

# Munich Wireless Technology

Ou bien on trouvera un chemin ou on en créera un  
Either we will find a way, or we will make one

**TATAWIN / MIDOUN**



# TATAWIN & MIDOUN

- The future of the wireless security alarm systems (technology)
- More robust and flexible than cable
- The beginning of the wireless breakover in the security sensor networks

# **VOLLDUPLEX**

**868/433 MHz**

**Double Transceiver on each Board**

**RX-SENSITIVITY**  
**-125 dBm/10kbits**

**-40 °C to +110 °C**

**EN 54-25 certified**

**First and unique system in all EC**

**Protected by**  
**6 Patents**

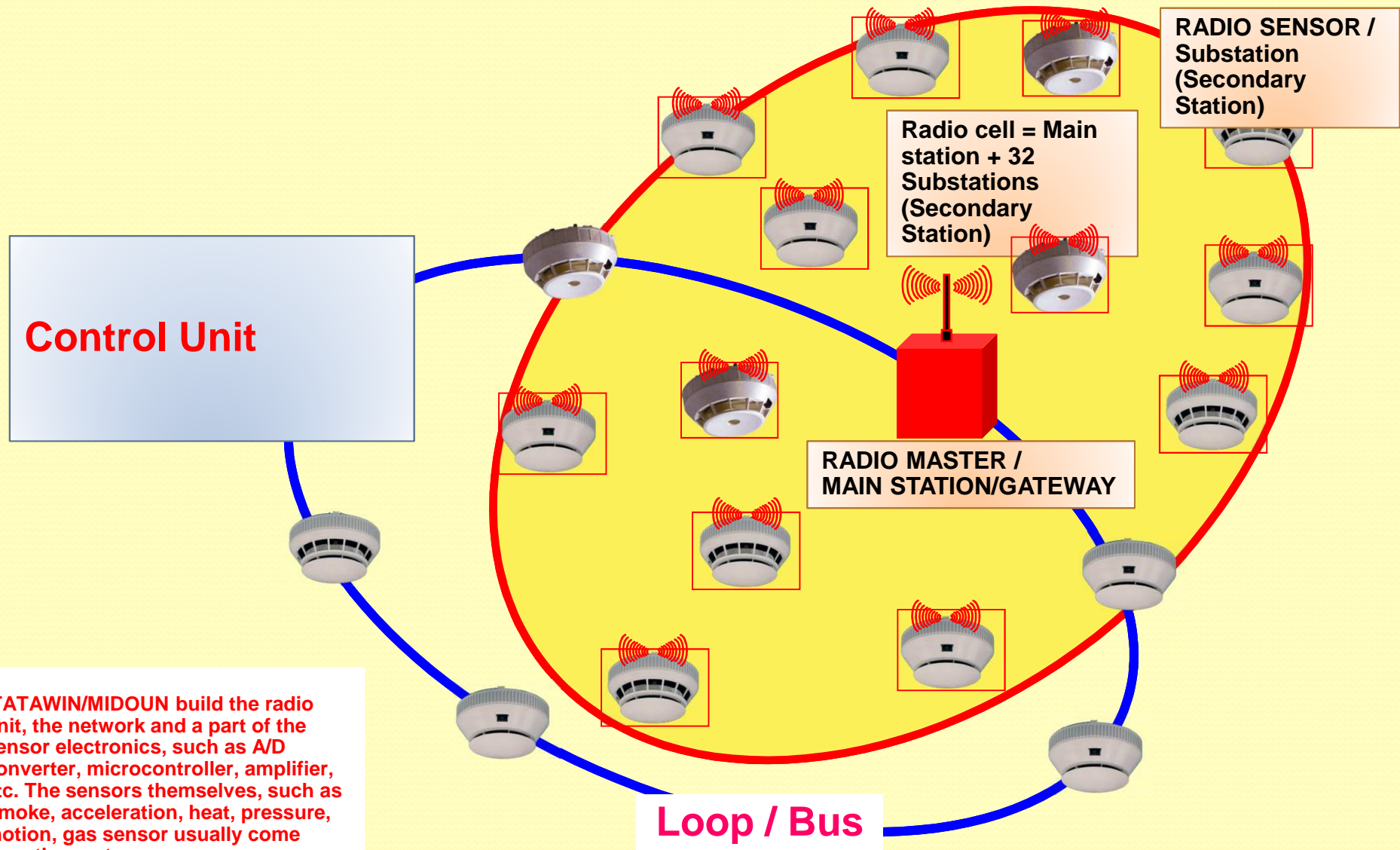
**RECEIVER**  
**CLASS ONE**  
**ETSI 300220**

# TATAWIN & MIDOUN = Radio und Netzwerk

- Introduction
- What are the advantages of TATAWIN/MIDOUN?
- Why TATAWIN/MIDOUN is better than the competition(competitors)?
- What are the advantages of TATAWIN/MIDOUN over cable?
- Summary

