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Sub-1GHz: Robustness & Long Range

Technical introduction, Sub-1GHz



Why Sub-1GHz RF technology

Long Range

- Radio range, up to several kilometers
- New technology from TI makes it more reliable

Co-existence

Rapidly growing number of RF devices requires good co-existence properties

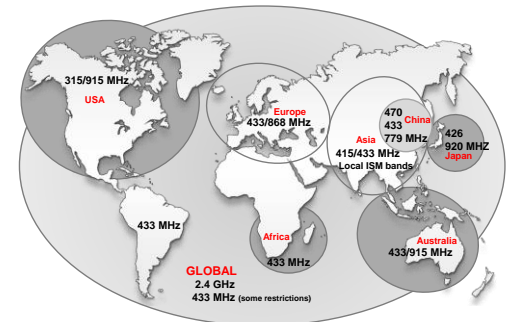
License Free Radio Communication

ISM (Industrial, Scientific and Medical)

- License free RF bands
- Available worldwide
- No need for subscription or fees

Battery life

On small Lithium cells, designed to last up to 15 years



Sub-1GHz target markets

Metering & SmartGrid

E-meters



Water & Gas meters



Heat Cost Allocators



Alarm & Security

Intruder Alarm



Social Alarm (Cat 1)



Smoke Detectors



Automation

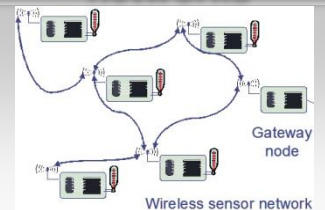
Home and building



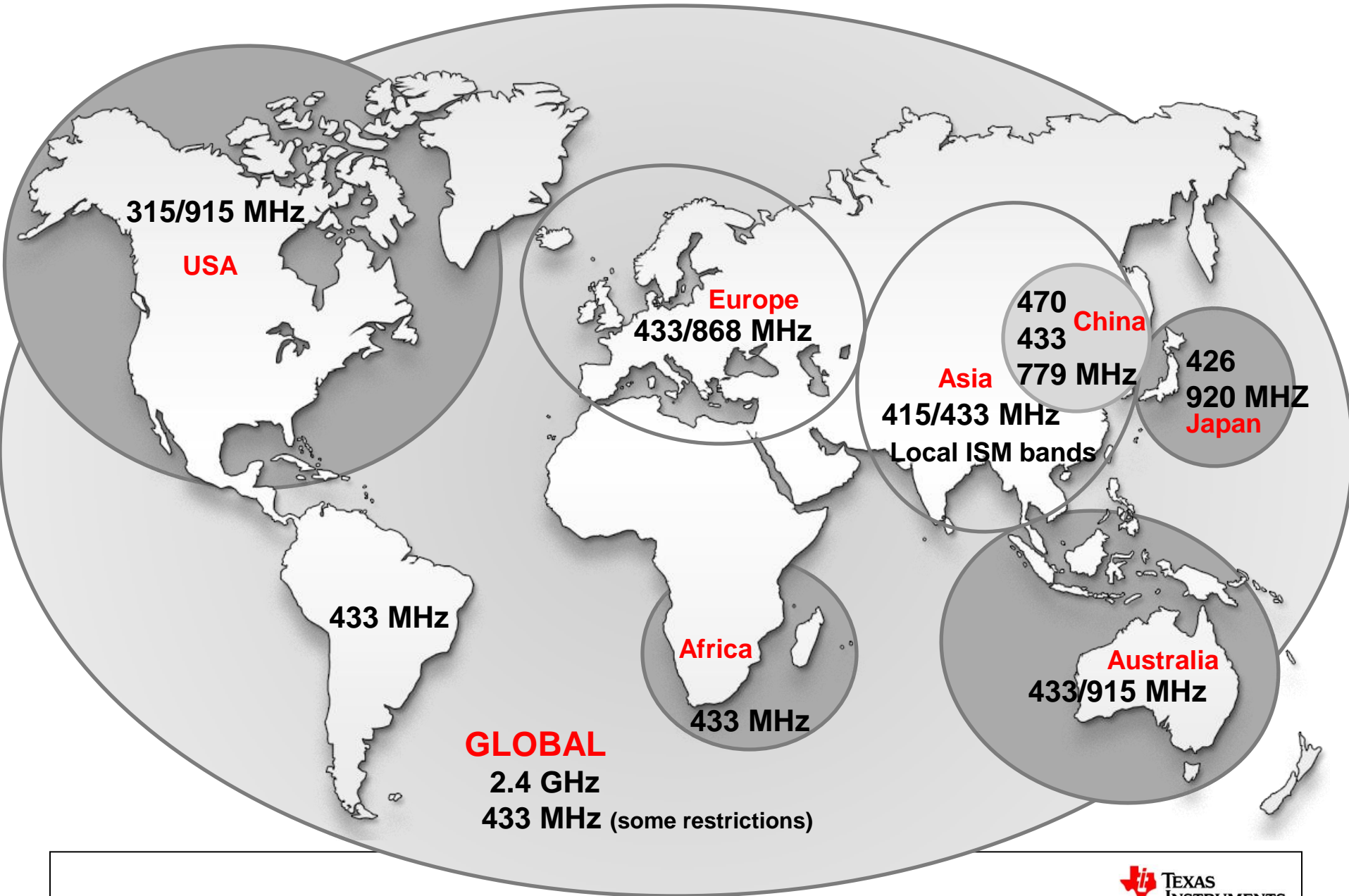
industrial automation



Wireless sensor networks

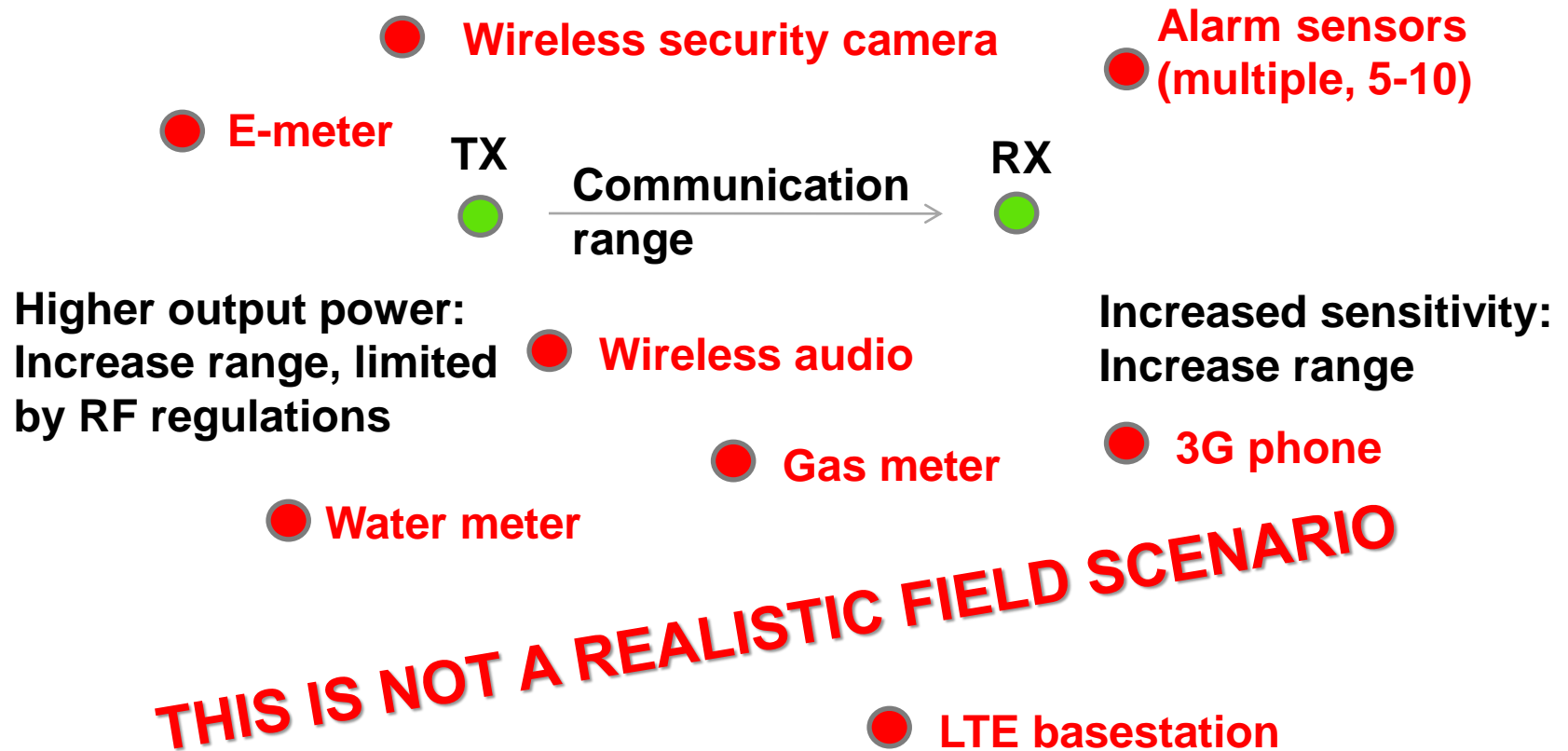


License Free ISM bands World Wide



Range and Co-existence

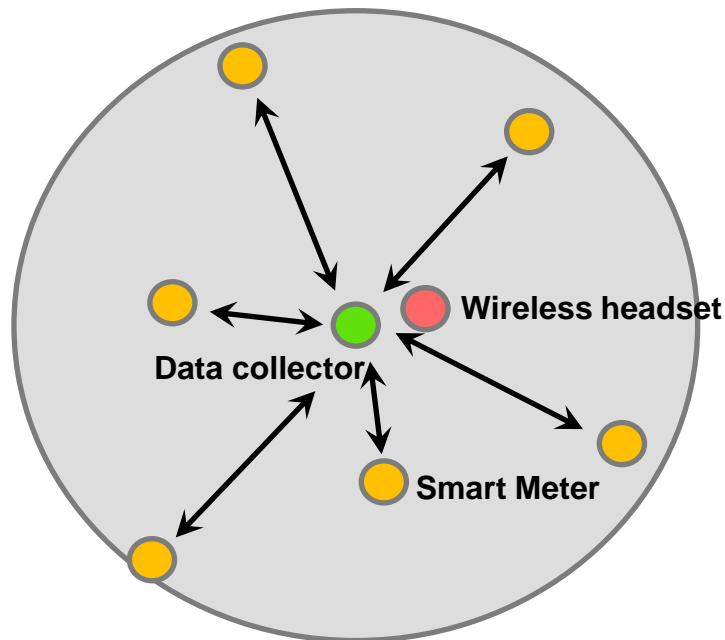
