C級動作VCOと注入同期型分周回路を用いた低電力位相同期回路

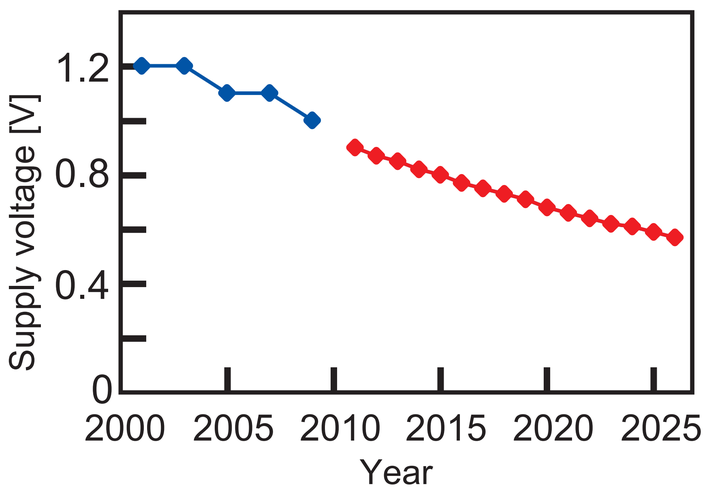
Masu Group
Tokyo Tech

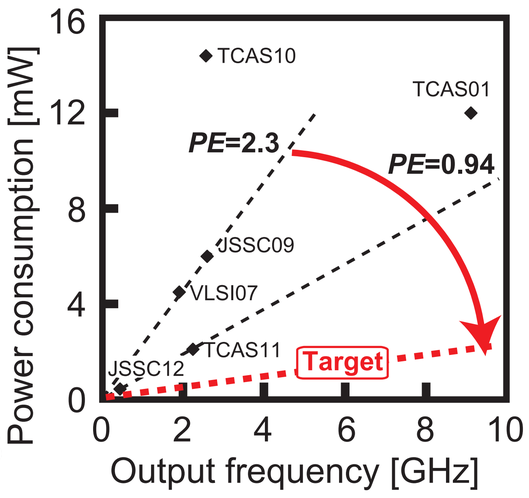
東京工業大学
発表者：李　尚曄・池田　翔　　代表者：石原　昇

