

LTE

JRC Network Planning Activities

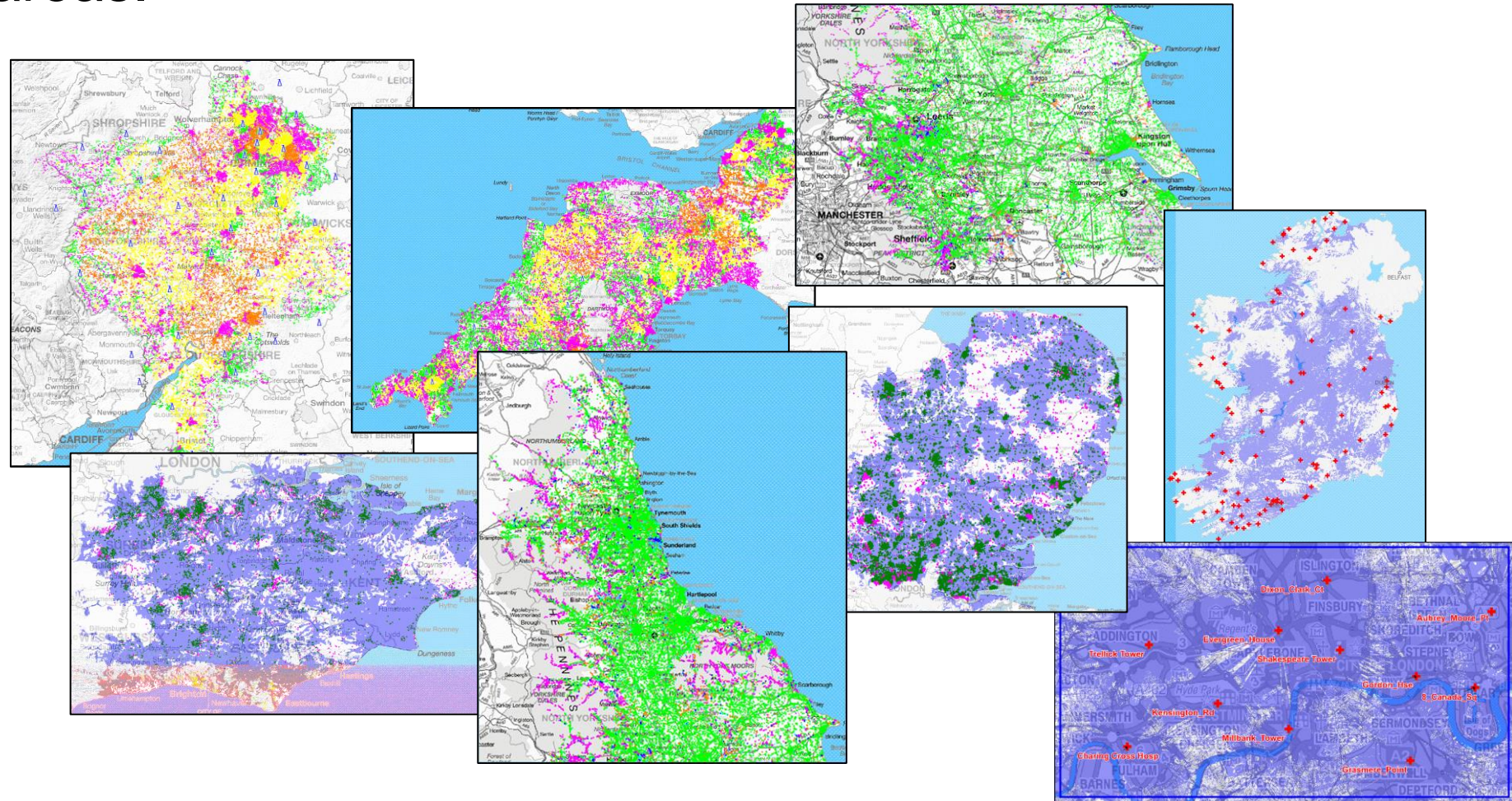
&

Traffic Considerations

March 2023

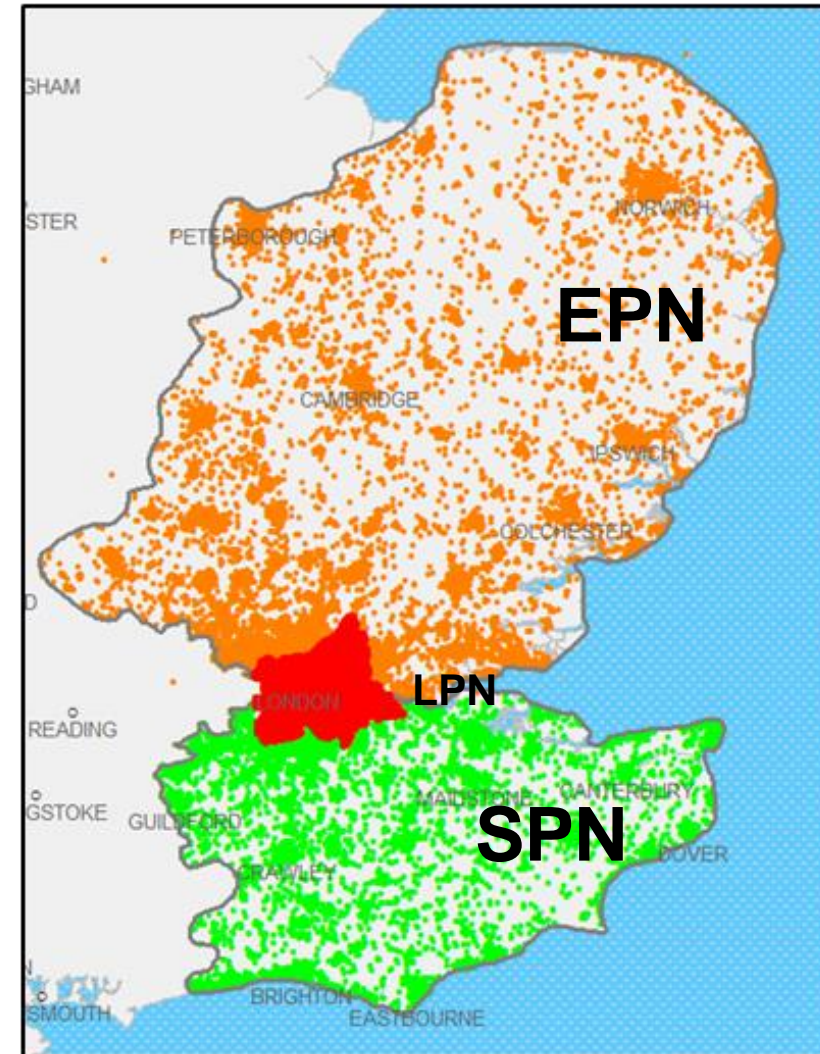
www.jrc.co.uk

For a range of Electricity DNO's, JRC has performed LTE planning studies, across a variety of rural, suburban and urban areas.



