

Low-cost spectrum sensor for ultra-narrowband transmissions

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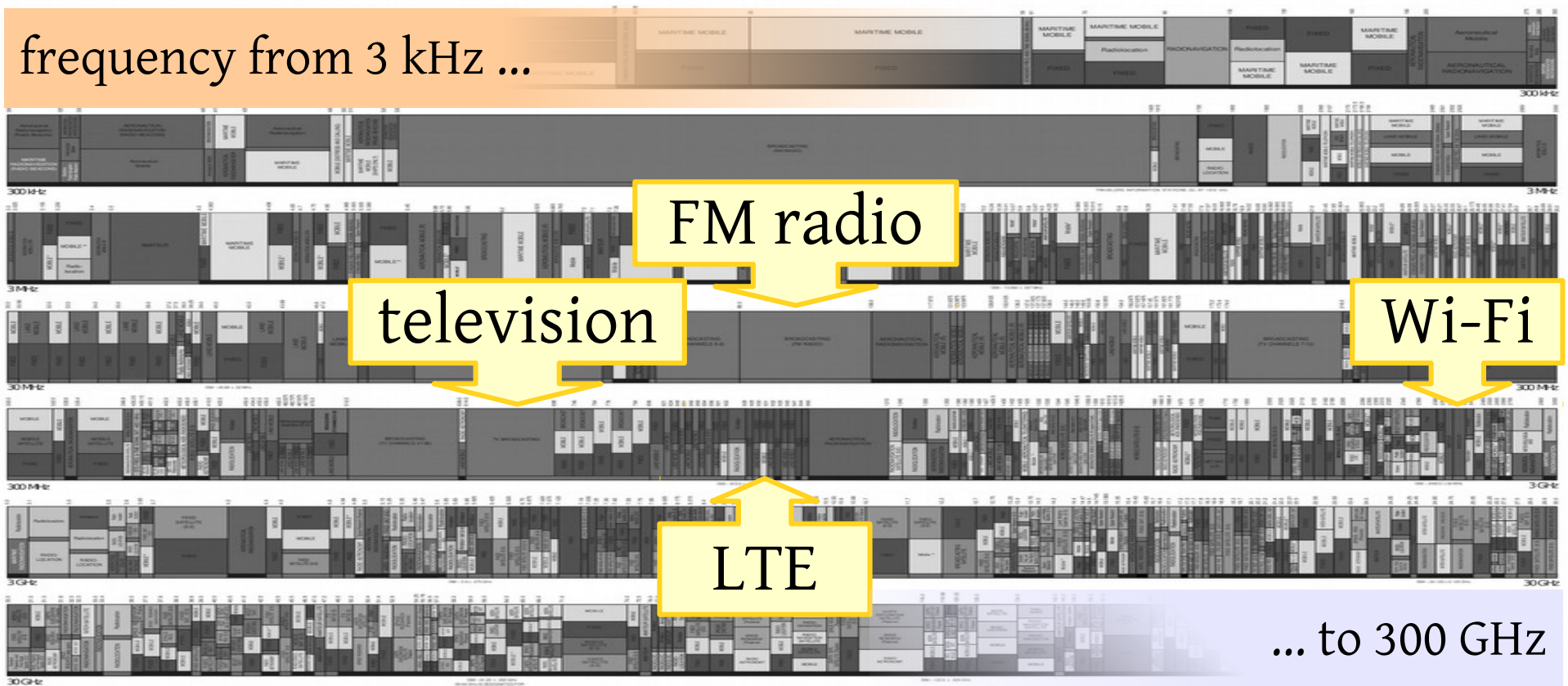
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Spectrum sensing

Part of electromagnetic radiation useful for **radio communications**.

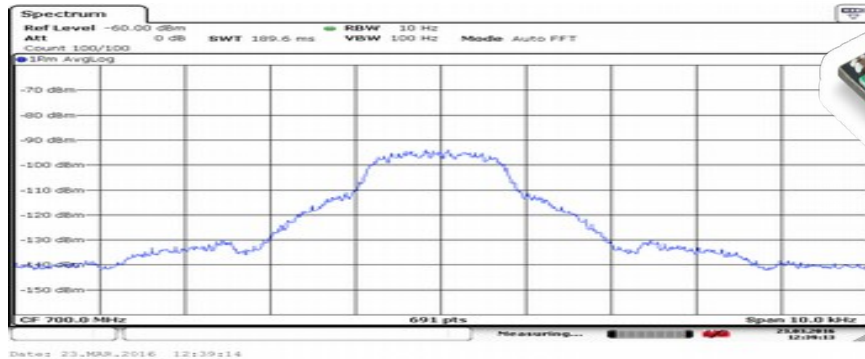
At a certain time and frequency, is there a **transmission or not?**



Ultra-narrowband transmissions

Radio technology for:

- short, infrequent transmissions,
- low-power devices,
- very dense networks.

