**Radio Frequency Interference Effects on Microcontroller Clock Stability**

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**Abstract**

While most microcontrollers can be used with a variety of clock sources, the device's internal oscillator is the preferred source if it is present, and if application requirements allow for its use. Unless a device requires external clock source, the internal oscillator is the smallest and least expensive option for clocking, as it adds no additional cost and requires no additional space. However, the R-C circuit usually used for this purpose is less accurate than a ceramic resonator, crystal, or oscillator. In addition, it also drifts more with temperature and other environmental factors. Moreover, the more data is available on its performance, the more applications it can be reliably used for. With adequate data, the source selection is based on known risk and performance, rather than a conservative approach to an unknown. This could be useful to anyone who uses microcontrollers in a high-interference environment, such as an RF testing lab, near a radio transmitter, or even near WiFi devices.

This experiment is designed to determine what, if any, effect radio-frequency emissions from external sources have on clock drift, and the consistency of that drift within different examples of the same MCU. MCUs from 4 popular vendors will be tested in this manner: Microchip Technologies, Texas Instruments, STMicroelectronics, and NXP Semiconductor. 6 examples (3 under test and 3 control) of 5 part numbers from each manufacturer will be tested. The MCUs will be tested under RF radiation of varying frequency and power density. Several treatments will be applied to each of the experimental units, in which the temperature will be held constant, all MCUs will be powered from identical power supplies, and RF radiation of 10 selected frequencies and 4 different power densities will be applied, one treatment at a time. For each treatment, a random selection of half the IUs under test will be placed in the test chamber at a time. Frequencies will be selected to correspond to commonly used radio services or other sources of RFI, and will range from 48KHz to 5GHz. A set of power densities will be selected for each frequency to correspond with common real-world scenarios, for example a device near an FM radio broadcasting tower, or a device 1 meter from a 5GHz WiFi router.