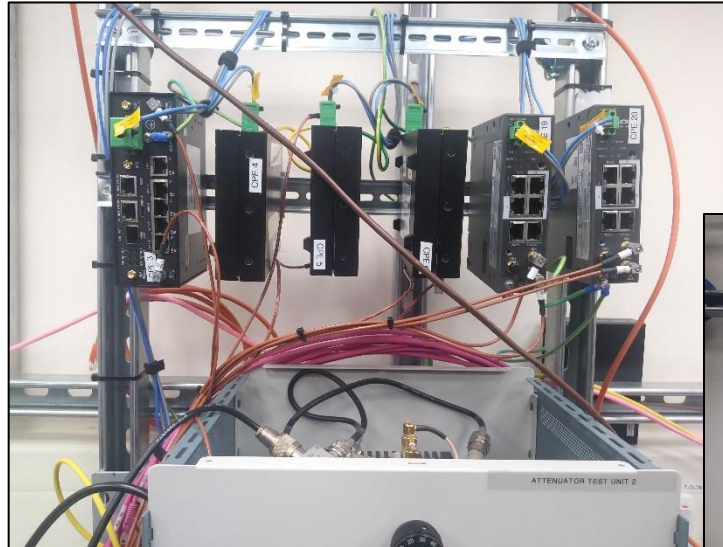
The difference in the density of asset is perhaps best demonstrated in the UKPN region

- EPN: 0.5 devices/sq km
- SPN: 0.9 devices/sq km
- LPN: 18 devices/sq km



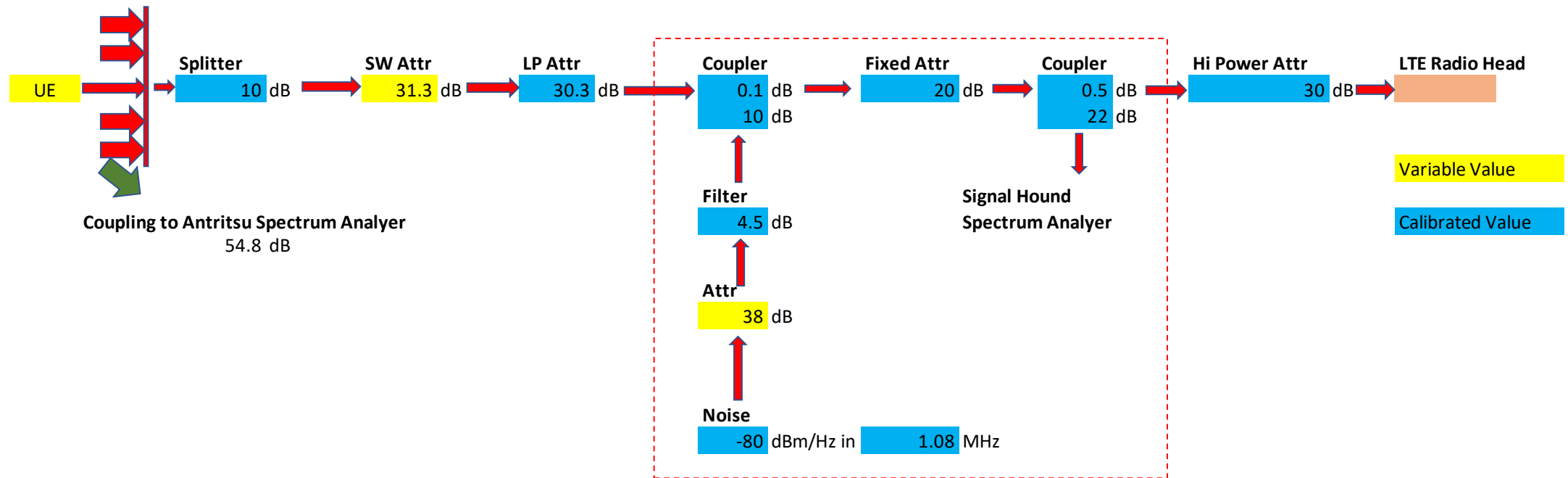
The Taunton Trial allowed bench measurements to be performed. These confirmed the performance of the LTE Base station and UE Devices:

