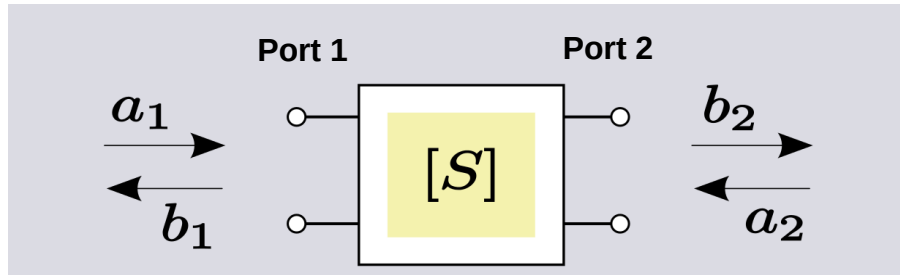


Comparison of 10 amplifiers

- RF (radio freq.) amplifiers: kHz - GHz
- Characterized by VNA (vector network analyzer)
 - Amplitude & phase properties
- Characteristics captured in '**Scattering parameters**':



S-parameters in a two-port network

Credit: User:Spinningspark, Filelink: Two-port_S-parameters.svg

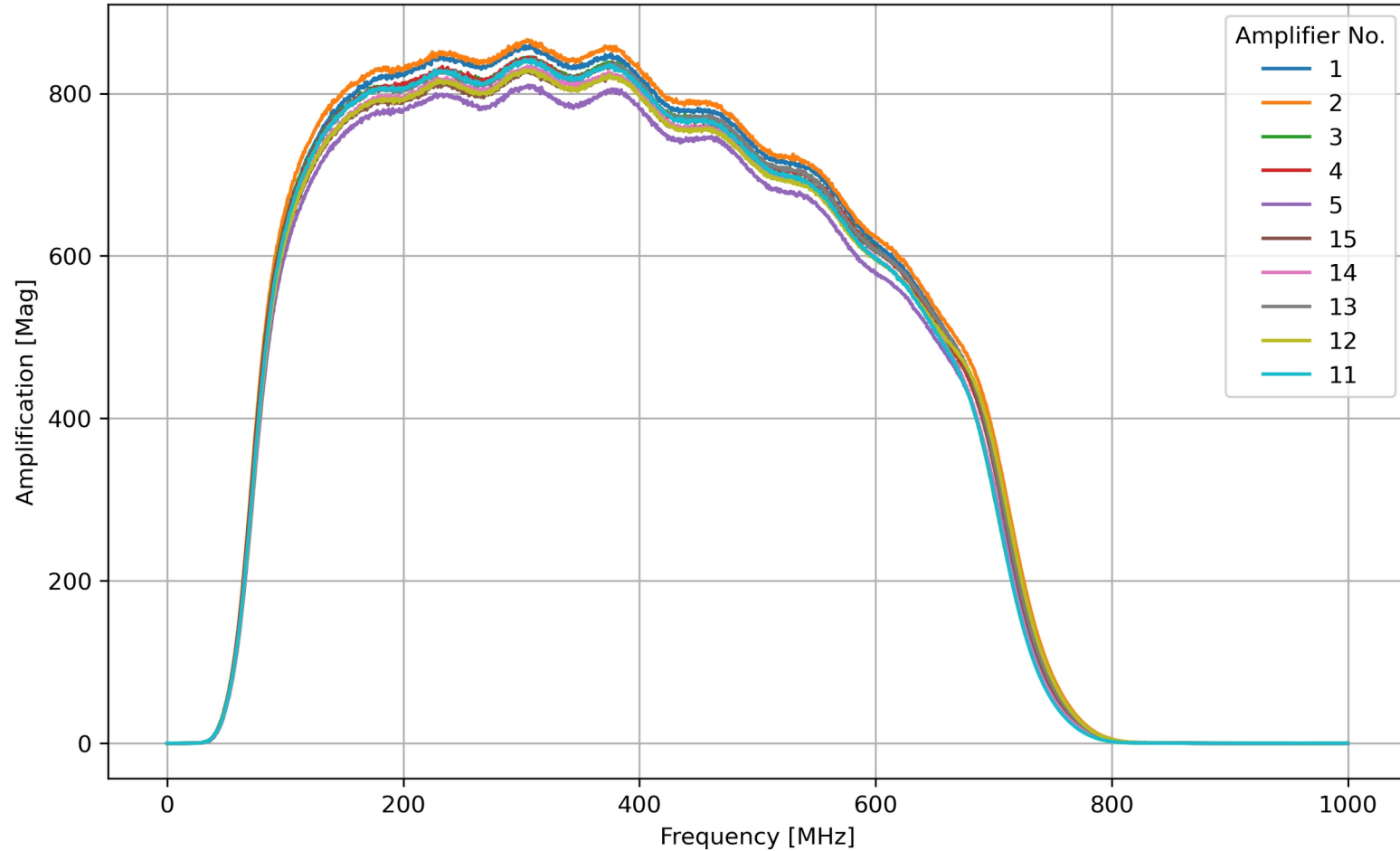
$$\begin{array}{c} \text{Reflected} \\ \text{waves} \end{array} \begin{bmatrix} b_1 \\ b_2 \end{bmatrix} = \begin{bmatrix} \boxed{S_{11}} \\ \boxed{S_{21}} \end{bmatrix} \begin{bmatrix} \boxed{S_{12}} \\ \boxed{S_{22}} \end{bmatrix} \begin{array}{c} \text{Incident} \\ \text{waves} \end{array} \begin{bmatrix} a_1 \\ a_2 \end{bmatrix}$$

