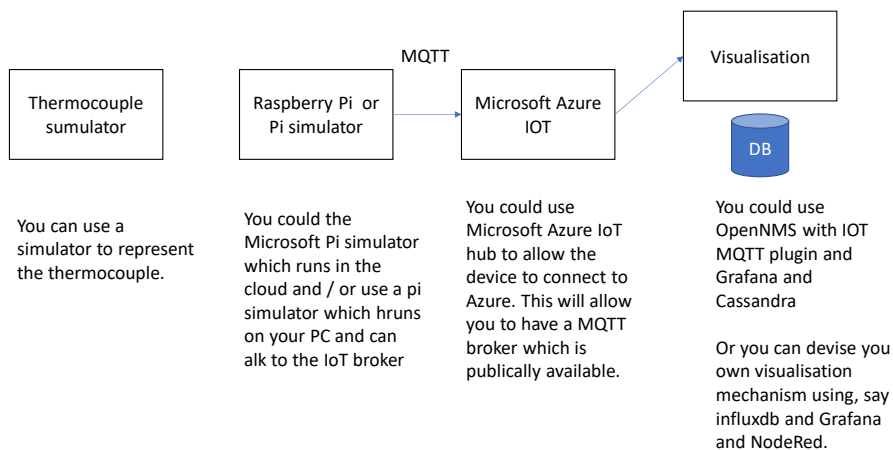# VHF Test Load Thermal Dissipation measurement.

Introduction.

Arqiva, own, operate and maintain the terrestrial broadcast TV and radio network of transmitters in the UK. This network of transmitters are controlled and monitored from a central location in Yorkshire.

High power VHF transmitters are tested by connecting them to a 'test load' instead of an aerial. The transmitter operates at full power but the radio frequency energy is sunk in a test load instead of being transmitted. Running at full power can cause the test load to become very hot. Currently the temperature of the test load is simply measured using a thermostat locally. However we would like a mechanism to allow the temperature to be measured using a thermocouple and reported remotely.

Task

The full design requirement is given below. However, we recognise that working on hardware in a lab will not be possible in the present circumstances. Therefore, the problem has been modified as follows. You can use the Raspberry Pi simulator and Microsoft IOT to simulate the solution.

Thermocouple sumulator	Raspberry Pi or Pi simulator	MQTT → Microsoft Azure IOT	Visualisation / DB
You can use a simulator to represent the thermocouple.	You could the Microsoft Pi simulator which runs in the cloud and / or use a pi simulator which hruns on your PC and can alk to the IoT broker	You could use Microsoft Azure IoT hub to allow the device to connect to Azure. This will allow you to have a MQTT broker which is publically available.	You could use OpenNMS with IOT MQTT plugin and Grafana and Cassandra. Or you can devise you own visualisation mechanism using, say influxdb and Grafana and NodeRed.

https://docs.microsoft.com/en-us/azure/iot-hub/iot-hub-raspberry-pi-web-simulator-get-started

https://github.com/opennms-forge/opennms-mqtt-plugin

https://windowsreport.com/raspberry-pi-emulators/

Design Requirement

This is the original design requirement:

Devise a standard way to replace the glass thermometers for 'calorimetry' power measurement at high power VHF sites on the Test Loads, using two-input digital thermometers, thermo-pockets and suitable temperature probes.

Selected temperature probes should have a sensible working accuracy and temperature range – we only need 0 – 100C not -300C to +3000C and a differential, not absolute, accuracy of 0.05C would be fine.

The digital thermometer should have the means to do the temperature difference calculation T1 – T2.

Commercially available parts should be used, with industry standard probes, not a bespoke electronics design. The probes could have a plug/socket arrangement with two handheld meters, one per 'side', or the meters could be permanent. If plugs/sockets are used they must be reliable so that means good quality and probably capped/sealed.

It needs to be tested and proven to be immune from VHF interference. Checked against known good glass thermometers. A parts list and detailed implementation Method Statement is required. The parts cost should be no more than around £200 per test load.

(Example sites: Wrotham, Sandale, Black Hill, North Hessary Tor, Rowridge, Wenvoe, Blaenplwyf, Holme Moss, Tacolneston). There is a real need to do this at Rowridge so if it goes ahead please let Travis Lumpkin know.

Example Thermcouple: https://uk.rs-online.com/web/c/automation-control-gear/sensors-transducers/temperature-sensor-accessories/?searchTerm=1%2F2%20bsp%20sensor&redirect-relevancy-data=636F3D3126696E3D4931384E53656172636847656E65726963266C753D656E266D6D3D6D61746368616C6C7061727469616C26706D3D5E2E2A2426706F3D31333326736E3D592673723D267374743D43415443485F414C4C5F44454641554C542673633D592677633D4E4F4E45267573743D312F32206273702073656E736F72267374613D312F32206273702073656E736F7226&r=f&searchHistory=%7B%22enabled%22:true%7D&sort-by=P_breakPrice1&sort-order=asc&pn=1