Stability analysis of Negative Impedance Converter(NIC)

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1.Introduction

Negative Impedance Converter (NIC) receives much attention to improve the restriction of antenna gain-bandwidth relationship. Base on the study in [1], NIC is unstable at low frequency. In this study, we propose a way of stability improvement

2 Non-Foster Circuit Structure

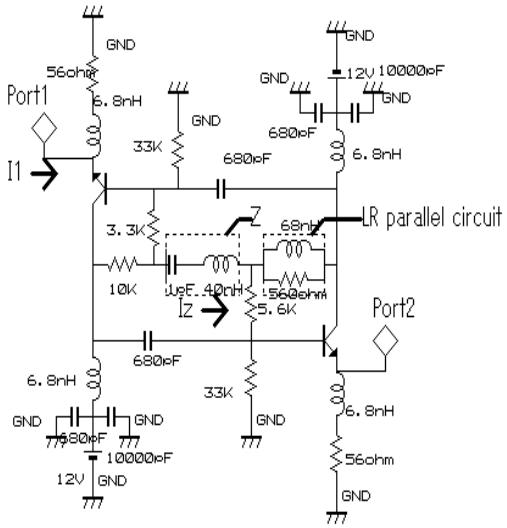

Fig.1 Propose NIC schematic

Fig.1 shows the proposed structure. This circuit has two input ports. The voltage at the input port is inverted with respect to that at the load port. Hence, this NIC is called a voltage inversion NIC.A LR parallel circuit has a role of improving stability.

3 Simulation Results

Fig.2 shows the input impedance at the port1. It shows the non-Foster behavior from 300MHz to 580MHz with the anticlockwise rotation of the trace.Fig.3 shows an antenna input impedance and the NIC matched antenna input impedance. It shows that NIC cancels the imaginary input impedance of antenna. The NIC matched antenna improves the bandwidth from 350MHz to 460MHz and from 550MHz to 650MHz as shown in Fig4.

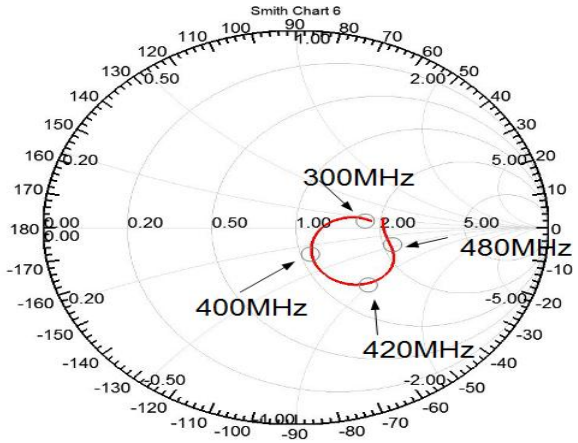

Fig.2 S-parameter of NIC

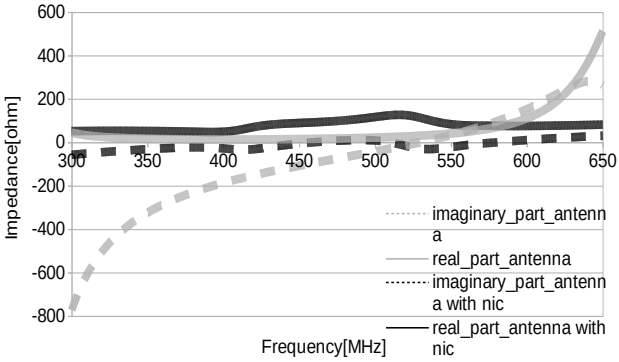

Fig.3 impedance

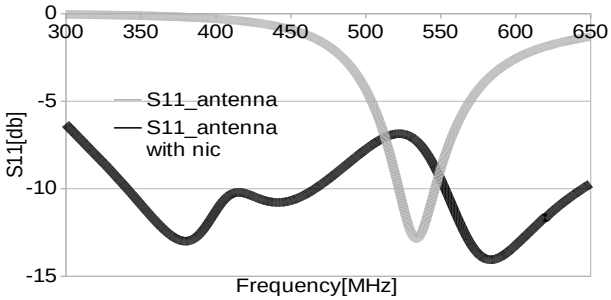

Fig.4 S11 characteristics

4 Conclusions

We have shown that NIC matching networks can help broadband matching of antennas. As future works, we investigate S21 of NIC and how the power is delivered to antenna

References

[1]Keum Su Song,“Non-Foster Impedance Matching and Loading Network for electrically Small Antenna,” ,Doctor of philosophy Dissertation ,The oho university 2011