- 1. Receive Sensitivity*
- 2. Receive Selectivity*
- 3. Date Rate vs SINR*

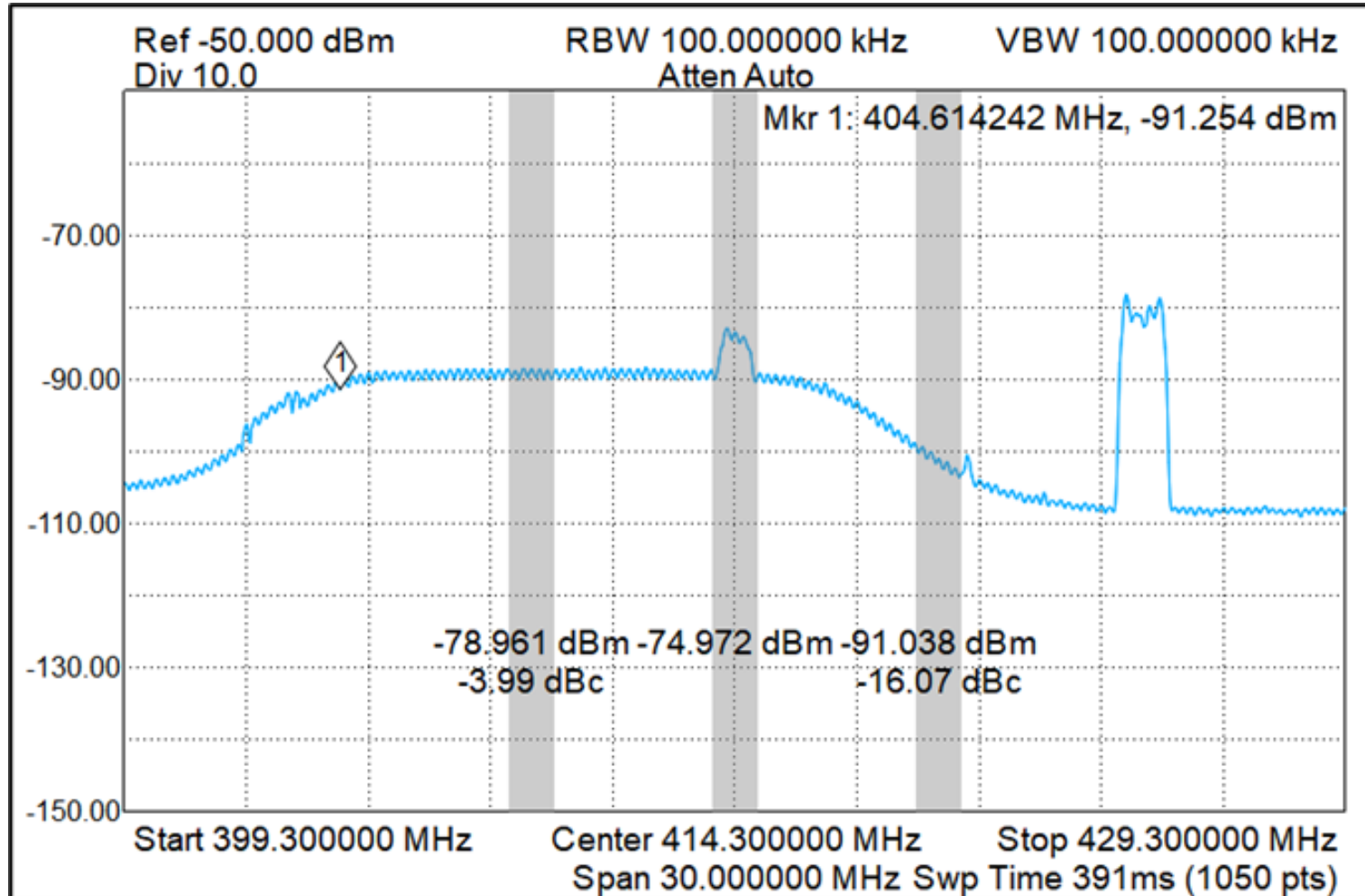




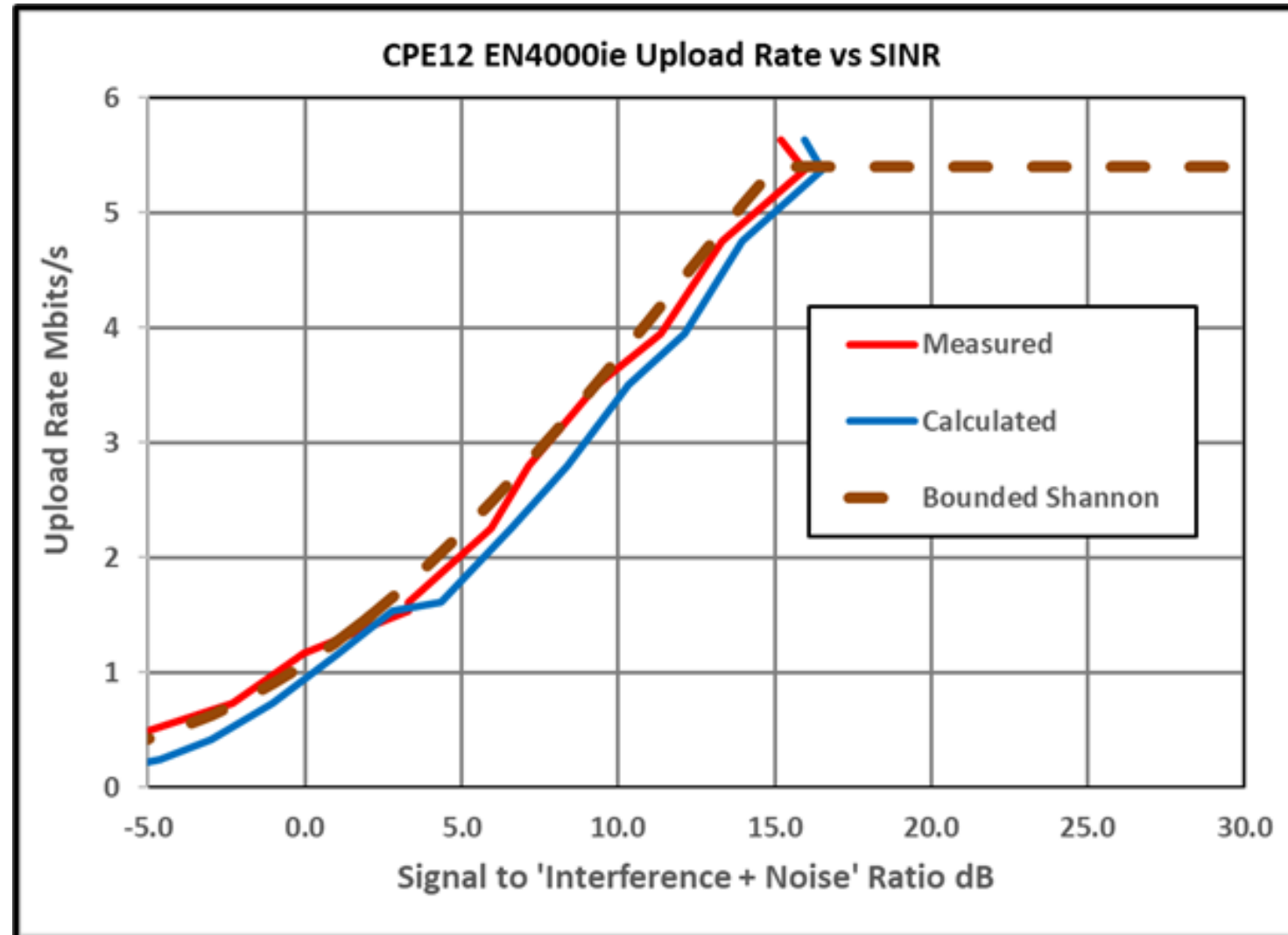
Taunton: Test Bench Setup with Injected Noise (Upload)



