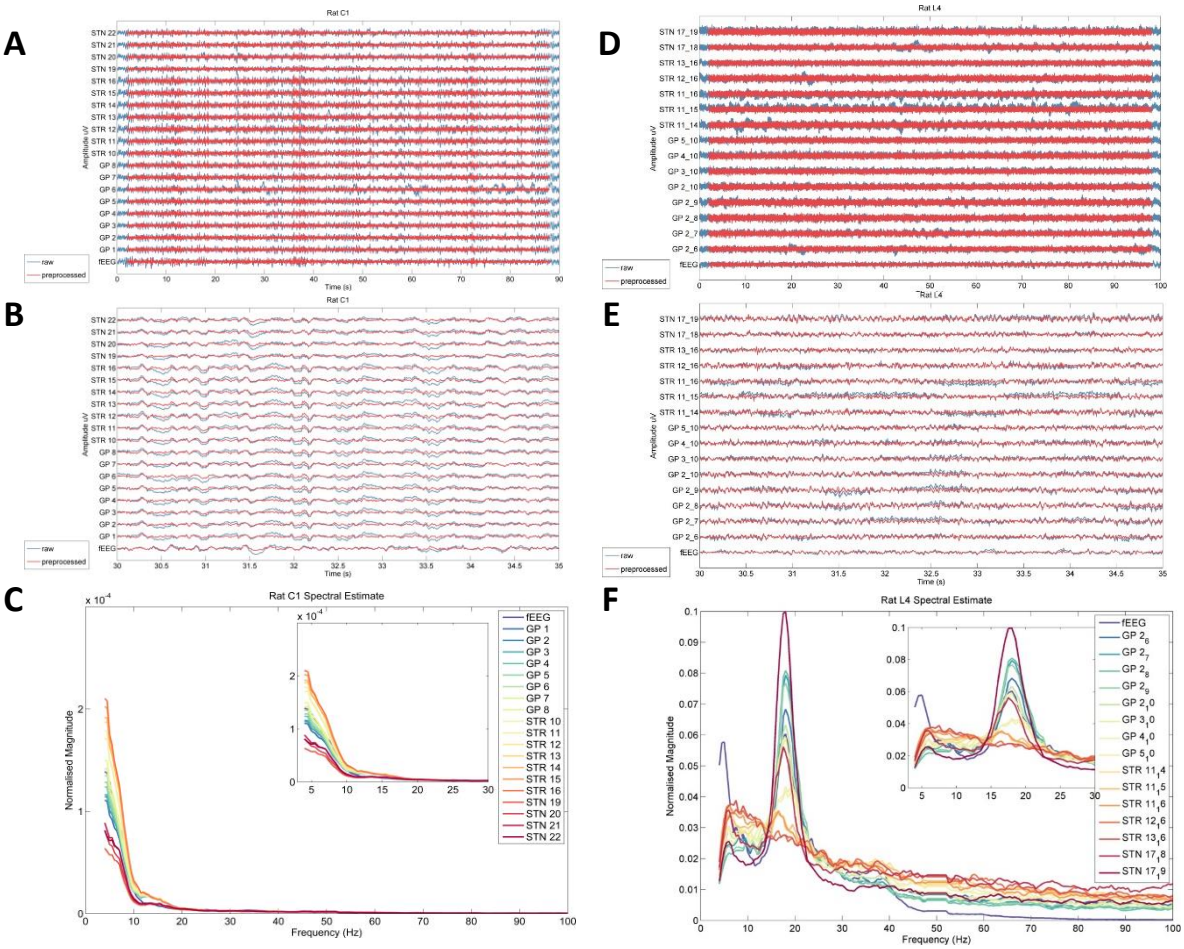


Figure 1 – ***Example outcome of data pre-processing of rat LFP and cortical EEG signals for a single animal from the control (A-C) or the 6-OHDA lesioned (D-F) groups. (A)*** *Full length of LFP recordings taken from the globus pallidus (GP), striatum (STR) and subthalamic nucleus (STN) each with multiple (4-8) channels. There is also a cortical EEG signal targeted to motor cortex (fEEG). Raw data is shown in blue whilst preprocessed signals are overlaid in red. Data was down sampled from native 255-256 Hz to a uniform 250 Hz for all animals. The data was then de-meaned, notch filtered for line noise and then high pass filtered at 4Hz. For spectral analysis data was then epoched into 2 second segments. Segments contaminated by muscle artefact were removed using Z-thresholding as described in the text. Data for continuous analysis (DFA) were not epoched but instead large transients were removed and then missing data interpolated. All data was truncated by 2 seconds from both the start and end of the signal.* ***(B)*** *Same as (A) but for a smaller scale.* ***(C)*** *Multitaper spectral estimates for single animal across all channels. Inlaid is same spectra but at finer resolution to examine frequencies between 4 and 30 Hz.*

