

A Power-Efficient Noise Canceling Technique

Using Signal-Suppression Feed-forward for Wideband LNAs

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Research Goal

Realize low noise and low power LNA.

Noise Cancelling Technique

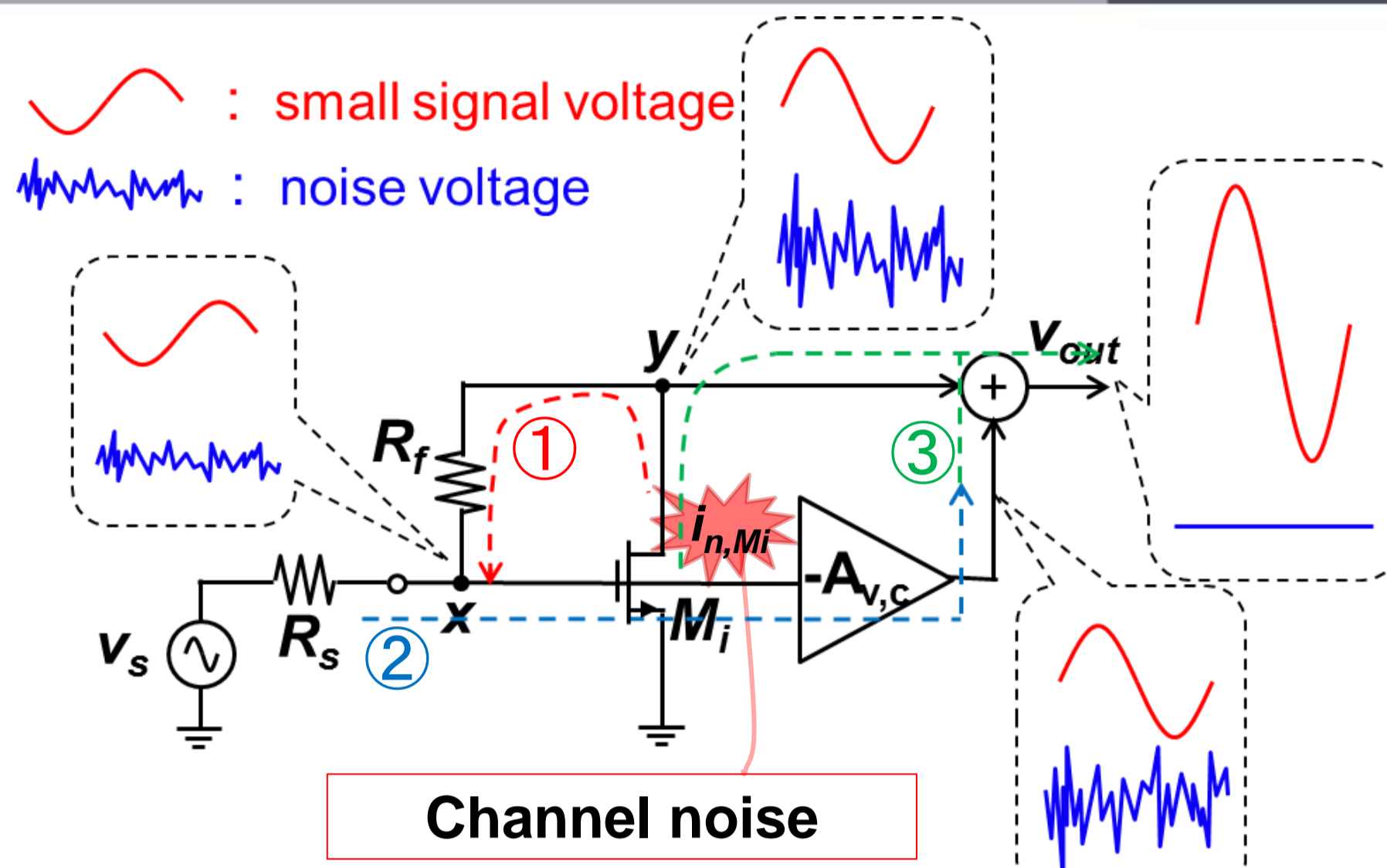
Signal Suppression

Low Noise Amplifier(LNA)