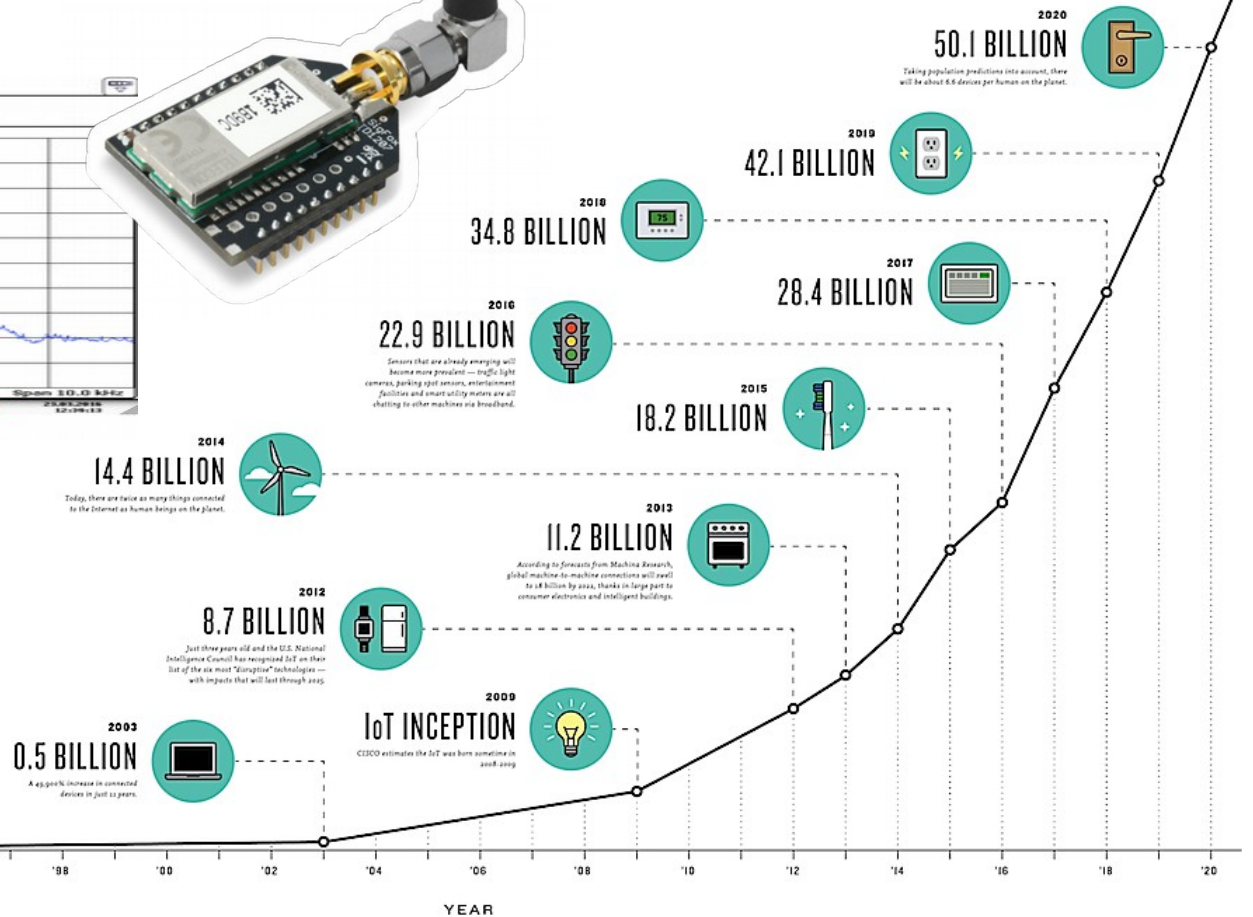


bandwidth ~100 Hz
 bitrate ~100 bit/s
 transmission time ~1 s
 BPSK or GFSK
 modulation



