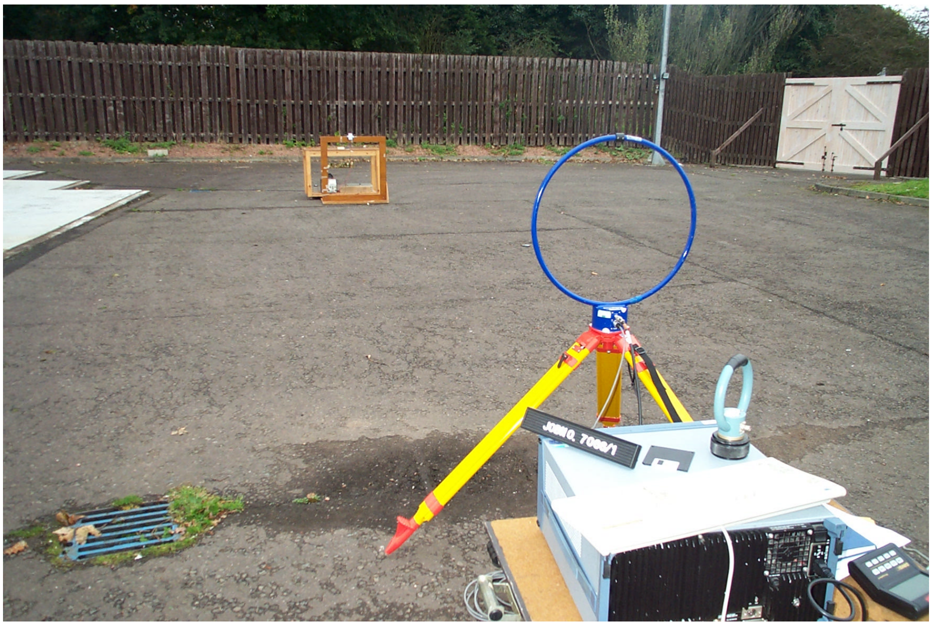
Appendix E

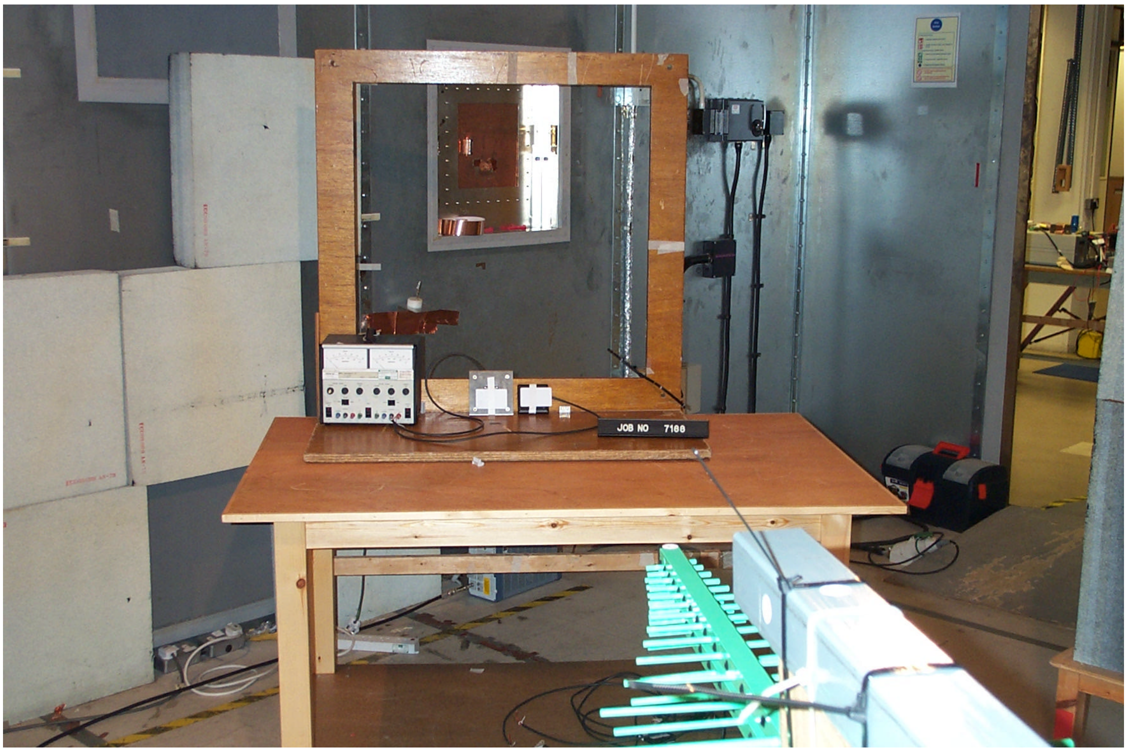
Photographs Of EUT Cabling

Conducted RF Emission

Conducted RF Emission (14/15/02/2006)