⇒ Always working

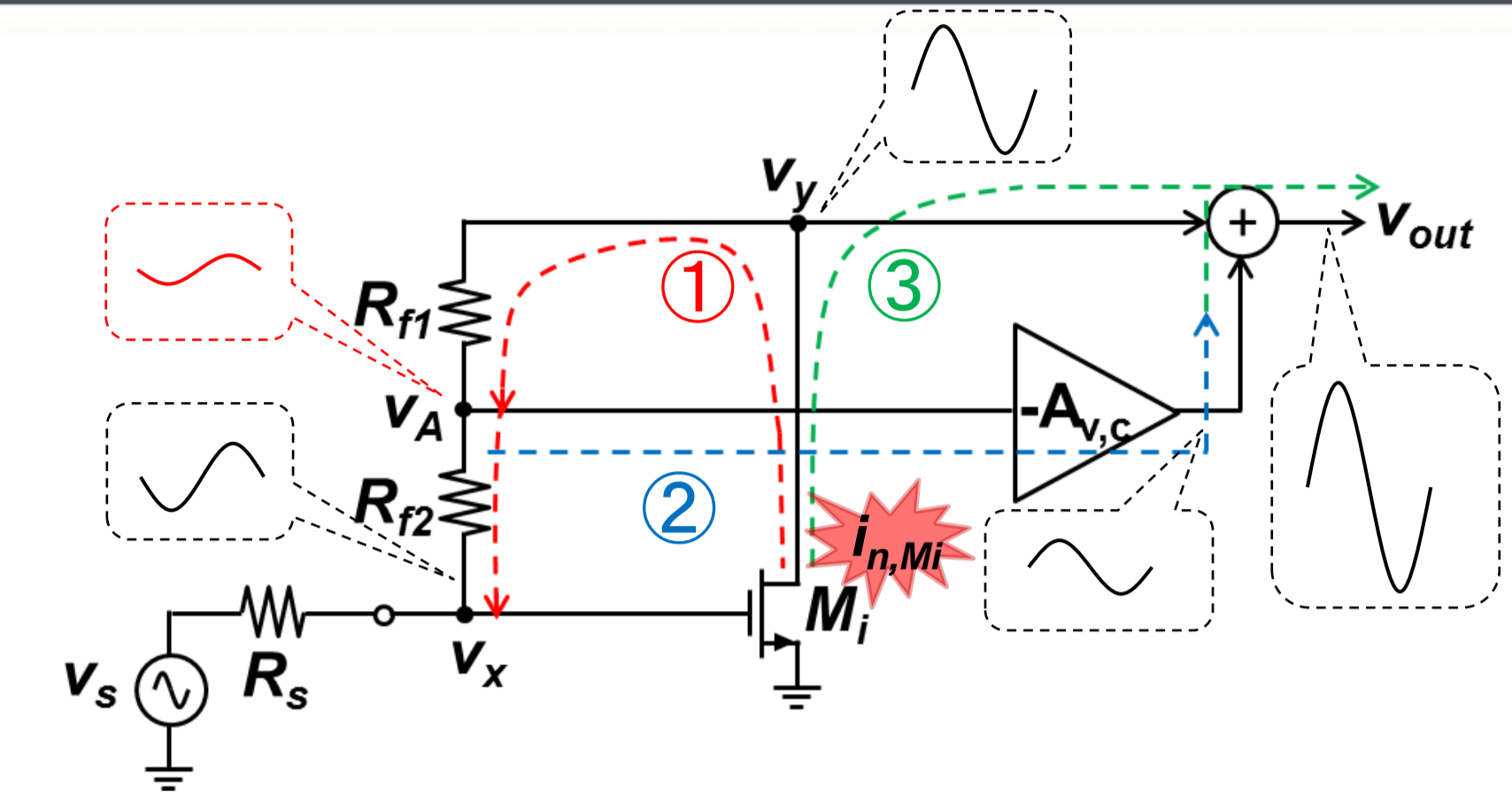
⇒ LNA power reduction is must for low power transceiver

Basic Noise Cancelling Technique



Power increase by $A_{v,c}$ operation

Proposed Solution (Signal Suppression Technique)