THE INTERNET OF THINGS

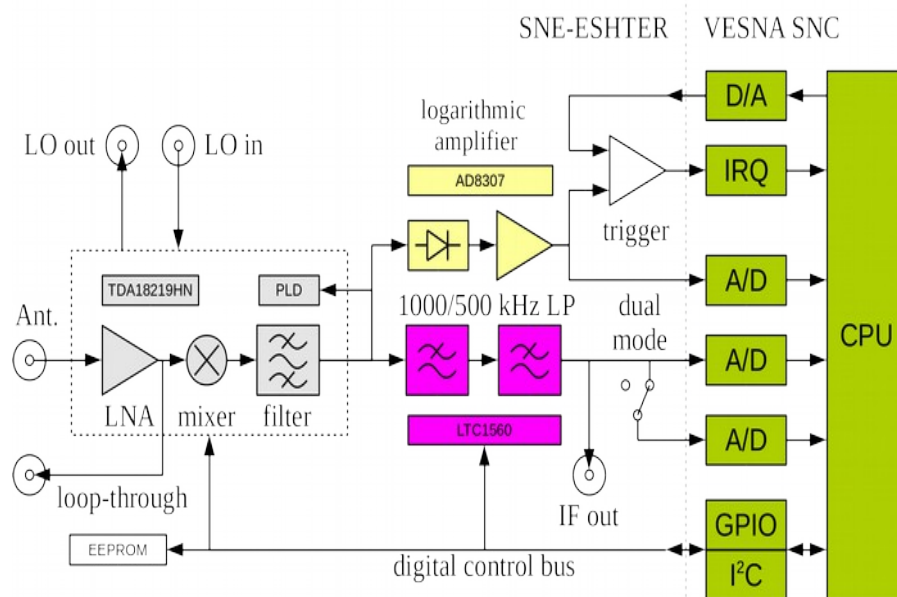
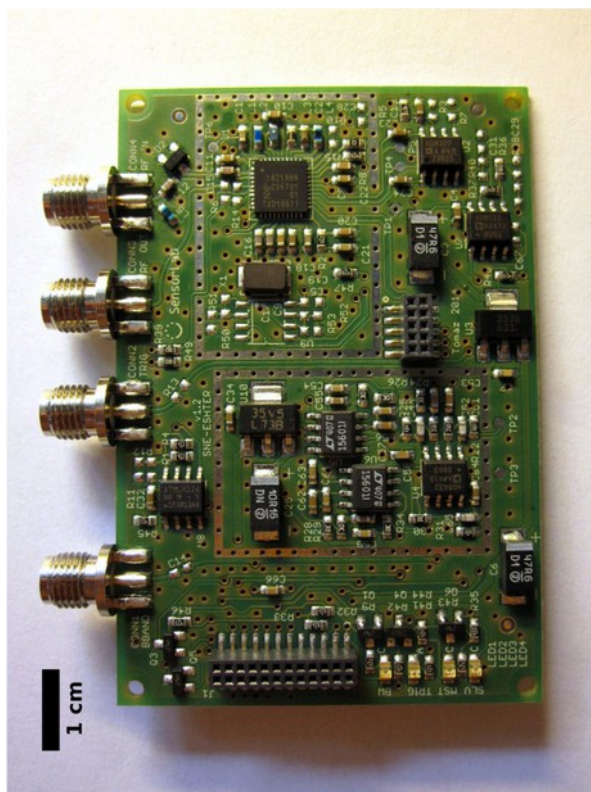
AN EXPLOSION OF CONNECTED POSSIBILITY



The Internet of Things – infographic, The Connectivist

SNE-ESHTER: a low-cost sensor

- UHF receiver, optimized for spectrum sensing.
- Own hardware design based on off-the-shelf components.
- Low complexity signal detection algorithms
- suitable for usage on microcontrollers.
- covariance-based detection, eigenvalue-based detection, ...



$$\lambda_l = \frac{1}{N_s} \sum_{n=0}^{N_s-1} x_n \cdot x_{n-l}$$

$$\begin{bmatrix} \lambda_0 & \lambda_1 & \dots & \lambda_{L-1} \\ \lambda_1 & \lambda_0 & \dots & \lambda_{L-2} \\ \vdots & \vdots & \ddots & \vdots \\ \lambda_{L-1} & \lambda_{L-2} & \dots & \lambda_0 \end{bmatrix}$$