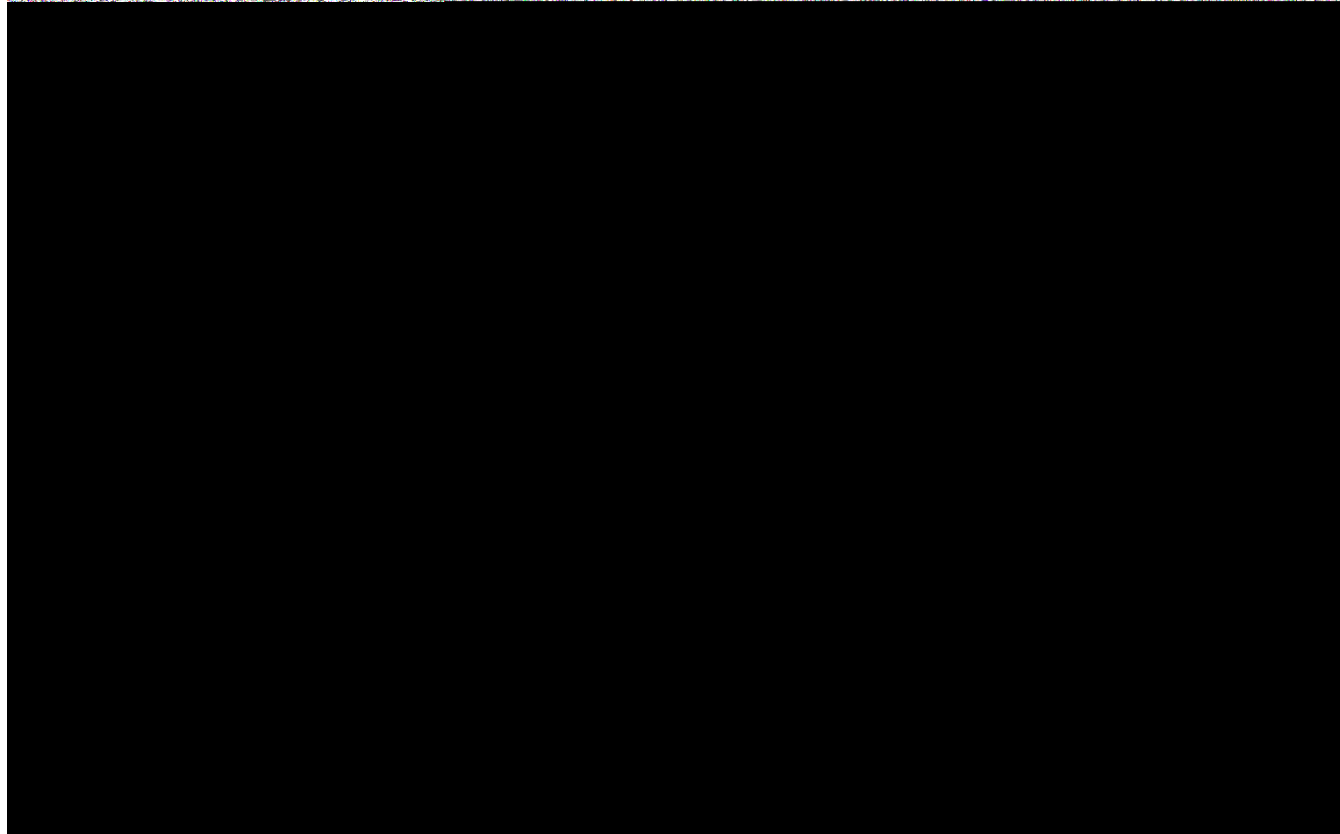
The Added Filtered Noise



Measured Upload Result



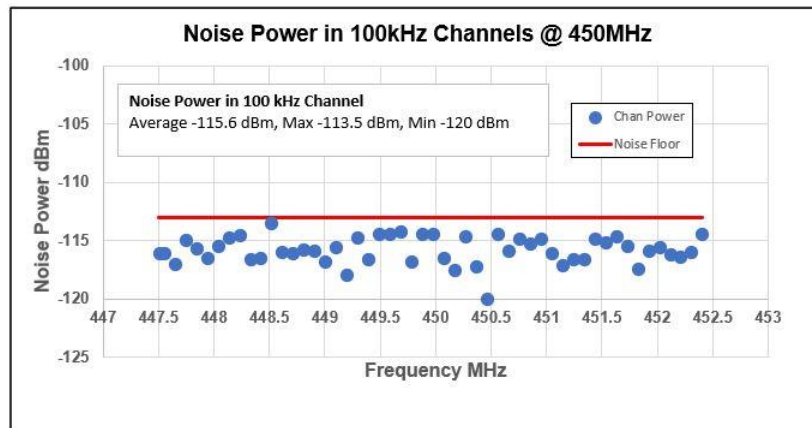
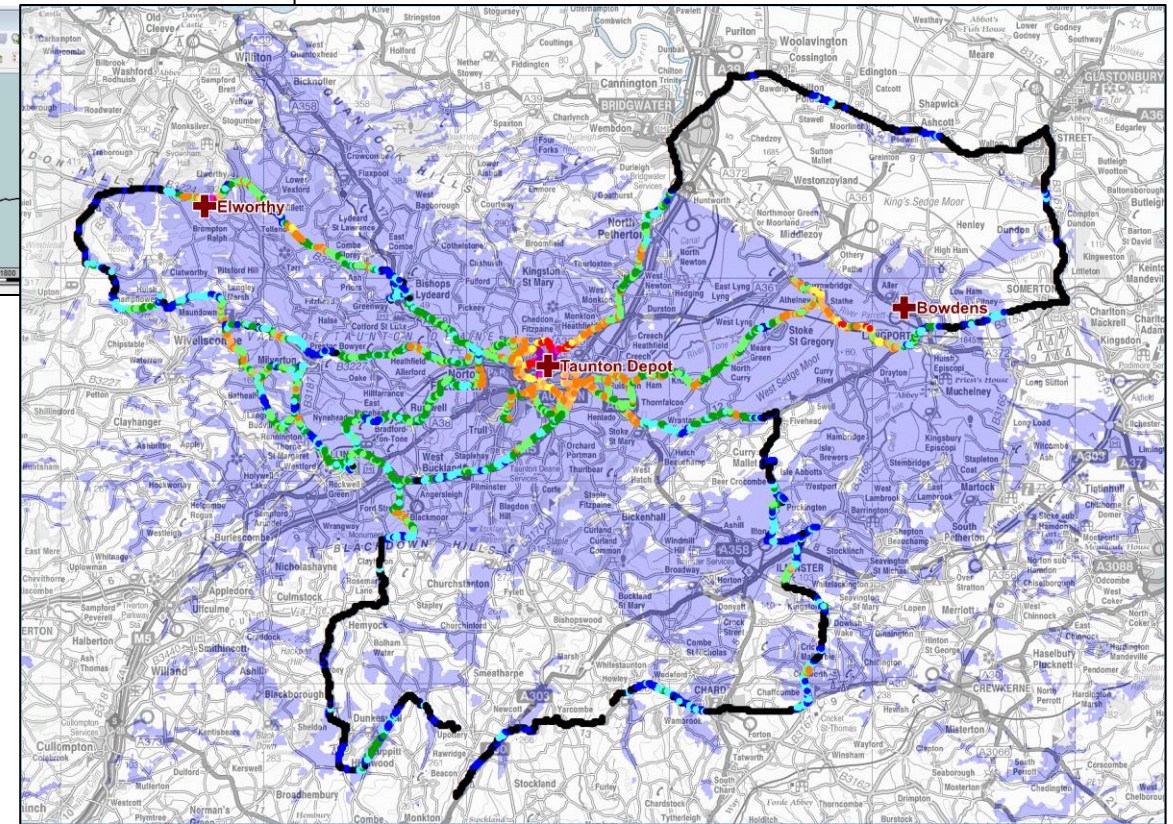