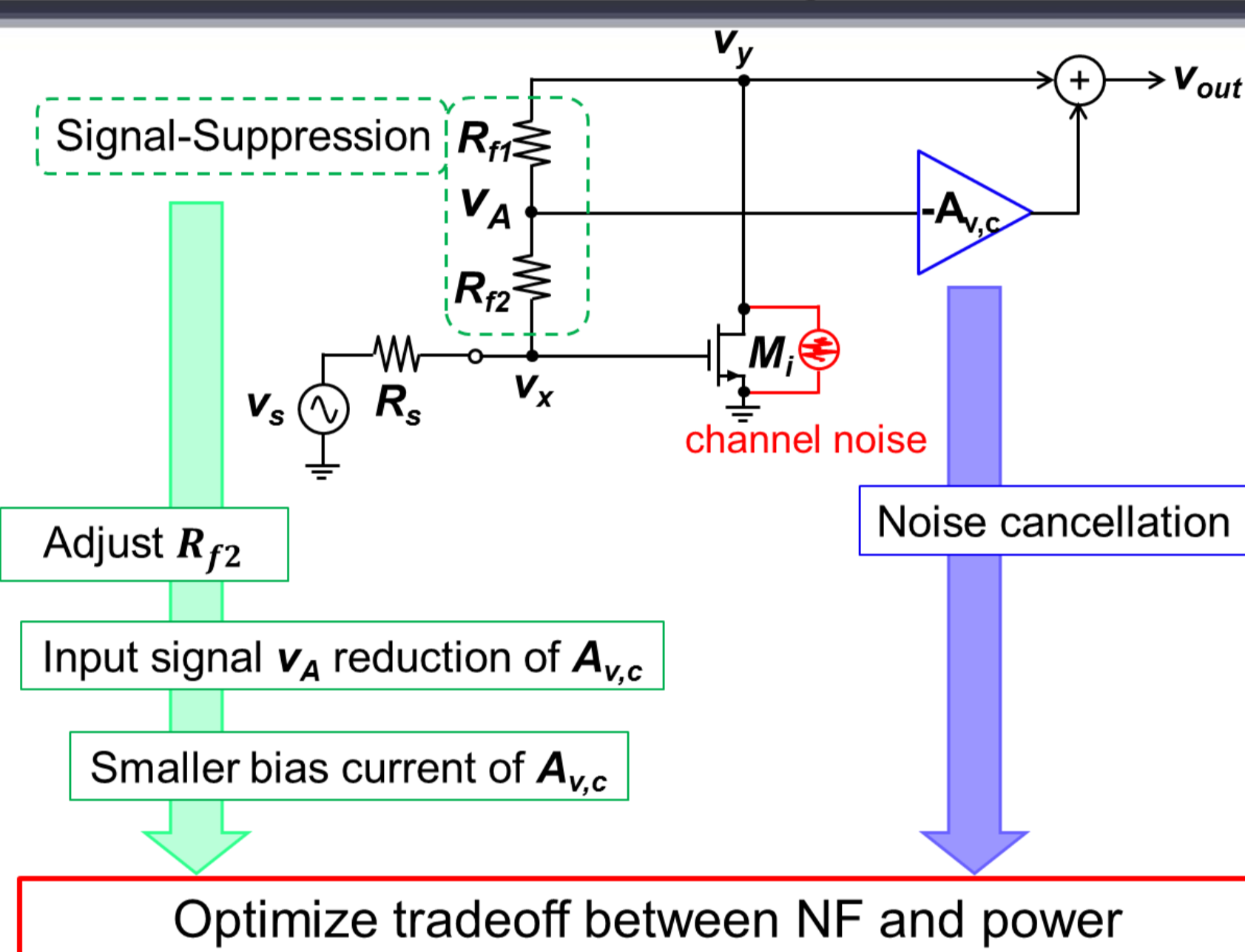
Division of R_f

⇒ Suppress input signal of $A_{v,c}(v_A)$

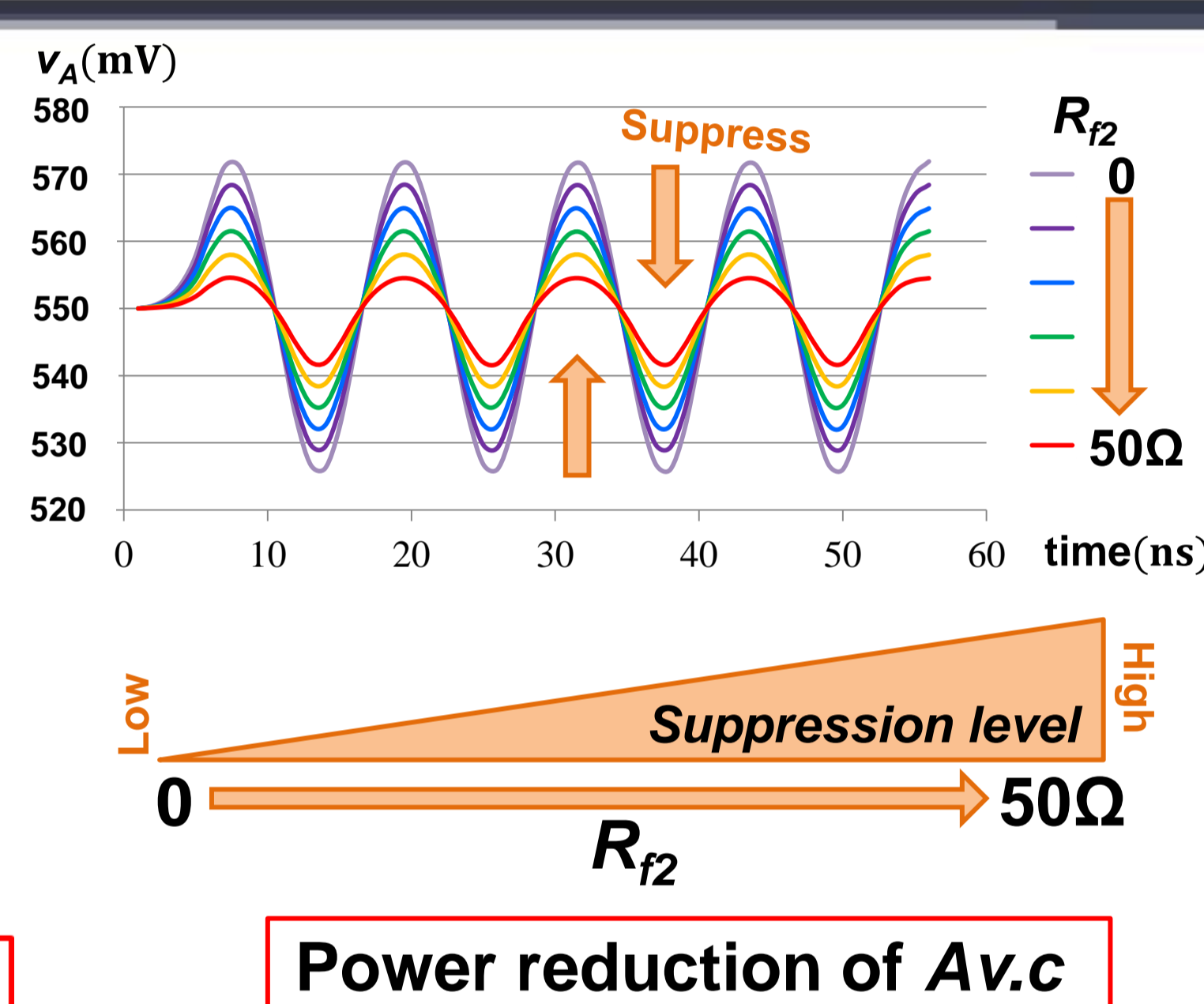
Power reduction of $A_{v,c}$

Introduction

Proposed Noise Cancelling Technique

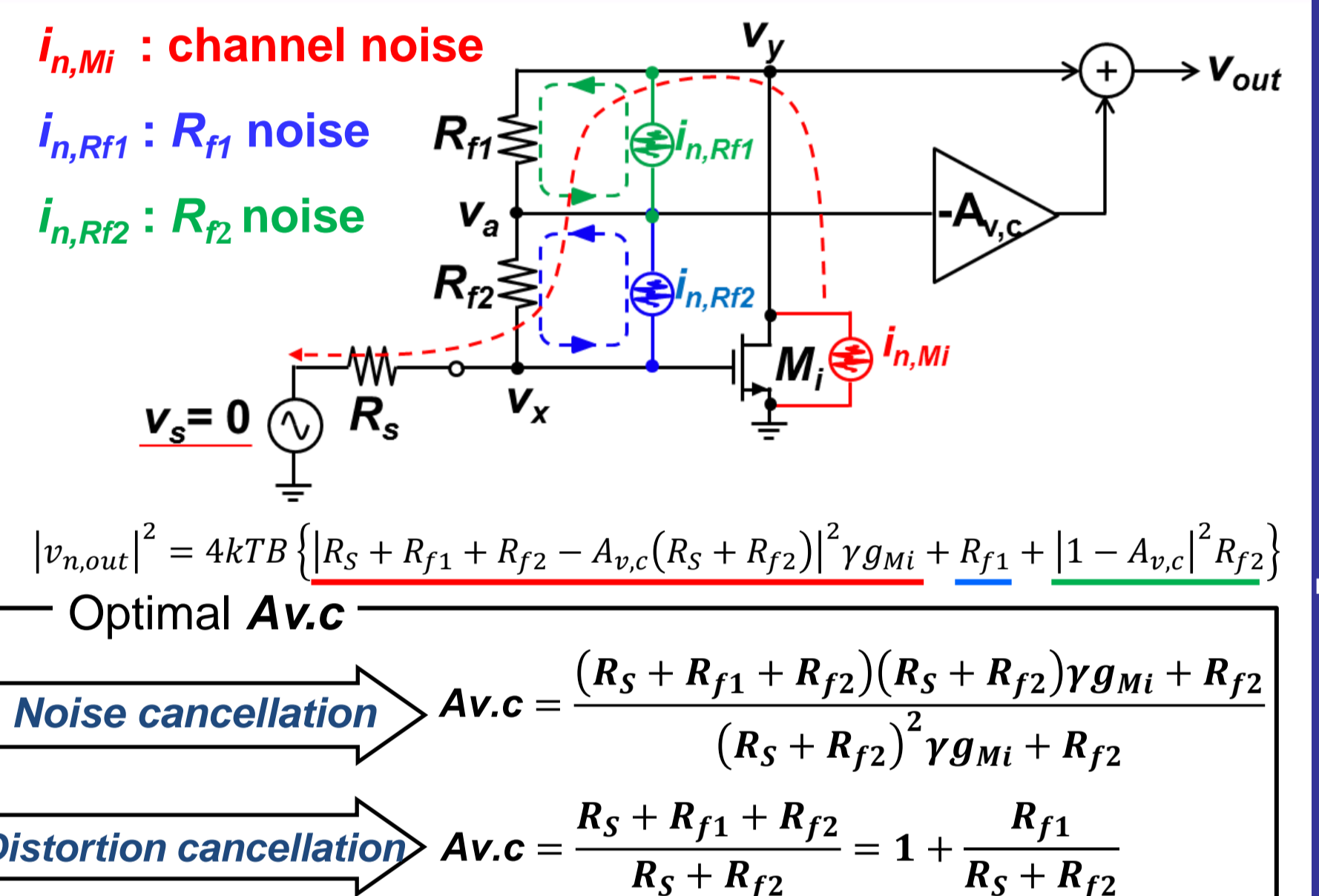