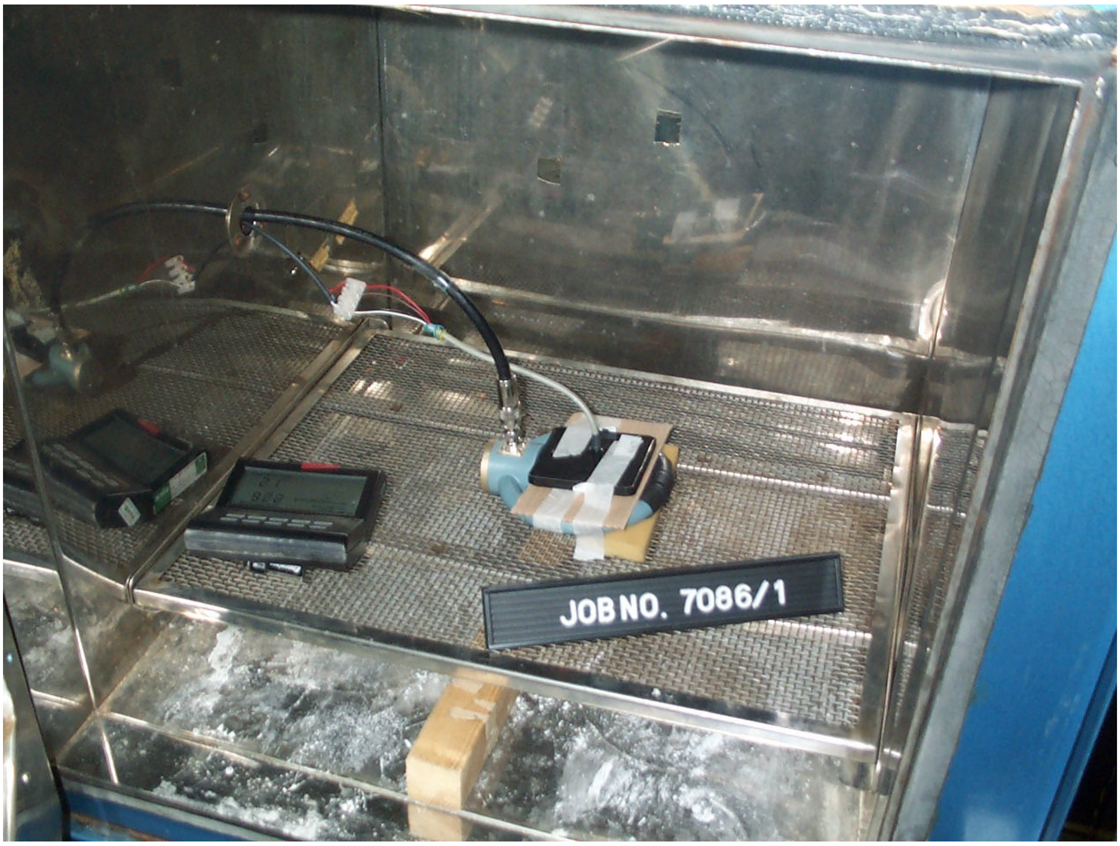


Radiated Emission <30MHz



Radiated Emission tests Pre-Compliance

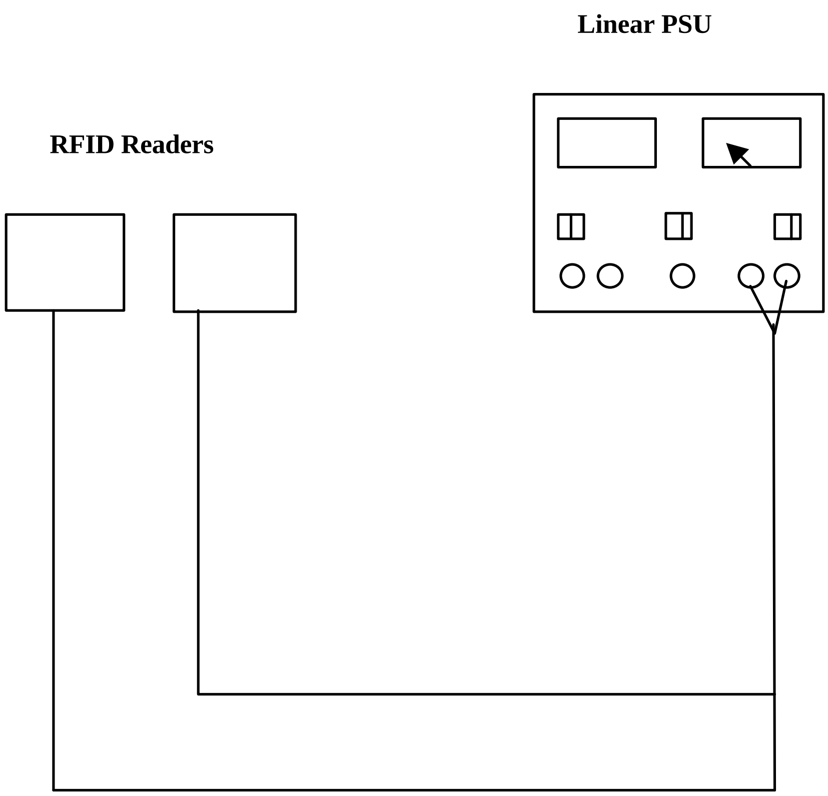
Radiated Emission tests Compliance



Fundamental supply voltage stability test.

Appendix F

EUT Configuration



Appendix G

Application of Measurement Uncertainty to Tests

Introduction
All measurements, be they length, time, voltage or of any other parameter are subject to error. Thus there will always be an element of uncertainty when comparing a measurement with a limit or setting a test level. The greater the precision of the measurement, the lower the uncertainty.
All UKAS accredited EMC laboratories have to make an uncertainty statement "where it is relevant to the validity or application of the test result" (ISO17025 Clause 5.10.3.1 c).
To ensure a uniformity of application all UKAS accredited laboratories are required to keep on file the uncertainty calculations that are vetted by UKAS on an annual basis.
The use of the uncertainty once calculated is the subject of discussion among many interested parties. The main point of contention is whether the test limits and levels within the standards were devised to include an element of uncertainty or whether uncertainty should be treated entirely separately and added or subtracted from the appropriate test level or limit. The treatment of uncertainty for Emission and Immunity tests is different.
Uncertainties in Emissions tests
The approach taken by UK laboratories in the treatment of uncertainty for emissions tests is to consider that measurement uncertainty is not already accounted for in the limit line and should be considered separately.
In practice the uncertainty value is commonly applied to the limit line instead of the actual measured result, such that there is a "grey" area either side of the limit line, which represents the value of the uncertainty as represented in Figure 1.

