

Induced & contact current measurements

Despite EMF Directive 2013/35/EU and the UK CEMFAW regulations listing Action Levels (ALs) for steady state contact currents and/or induced limb currents over the frequency range 100kHz to 110MHz it's not easy to find equipment capable of performing the necessary measurements.

The reason for this is that compared to field strength measurements there are relatively few situations that require current measurements so equipment manufacturers struggle to make a good business case for developing and supporting measurement equipment that will only be of interest to a handful of customers. This leads to an anomaly in that it's easy to perform field strength measurements where even relatively high exposure levels will generally result in few or no real health effects compared to contact currents that can have an instantaneous effect ranging from unpleasant to fatal with no easily available means of assessment.

So are contact currents just an obscure requirement of the EMF Directive or a true hazard? Unfortunately in the right /wrong, circumstances they are definitely hazardous. For sure you need a high power source to create a problem but radio broadcasters using low, medium or high frequency (LF, MF & HF) transmitters, defence organisations using high power HF communication systems and companies in the manufacturing sector using radio frequency (RF) equipment for drying/heating or sealing processes can all be affected. It should also be remembered that aside from the possibility of RF burns (or worse) to personnel there is the additional risk of 'secondary effects' i.e. initiating an explosion in a flammable atmosphere or in the case of induced current inadvertently affecting ordnance or other safety critical systems.



A hand held contact current meter in use, in this case the body is used to determine the current flowing to ground .

This leaves the few organisations that have a need to perform current measurements in a tricky situation. The most common measurement solution is to fit a current probe or clamp around the relevant limb of a willing subject and measure the current flowing in the limb using a suitable analyser such as the Narda Safety Test Solutions SRM3006. This obviously has some safety implications in that somebody has to touch an object and in doing so may receive a contact current. This can be mitigated if the output from the system under test can be controlled and a low power level is used for the initial measurement but if there is no easy means of guaranteeing a suitably low current then an alternate method must be used.

The steady state contact current listed in the EMF Directive is 40mA which doesn't sound much but you don't need to go much beyond this to start causing pain in a human body. Exactly what is felt will depend on frequency, how well earthed the body is (often depending on the type of footwear) and of course the amount of current. In not particularly scientific circumstances measurements at a radio site (operating at a frequency of approx. 1MHz) identified induced currents in various different metal objects.

Induced & contact current measurements (cont.)



Remember there may be secondary effects; here RF current has caused a wooden fence post to smoulder).

Touching a fence wire with a measured value of approximately 80mA of current was completely pain free in plastic/rubber soled shoes but just in socks touching the fence became uncomfortable. With a current of approximately 160mA touching the fence was very painful even when wearing shoes. Also worthy of note where the fence wire was in contact with a wooden fence post (via metal staples) the fence post was burnt. At >300mA the voltage was sufficient to draw large arcs to the tip of the contact current meter (and here it seemed prudent not to touch the object by hand).

Contact current meters that do not use the human body as part of the circuit are the safest option. The Narda 8870 contact current meter imitates the impedance of the body and measures the current flow from the metal tip of an insulated hand held probe through to a ground plate. Unfortunately the meter is no longer in production and manufacturing start-up costs ensure that the price for new units would be significant so generally it's a case of trying to borrow an existing unit. At time of writing we've trialled another meter which uses the body as the path to ground but with the option of using a ground plate for higher current values but this is yet to be released onto the market.

So what should you do? Unfortunately unless you have some expertise and access to some measurement equipment this is one of the situations where you probably need some outside help. In the first instance contact us and if we can't solve the problem we can most likely point you in the right direction.



A contact current meter in use in circumstances where it's definitely best not to touch the object by hand (the object is part of a mast stay isolated from the antenna).