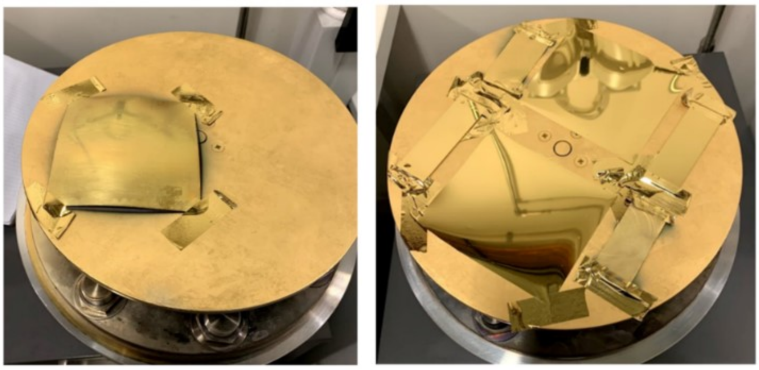
Supplementary data

S1. Images of the substrates after sputter coating:

The images of the PDMS and the PMMA substrates with 100 nm of deposited gold is shown in figure 1 (a) and (b). Images were taken after removing the substrates from the vacuum chamber of the sputter coating equipment. From the images, a visual difference between the gold film formed on the PDMS which has a rather matte appearance compared to the PMMA with a mirrored finish can be seen.



(a) (b)

Figure 1. Images of the substrates with 100 nm of gold after sputter coating immediately after release from the vacuum chamber (a) PDMS (b) PMMA.

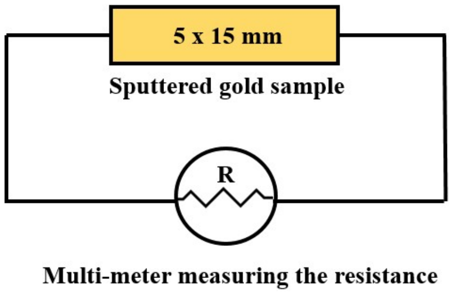
S2. Measurement of electrical resistance of sputter coated gold at varying thicknesses on the PDMS substrate

The electrical resistance of the sputter deposited gold on both the PDMS and the PMMA substrates are given in table 1 below. With increase in the gold metal thickness on respective substrates, simultaneous decrease in the electrical resistance is observed. To note for measurement of these resistances, 5x 15 mm strips of samples used.

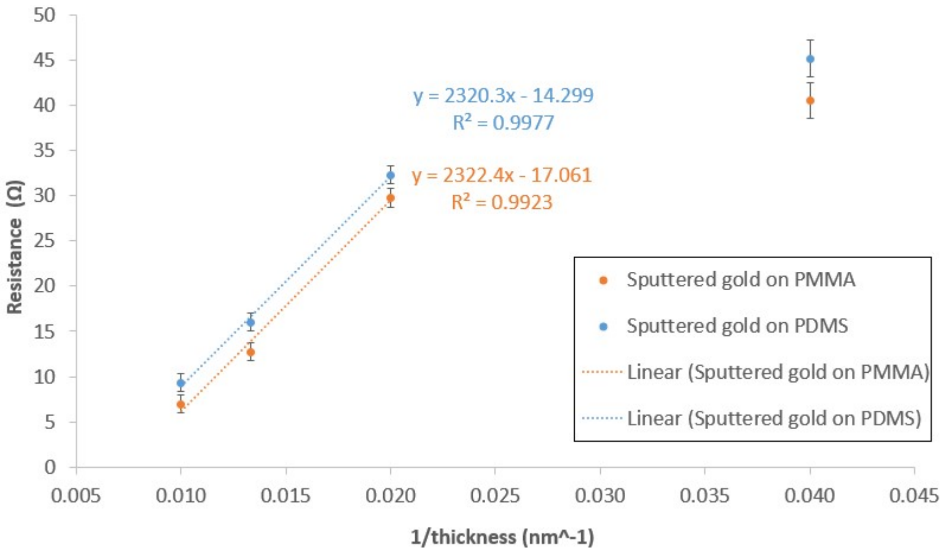
Table 1: Table showing the electrical resistance of the sputtered gold on PDMS substrate and PMMA for varying thicknesses of the gold layer.

