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What do we mean by a "short ranged device ?"

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From looking at the technical press over the last two or three years, you could be forgiven for thinking that all low power radio activity had moved to 2.4GHz, using highly complex proprietary mesh network protocols such as Zigbee and Bluetooth.

This is a misconception. 'low power' or 'ISM' radio is a very broad category indeed, and suffers from the (all too human) attempts by suppliers in this area to push 'their' solution as the 'only' one.

The terms 'SRD' (short range device) has come to refer to a wide class of data communication radios with rf power outputs of less than 1 watt (with the greater proportion of units actually at 10mW or below), operating at ranges of less than 1km (...although low data rate VHF units can reach over 10km) at a wide variety of data rates (from below 100bit/sec, to over 1Mbit/sec).

They are used in general data communication, remote control, monitoring and alarm applications. The term 'telemetry' radio is commonly applied to these devices (although they should properly be termed 'telemetry and telecontrol')

Fig 1: A NBFM ISM band transceiver

Radios of this type usually operate in 'unlicensed' areas of spectrum (assigned to low power industrial, scientific and medical (ISM) usage). In these bands the regulatory authorities allow suitably approved and tested radios to be used without the need for individual user licenses.

Some parts of these bands are assigned to 'general' usage, while other segments may be limited to (for instance) alarms, or remote meter reading. Unfortunately, despite attempts to harmonise usage within the EU and beyond, the permissible bands and approval standards can vary from country to country. Most of Europe, Africa and Australia have fairly similar regulations (look for the "EN300-220-3" standard approval), but America and Canada are totally different (FCC 'chapter 15, part 247').

Fig 2: An 868MHz band transceiver

Great care is needed in selecting radios for a globally marketed product. Some bands are world wide, (such as the 2.4GHz allocation) some are regional (such as the 433MHz and 868MHz European bands) and some are specific to a given nation (such as the British 458MHz or the American 915MHz band)

So what is available ? Assigning any absolute categories is fraught with difficulty, so instead we will consider them in terms of usable range. (In all these cases the 'range' quoted is in a typical in-building or urban environment. Much longer ranges are seen across valleys, over sea, or air to ground. In fact, any range quoted by a manufacturer must be taken with a large pinch of salt)

- **Up to 10 meters**. Two very different types of radio provide very short range coverage. High data throughput "Personal area Network" links (digital wireless audio, computer peripherals, point of sale terminals) are moving towards complex integrated circuit solutions, normally using protocol standards such as Bluetooth in the 2.4GHz band. On the other hand, simple remote control tasks (toys and gadgets, controls for domestic goods, wireless keyboards) are typically handled by simple 27MHz designs.

- **Up to 50 meters**. Wireless LAN and other high data rate systems use WiFi or similar in the 2.4 or 5.8GHz bands. Complex mesh-network systems (data gathering, home automation networks) use ZigBee, or one of it's imitators. Simpler one to one, or polled network data systems, and higher end remote control tasks, use lower cost, lower power conventional wideband radios in the sub-1GHz bands (either simple modules, or single chip radio designs are found)

- **Up to 250 meters**. Alarm systems, vehicle data download systems. As range increases, the 2.4GHz high speed units reach their limit. Conventional wideband modules begin to show superior RF performance to single chip solutions and simpler narrow band radios are used for critical industrial and alarm tasks. High data rate links using 2.4GHz require more sophisticated, fixed aerials. In USA/Canada this market segment is addressed by high power 915MHz spread spectrum radios.

- **Up to 1km**. Industrial control and monitoring, large site alarm systems. More complex narrow band radios dominate. Multichannel designs are used to improve adaptability and allow multiple co-sited systems. Data rates rarely exceed 10kbit/sec. Low power VHF equipment is used (lower path loss, giving more range for given power)

- **Over 1km**. Long range telemetry and command, remote operated vehicles, high value asset tagging. Only VHF band and higher powered (500mW or more) UHF radios offer sufficient link reliability. National regulations become more of an issue, as not all countries have suitable bands. GSM/GPRS infrastructure modems begin to compete, but only where good cellular network coverage is available

Fig 2: A NBFM 500mW transceiver

- **Over 10km**. Marine data telemetry, agricultural control. Of all the unlicensed ISM band radios, only VHF units can offer this range, and even then good aerials will be needed. At these ranges licensed operation (UHF, with much higher allowable transmitter power) starts to become economic, as does GPRS (assuming coverage) and admittedly high cost satellite based systems (ARGOS for instance)

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