- Interference can severely limit communication range
- Good Co-existence = first pass installation success



Co-existence – how it works

What Selectivity and Blocking translates to for real life applications

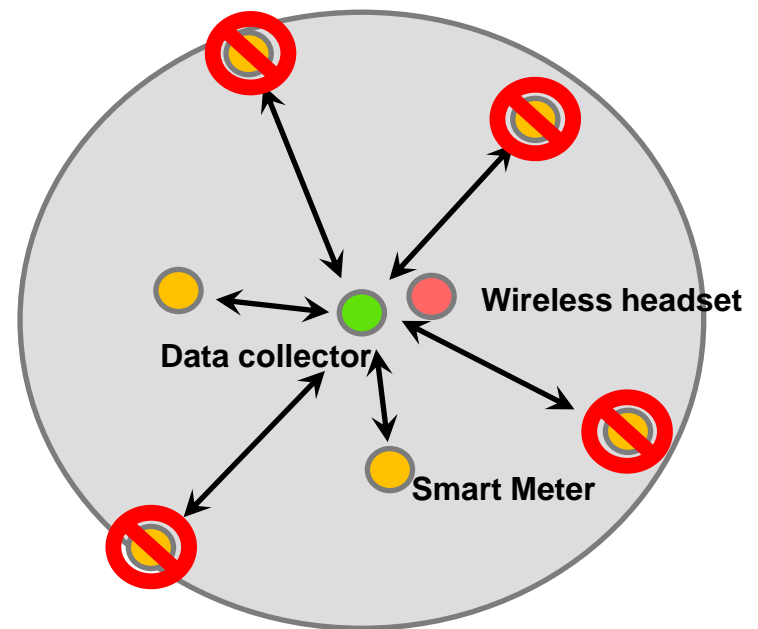
TI Sub-1GHz Performance Line



No range reduction for data collector

- Less data collectors needed
- Longer links possible
- Fewer re-transmissions

Competition



Data collector range is reduced

- More data collectors needed
- Temporary interference will result in higher packet loss, more re-transmissions needed

