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Subject: "Electrical breakdown is not always associated with high voltage"

Posted by [muman](#) on Tue, 17 May 2005 02:12:20 GMT

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Thank you for the reference. I looked and found Morgan Jones book. I don't agree that air is a better dielectric or that it sounds better, but at least this reference is something. At the microvolt level of a moving magnet cartridge, if the air is clean and humidity controlled, it would work. I work in power systems, and we always consider air to be a problem. The dielectric properties of other insulators are much better. Even an air bubble in an insulator can be catastrophic. Advances in materials have made air gap insulators obsolete, IMO. The fact they aren't used in most good radios anymore says something too. Quoting John J. O'Dwyer, "Breakdown voltage is directly related to the dielectric thickness. Its counterpart, dielectric strength, indicates the relationship between thickness and breakdown voltage, and is expressed as a ratio of voltage to thickness. Thermal effects due to local Joule heating can cause thermal breakdown at sufficiently high temperatures. This correlates to electrical conductivity through an exponentially increasing function of the temperature. Other factors that contribute to breakdown include particulates, material contamination and water vapor. Each can influence breakdown; actions must be taken to eliminate their contribution to breakdown voltage measurements. Humidity, for example, reduces the resistance of most dielectrics, thus increasing the return current (the current that opposes a charge build-up). Contamination can contribute to leakage currents and charge mobility across isolation areas." Two plates separated by a 1mm air gap will arc with 3000 volts, and can as low as 300 volts. Air is a fluid mixture and unless controlled, it is a nonspecific gas. Water vapor is a big factor in reducing the dielectric strength of air (or any other dielectric, for that matter) and other contaminations also contribute to modify dielectric properties. It's a crap shoot with air so I don't think an open capacitor is the best way to go.

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