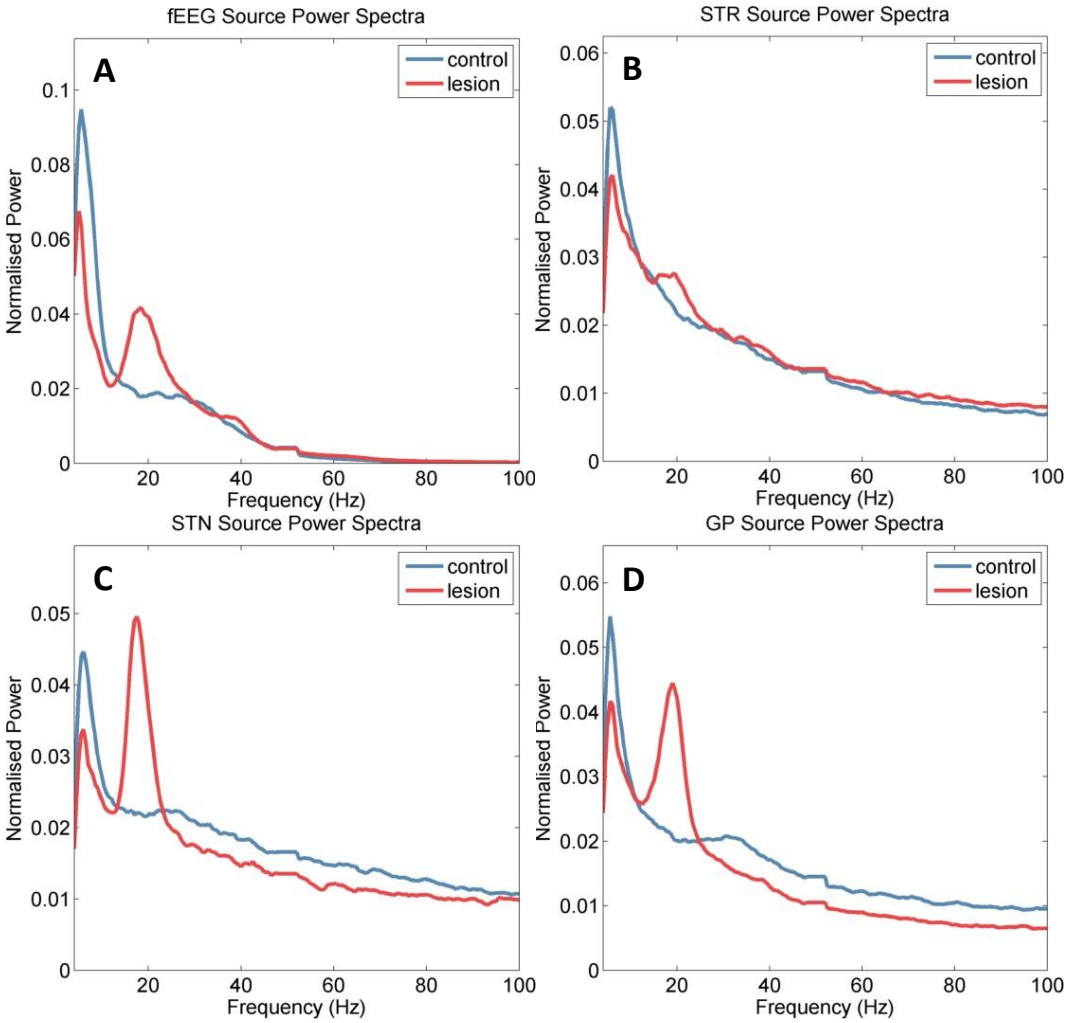


Figure 2 – ***Group mean power spectra for the two groups: control and 6-ODHA lesioned rats. Multitaper spectral estimates were computed and then averaged across all animals and available channels. Spectra are show for (A)*** *feeG signal recorded from intracranial screw electrode targeted to the motor cortex.* ***(B)*** *Striatum* ***(C)*** *Subthalamic Nucleus, and* ***(D)*** *Globus Pallidus Externus. Clear differences in beta power can be seen between groups with the control group showing an absence of a peak between 13-30 Hz.*