More than 10 km range (video from Oslo, Norway)

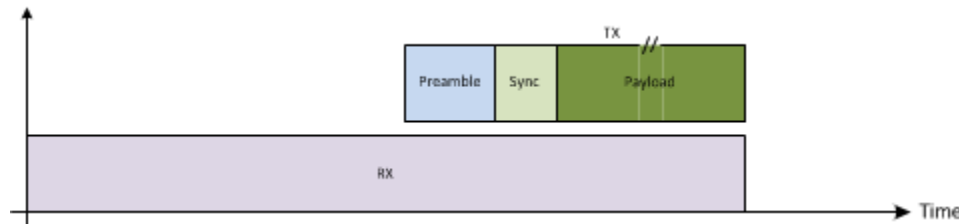


CC112xC
C120x

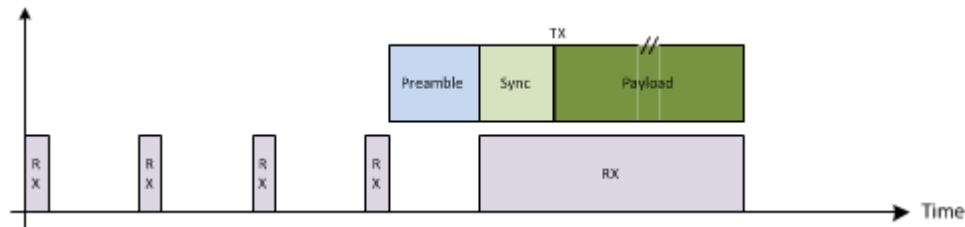
RX Sniff Mode with $<3\text{mA}$ RX current

Short start-up times and a fast receiver will save power.

- **Competition (traditional receiver):** Radio must stay in RX continuously to make sure the transmitted packet is received, settling the receiver during the preamble



