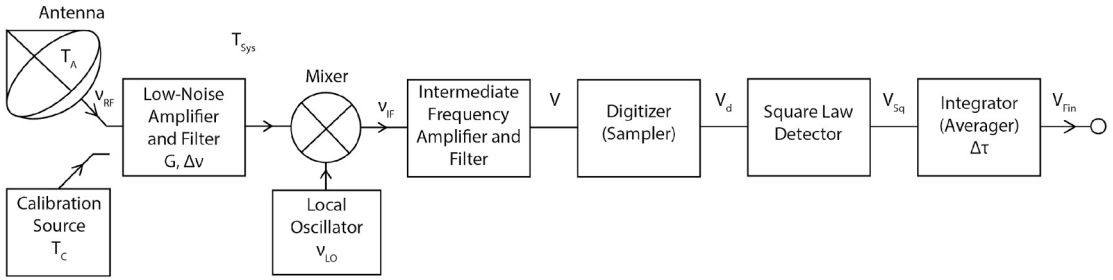
Yurii Pidopryhora,
MPIfR Bonn / interTwin

Noise Analysis

Simple Radiometer (Superheterodine Single Sideband) model predicts **white noise**:



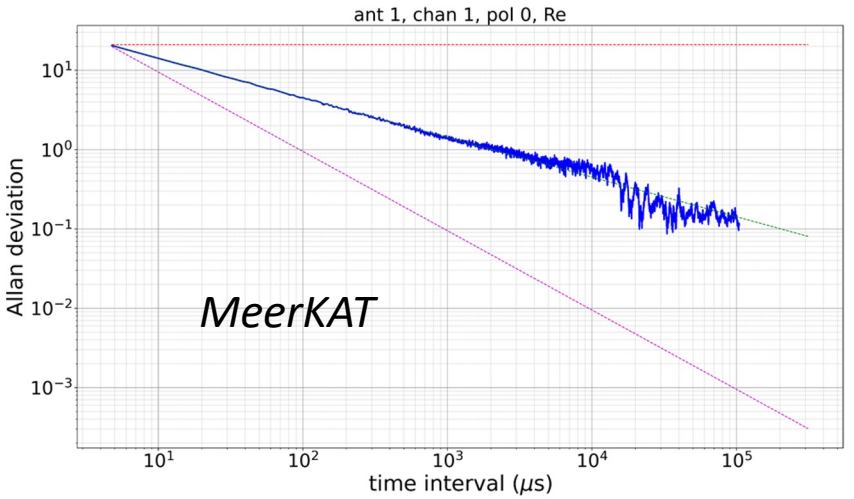
$$T_{\mathrm{Sys}} = T_{\mathrm{rad}} + T_{\mathrm{cmb}} + T_{\mathrm{bg}} + T_{\mathrm{atm}} + T_{\mathrm{spill}} + T_{\Omega}$$

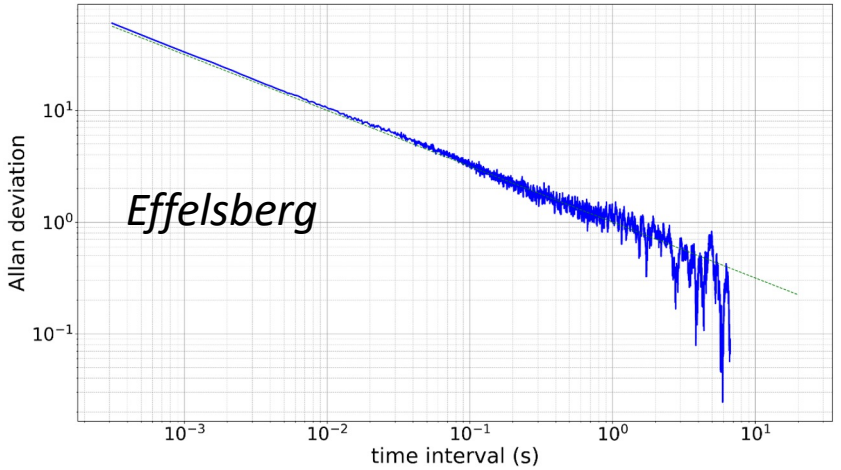
$$\langle V_{\mathrm{Fin}_T} \rangle = T_A + T_{\mathrm{Sys}}$$

$$\sigma_{\mathrm{Fin}_T} = \frac{T_A + T_{\mathrm{Sys}}}{\sqrt{\Delta\nu\Delta\tau}}.$$

