

Education Special: Pulse Cut Modes

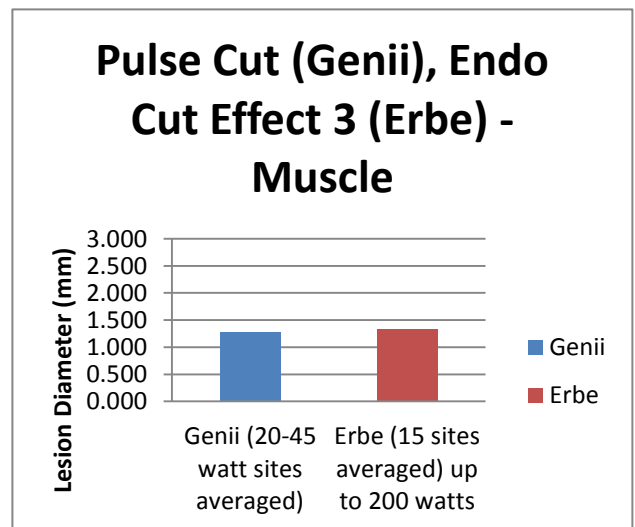
The most common use of various ‘Pulse Cut’, ‘Pulse Blend Cut’, or EndoCut®¹ modes are for biliary and pancreatic sphincterotomy. Other frequently reported uses are for polypectomy, endoscopic mucosal resection (EMR) and endoscopic submucosal dissection (ESD). The concept of pulsing, or interrupting a cut waveform was introduced to US endoscopy in 1997 with the import of the Erbe® ICC200E® electrosurgery generator. It was shown in several peer reviewed studies to significantly reduce the incidence of runaway, uncontrolled cuts during sphincterotomy (referred to as ‘zipper cuts’) when compared to standard cut waveforms.¹ In multiple studies, EndoCut did not reduce any other complications of sphincterotomy such as pancreatitis, or immediate or late bleeding². Due to the added control gained by interrupting the cut progress in procedures that demand high technical skill, the EndoCut concept gained wide acceptance. Pulse Cut or Pulse Blend Cut modes were soon included in generators produced by several makers including Conmed, Boston Scientific and Genii®. With the introduction in 2002 of the VIO®300D, Erbe expanded EndoCut in expert user modes to a total of 320 different user selectable variations.

Genii® Pulse Cut and Pulse Blend Cut modes explained

The Genii *gi4000* Pulse Cut mode provides minimal hemostasis with a controlled cut. (Recall that in any electrosurgery cut mode, some thermal coagulation is always present. The only *pure* cut is a cold cut!³) The Pulse Blend Cut option produces reliable added hemostasis during the cut advance. Both modes have a low voltage, low coagulation potential staging phase between each cut phase.

Genii third party pre-clinical data showed that the tissue effect of Genii Pulse Cut was equivalent to the ICC200 EndoCut. Physicians can sometimes sense slight differences between similar modes of different generators even when the modes produce acceptable and equivalent results and the change is only moving from one model to another in the same brand line but most quickly adapt. Following are graphic representations of the Genii pulse mode technology.

Fig 1 *gi4000* Pulse Cut Mode shows equivalence to ICC200 EndoCut in preclinical trial. (Genii March 2014 White Paper)



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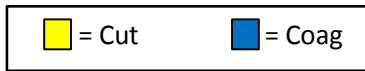


