

response obtained when a laser array is used as an optical source due to periodicity of its electrical transfer function. Indeed, the nonlinearities of the filtering structure come exclusively from the E/O and O/E conversion processes. However, Fig. 4(b) shows measurements corresponding to the case when the broadband source is continuously sliced by means of a MZI. A clear difference with respect to previous filter can now be observed. In this second case, the RF power of second and third harmonic is reduced considerably due to the fact that its electrical transfer function has a single bandpass. We have measured a spurious-free dynamic range (SFDR) of $40 \text{ dB}\cdot\text{Hz}^{1/2}$ for the AWG slicing filter meanwhile with MZI slicing filter we obtain a SFDR value of $60 \text{ dB}\cdot\text{Hz}^{1/2}$, respectively. This means that using the MZI slicing filter configuration is possible to achieve a much higher harmonic suppression in the electrical transfer function. In all cases, a good agreement is found between the theoretical and experimental results where average noise signal level is around -145 dBm/Hz . In our case, SFDR is defined as the carrier-to-noise ratio when the noise floor (P_{noise}) in the signal bandwidth equals to the power of a second order intermodulation product (IP_2), $\text{SFDR}(\text{dB}\cdot\text{Hz}^{1/2}) = 1/2 \cdot (IP_2 - P_{\text{noise}})$.

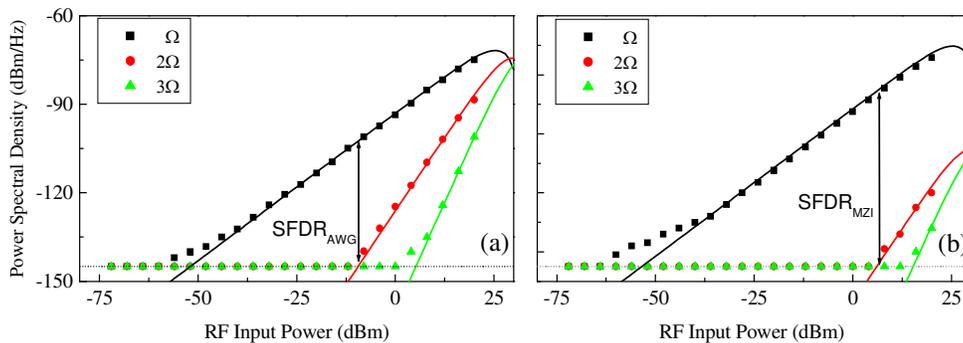


Fig. 4. Experimental (dotted line) and theoretical (solid line) RF power of (■) fundamental tone, (●) second and (▲) third harmonic for (a) AWGs and (b) MZI slicing as a function of RF input power.

4. Conclusion

We have presented a theoretical evaluation and an experimental demonstration of the impact of harmonic distortion in microwave photonic filters. We have compared different MWP structures in order to show the impact of considering a laser signal operation. Indeed, we have demonstrated that the design of MWP filters taking into account the harmonic distortion permits to achieve additional filtering properties as the linearization of the system. Therefore, the interest to consider this harmonic distortion model on the design of advanced microwave photonic filters is demonstrated.

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