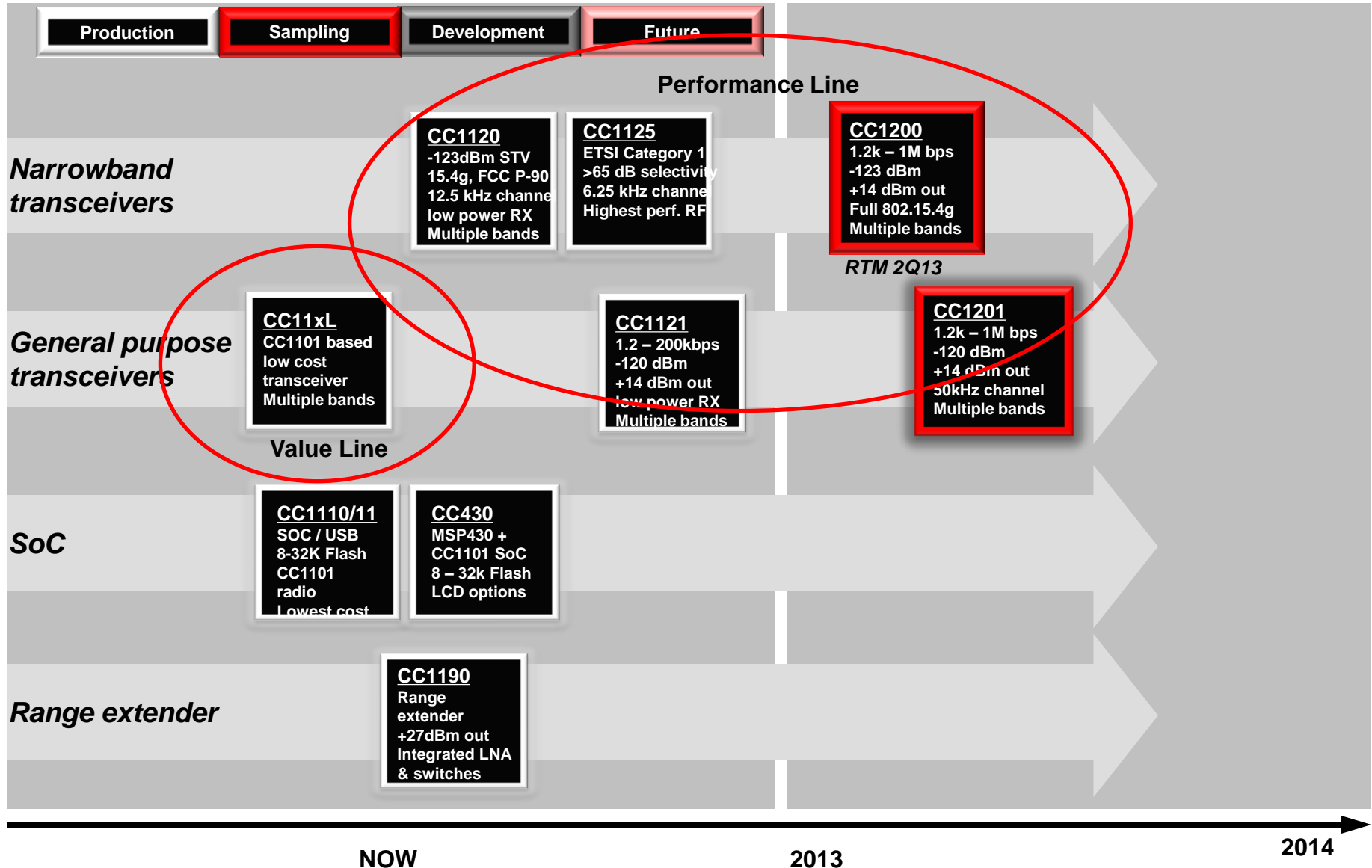
- **Performance Line; WaveMatch receiver:** The fast settling receiver can automatically duty cycle RX to greatly reduce average power consumption when searching for packets, without sacrificing RF performance



LOWEST RX current with keeping highest PERFORMANCE



Low Power RF – Industrial Sub-1GHz HW Roadmap



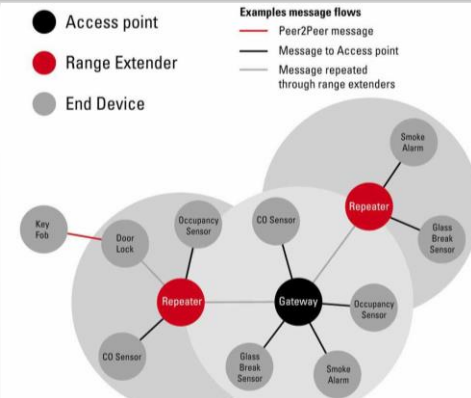
TI Sub-1GHz offering – Software

LPRF Software Solutions – Free of Charge

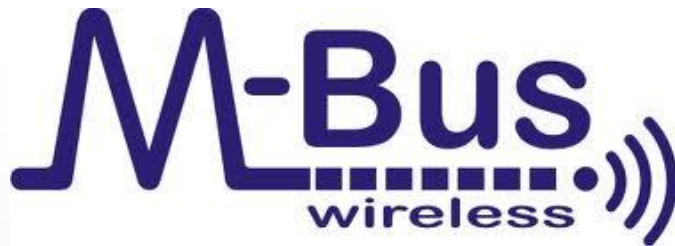
Sub-1GHz market dominated by Proprietary and legacy solutions.

Basic Software Examples:

- Easylink
- Packet Error Rate tester



SimpliciTI – star network, source code



**IPv6-based Low-power
Wireless Personal Area Networks**

6LoWPAN, mesh network

TI Sub-1GHz offering – RFICs/kits

RF ICs



CC112x/CC120x
Performance
line



**CC11xL,
CC115L**
Value Line



CC1190
Range Extender



CC1110/CC430
SoC

Development Kits



Boosterpack

Anaren module
With value line RX/TX
For MSP430



CC11xxEMK

Reference design.
Two modules and
two antennas.