目的

CMOSプロセスの微細化

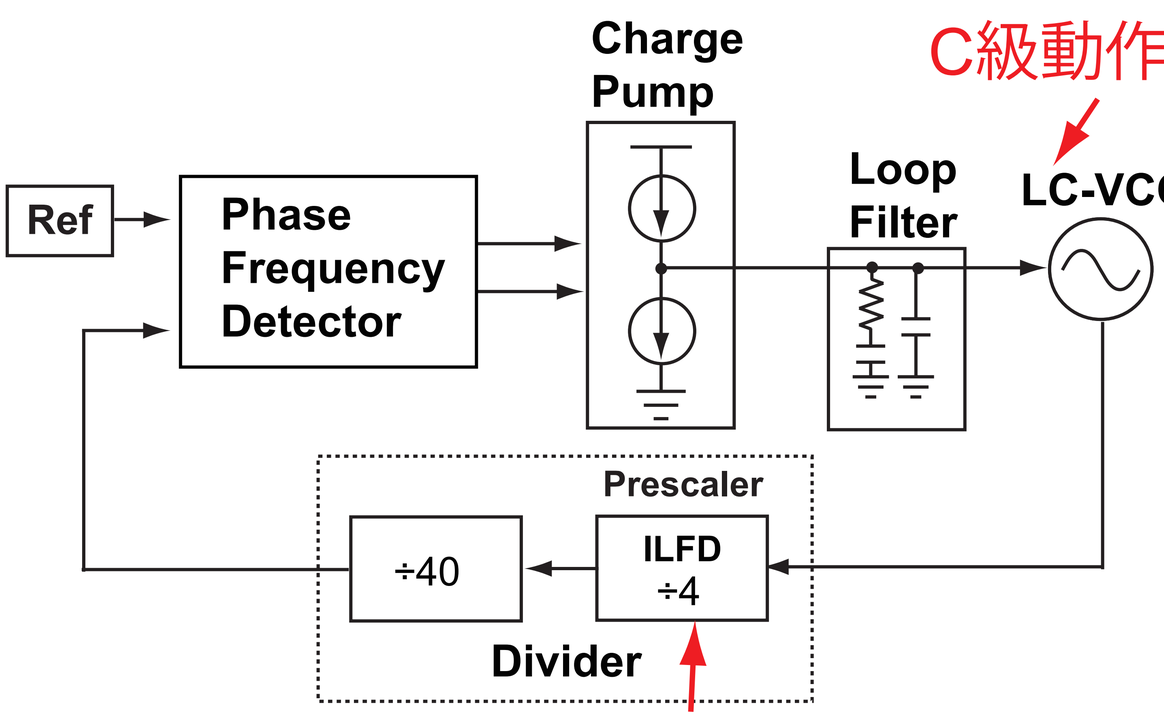
- 電源電圧低下
- SNR悪化





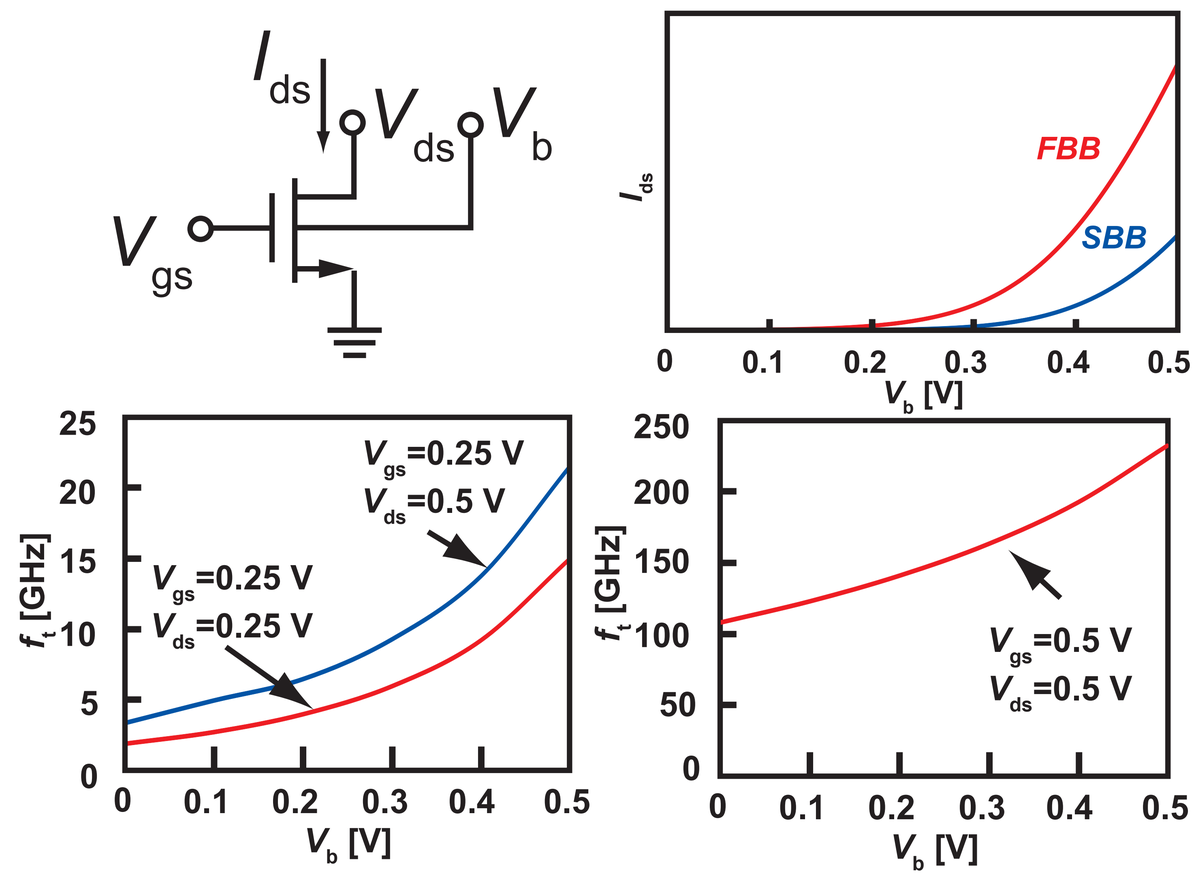
0.5V動作、低電力周波数シンセサイザの実現

提案構成



超低電力4分周回路(FBB)

