1. 文章篇名 : Design of a Bone-Guided Cochlear Implant Microsystem With Monopolar Biphasic Multiple Stimulations and Evoked Compound Action Potential Acquisition and Its In Vivo Verification
2. 期刊名稱：IEEE Journal of Solid-State Circuits
3. 期刊 IF 分數：5.013 (2020 年)
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5. 中文摘要：本團隊提出並驗證了一種 CMOS 骨導式人工耳蝸(BGCI)微系統。在所提出的 BGCI 的植入式片上系統(SoC)中，集成了誘發複合動作電位(ECAP)接受和電極-組織阻抗測量(EAEIM)電路，以測量 ECAP 和電極-組織阻抗以進行臨床診斷。正/負電壓電荷泵和單極雙相恆流刺激(CCS)刺激器均在片上設計，實現單極雙相 CCS 或雙電極多重相位調變刺激，最大刺激電流 1.2 mA，間隔 10 μA .通過雙電極多重相位調變刺激，電場可以在刺激電極下方移動定位，從而刺激聽覺神經。帶有全波有源整流器和脈衝負載移鍵控(PLSK)調製器/解調器的無線雙邊數據控制及偵測電路專為電力和數據傳輸而設計。天竺鼠的體內動物試驗表明，電誘發聽覺腦幹反應(EABR)的第三波可以通過電刺激成功誘發。此外，在雙電極多重相位調變刺激下測量了誘發波 III 的遞減潛伏期梯度，其中峰值電場的位置可以轉移到耳蝸頂端部位的刺激電極以刺激低頻聽覺神經。因此，可以實現刺激的所需頻率分辨率和空間特異性。電測量和體內動物試驗均證實，所提出的骨導式人工耳蝸(BGCI)微系統是消除高頻聽力損失患者症狀的可行解決方案。

原文:

Abstract—A CMOS bone-guided cochlear implant (BGCI) microsystem is proposed and verified. In the implanted System on Chip (SoC) of the proposed BGCI, the evoked compound action potential (ECAP) acquisition and electrode–tissue impedance measurement (EAEIM) circuit is integrated to measure both ECAP and electrode–tissue impedance for clinical diagnoses. Both positive-/negative-voltage charge pumps and monopolar biphasic constant-current stimulation (CCS) stimulator are designed on-chip to realize monopolar biphasic CCS or double-electrode multiple stimulations with a maximum stimulation current of 1.2 mA and a step of 10 μA. With the double-electrode multiple stimulations, the electric field can be shifted and localized under the stimulating electrode to stimulate the auditory nerves. The wireless bilateral data telemetry circuits with a full-wave active rectifier and the pulsed load-shift keying (PLSK) modulators/demodulators are designed for power and data transmission. *In vivo* animal tests on guinea pigs have shown that theWave III of electrically evoked auditory brainstem responses (EABRs) can be evoked successfully by electrical stimulation. Moreover, the decreasing latency gradient of evoked Wave III has been measured under the double-electrode multiple stimulations where the location of peak electric field can be shifted to the stimulating electrode in the apical site to stimulate the auditory nerves. Thus, the desired frequency resolution and spatial specificity of stimulation can be achieved. Both electrical measurement and *in vivo* animal tests have verified that the proposed BGCI microsystem is a feasible solution to eliminate the symptoms for patients with high-frequency hearing loss.

Index Terms—Bone-guided, cochlear implant (CI), evoked compound action potential (ECAP), implantable medical device (IMD), *in vivo* animal test, stimulator, wireless power and bilateral data telemetry.