Dimensions of the measured sample			**Electrical resistance of sputtered gold on**	
Length of the sample (mm)	**Width of the sample (mm)**	**Thickness of gold (nm)**	**PDMS substrate (Ω)**	**PMMA (Ω)**
15	5	25	45 ± 2	41 ± 2
		50	32 ± 3	30 ± 2

		75	16 ± 2	12.7 ± 1.2
		100	9 ± 2	6.9 ± 1.7



(a)

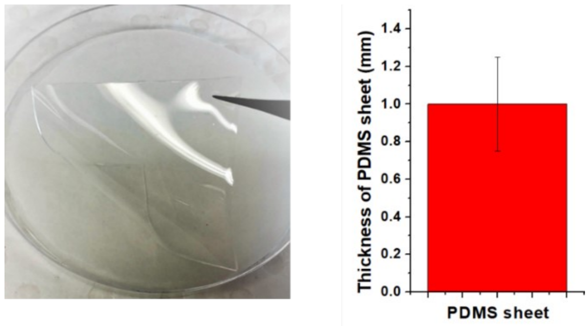


(b)

Figure 2. (a) Schematic of the measurement of the electrical resistance of the sputtered gold samples (b) Electrical resistance compared to 1/thickness of the sputter coated gold layer. Gold thickness of 50 nm, 75 nm and 100 nm are used. Graph shows a linear trend between samples with the same slope, indicating that differences in measurement of electrical resistance arise from contact rather and not internal to gold.

S3. PDMS thickness measurements

The image of PDMS used as substrate in the given work is shown in figure 2 (a). It is transparent and measured an average thickness of 1.04 ± 0.25 mm shown in the bar graph in figure 2(b). Higher thickness of PDMS is reported to suffer from higher deviation in their ideal shape and irregularity.[54]



(a) (b)

Figure 3. (a) Image of the prepared PDMS sheet (b) Bar graph of the PDMS thickness including standard deviation

S4. Schematic representation of the fabrication process for laser engraved antenna coil.

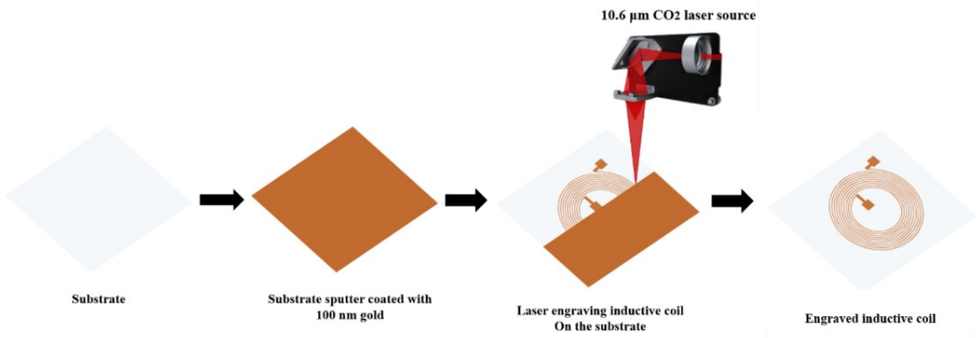
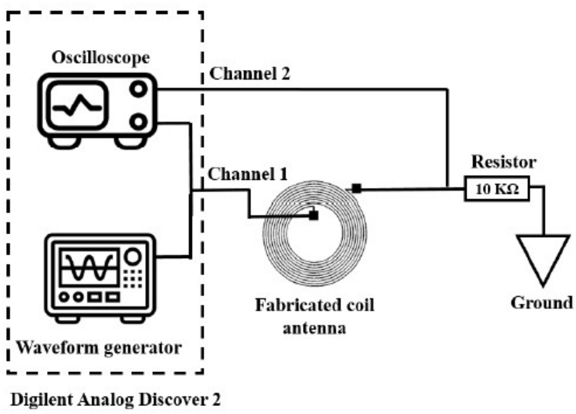
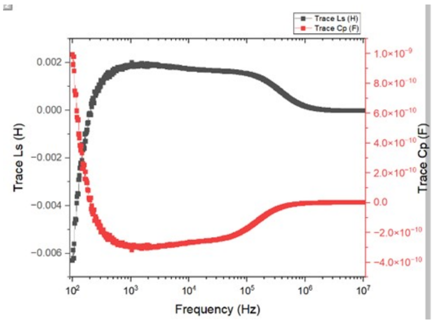


