Table II also shows that the TRSM radar has high flexibility to adapt to all performance based on various desired target conditions. This fact is also supported by the calculation of T-R gain for variants of PMIMO radar, such as the PMIMO radar [16], HPMR-US [17], and OPPM [19]. Another calculation result is the comparison of radar performances, T-R and SINR gain, between the TRSM radar ($M = N = 25$) against the PMIMO radar ($M = 25$, $N = 50$), i.e., an increase in T-R and SINR gain by a factor $(N/L)^2 LN^2$ and $(N/L)LN$, respectively.

In general, radar configurations with subarrays in either Tx or Rx array incline to produce higher gain than without using it. This is shown in Figs. 7(a) and 7(b) for the performance of the T-R and SIR gain. Despite the fact that the SNR gain performance with a subarray configuration ($M = N = 25$) is not a configuration that provides optimum performance (see Fig. 7(c)). For example, a radar configuration with ($M = 1$, $N = 25$) has the highest SNR gain rather than to other configurations, which is 62.11 dB. This also indicates that a radar configuration having a high SNR does not necessarily provide the other performance as well.

IV. CONCLUSION

In this paper, a formula for Tx-Rx subarrays at the MIMO radar (TRSM) has been formulated, including performance parameters, especially Tx-Rx gain, SINR, MPSLL, directivity, and HPBW. Determination of the optimum Tx subarray (M), which affects the MPSLL, directivity, and HPBW for various K has also been presented and evaluated. The use of subarray methods on Tx and Rx arrays, i.e., M and N simultaneously on the TRSM radar, generates beamwidth from the main beam with the lowest MPSLL without compromising its directivity so that a high SINR output is produced compared to other types of radars. The high flexibility of the TRSM radar can make it easier to detect various conditions of the target and its environment. This can be realized through adjustments to the number of subarrays (M and N) in Tx-Rx array so that it will simplify the implementation and design of the radar system.

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