



Close Proximity Electric Induction Data Transfer

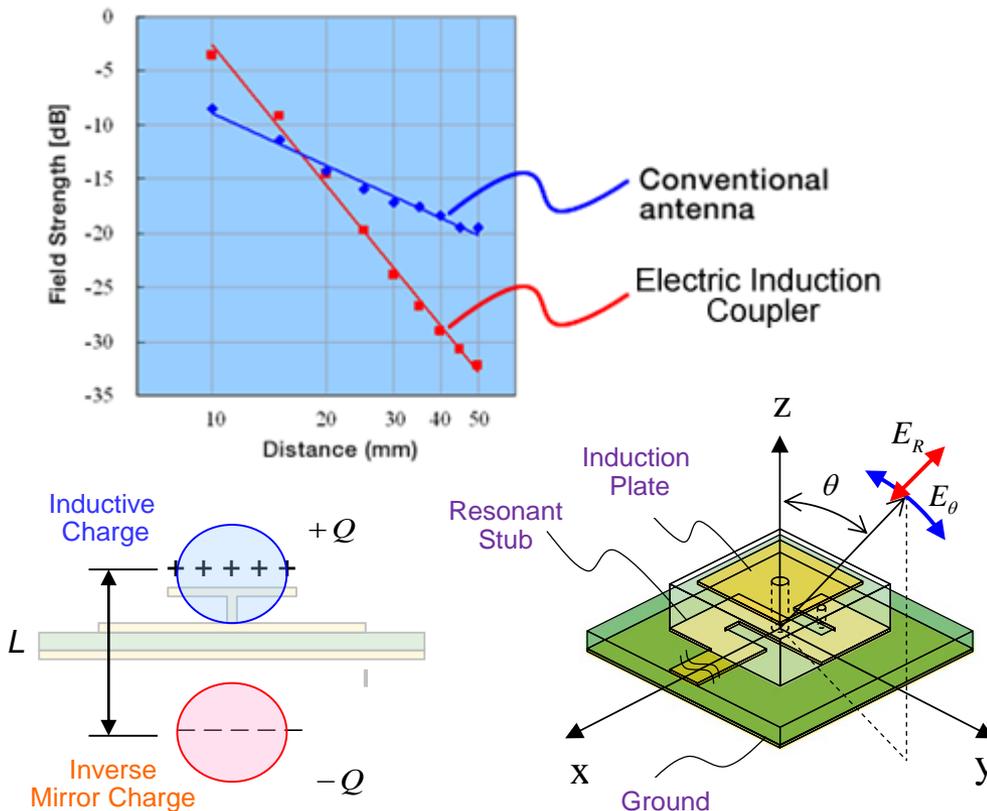
Electric Induction Coupling

- Electric induction is a mode of wireless field propagation that operates only for short distances up to a few centimeters. By taking advantage of this characteristic in combination with a very low transmission power, it is possible to create a wireless system optimized for close proximity communications and data transfer. From a usage standpoint, the system can be implemented as an touch-activated, high-speed coupling interface providing instant connectivity between two active electronic devices.



Induction vs. Radiation

A specially designed antenna called a *coupler* is used to maximize the longitudinal electric induction component and minimize the radiation component of the wireless energy. This results in highly efficient coupling in the near field while providing sharp attenuation in the far field.



Electric Induction Coupling Mode

Longitudinal Component

$$E_R = \frac{pe^{-jkR}}{2\pi\epsilon} \left(\frac{1}{R^3} + \frac{jk}{R^2} \right) \cos \theta$$

Transverse Component

$$E_\theta = \frac{pe^{-jkR}}{4\pi\epsilon} \left(\frac{1}{R^3} + \frac{jk}{R^2} - \frac{k^2}{R} \right) \sin \theta$$

$$H_\phi = \frac{j\omega pe^{-jkR}}{4\pi} \left(\frac{1}{R^2} + \frac{jk}{R} \right) \sin \theta$$