CC11xxDK

Complete kit for
RF evaluation
and PER testing.
Includes MSP430



Antenna kit

Selection guide and
belonging
application note

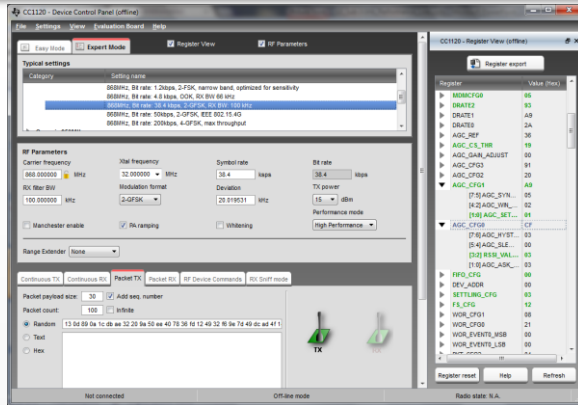


CC1110 mini kitC

Low cost kit for
prototyping

TI Sub-1GHz offering – Tools

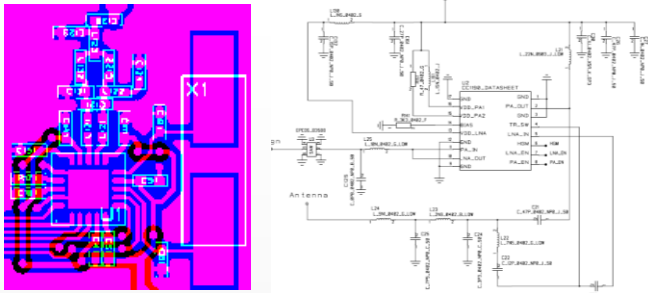
LPRF tools and support



SmartRF Studio: RF configuration tool



Packet Sniffer



Reference designs:
Layout and schematics

Application Notes

Showing 100 of 119 results View All Results

Title	Abstract	Type	Size (KB)	Date	Views
AN122 – CC1125 Operating in 25 kHz Channels at 869 MHz ETSI Category 1	Read Abstract	PDF	1009	21 Mar 2013	149
AN112 – Using CC1190 Front End with CC112x Under EN300220 (Rev. B)	Read Abstract	PDF	540	11 Mar 2013	1,406
DA403 – CC112x/CC120x On-Chip Temperature Sensor (Rev. A)	Read Abstract	PDF	264	07 Mar 2013	1,317
DA524 – 869 MHz, 915 MHz and 955 MHz Monopole PCB Antenna (Rev. E)	Read Abstract	PDF	1016	22 Feb 2013	5,291
AN121 – Wireless M-Bus Implementation with CC112x/CC120x High Performance Trans	Read Abstract	PDF	2798	20 Feb 2013	803
DA635 – Antenna Quick Guide (Rev. A)	Read Abstract	PDF	138	12 Feb 2013	6,361
DA510 – CC112x RSSI and CS Response Time	Read Abstract	Multiple Files		05 Dec 2012	858
DA639 – Miniature Helical PCB Antenna for 869 MHz or 915/920 MHz	Read Abstract	PDF	905	27 Nov 2012	2,889
AN119 – Using CC1190 Front End with CC1100E in the 470-510 MHz Band	Read Abstract	PDF	367	09 Oct 2012	700
DA104 – Reduced Battery Current Using CC112x, CC1175, and CC1100E	Read Abstract	PDF	454	02 Oct 2012	1,019
DA633 – Operation	Read Abstract	PDF		20 Aug 2012	1,131
AN115 – CC112x/CC1175 Operation in 274-320 MHz Frequency Band	Read Abstract	PDF	568	08 Jun 2012	915

100+ application notes and support forum

Knowledge database:

Learn more on Sub-1GHz

- Performance Line: www.ti.com/rfperformanceline
- Value Line: www.ti.com/rfvalueline
- App notes: [Application Notes](#)
- E2E forum: www.ti.com/e2e
- “Getting Started on Sub-1GHz” training:
[Available on TI training portal](#)
- Wireless Connectivity Selection Guide:
www.ti.com/wirelessconnectivityguide