Signal Suppression at Noise Cancelling Amp



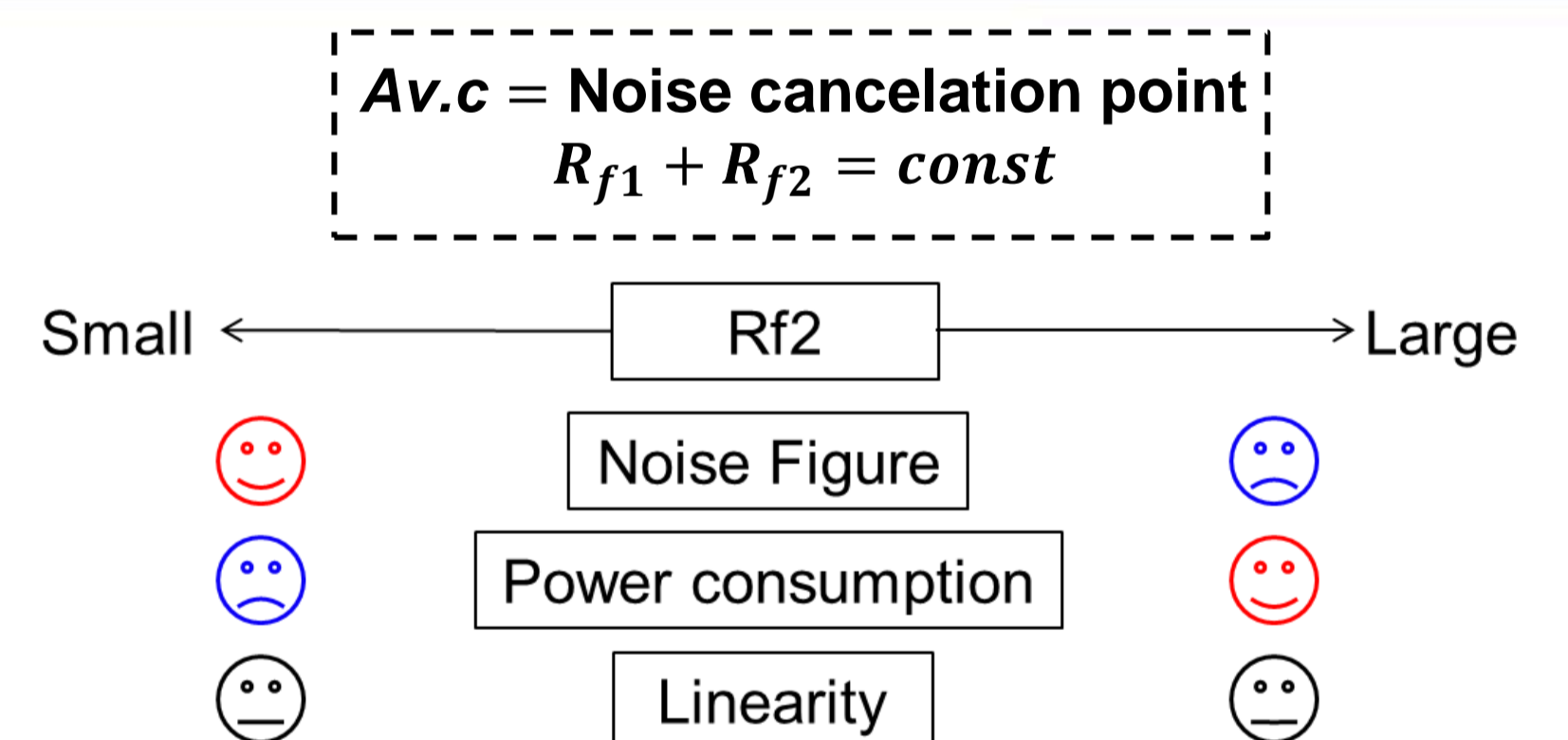
Power reduction of $A_{v,c}$

Noise, Distortion Analysis of Proposed LNA



Proposed Circuit

Performance Tradeoff



Summary

- This work provides optimal tradeoff in between NF and power in wide-band LNA.
- ⇒ By adjusting feedback resistor R_{f2} .
- SPECTRE simulation with 90nm CMOS has proved
 - noise cancelling.
 - low power.
 - distortion cancelling.
 - good frequency characteristics with $R_{f2}=20\Omega$

