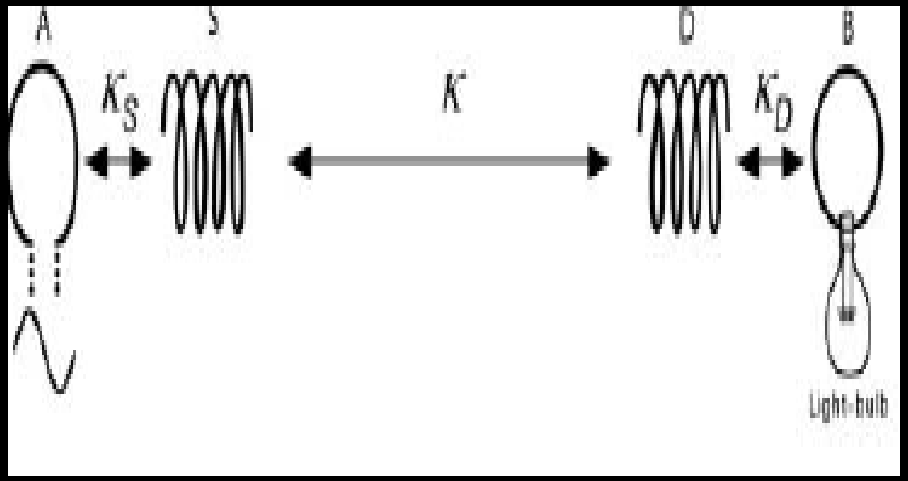
WITRICITY
OR
WIRELESS ELECTRICITY

WHAT DO WE MEAN BY "WITRICITY"?

- The transfer of electricity from one place to another without wires is known as "witricity".
- On June 7'07, a team of researchers at MIT announced the successful operation of witricity concept.
- They had lit up a bulb of 60W with a power source that has seven feet away with no wires.

How wireless electricity works?

- In the MIT experiment, two copper coils were set up-one at the ‘sender end’ and one at ‘receiver end'. The sender coil was attached to the power source, while the receiver coil was attached to the light bulb.
- When turned on ,the sender coil emits electricity in the form of a magnetic field, oscillating at a specific frequency.
- The receiver coil picks up the transmission, while the rest of the environment is unaffected.



- Our experimental realization of the scheme consists of two self-resonant coils.

- One coil (source coil) is coupled inductively to an oscillating circuit, the other (device coil) is inductively to a resistive load. Self resonant coils relay on the interplay between distributed inductance to achieve resonance.

- The two coils are made up of an electrically conducting wire of total length l and cross sectional area a, wound into a helix of n turns, radius r & height h.

- Using electromagnetic theory, we can define an effective inductance L and an effective capacitance C for each coil as follows:-

$$L = \frac{\mu_0}{4\pi|I_0|^2} \iint d\mathbf{r}d\mathbf{r}' \frac{\mathbf{J}(\mathbf{r}) \cdot \mathbf{J}(\mathbf{r}')}{|\mathbf{r} - \mathbf{r}'|}$$

$$\frac{1}{C} = \frac{1}{4\pi\varepsilon_0|q_0|^2} \iint d\mathbf{r}d\mathbf{r}' \frac{\rho(\mathbf{r})\rho(\mathbf{r}')}{|\mathbf{r} - \mathbf{r}'|}$$