Transmission
forward (21) / backward (12)

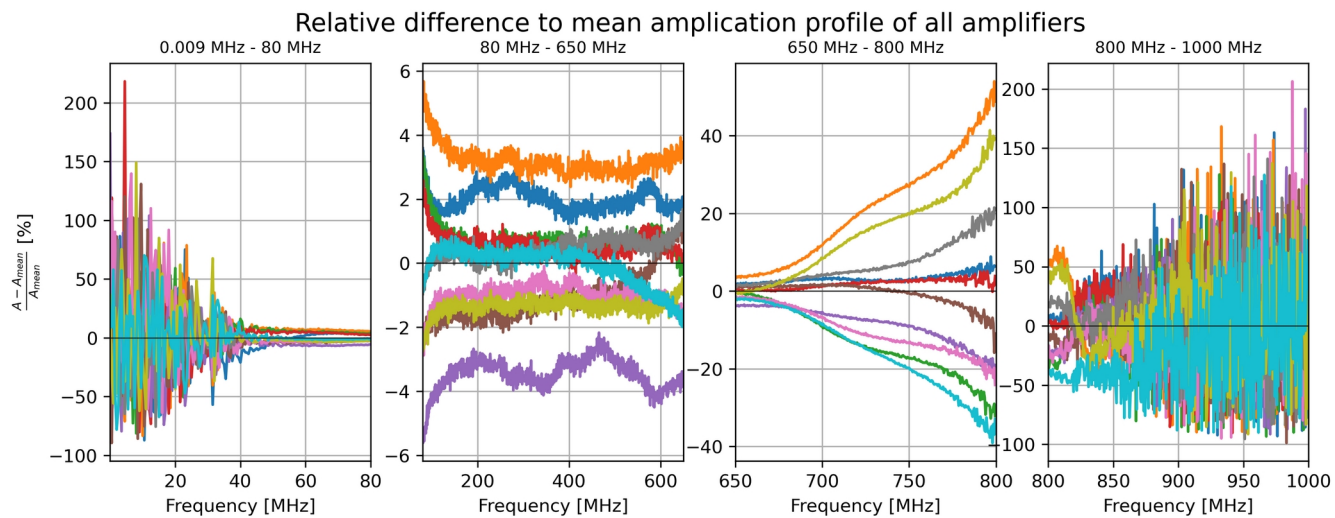
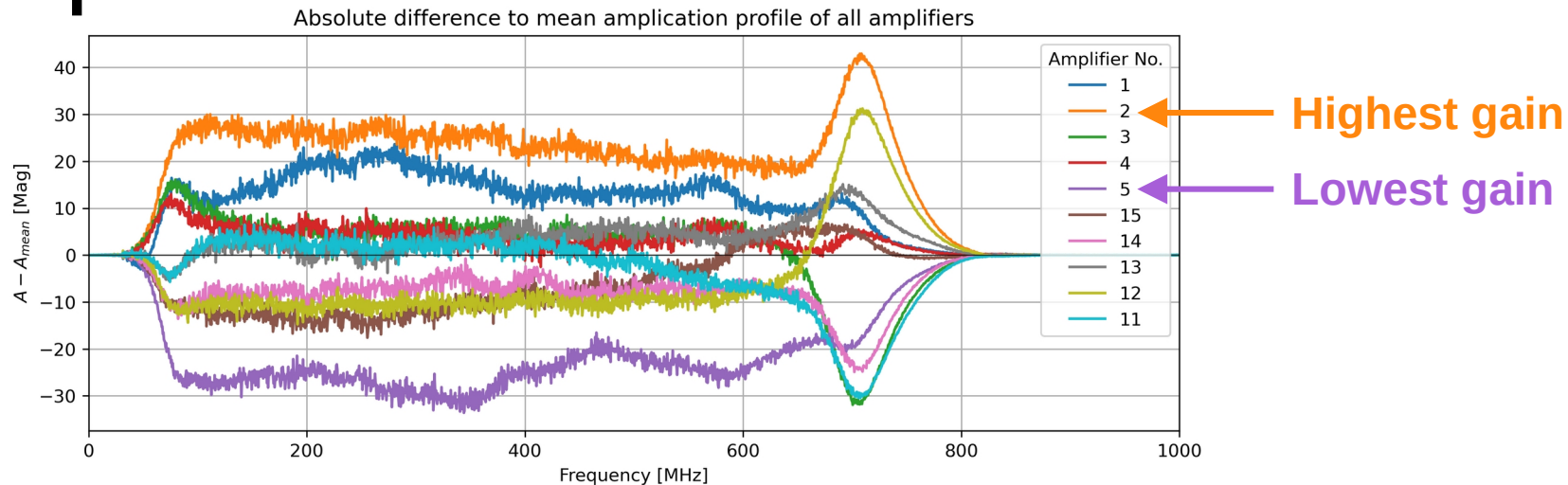
Reflection
at Port 1 (11) / Port 2 (22)