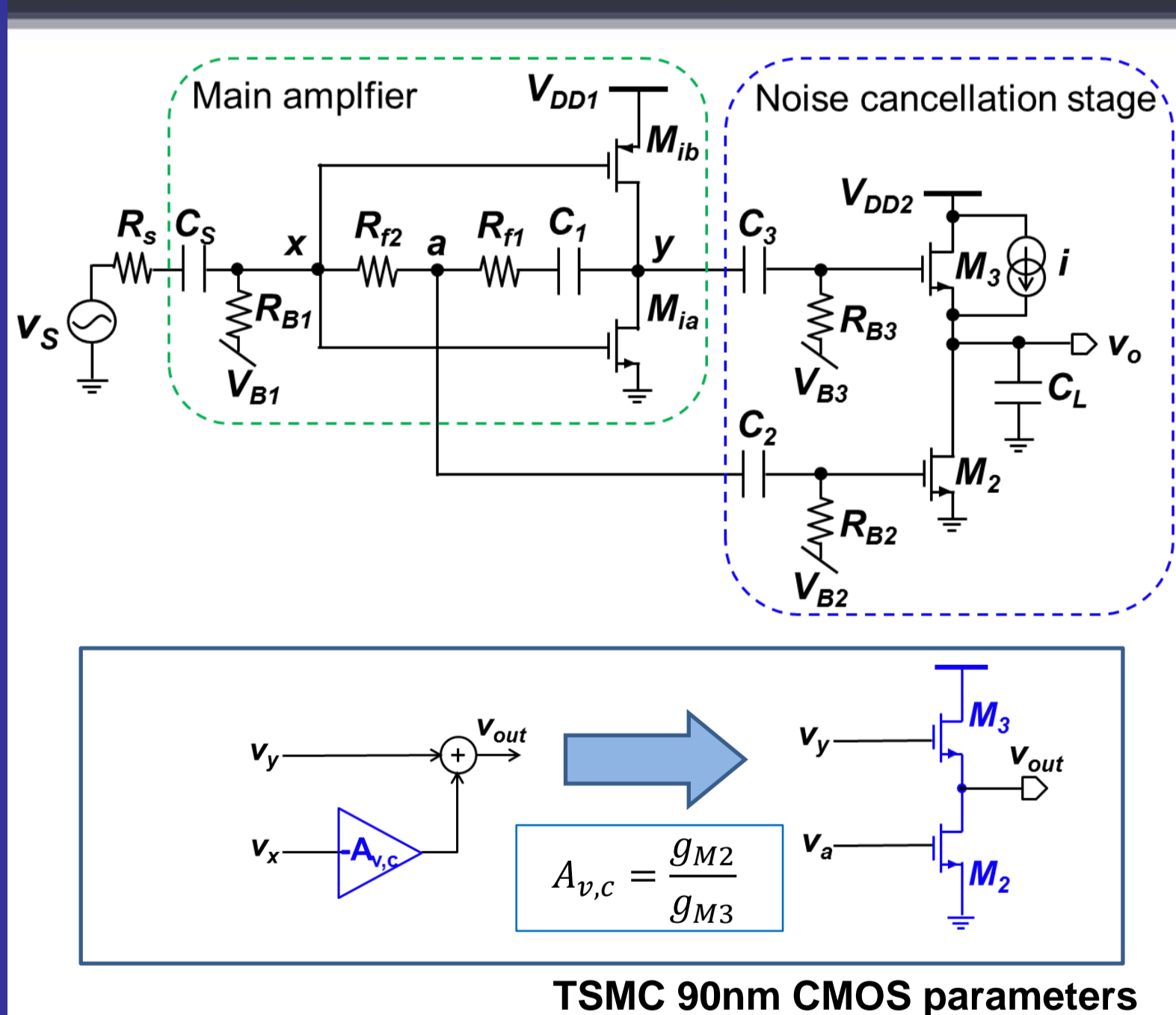
References

[1] F. Bruccoleri, E. A. M. Klumperink, B. Nauta "Wide-Band CMOS Low-Noise Amplifier Exploiting Thermal Noise Cancelling" IEEE Journal of Solid-State Circuits, (Feb. 2004).