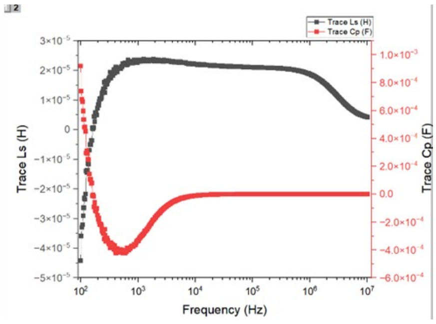
Figure 4. Schematic of the fabrication process

S5. Impedance measurements:

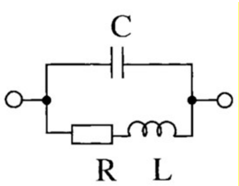


(a)





(b) **(c)**



(d)

Figure 5. (a) Schematic of impedance measurement set up. Frequency dependent series inductance and parallel capacitance of fabricated antenna coils on (b) PDMS and (c) PMMA (d)Equivalent R-L-C electrical circuit representation of planar spiral antenna with series resistance (R), series inductance (L) and capacitor (C)

S6. Video of PDMS based inductive coil receiving wireless signal from the Qi based transmitter:

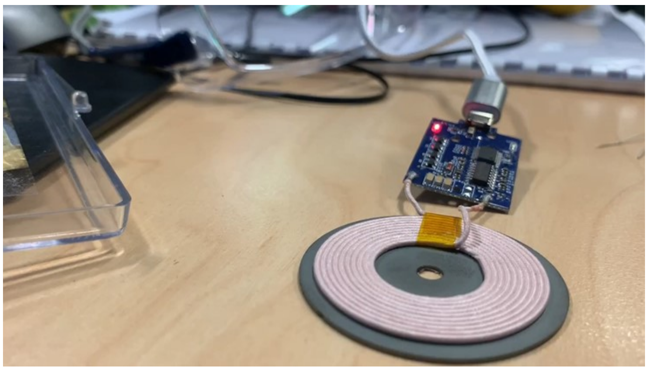


Figure 6. Video showing WPT using LED blinking for PDMS based coil and Qi transmitter

S7. Estimation of Received Power from Measured Voltage Ratios

To provide an approximate quantitative measure of power transfer, the received-to-transmitted power ratio was derived from the measured voltage amplitudes. Assuming sinusoidal excitation and identical load impedance on both sides, the received power can be expressed as

$$P_{received} = \frac{{V_{rms,rx}}^2}{R}$$

Where $P_{received}$ = received power from measured voltage

$V_{rms,rx}$ =RMS (root mean square) voltage

R =load resistance

Similarly, the transmitted power can be expressed as

$$P_{transmitted} = \frac{{V_{rms,tx}}^2}{R}$$

Where $P_{trasnmitted}$ = transmitted power from measured voltage

$V_{rms,tx}$ =RMS (root mean square) voltage

R =load resistance.

Since, RMS (root mean square) voltage is $V_{rms} = \frac{VPP}{2\sqrt{2}}$

The ratio of received and transmitted power simplifies as

$$\frac{P_{received}}{P_{transmitted}} = \left(\frac{V_{rms,rx}}{V_{rms,tx}}\right)^2$$

This calculation provides a simple estimate complementing the voltage-based comparison presented in the main text.