

## Erratum to “A 66 $\mu\text{W}$ 86 ppm/ $^{\circ}\text{C}$ Fully-Integrated 6 MHz Wienbridge Oscillator With a 172 dB Phase Noise FOM”

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In the above paper [1], Table II compares the phase noise behavior of the Wienbridge oscillator with other work. While this work uses

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W(att) in the FOM formula (2), the authors of [2] and [3] have used the more common definition with the power normalized to mW (1), [4]. Unfortunately, due to this mistake, the figure of merit (FOM) of [2] and [3] was underestimated by 30 dB. Table II is reprinted with the corrected FOM values ( $\text{FOM}_2$ ), (2). An extra column is added where the more common definition (1) is used (FOM).

$$\text{FOM} = 10 \cdot \log \left( \frac{f_{\text{osc}}^2}{f_m^2 \cdot L(f_m)} \cdot \frac{1}{P_{\text{diss}}[\text{mW}]} \right) \quad (1)$$

$$\text{FOM}_2 = 10 \cdot \log \left( \frac{f_{\text{osc}}^2}{f_m^2 \cdot L(f_m)} \cdot \frac{1}{P_{\text{diss}}[\text{W}]} \right). \quad (2)$$

The authors regret their mistake. The authors would also like to take the opportunity to correct some typos in the reference list. References [19] and [24] of the original manuscript should be [5] and [11] of this erratum.

TABLE I  
COMPARISON TO THE STATE-OF-THE-ART

Ref.	Type	Tech.	f (MHz)	T Sens. (ppm/ $^{\circ}\text{C}$ )	P	$\text{FOM}_2$ (dB)	FOM (dB)	Trimming/Calibration?
This Work	RC	65 nm	6	86	66 $\mu\text{W}$	172 (180)	142 (150)	No
[5]	LC	0.35 $\mu\text{m}$	12	12	31 mW	180	150	No
[6]	relaxation	0.5 $\mu\text{m}$	4 – 22	460	400 $\mu\text{W}$			Yes
[7]	ring	0.6 $\mu\text{m}$	0.68	106	400 $\mu\text{W}$			No
[8]	ring	0.25 $\mu\text{m}$	7	400	1.5 mW			No
[2]	relaxation	65 nm	12		90 $\mu\text{W}$	191	161	No
[3]	relaxation	0.8 $\mu\text{m}$	1.5		1.8 mW	180,7	150,7	No
[9]	relaxation	1.2 $\mu\text{m}$	148	1000	1.1 mW	176	146	No
[10]	relaxation	65 nm	0.1	103	41.2 $\mu\text{W}$			Ext. Ref.
[11]	relaxation	0.13 $\mu\text{m}$	2	375	3 $\mu\text{W}$	169,7	139,7	Yes

## REFERENCES

- [1] V. De Smedt, P. De Wit, W. Vereecken, and M. Steyaert, “A 66  $\mu\text{W}$  86 ppm/ $^{\circ}\text{C}$  fully-integrated 6 MHz Wienbridge oscillator with a 172 dB phase noise FOM,” *IEEE J. Solid-State Circuits*, vol. 44, no. 7, pp. 1990–2001, Jul. 2009.
- [2] P. Geraedts, E. van Tuijl, E. Klumperink, G. Wienk, and B. Nauta, “A 90  $\mu\text{W}$  12 MHz relaxation oscillator with a –162 dB FOM,” in *IEEE ISSCC Dig. Tech. Papers*, Feb. 2008, pp. 348–618.
- [3] S. Gierkink and E. van Tuijl, “A coupled sawtooth oscillator combining low jitter with high control linearity,” *IEEE J. Solid-State Circuits*, vol. 37, no. 6, pp. 702–710, Jun. 2002.
- [4] P. Kinget, *Integrated GHz Voltage Controlled Oscillators*. Norwell, MA: Kluwer, 1999, pp. 353–381.
- [5] M. S. McCorquodale, J. D. O’Day, S. M. Pernia, G. A. Carichner, S. Kubba, and R. B. Brown, “A monolithic and self-referenced RF LC clock generator compliant with USB 2.0,” *IEEE J. Solid-State Circuits*, vol. 42, no. 2, pp. 385–399, Feb. 2007.
- [6] A. Boas, J. Soldera, and A. Olmos, “A 1.8 V supply multi-frequency digitally trimmable on-chip IC oscillator with low-voltage detection capability,” in *17th Symp. Integrated Circuits and Systems Design, SBCCI 2004*, Sep. 2004, pp. 44–48.
- [7] Y.-S. Shyu and J.-C. Wu, “A process and temperature compensated ring oscillator,” in *1st IEEE Asia Pacific Conf. ASICs, AP-ASIC’99*, 1999, pp. 283–286.
- [8] K. Sundaresan, P. Allen, and F. Ayazi, “Process and temperature compensation in a 7-MHz CMOS clock oscillator,” *IEEE J. Solid-State Circuits*, vol. 41, no. 2, pp. 433–442, Feb. 2006.
- [9] Y. Deval, J. Tomas, J. Begueret, H. Lapuyade, and J. Dom, “1-V low-noise 200 MHz relaxation oscillator,” in *Proc. 23rd European Solid-State Circuits Conf., ESSCIRC’97*, Sep. 1997, pp. 220–223.
- [10] F. Sebastiano, L. Breems, K. Makinwa, S. Drago, D. Leenaerts, and B. Nauta, “A low-voltage mobility-based frequency reference for crystal-less ULP radios,” in *Proc. 34th European Solid-State Circuits Conf., ESSCIRC 2008*, Sep. 2008, pp. 306–309.
- [11] M. Paavola, M. Laiho, M. Saukoski, and K. Halonen, “A 3  $\mu\text{W}$ , 2 MHz CMOS frequency reference for capacitive sensor applications,” in *Proc. IEEE Int. Symp. Circuits and Systems (ISCAS)*, 2006, p. 4.