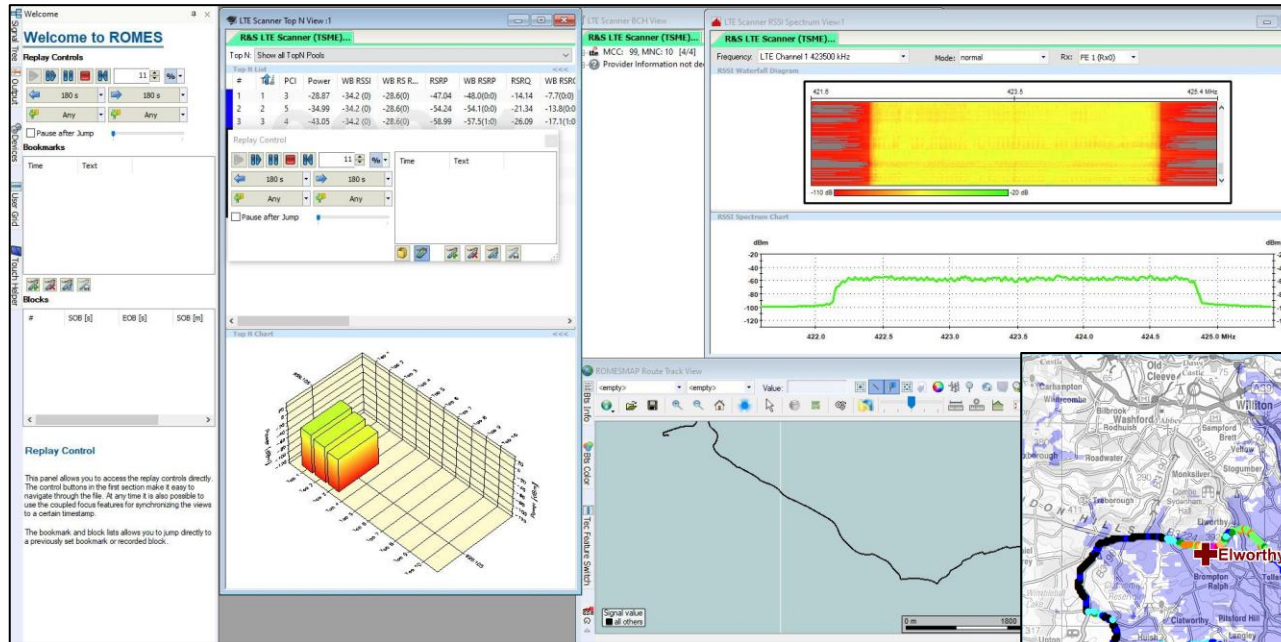
The Taunton Trial provided the opportunity to compare coverage predictions with field measurements.



