Spatial Low Pass Filter for *TE* Experimental Measurements for Microwave Image Enhancement

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Reconstruction using actual experimental microwave measurements has always been more challenging than using synthetic data even when it is corrupted with noise. Experimental measurements typically contain noise and distortions which are difficult to emulate in synthetic data. Extensive work has been reported in the literature on de-noising experimental measurements for image enhancement.

One major type of noise is the drift noise originally coined by C. Eyraud, J. M. Geffrin, A. Litman, P. Sabouroux, and H. Giovannini, Applied Physics Letters, 89, 244104, 2006. This drift noise arises because of the subtraction of two measurements: (*i*) a measurement without the target, and (*ii*) a measurement with the target. Changes in the conditions between the two measurements, e.g. the network analyzer drift due to temperature, inaccurate motor repeatability, are the sources of the drift noise.

The *TE* reconstruction using experimental measurements has always been more challenging than the *TM* case which motivated this work. The goal is to remove the drift noise to improve the *TE* reconstruction. Two ultra-wideband strip-fed Dielectric Resonator Antennas (DRA) are used as the sensors. The antennas have a center frequency of 5.6 GHz and a bandwidth of 51.3%. In the experimental measurements, the target is placed between the two rotating DRAs. The collected data are then forwarded to the level set algorithm to reconstruct the target.

In this work, the drift noise is removed using spatial low pass filtering of the measurements. Three different filters are investigated: rectangular moving average filter, a triangular filter, and a sinusoidal filter. Significant improvement in the *TE* reconstruction is achieved which clearly demonstrates the need to remove the drift noise from measurements. In addition, the results clearly show the sensitivity of the *TE* case to the drift noise.