INTRODUCTION

The objective of this document is to outline the science behind a proven, patented method of motor neuron activation, called Sigma Q (∑Q).

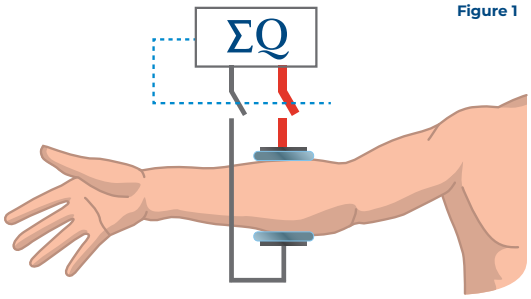
Several solutions exist today that claim to help alleviate pain and restore function by stimulation of the nervous and muscular systems. Sigma Q distinguishes itself immediately since it activates, versus stimulates the muscle tissue and nerves.

The references in this document to "standard stimulators" refers to a type of device readily available on the market today that uses skin mounted electrodes as a mode of delivery to the body. (i.e. TENS, Micro-current, E-stim, ultrasound, laser)

This document will outline the foundational differences between them and Sigma Q. Sigma Q's efficacy above other solutions lies in its patented signal and its unique delivery method. ("charged packet")

Sigma Q (ΣQ) was developed in response to a demand in the pain relief and injury rehabilitation market for motor neuron and deep-seated muscle activation without the need for invasive probes, needles or narcotic pain medication. In addition, Sigma Q removes the typical "pins and needles" effect, as well as the discomfort and burning sensation found using other methods. Uniquely, Sigma Q may be used in water based spa-like systems as well, thus, providing multiple forms of treatment delivery. User comfort is therefore enhanced, plus the practitioner can assist with hands on techniques to help facilitate and speed up the muscle recovery process.

Figure 1

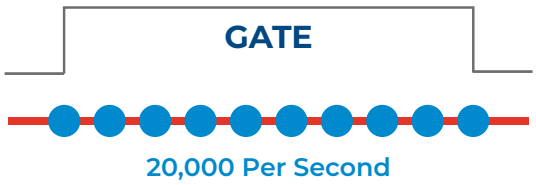


ΣQ GENERATOR

A ΣQ Generator is connected to the electrodes of the treatment area as shown in **Figure 1.** The generator, denoted by the "ΣQ" block is not directly connected to the treatment area but, instead controls, and is connected through, electrical currents represented by switches in **Figure 1.**

In comparison to standard stimulators, the ΣQ generator is unique, in that it does not generate a single, large charge but, instead generates smaller "Charge Packets" at a rate of 20,000 per second, as shown in **Figure 2.**

Figure 2

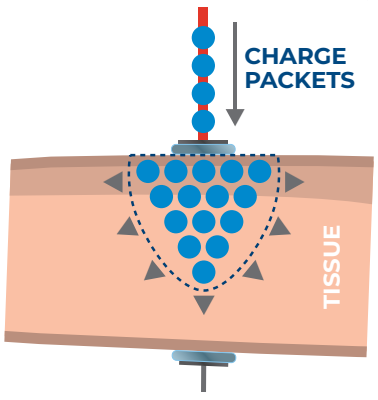


These charge packets are "gated" to the treatment area by control of the switch electronics. During the gate period, these charge packets form a "Saturation Zone" beneath the electrode as shown in **Figure 3.**

At the end of the gate period, the ΣQ generator disconnects from the treatment area using switch electronics.

Because there is now NO return path to generator for the charge, the potential of the saturation zone forces the charge to migrate to the surrounding tissues, as shown if **Figure 3.**

Figure 3



The charge migrations will be along the "paths of least resistance" and as muscle tissue is one of the more conductive paths available, migration along these tissues is evident. Successive bursts of charge packets from the ΣQ generator accelerate the migration process.

The build-up of charge in the saturation zone is cumulative, hence Σ, and dependent on the tissues ability to migrate the charge to surrounding areas. The charge contained in the saturation zone should remain relatively constant.