- **Now the energy contained in the coil is given by:-**

$$U = \frac{1}{2}L|I_0|^2$$

$$= \frac{1}{2C}|q_0|^2$$

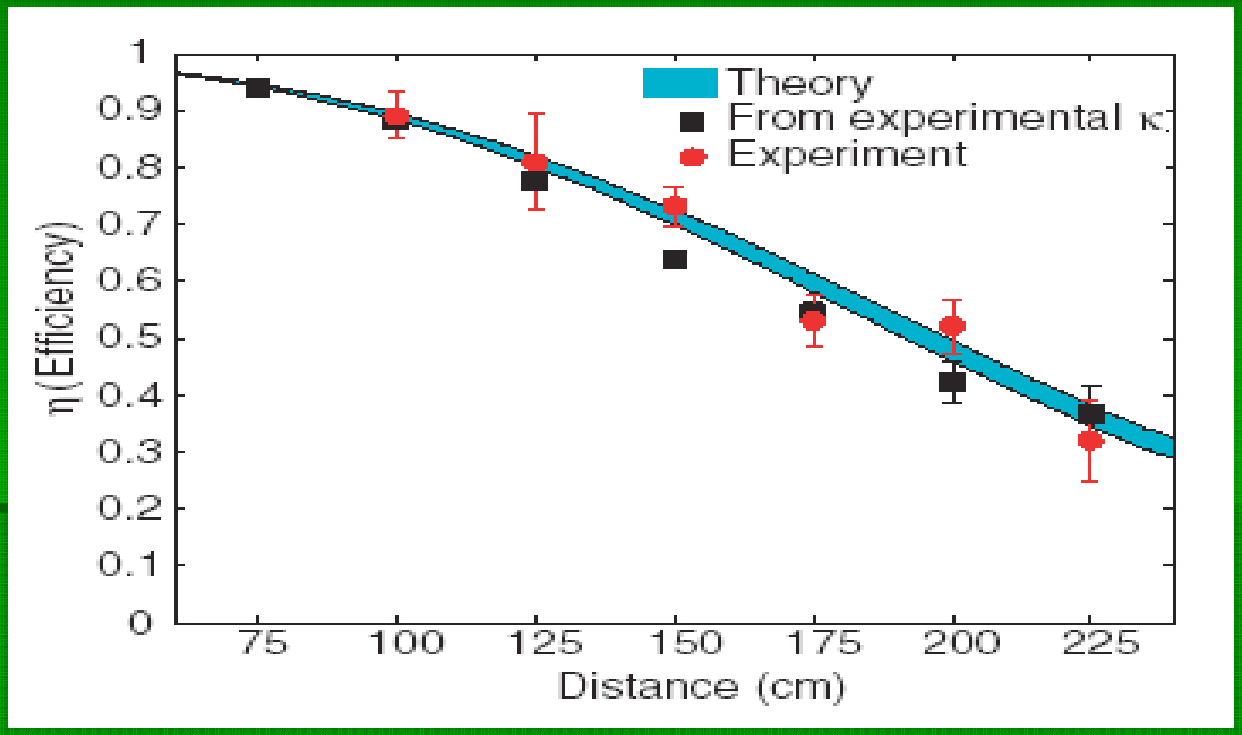
Efficiency

- In order for the power transfer to be efficient, we design the system such that the rate of energy transfer between the emitter and the receiver is greater than the rate of energy dissipation.
- This way the device can capture the energy and use it for useful work before too much of it get wasted away.
- We determine the efficiency of transfer of energy taking place between the source coil and the load by measuring the current at the midpoint of the self resonant coils with a current probe.
- This gives a measurement of the current parameters I_S and I_D

- We then compute power dissipated in each coil from:-

$$P_{S,D} = \Gamma L |I_{S,D}|^2,$$

- Then the efficiency can be calculated .



- Graph between efficiency and distance.

- **ADVANTAGES:-**
- The main advantages of this system is that we can get electricity anywhere without wires.
- The nature of power delivery is omni directional i.e. in every direction.
- Magnetic resonances are particularly suitable for everyday application because most of the common materials do not interact with magnetic fields, so interactions with environmental objects are suppressed even further.

Is it practical and is it safe?

- Witricity demonstration is still too recent, and too focused, to produce any definite conclusions.
- With the witricity method ,they anticipate transmitting power over distances about a meter, which is much less than ideal but still very impressive.
- If the technology is improved and honed to a point where it can be “productized", it stands to turn any number of industries on their respective ears.
- The MIT team said its discovery is different from all previous effort because it uses “magnetically coupled resonance", which means it will not only be safe but it will be fairly efficient.

CONCLUSION

- This technology is a big impediment to development in the retail sector right now.
- The wireless transfer of electricity has been a sci-fi dream up to this point ,and truly, if electricity could simply be in the air, in the same way radio waves and wi-fi signals are, it would change the world.

THANK YOU