S21 amplitude

Amplification vs. Frequency comparing different amplifiers

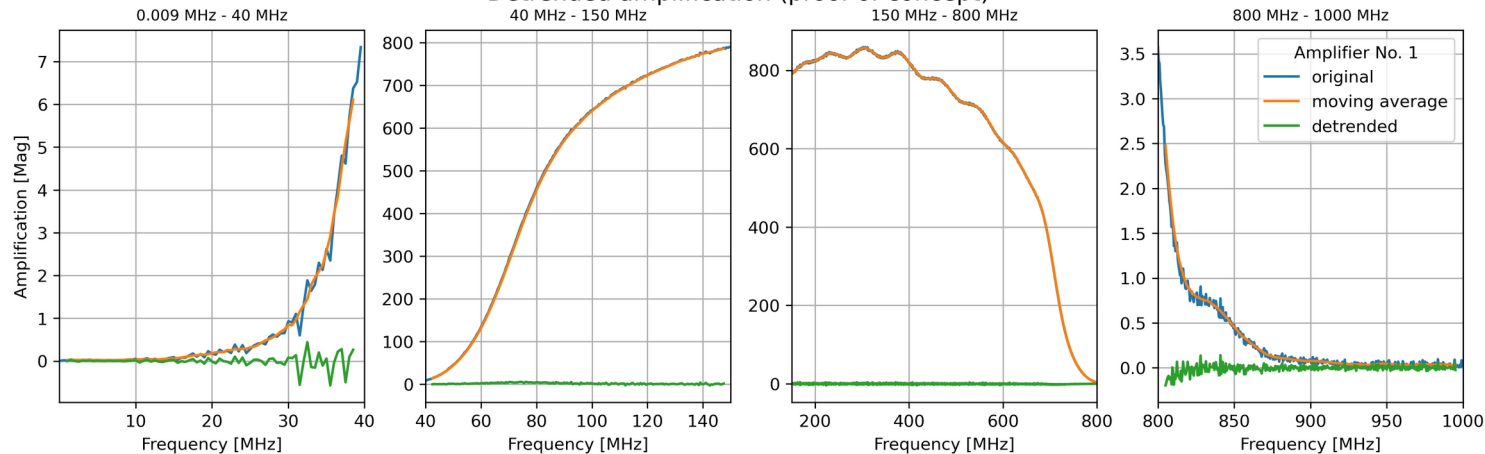


S21 amplitude



S21 amplitude

Detrended amplification (proof of concept)



Standard deviation of detrended amplification ('white noise')