The pins and needles effect felt by standard stimulators is not apparent when using a ΣQ generator in theory, because a charge is always present in the tissues, having not been removed by the ΣQ generator. The Sensory Nerves re-threshold to the charge present are consequently un-triggered by the next charge insertion, leading to the conclusion that the pins and needles effect felt by standard stimulators is not apparent when using a ΣQ generator in theory, because a charge is always present in the tissues, having not been removed by the ΣQ generator.

The Sensory Nerves re-threshold to the charge present are consequently un-triggered by the next charge insertion, leading to the conclusion that the ΣQ generator is achieving muscle activation using the motor, not sensory nerves. The lack of pins and needles leads to a higher user tolerance, hence controlled level set by the user.

The intensity of ΣQ Generator is regulated by "Packet Skipping" during the gate period as shown in **Figure 4.** This regulation process serves to increase or decrease the saturation zone, thus the rate of charge migration.

In uni-polar operation, the charge migration is towards the non-insertion electrode during the gate period, and free migration between gate pulses. The overall effect should be a spread of charge from the saturation zone then "step "re-concentration at the non-insertion electrode and exit during a gate pulse. The ΣQ Generator, however, is capable of alternate bi-polar operation as seen in **Figure 5.**

Charge packets are inserted alternately through each electrode, causing the formation of two or more saturation zones at each of the electrode locations.

The migration of charge to the opposite electrode is now opposed by the second saturation zone that repels the charge—this principle works in both directions. The result is a high degree lateral migration causing muscle activation a considerable distance from the electrode placement. For example, observations have been made of abdominal muscle activation from electrode placement on the lower lumber region. If a high impedance measuring device is used to plot electrode voltage against time, the "waveform" observed is as shown in **Figure 6.**

During the gate period, the charge builds and starts a slow decay as the saturation point is reached. Once the gate is shut off, the decay seen is purely due to the migration of the accumulated charge which in turn is due to biological factors. It's anticipated that further research will show that this decay curve provides and alternative feedback method to EMG biofeedback, with the added advantage that it is "real time," i.e. during activation/re-education.

Figure 4

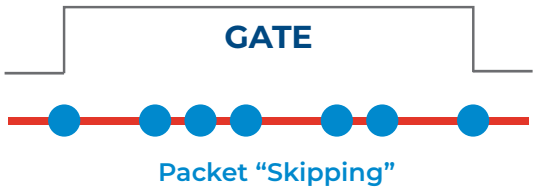


Figure 5

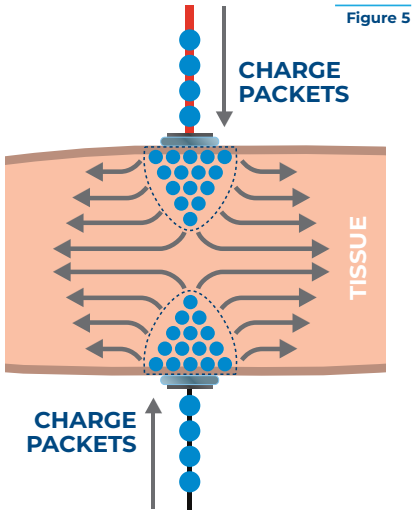
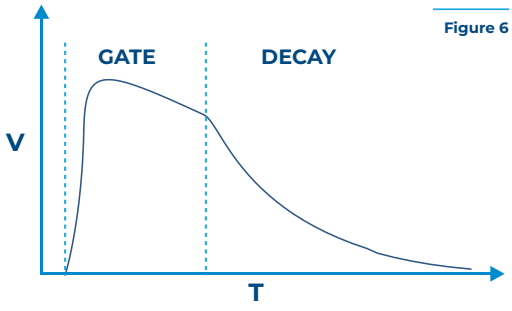


Figure 6



STANDARD STIMULATORS

In general, standard stimulators electrically connect to the treatment area shown in **Figure 7**.

The charge generator denoted by the "STIM" block is directly connected to the treatment area. Whether the stimulator generates using Galvanic, Faradism and/or micro current principles and regulates stimulation by using Constant Voltage (CV) or Constant Current (CI), the stimulation is the same. Figure 2 shows the stimulation principle:

A charge is built up in the stimulation generator and delivered to treatment area as a single charge pulse in response to a "DRIVE" signal. This is represented in **Figure 8** by the larger circle moving in the direction of the "CHARGE" arrow.