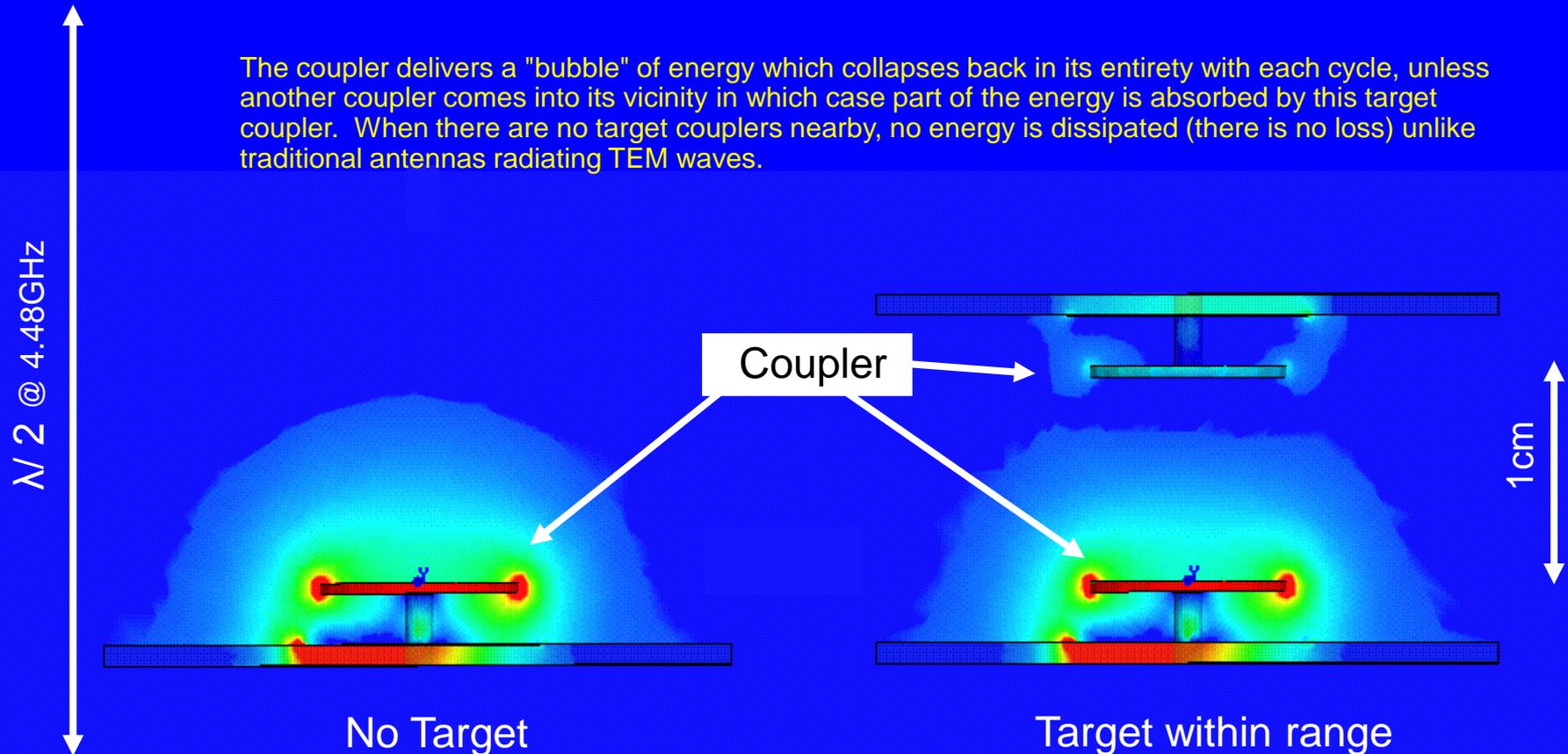
Quasi-Static

Induction

Radiation

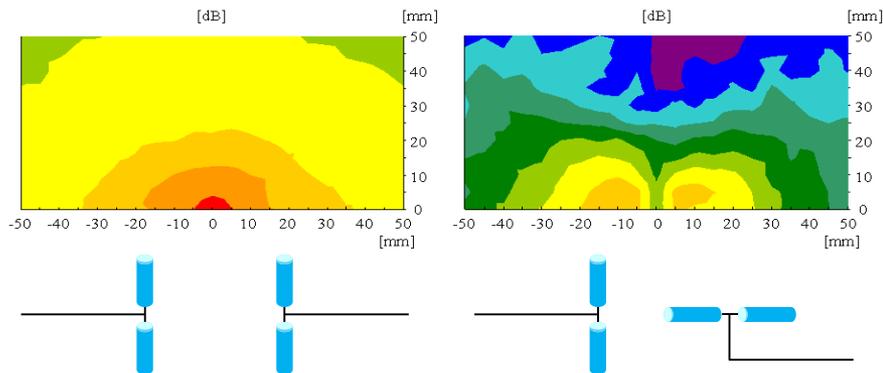
Conventional Wireless TEM Mode

The coupler delivers a "bubble" of energy which collapses back in its entirety with each cycle, unless another coupler comes into its vicinity in which case part of the energy is absorbed by this target coupler. When there are no target couplers nearby, no energy is dissipated (there is no loss) unlike traditional antennas radiating TEM waves.