Coherence/WPLI

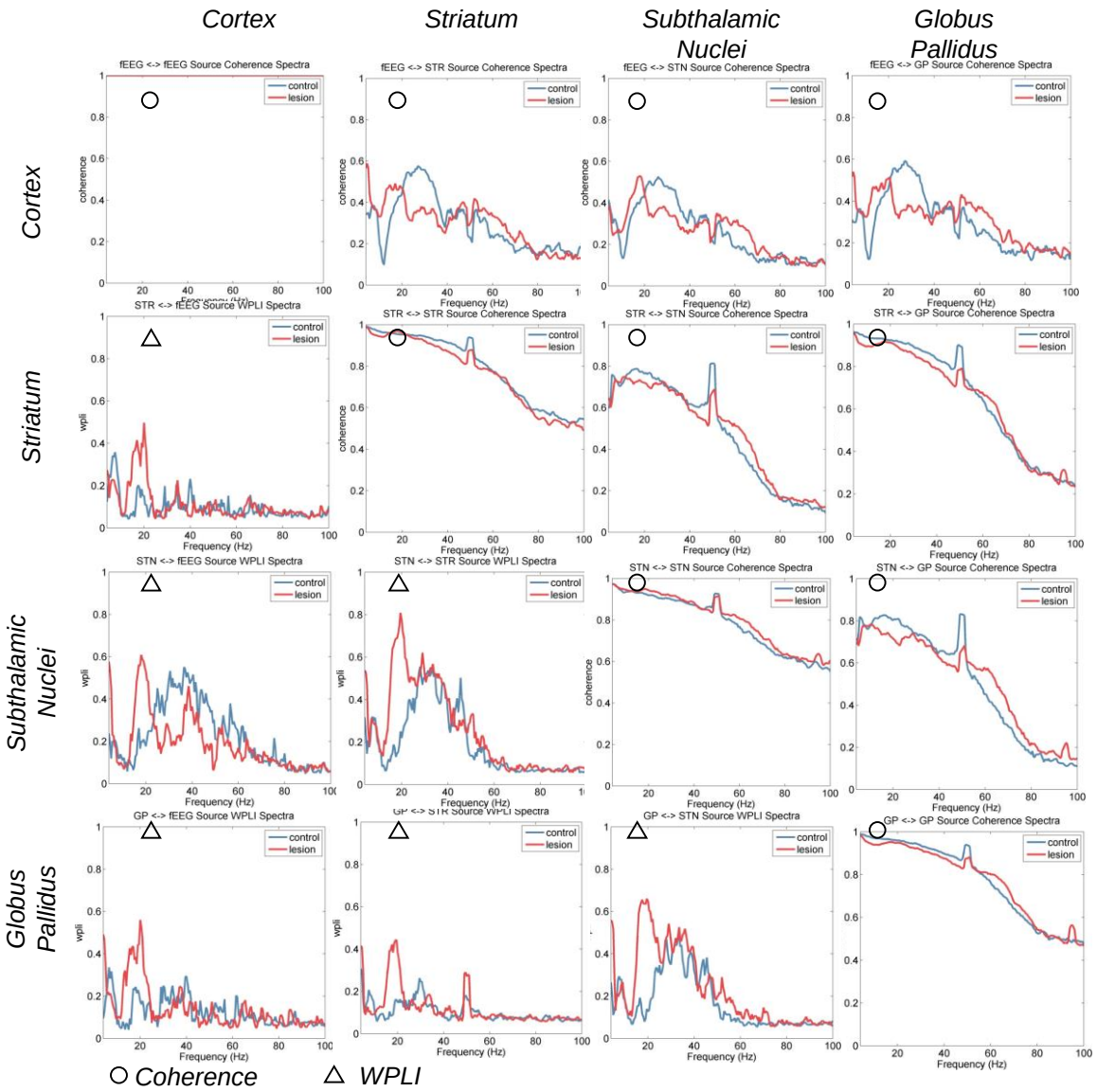


Figure 3 – ***Connectivity matrix between signals from differing recording sites. Functional connectivity is measured with either coherence (○) or the weighted phase lag index (WPLI, Δ). Metrics were computed for both the control and 6-OHDA lesioned experimental groups. (On and Above Diagonal)*** *It can be seen that when measuring with coherence there is a high degree of correlation across a wide band, particularly for the LFP recordings which were taken in close spatial proximity. Cortical connectivity (from fEEG) suggests some evidence for a depletion of coherence in the high beta band (24-30 Hz) for lesioned animals but an exaggerated connectivity in the low beta (~20 Hz).* ***(Below Diagonal)*** *When correcting for zero-lag activity (volume conduction), there is improved clarity as to the cortical connectivity. Indeed there is a raised level of interaction in the 20 Hz range but significant coherence for high beta/gamma (25-60 Hz) is mainly seen in the STN. From the network topology this would suggest influence in this range from the hyper-direct pathway that bypasses striatum.*

