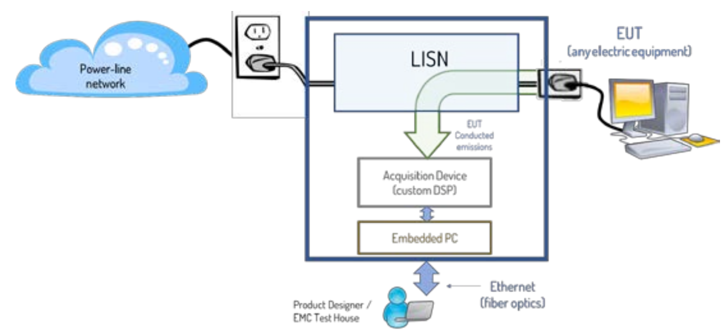
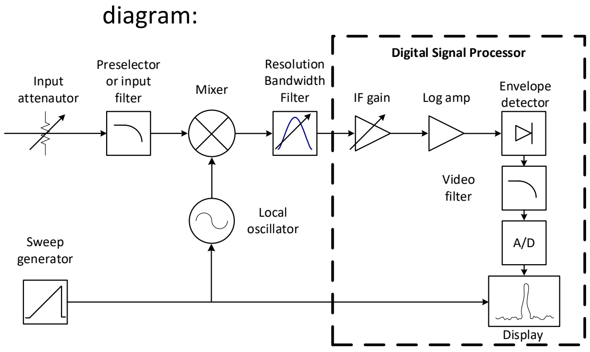
EMSCOPE, a new FFT-based Dual-port Multimodal Receiver for fast measurements of conducted emissions

emzer
Innovative Lab Instruments

Doing conducted-emission measurements in time domain can speed up the measurement time, but several issues need to be considered in order to meet the measurement standards. This poster describes some considerations that have been implemented in EMSCOPE to meet the CISPR 16.



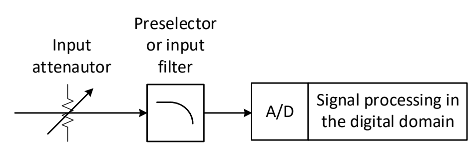
The "conventional" superheterodyne spectrum analyzer block diagram:



Disadvantages

- All paths must be highly matched
- The analog filters introduce phase distortion
- The ADCs inject a DC term that cannot be easily removed from the desired information
- Measurements for the whole frequency band are slow

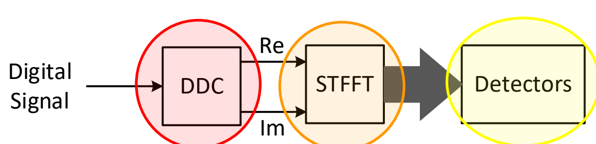
Modern spectrum analyzer block diagram:



Advantages

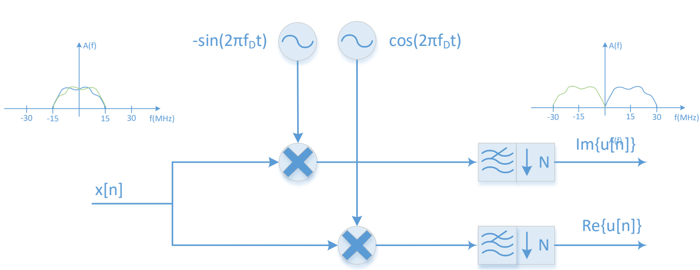
- Imbalance-related distortions due to the mismatch between analog components disappear
- We can easily design linear-phase digital filters
- The DC term injected by the ADC can easily be removed by a digital filter
- Faster measurements

In the digital domain:

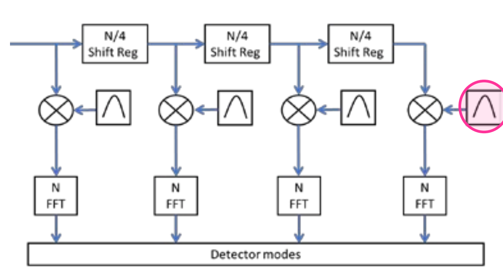


The first block is a downconverter, that moves the input signal to a lower frequency, relaxing then the needed sampling rate. The second block is where the spectra of the signal is computed by means of the STFFT. And finally, the EMI detectors: peak, quasi-peak and average.

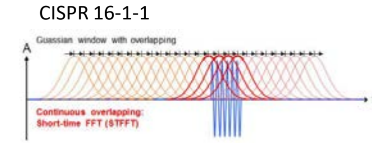
DDC:



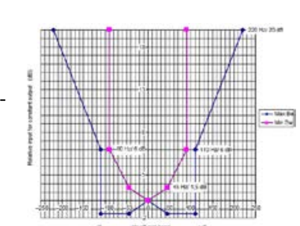
STFFT:

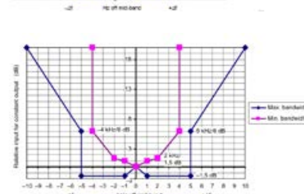


N must be dense enough to meet CISPR 16-1-1



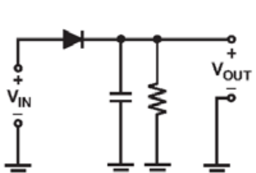
Time-domain version of the RBW (CISPR 16-1-1)





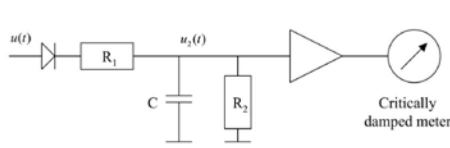
Detectors:

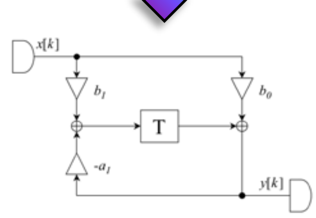
Peak detector



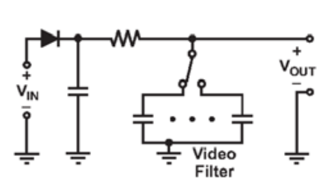
$$A_p = \mathrm{MAX}\{|s_{\mathrm{bb,fsel}}[n]|\ n \in \{1, \ldots, M\}\}.$$

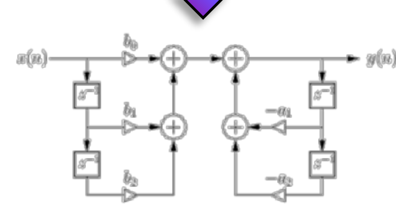
Quasi-peak detector





Average detector





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