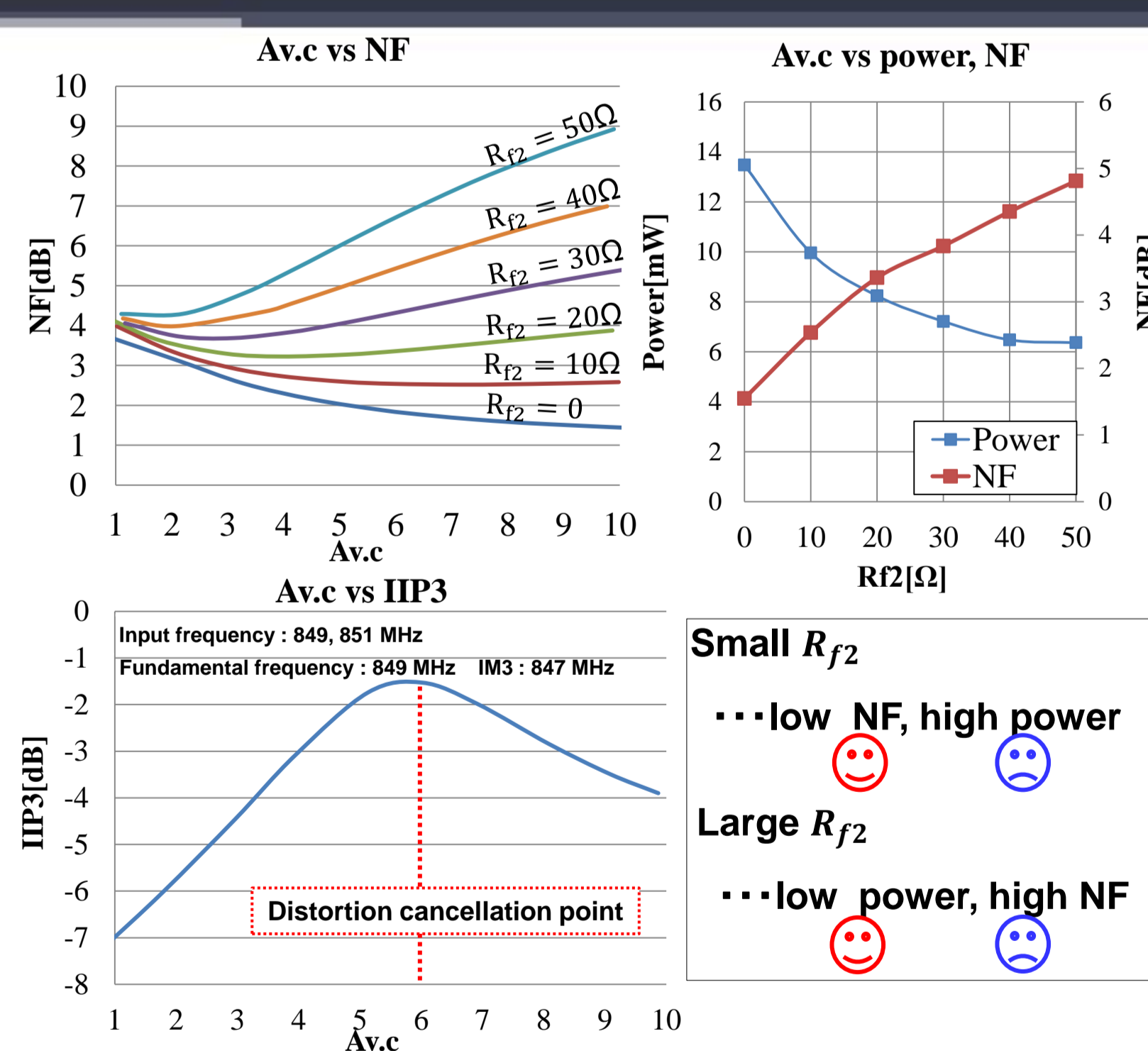
[2] C.-F. Li, S.-C. Chou, G.-H. Ke, P.-C. Huang "A Power-Efficient Noise Suppression Technique Using Signal-Nullled Feedback for Low-Noise Wideband Amplifiers" IEEE Trans on Circuits and Systems (Jan. 2012).