This sudden arrival of charge causes de-polarization of the motor and sensory nerve(s) directly under the electrode, and results in localized tissue stimulation.

At the end of the "DRIVE" signal, the electrode is actively driven to a low potential by the stimulator.

The low resistance path this provides encourages the charge to travel back to the stimulator. This is represented in **Figure 8** by the smaller circle moving in the direction of the "RETURN" arrow.

The stimulation of the Sensory Nerves produces the "pins and needles" effect that is often described as uncomfortable and leads to a reduced threshold, hence reduce stimulation levels by the users. With this charge insertion and removal process, the charge is only present in the tissues for a very short time. This results in the stimulation of nerve(s) limited to the local area of the insertion electrode. Electrode placement is therefore critical in defining which muscles will be stimulated.

Figure 7

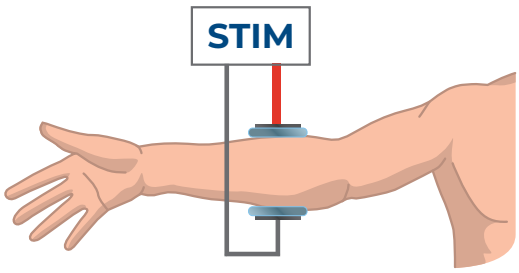
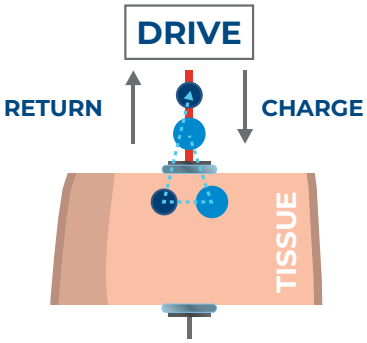


Figure 8



COMPETITIVE ANALYSIS

FEATURES	Sigma Q	GALVANIC	ULTRASOUND	FARADISM	TENS
Portable	✓	✓	✓	✓	✓
Low voltage	✓	✓	✓	✓	✓
High voltage	✓	✓	✓	✓	✓
Low frequency	✓	✓	✓	✓	✓
High frequency	✓	✓	✓	✓	X
Variable frequency	✓	X	X	X	X
Packet delivery	✓	X	X	X	X
Variable flow direction	✓	X	X	X	X
Deeper tissue penetration	✓	X	X	X	X
Precise control in real time	✓	X	X	X	X
Extended effected zone	✓	X	X	X	X
Tailored to recipient	✓	X	X	X	X
Diagnostic capability	✓	X	X	X	X
Cumulative effect	✓	X	X	X	X
No sensory stimulation	✓	X	X	X	X
Treats source of problem rather than symptom	✓	X	X	X	X
Patent & Trade Mark	✓	X	X	X	X

CONCLUSIONS

Sigma Q (∑Q) provides a method for deep-rooted motor neuron muscle activation vs. topical stimulation. The signal is able to bypass the sensory nerves and initiate muscle contraction and re-education without the pain and discomfort felt using traditional methods. Sigma Q is able to reach the "root cause" of dysfunction in the nerve. The deep muscle contraction that occurs results in a rapid re-education and controlled capacity.

Since the underlying mechanism of the charge build up is cumulative, it's possible to initiate direct muscle re-education and contraction in users with both Sensory and Motor Nerve dysfunction. This process is normally only possible with long wave electrotherapy.

Current studies into Sigma Q technology validate the ability to speed up recovery and alleviate pain faster, and without the use of prescription pain pills. Patients experience greater muscle activation, re-education and overall benefits from Sigma Q treatments. Future generations of product features include biofeedback, as well as diagnostic analytics capabilities.

CONTACT US TO LEARN MORE

info@sigmaqtech.com
123.456.7890
333 S. Wabash, 27th Floor,
Chicago, IL 60604

WWW.SIGMAQTECH.COM