Forward Body Bias (FBB)

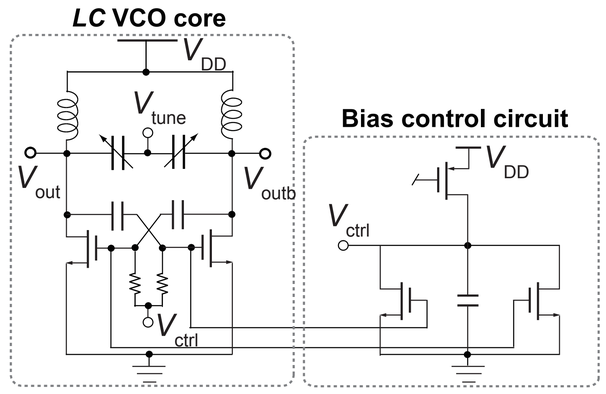


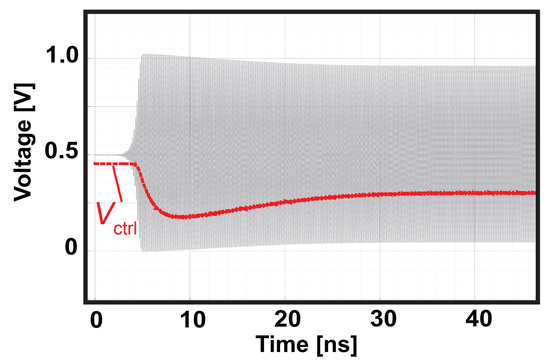
しきい値↓　遮断周波数↑

⇒低電圧・高周波動作！

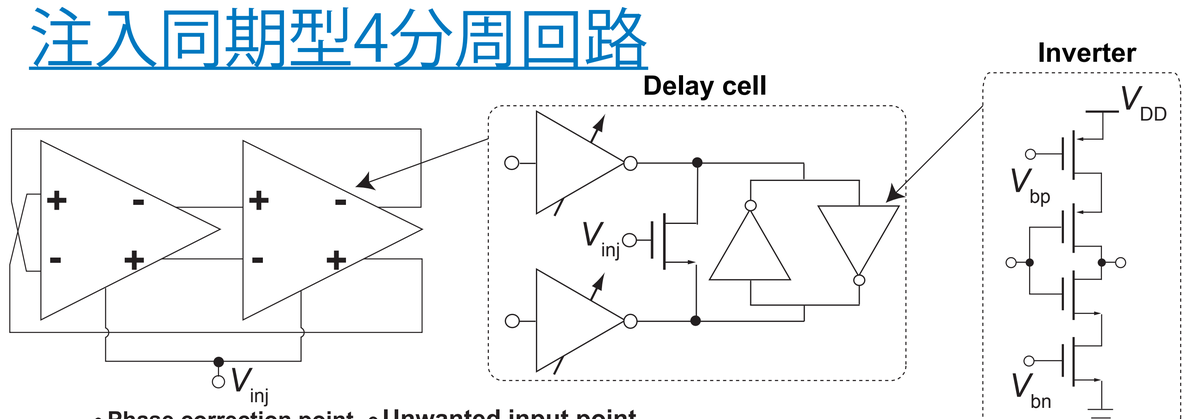
回路詳細および測定結果

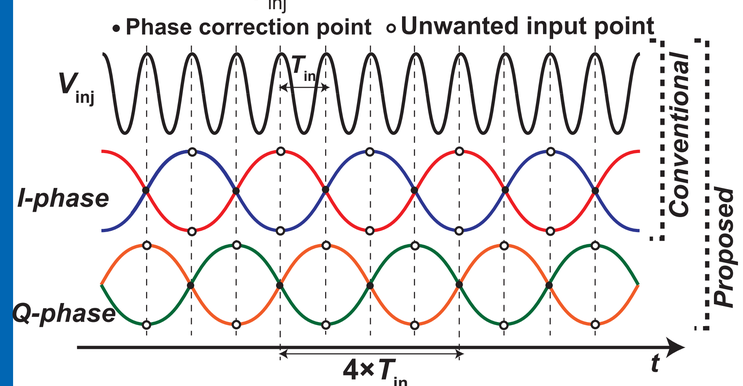
C級動作VCO

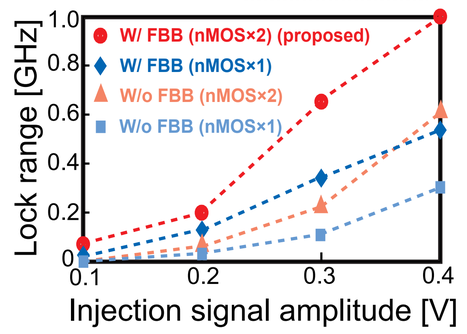




注入同期型4分周回路

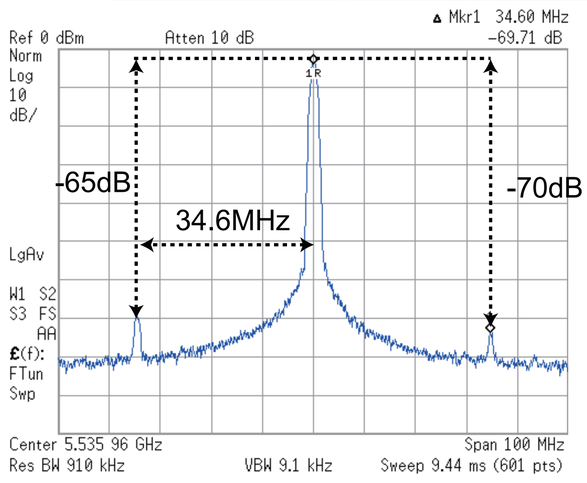


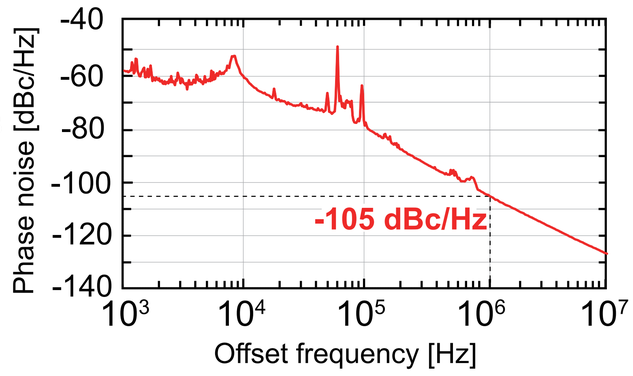




測定結果

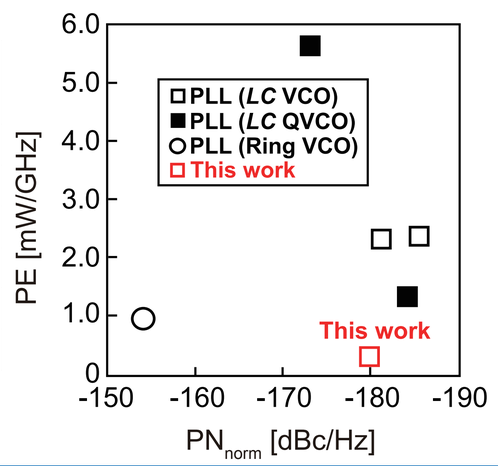
	Power [mW]
VCO	0.915
FD	0.425
PFD+CP	0.260
Total	1.6





	Tech. [nm]	f_{out} [GHz]	V_{DD} [V]	PN [dBc/Hz]	Power [mW]
This work	65	5.54	0.5	-105	1.6
[1]	180	1.9	0.5	-120	4.5
[2]	180	2.56	0.5	-105	14.4
[3]	90	2.59	0.5/0.65	-113	6.0
[4]	130	9.12	0.5/0.8	-105	12
[5]	90	2.24	0.5	-87	2.1

[1] H.-H. Hsieh, et al., VLSI 2007
[2] C.-T. Lu, et al., TCAS 2010
[3] S.-A. Yu, et al., JSSC 2009
[4] C. -Y. Yang, et al., TCAS 2001
[5] K. -H. Cheng, et al., TCAS 2011



まとめ

◆0.5V 動作超低電力周波数シンセサイザ
　・C級動作VCO，超低電力4分周回路（FBB）
◆5.5GHz 動作時，1.6mW 消費電力
⇒世界トップレベルパワー効率（0.29mW/GHz）