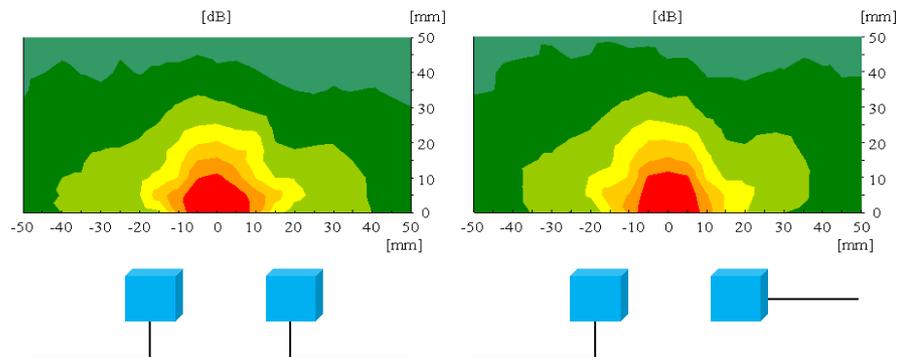
Conventional Radiating Dipole Antenna

Linear Polarization



Longitudinal Electric Induction Coupler

Polarization Free



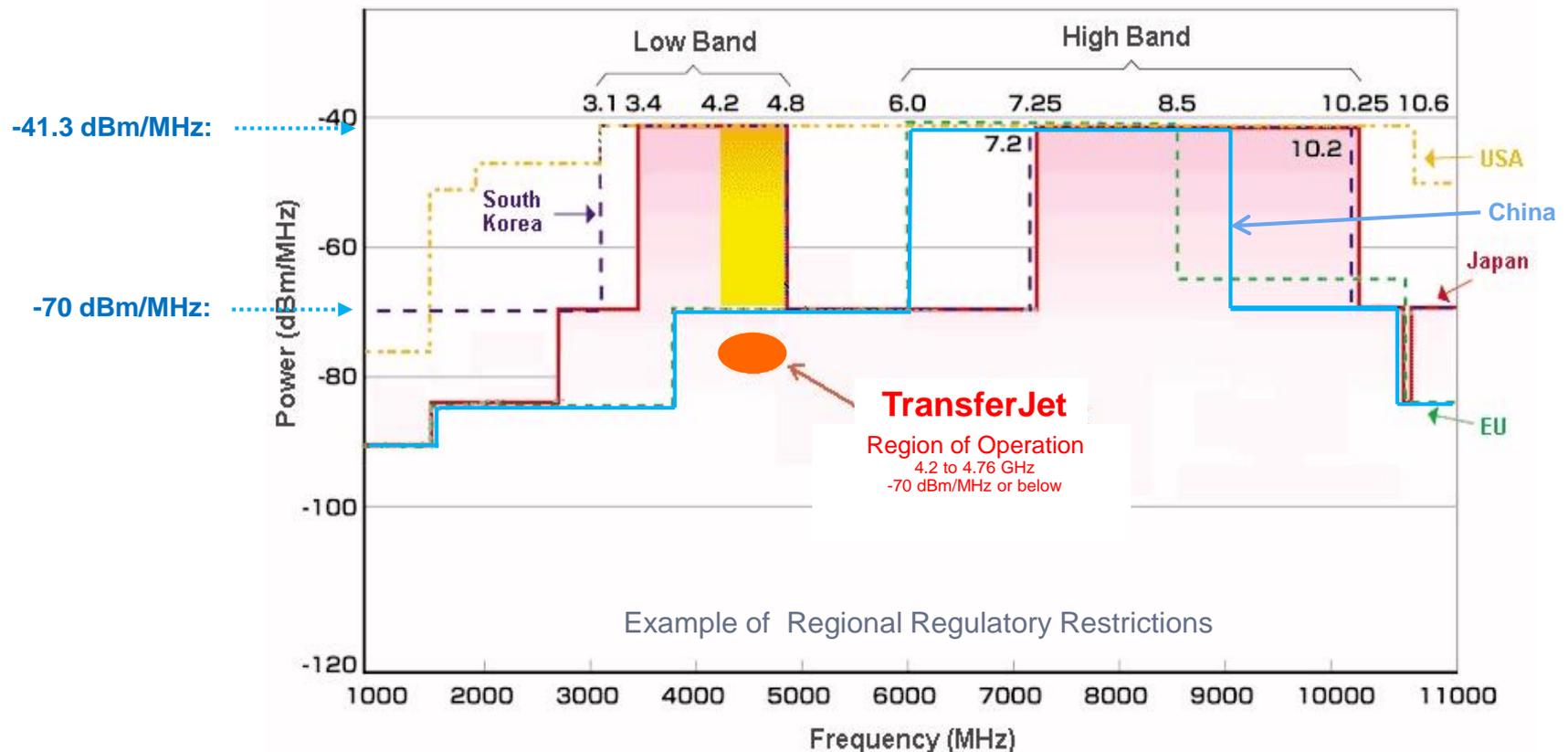
Because the longitudinal electric induction fields originate from a single plate, they are not polarized. The couplers can approach each other at any angle without sacrificing coupling performance, in contrast to radiating antennas which generally have clear polarizing characteristics.

The near-field sensitivity is also higher using couplers compared to traditional dipole antennas.

Only electric induction couplers are used as antenna elements for Close Proximity Electric Induction Data Transfer.

Regulatory Compliance

The frequency used is from 4.2 to 4.76 GHz, corresponding to a narrow section of the UWB band available in most regions of the world. The power level is kept at or below -70 dBm/MHz, which means that a compliant device will be DAA exempt.



- Major global consumer electronics vendors and technology/service providers are considering deployment of products on an international scale. The establishment of these specifications as international standards is very important to ensure that products and systems interoperate seamlessly and deliver the intended user experience.
- Regulatory compliance has been confirmed for most of the major countries and regions of the world, which will allow rapid market deployment of products and applications across different regulatory domains.

Basic Specifications

Center Frequency	4.48 GHz
Bandwidth	560 MHz
Transmission Power	≤ -70 dBm/MHz
Transmission Rate	560 Mbps (physical layer)
Modulation	Direct Sequence Spread Spectrum (DSSS)
Communication Distance	Up to a few centimeters
Data Transfer Direction	Bi-directional, symmetric
Antenna Element	Electric Induction Coupler
Connection Topology	1-to-1, Point-to-Point





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