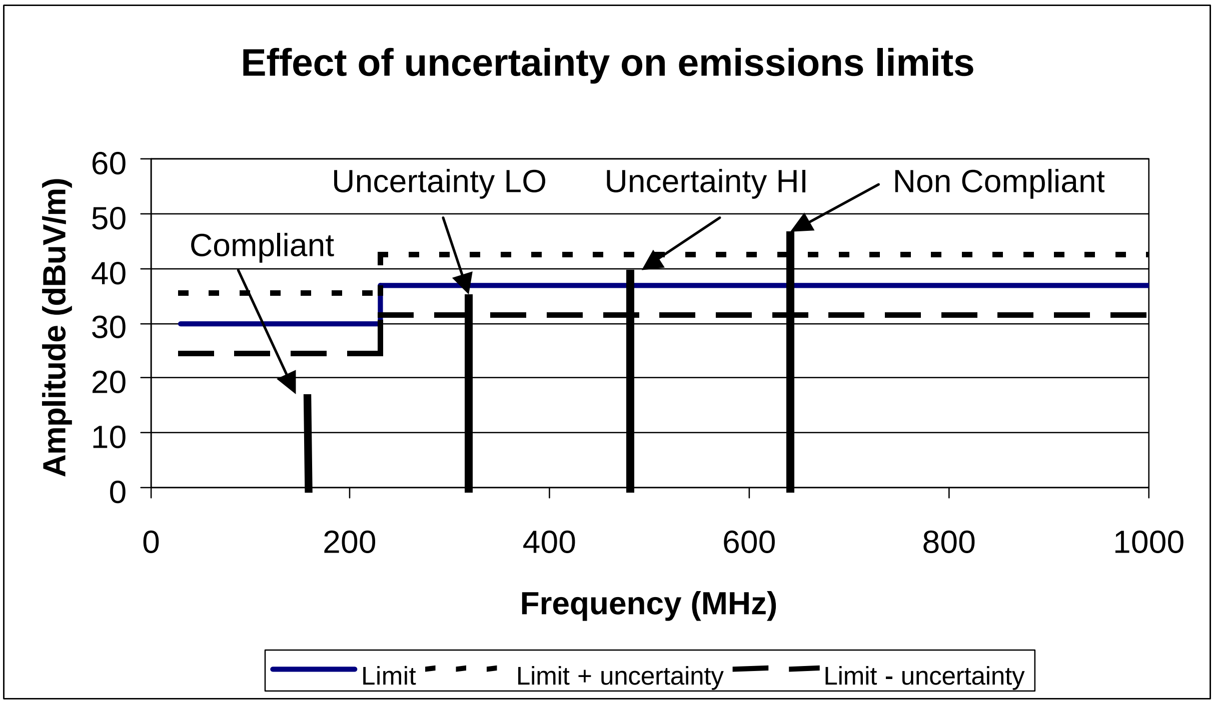


Figure 1. Addition of the uncertainty to the limit line
The easiest way of understanding uncertainty statements is by means of an example. There are 4 possible compliance situations relative to the limit.
An emission that is well below the lower offset limit line is compliant with a 95% probability. Conversely an emission well above the upper offset limit line is non compliant with a 95% probability. No uncertainty statement is required in these cases.

An emission measured within the lower uncertainty may have a real value above or below the limit depending on whether the measuring system reads low or high. Similarly an emission measured above the limit its real value may again be above or below the limit. In both these cases it is not possible to make statements of compliance with 95% probability and so the laboratory makes an uncertainty statement in a form as suggested in UKAS document LAB34.
This statement means that due to uncertainty of measurement the test laboratory cannot say, "hand on heart", that an emission is guaranteed to be compliant/non compliant with the limit of the standard. The statement does however go on to say that all things considered it is more probable that the emission is compliant/not compliant as appropriate with the limit. The UKAS requirement is that the uncertainty statement must be made when a lower than 95% probability is found for the measurement.
It should be noted that the uncertainty calculated by a laboratory only contains contributions over which the laboratory has control, e.g., instrumentation accuracy, measurement repeatability etc. If the emission varies in level due to the characteristics of the apparatus the uncertainty estimate will not include this variability. Thus the statement only applies to the particular apparatus tested when it was operating in a particular mode and configured in the way it was during test. Multiple measurements of the emission in different modes and configurations and from more than one sample would define the uncertainty better but would not remove it.
In pure metrology terms the uncertainty calculation is deficient since multiple measurements are not usually done and many contributions are omitted. The UKAS requirement is a balance between metrology and practicality and hence is a compromise.

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