

Project title	Class 442 NEI Converter Modification
Client name	South Western Railways
Date	June 2020

## SCOPE/OBJECTIVE

British Rail Class 442 electric multiple unit trains were first introduced to the railway in 1988 by Network Southeast. Since then they have operated on the South Western Main Line from London Waterloo to Weymouth, coinciding with the electrification of the line from Bournemouth. Currently, eighteen are in service with South Western Railways (SWR), operating between London Waterloo and Portsmouth Harbour.

Class 442 units fitted with Northern Engineering Industries (NEI) auxiliary converters had previously been causing Right Side Failure of a T121/ ET200 track circuit ('ND') in the Wimbledon area. AEGIS were contracted by South West Railway (SWR) to investigate this by measuring the conducted emissions of the converter. The results of the investigation identified that auxiliary converter emissions, possibly increased by interaction with the traction power supply ripple, are likely to be a factor in this issue. NEI modified the converters which resolved the issues, with the modified units now being used in service.

## TECHNOLOGY USED (IF APPLICABLE)

Measuring the conducted emissions entails: measuring the line voltage and AC line current. Alongside these, GPS data is recorded for speed, direction and location to inform the results. To record the line voltage and current, voltage probes and Rogowski coils are attached to cables on the underframe of the train.



Figure 1 - Identifying measurement positions with SWR

Signal cables from these sensors are routed back into the passenger compartment where they are digitalized by a Dewe-43A, providing live results in Dewesoft (shown in Figure 2) and data for post-test analysis.

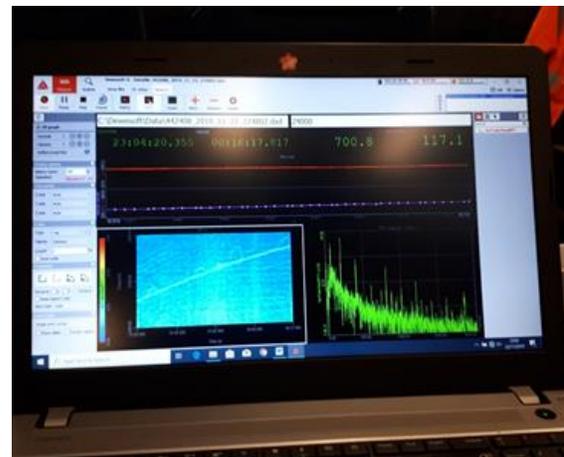


Figure 2 - Live Dewesoft results

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### HOW WE HELPED

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Following the modification, initially static testing was conducted in Bournemouth Depot to ensure the newly modified train was safe to operate on the line during dynamic testing. Subsequently, following successful static testing, testing of the converter was undertaken on a test train over a period of several days of dynamic testing. The acquired data was analysed by AEGIS to identify the conducted emissions levels of the modified NEI converter. It is also worth noting that there were no incidents such as a right-side failure recorded on the test trips, this is significant as a right-side failure was the initial incident which prompted the modification. Following the review of the test data from the modified unit, it was established that the new conducted emissions of the modified Class 442 were acceptable for entering back into service. This was subsequently, backed up by the successful test runs in peak demand conditions.

### OUTCOME

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The collaboration of SWR and AEGIS to get the refurbished Class 442 units back into service was a success. Due to the great support of SWR staff and the mutual organisation and experience of both teams, there were no major delays during the converter modifications and the trains were able to be brought back into public service within the planned timescales.