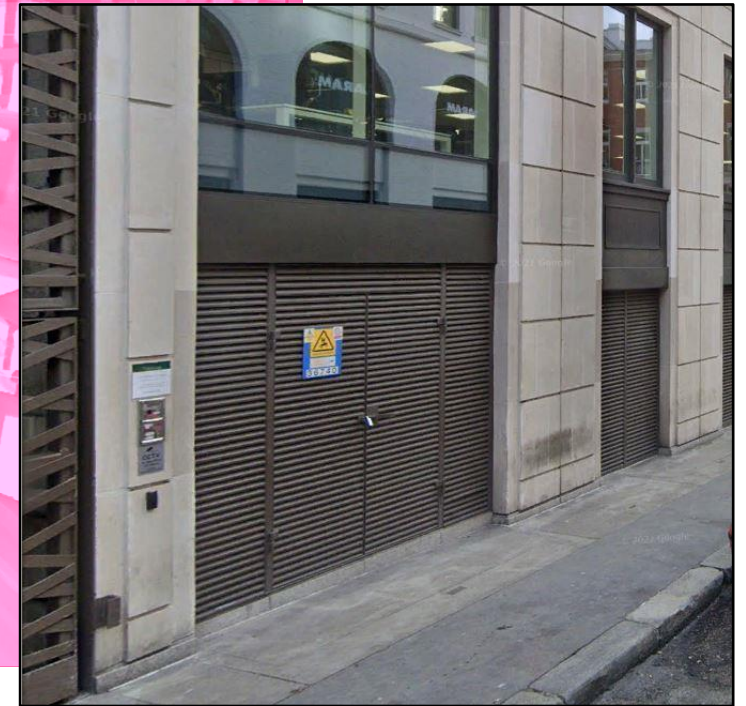
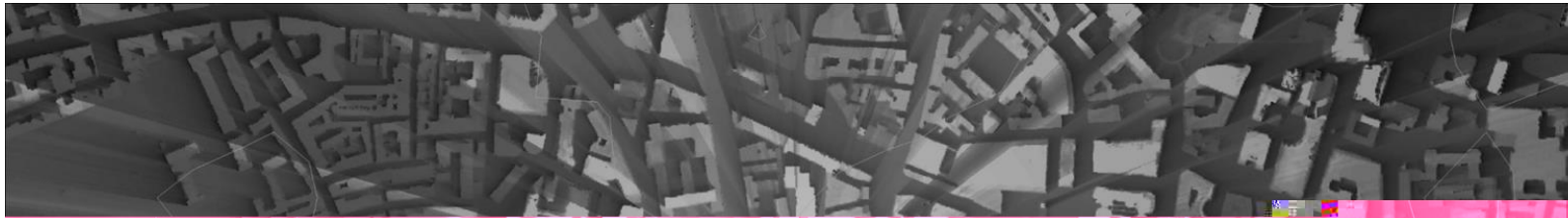
Best Server:

-  Taunton Cell 1
-  Taunton Cell 2
-  Taunton Cell 3
-  Elworthy
-  Bowdens

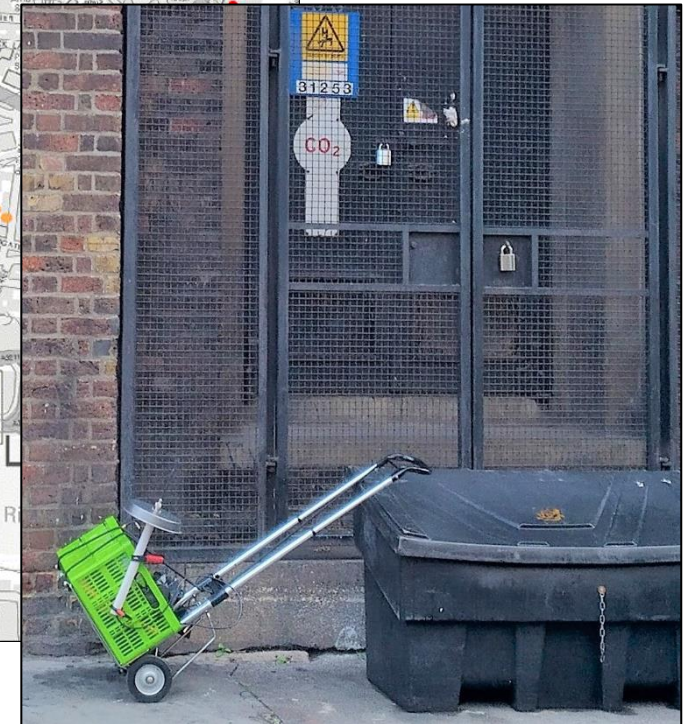
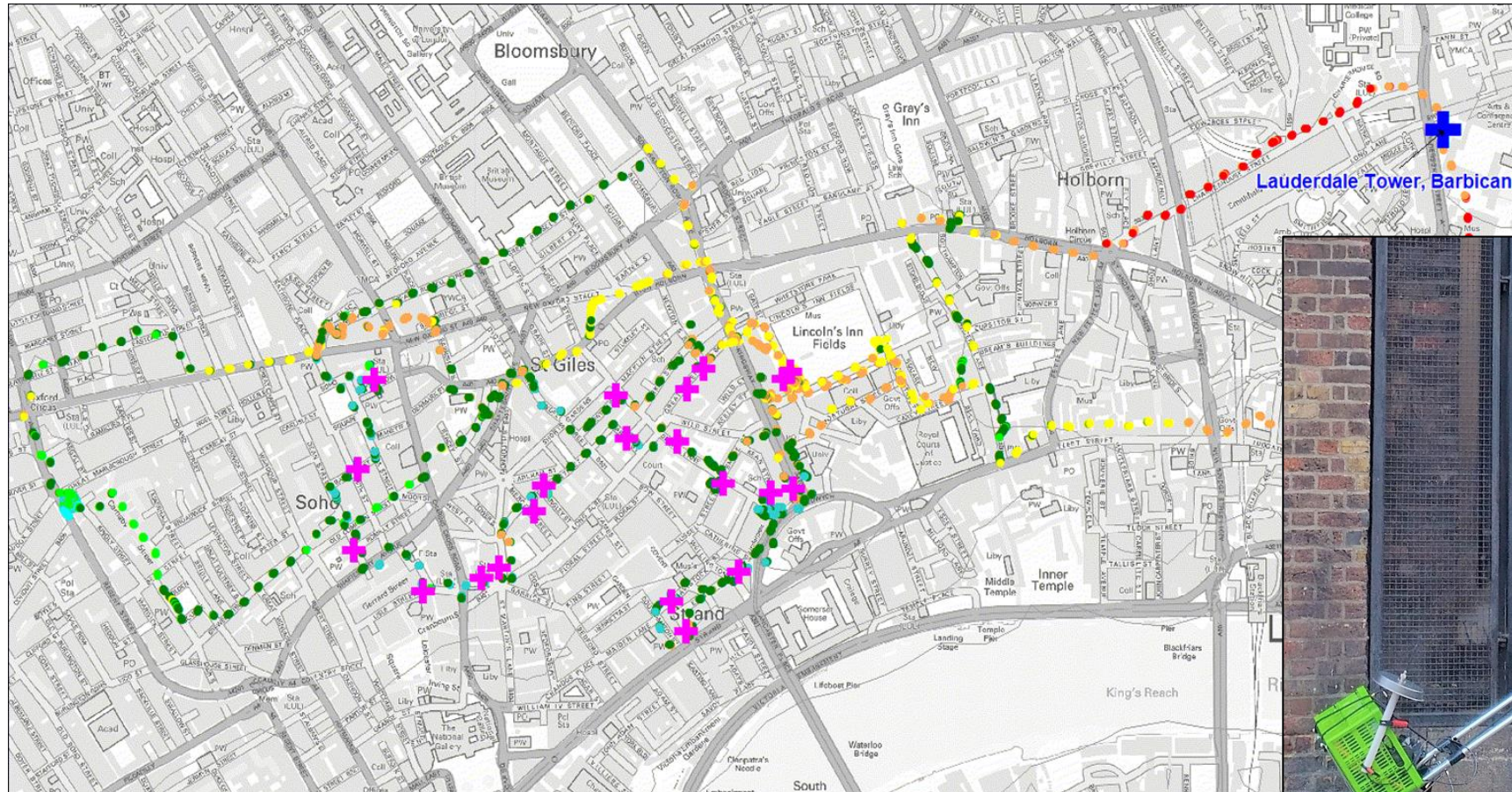