NPD

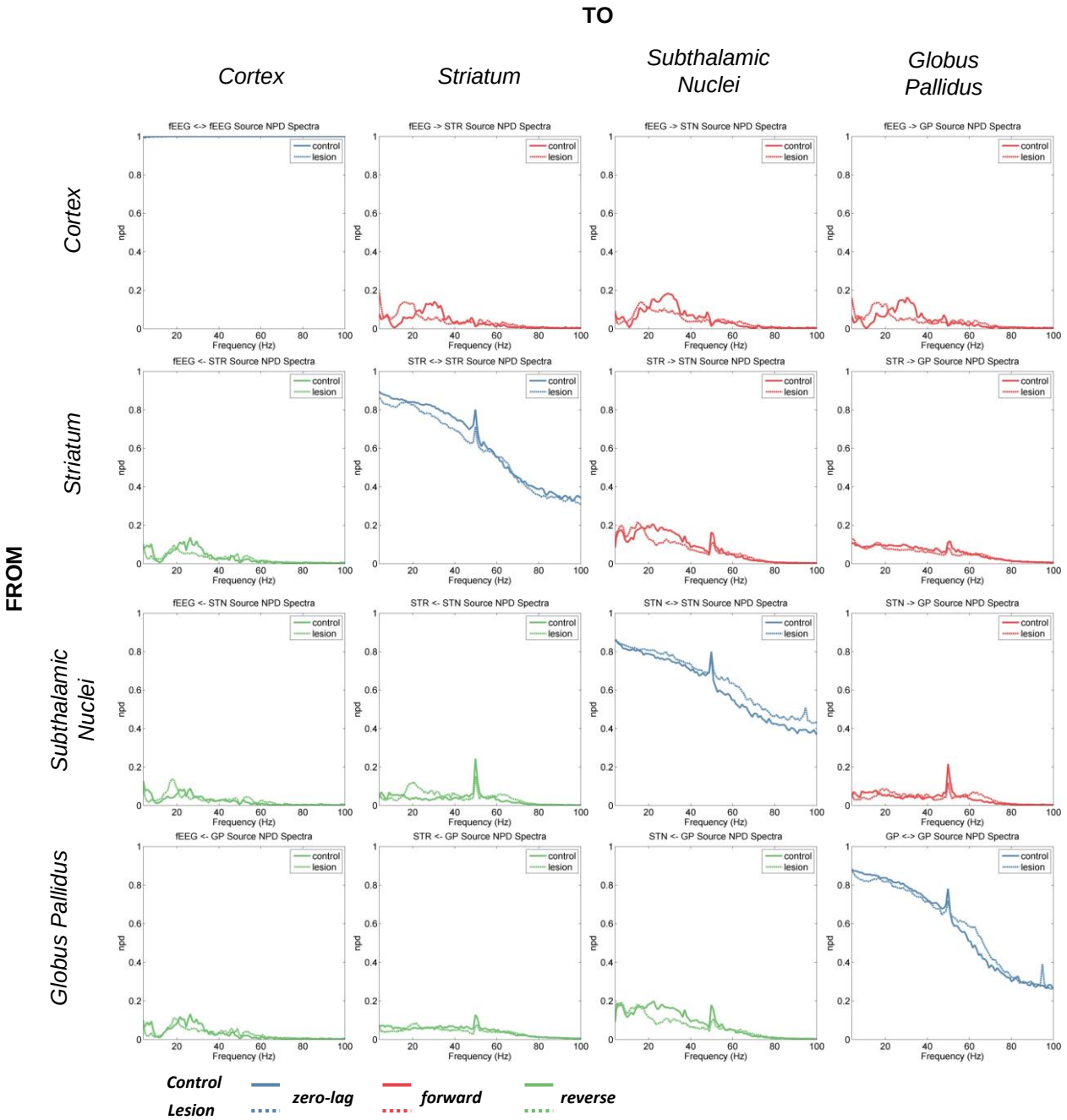
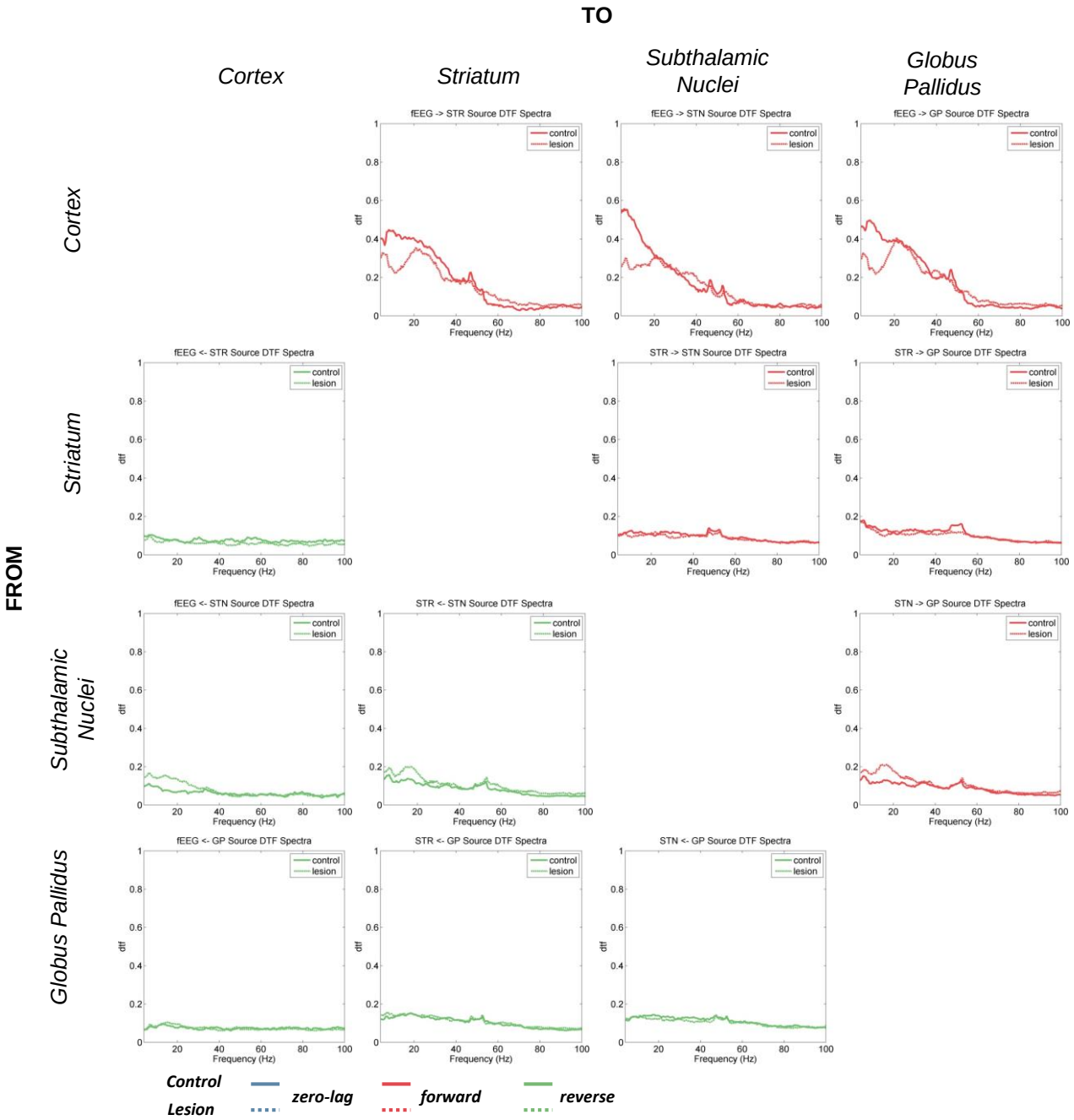


Figure X – ***Connectivity matrix between signals from differing recording sites. Directed connectivity is estimated using non-parametric directionality (NPD) estimated from the multi-taper spectral estimate.*** *By conversion from frequency to time domain, the spectra are decomposed into forward, zero and reverse components. Spectra were estimated for both the control and 6-OHDA lesioned group of rats and results are shown as a group average. The legend is given below the matrix.* ***(On and Above Diagonal)*** *Connectivity is plot across 0-100 Hz and at a wider scale. It can be seen that the subcortical signals are dominated by a large zero lag component largely unchanged by 6-OHDA.*

DTF


TO
Cortex
Striatum
Subthalamic Nuclei
Globus Pallidus
FROM
Cortex
Striatum
Subthalamic Nuclei
Globus Pallidus
fEEG -> STR Source DTF Spectra
fEEG -> STN Source DTF Spectra
fEEG -> GP Source DTF Spectra
fEEG <- STR Source DTF Spectra
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control
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Frequency (Hz)
Control
Lesion
zero-lag
forward
reverse