

## EuMA Internship Topic

Ultra-wideband power amplifier become more and more important for high-speed data transmission like it is planned in 6G communication networks.

Thereby, a flat gain shape response of a total system is required for those highspeed data communication systems.

An imbalance in the gain of e.g., a transmitter leads into different power densities in different channels, which is unwanted.

Additionally, the fact that the insertion loss of passive components in the communication system like in cables, or transmission lines rise with frequency, affects the gain response of the total system [Fig. 1].

To overcome now this issue a peaking ultra-wideband amplifier with increasing gain shape over frequency can be implemented.

The goal of this amplifier is to compensate the rising losses of those passives in order so lead into an overall flat gain and power response of the total communication system.

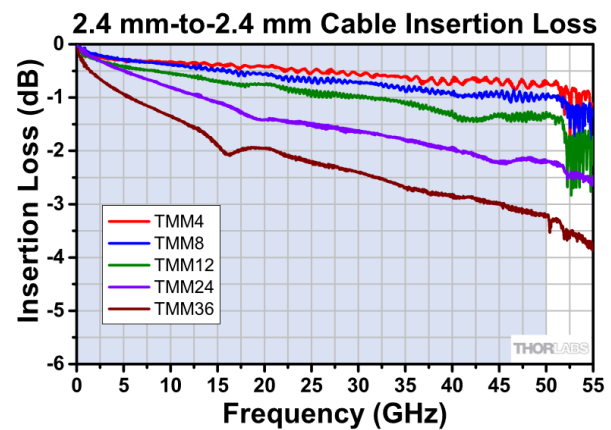
With different kind of peaking techniques, a gain response of a peaking amplifier as depicted in Fig. 2 can be reached.

### Goals of this work

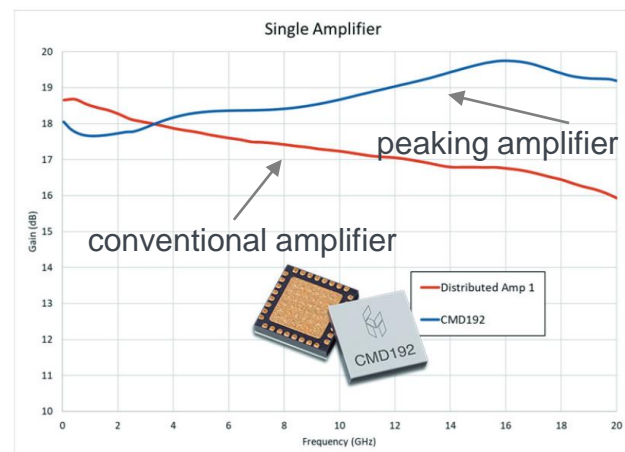
- Make a state-of-the-art analysis and consider e.g., the used technology, the maximum frequency, the range of the positive gain slope (dB/frequency)
- Investigate what kind of circuit design techniques are used to reach a positive gain slope
- design at least one gaincell with a peaking gain performance at schematic level

You are perfectly suited if:

- you are interested in integrated circuit design
- you have a good knowledge in the RF/mmW domain
- you have already experience with developing tools like Cadence or ADS



Source: <https://www.thorlabs.com/drawings/c3b0ec231bf2afdd-A95292E4-F598-C418-C4EF8D669025D3D3/TMM12-SpecSheet.pdf>



Source: <https://www.mwrf.com/technologies/components/article/21849179/take-advantage-of-amplifier-mmics-with-positive-gain-slopes>