$$\mathrm{SNR} \approx \frac{T_A}{T_{\mathrm{Sys}}}\sqrt{\Delta\nu\Delta\tau}.$$

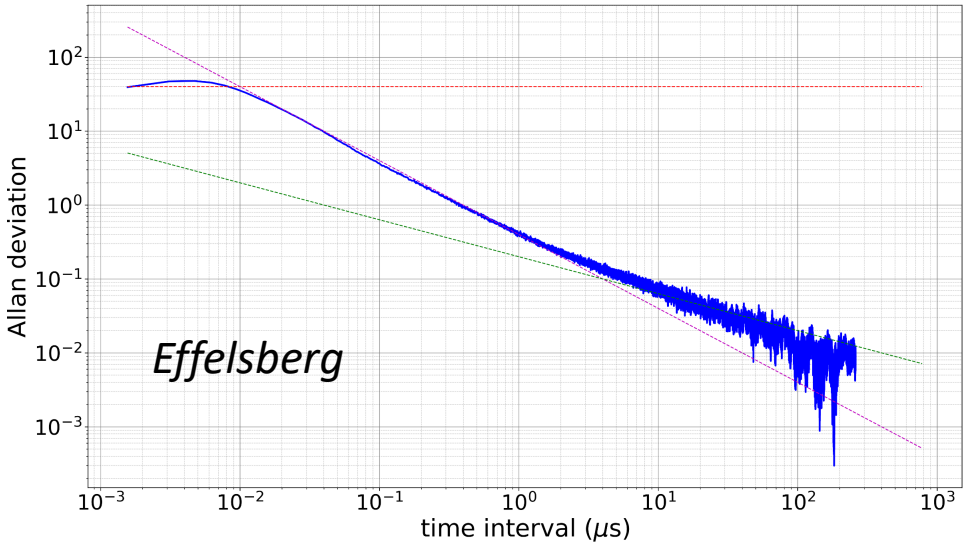
…and it is **confirmed** by statistical analysis of **real data**:



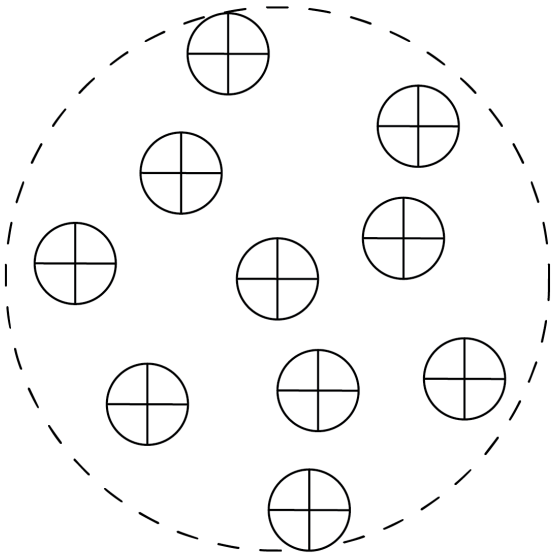


Noise Analysis 2

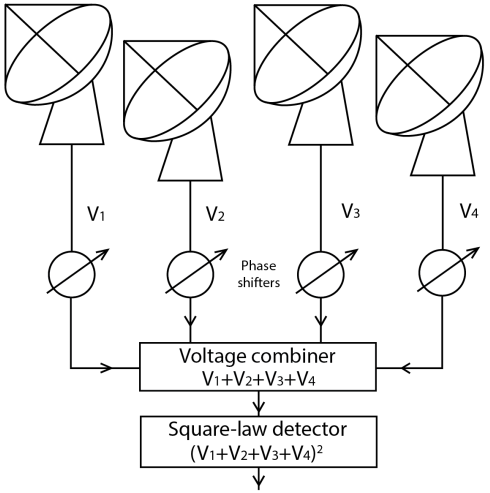
Colored noise example at much shorter time intervals:



Works the same with a phased array?



Phased Array



HPC Testing and Integrating ML-PPA with interTwin

- ML-PPA deployment has been successfully tested at three HPC systems:
  - ✓ DESY, DZA, and VEGA (IZUM, Maribor, Slovenia)
  - ✓ and the testing continues at the latter two
- Within interTwin:
  - ✓ distributed learning using *itwinai*
    - DTE core module that streamlines AI workflows and reduces coding complexity
  - ✓ direct and/or authorized access to the interTwin data lake:
    - *Teapot* = easy-to-install edge service providing remote access to data storage
    - *InterLink* = open-source service to enable transparent access to heterogeneous computing providers

interTwin

itwinai

Teapot

interLink