Below are formulas to calculate the peak magnetic field and rise time (time required for the field to rise to that peak) for an ideally-functioning capacitively-driven magnetic pulse device which uses an inductive loop.

In calculating peak field and rise time, an incorrect assumption is often used—that the peak current in the loop is the capacitor voltage divided by the resistance of the loop. This is not correct. The peak current is principally limited by the inductance of the loop, not by the resistance, and the real peak current is usually much less than the resistance alone might imply. Also, the rise time is determined principally by the inductance and capacitance.

The following symbols and units will be used:

L	The inductance of the loop in microhenrys (µH). This can be measured directly using an inductance meter, or it can be calculated from the loop geometry (see below).

N	The number of turns in the loop.

C	The capacitance of the capacitor, in microfarads (µF).

V	The voltage that the capacitor is charged to, just before discharge, in volts.

D	The diameter of the magnetic loop (the inductor), in cm

R	The total resistance, in ohms, of the loop (and any resistance of the spark gap, relay, or solid-state switch).

To calculate the inductance, $L=DN^2/60$ (approximately. The exact value slightly depends on the thickness of the bundle of wires in the loop, compared to D, and this loop thickness is set at D/12 here). If you can measure L directly with a meter, use that measurement for "L" in the following equations. Otherwise use the formula above.

B_{max}	The maximum magnetic field, in gauss (1mT=10 gauss), at the center of the loop.
Approximately, $B_{max} = 1.25(VN/D) \times (\sqrt{C/L} - \frac{RC}{2L})$

Note that an increase in resistance R will decrease B_{max}. Also, this equation becomes fairly inaccurate if R is large enough that $\frac{RC}{2L}$ is more than half of the value of $\sqrt{C/L}$. If you have a meter to measure B_{max}, and the measured value of B_{max} is much less than the value calculated above using just the loop resistance for R, then the switch may be inefficient (high resistance).

T_{rise}	The rise time required for the field to rise to B_{max}. The fall time (after the rise) is usually slightly longer, and the first full pulse will look approximately like one half of a sine wave. If a "snubber" diode is connected across the loop, this first half sine wave will be the only significant pulse. Without a snubber, the magnetic field will oscillate several times as a time-decaying sine wave.

$T_{rise} = 1.5\sqrt{LC}$ (approximately)

Note that for a given B_{max}, both the amount of current and the electric field induced in a conductive body are inversely proportional to T_{rise}, so a short T_{rise} gives more of a 'jolt' than a long T_{rise}, given the same B_{max}.