Fig 2. Genii Pulse Cut

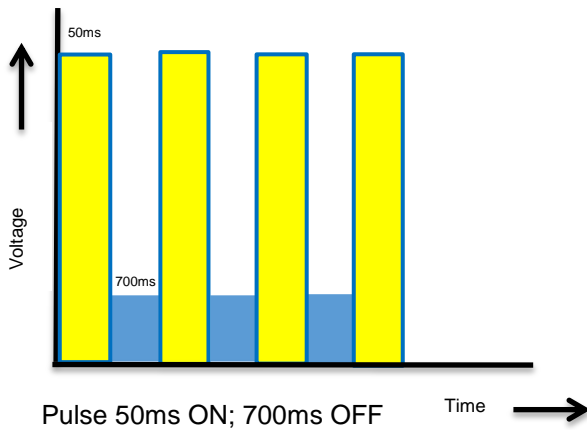
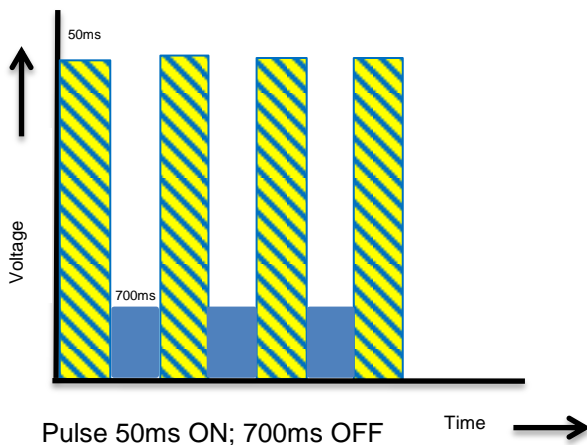


Fig 3. Genii Pulse Blend Cut



The Genii **gi4000** Pulse Cut waveform produces an interrupted, cut phase interspersed with a low voltage, low coagulation potential phase.

The Cut ON phase is 50ms. The clinical cut only advances during this controlled ON phase. No cutting or advancing takes place during the 700ms OFF phase. During the ON phase the waveform is a 100% duty cycle, 1.4 Crest Factor sine wave producing electrosurgical cutting with minimal hemostasis.

The output takes advantage of state of the art tissue impedance change sampling at a rate of 4KHz (samples every 250 micro seconds) to create a broad power to impedance curve over the ON times. This gives a smooth effect throughout the cut as impedances are changing.

The Genii **gi4000** Pulse Blend Cut waveform also produces an interrupted pulse cut but it produces a slightly higher amount of reliable hemostasis along the cut edge.

The ON phase is also 50ms. This means the cut only advances during this controlled ON phase. No cutting or advancing takes place during the 700ms OFF phase. During the ON phase, the waveform is a 50% duty cycle, 2.7 Crest Factor modulated wave.

The output takes advantage of state of the art tissue impedance change sampling at a rate of 4KHz (samples every 250 micro seconds) to create a broad power to impedance curve over the ON times. This produces low thermal injury but with reliable hemostasis and a smooth effect throughout as impedances change.

To date, no peer reviewed comparative clinical trials are known comparing ICC200 to VIO EndoCut in any of the various VIO EndoCut permutations and none are known comparing any of the EndoCut modes to the **gi4000** Pulse Cut and Pulse Blend Cut modes. All are FDA cleared. Physician experience is likely the largest determiner of preference among the options.

Physicians who use the **gi4000** Pulse Cut modes report that they like the somewhat immediate start of the cutting and are comfortable with the long familiar 50ms cut advance. They prefer the 700ms 'OFF' mode to the slightly slower 750ms of 'OFF' time with ICC EndoCut. They appreciate having a choice of coagulation effects without having to choose among an overwhelming number of options. They feel comfortable that the Pulse Blend Cut waveform technology seems to deliver reliable hemostasis when needed.

¹ Norton ID, Peterson BT, Bosco J, et al. A randomized trial of endoscopic biliary sphincterotomy using pure-cut versus combined cut and coagulation waveforms. Clin Gastroenterol Hepatol 2005; 3:1029-33.

² Tokar J, ASGE Technology Committee, Technology Status Evaluation Report: Electrosurgical Generators, Gastrointest Endosc 2013; 78:197-208.

³ Morris M L, Tucker RD, Baron TH, Wong Kee Song, LM. Electrosurgery in Gastrointestinal Endoscopy: Principles to Practice. Am J Gastroenterol 2009;104:1563-74.