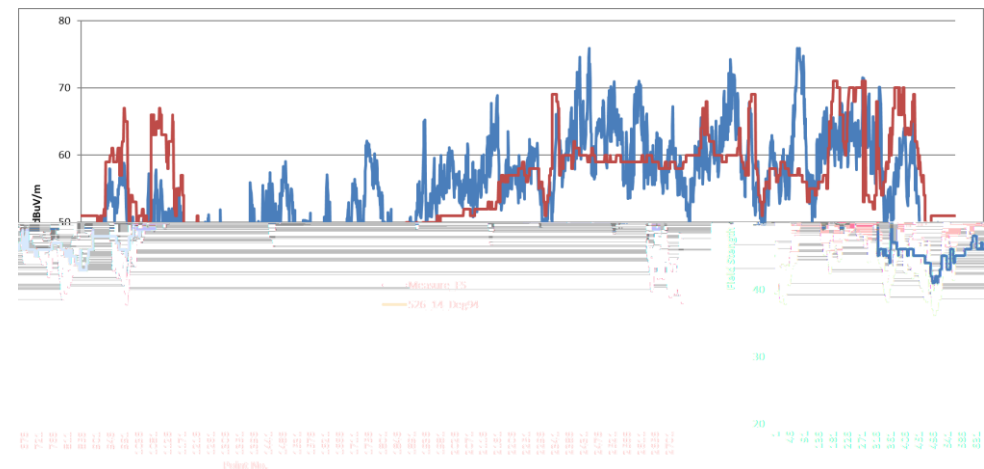
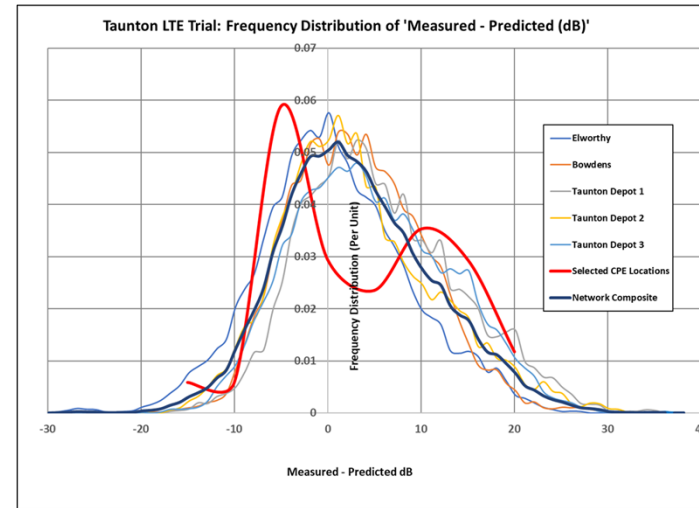
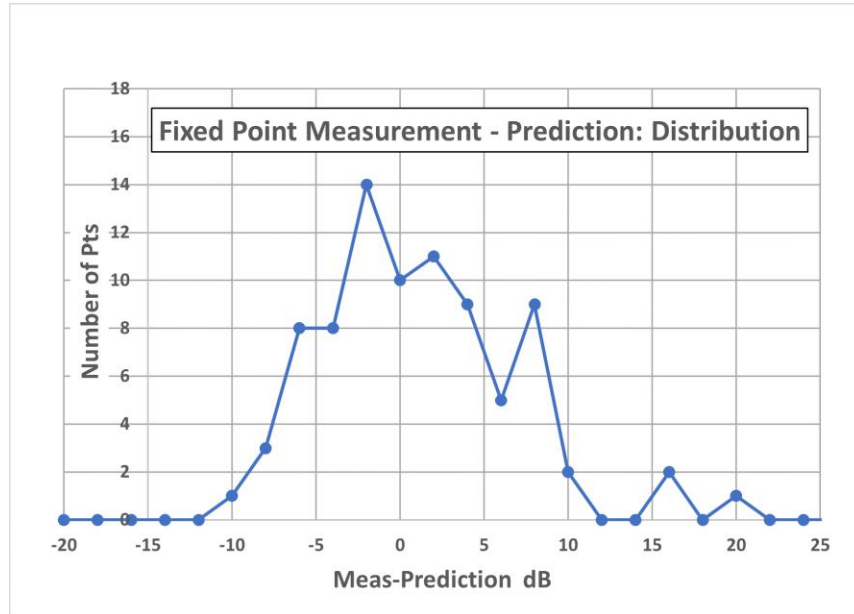
Investigating a network for UKPN (London Area), allowed planning and confirmation of measurements in a very dense urban area, where substations are hidden within buildings.



Survey measurements were performed at both 1.5m and 0.4m above ground, making use of existing 440MHz transmissions within London.



From the various survey campaigns, predictions have been compared with measurement.



