Waveform and Passive Beamforming Design for Intelligent Reflecting Surface-Aided Wireless Information and Power Transfer

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Table of Contents

What is WPT?

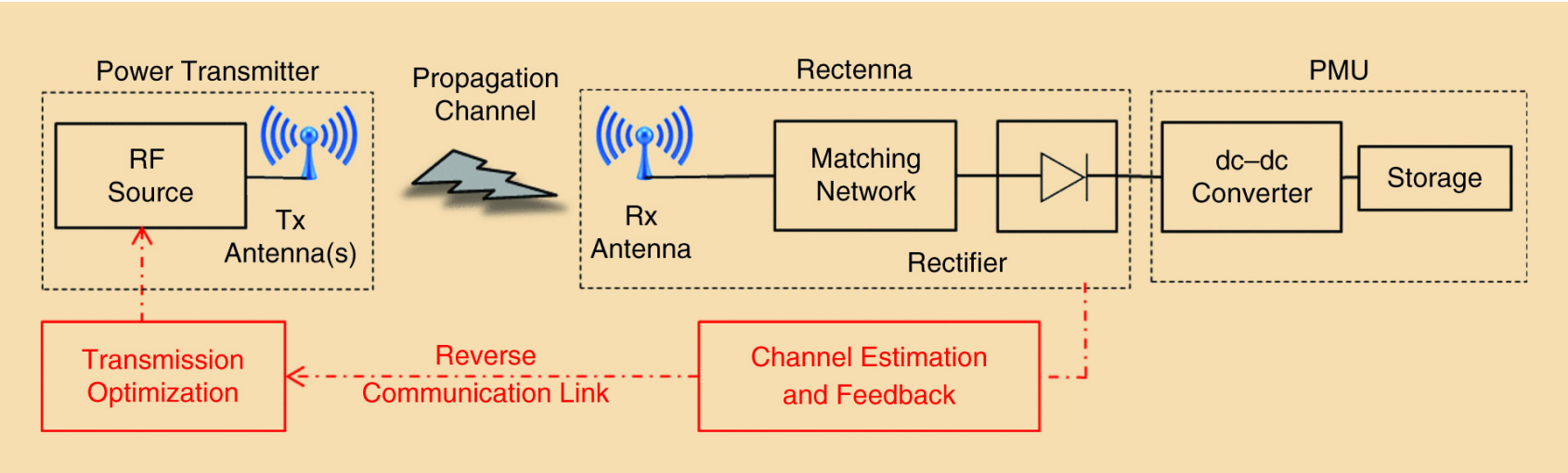
Wireless Power Transfer (WPT) varies electromagnetic fields to deliver power.

Table: WPT Technologies

Categories	Technology	Devices	Power	Frequency	Range
Near-field	Magnetic resonant coupling	Resonators	Up to 10 W	kHz – MHz	m
	Inductive coupling	Wire coils	Up to 10 W	Hz – MHz	mm – cm
	Capacitive coupling	Metal plates	Up to 1 W	kHz – MHz	mm
Far-field	RF waves	Rectennas	μW – mW	MHz – GHz	m – km
	Light waves	Lasers	μW – mW	THz	km

WPT by RF waves

Energy flow: DC $\rightarrow$ RF $\rightarrow$ RF $\rightarrow$ DC



Pros:

- long range (up to hundreds of m) with NLoS support
- compact receiver (few cm), easy integration
- suitable for mobile devices

Cons:

- low power level (μW – mW)
- low energy harvesting efficiency (40% at 100 μW, 20% at 10 μW)