[3] C.-F. Li, S.-C. Chou, P.-C. Huang "A Noise-Suppressed Amplifier with a Signal-Nullled Feedback for Wideband Applications" IEEE Asian Solid-State Circuits Conference, (Nov.2008).

Proposed Circuit for Simulation



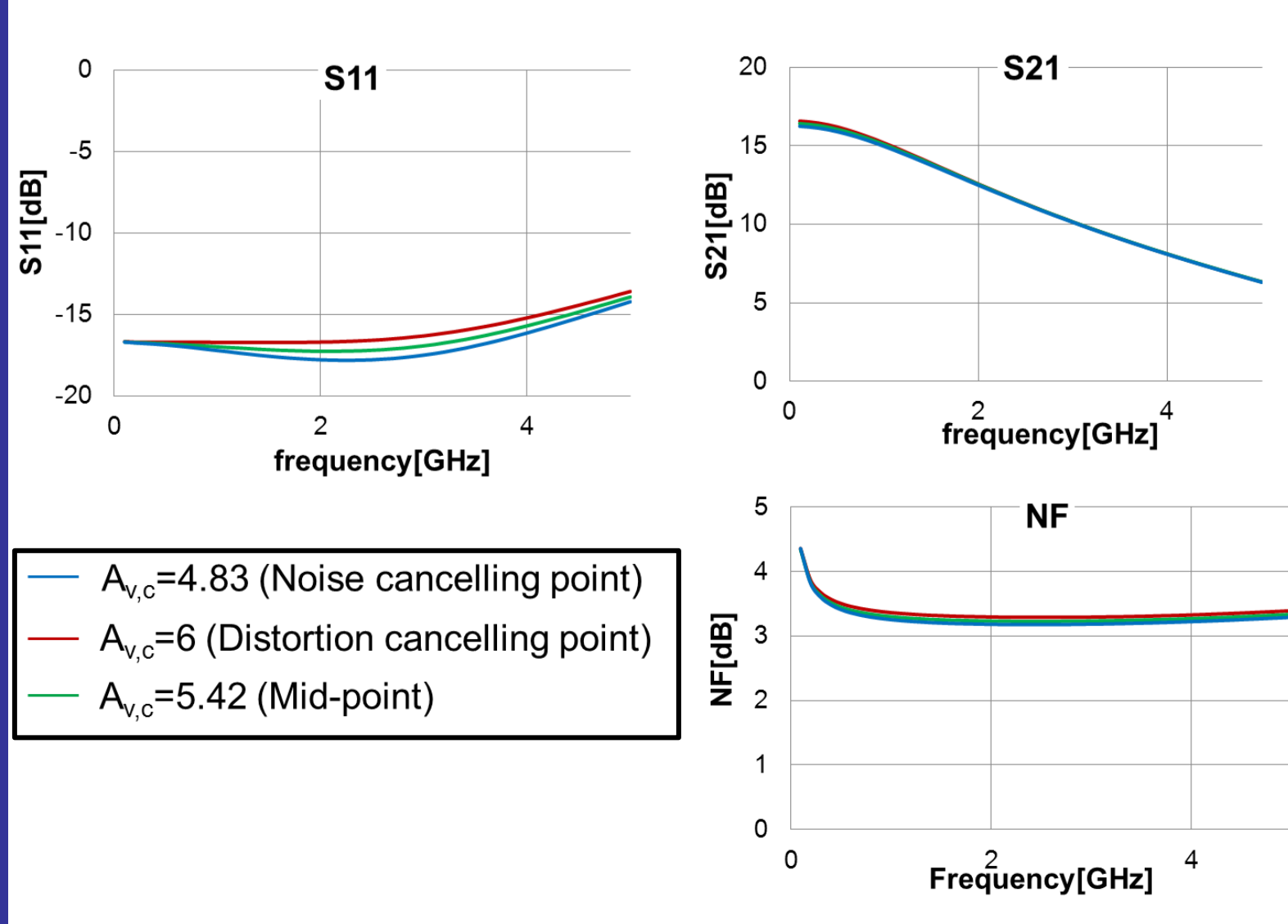
Performance Tradeoff



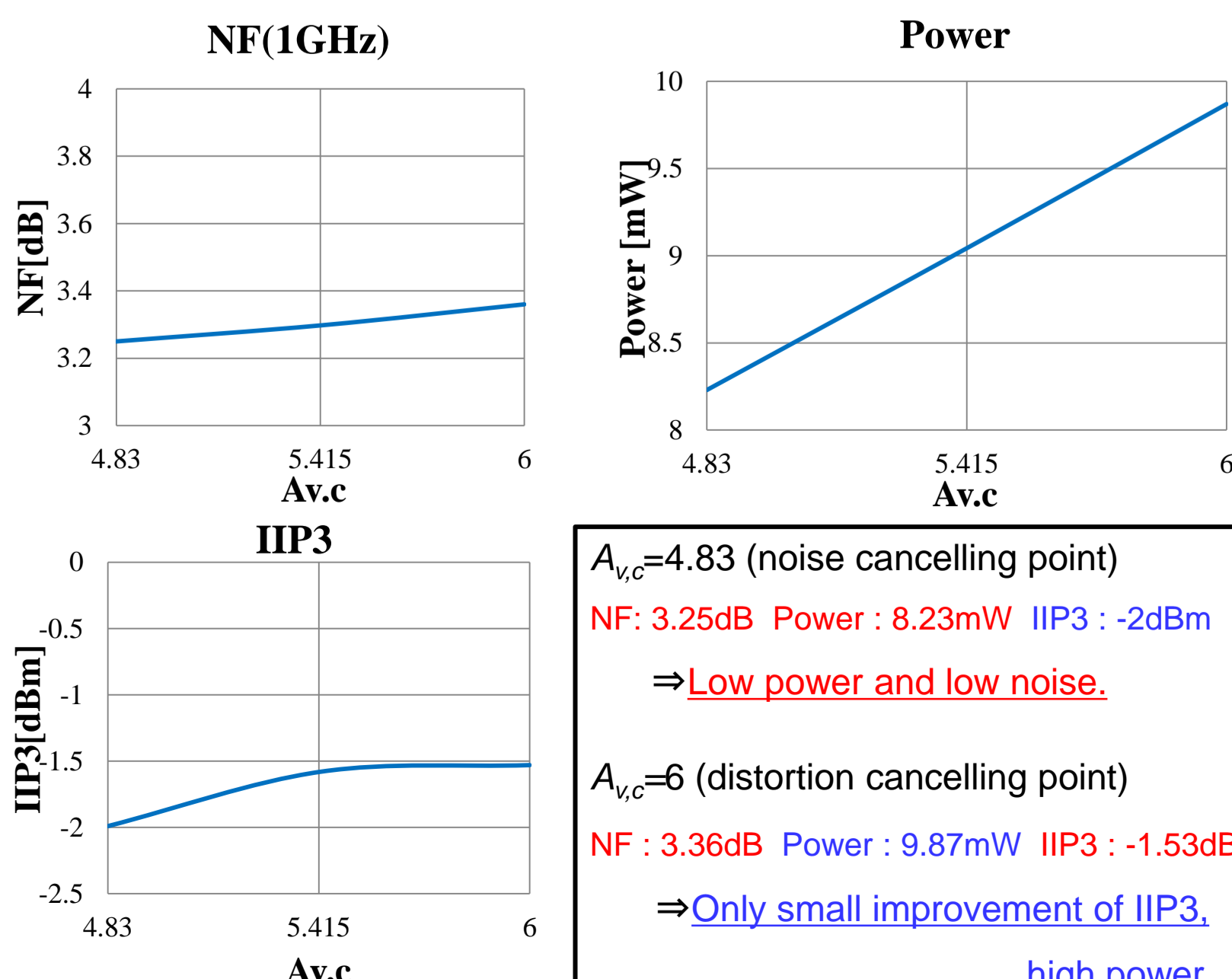
Simulation when $R_{f2}=20\Omega$

LNA frequency characteristics

Little influence by $A_{v,c}$



Performance change by $A_{v,c}$



Simulation