Network Traffic Capacity:

Traffic capacity might be considered as comprising of two major component:

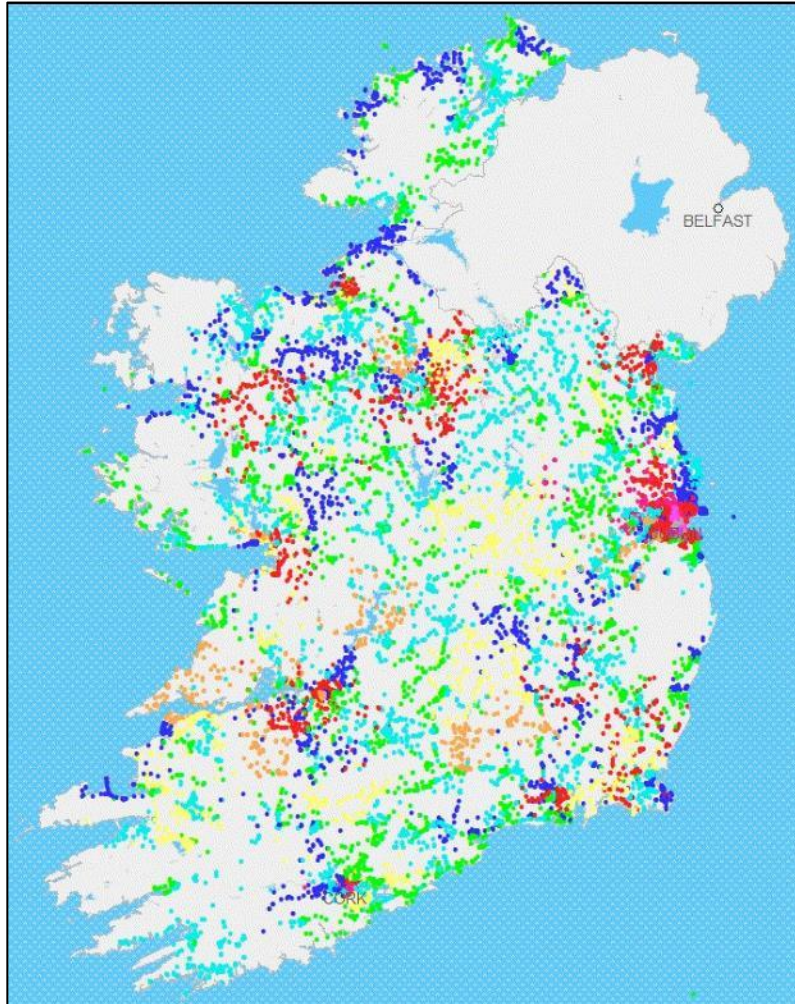
- Regular Telemetry Data, which might be a full set of substation parameters, updated every 2 minutes.
- Non continuous data e.g. Mobile Network Access
Mobile Voice Calls
Video Monitoring
Immediate Fault Notification

The regular telemetry data (updated every 2 minute) might be **equivalent** to a continuous 4 kbps.

The potential data rate for each path is individually calculated and the total derived for each LTE cell. This is compared with the available capacity of each cell. From this, a % 'base loading' is calculated.

The aim would be for sufficient capacity to remain for the 'Non Continuous' (ad hoc) usage, in all locations.

Example of a Deliberately* Overloaded Network



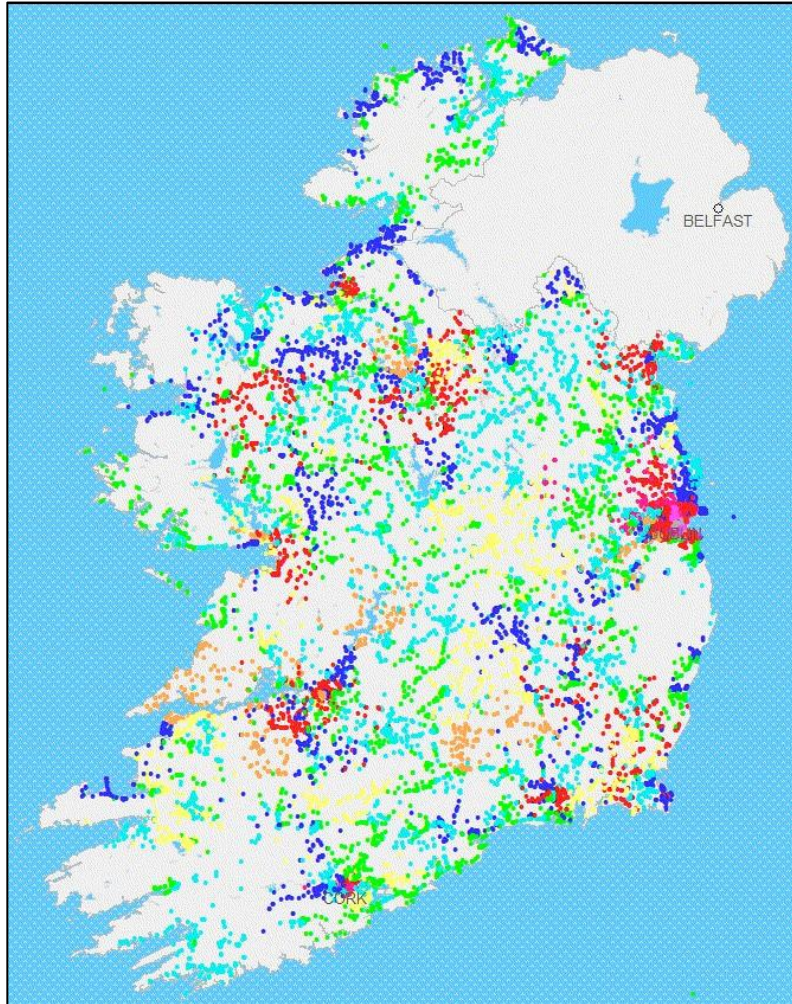
The base load for each substation is set equivalent to 20 kbps*

Base Traffic Loading %

Grey	800 to 1000
Magenta	400 to 800
Red	200 to 400
Dark Red	100 to 200
Orange	80 to 100
Yellow	60 to 80
Dark Blue	40 to 60
Light Blue	20 to 40
Green	0 to 20

} Reasonable
Base Load
(20 kbps)

Example of a Less Loaded Network



The base load for each substation is set equivalent to 4 kbps

Base Traffic Loading %

Grey	160 to 200
Magenta	80 to 160
Red	40 to 80
Dark Red	20 to 40
Orange	16 to 20
Yellow	12 to 16
Dark Blue	8 to 12
Light Blue	4 to 8
Green	0 to 4

Reasonable
 Base Load
 (4 kbps)

Should a more realistic base load be assumed (i.e. 4 kbps), most areas would have sufficient capacity for Non Continuous (ad hoc) usage.