# Introduction

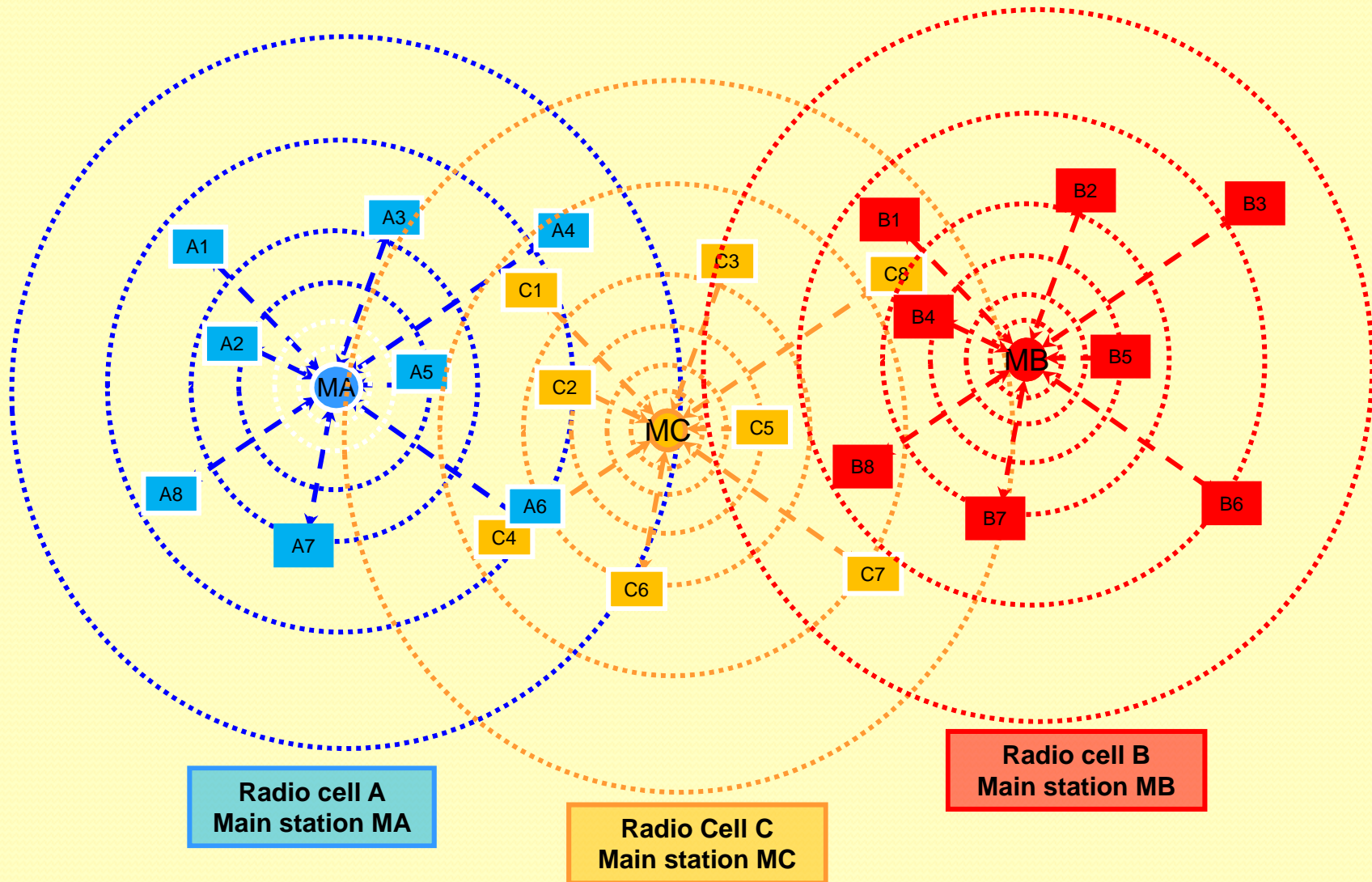
## TATAWIN = Radio and Network



TATAWIN/MIDOUN build the radio unit, the network and a part of the sensor electronics, such as A/D converter, microcontroller, amplifier, etc. The sensors themselves, such as Smoke, acceleration, heat, pressure, motion, gas sensor usually come from the customers

# Introduction

## TATAWIN = Radio and Network



# Introduction

- **Main station A, main station B and main station C each with 32 separate radio (wireless) sensors (see last slide) are radio cells in the direct neighborhood.**
- **No interference between the radio cells. Each cell has its own operating frequency / base frequency channel.**
- **In case of interference each main station has alternatively it's own 6 distinct frequency channels where the main station (master) and the substation (sensor) can hop simultaneously to allow the communication. The alternative frequencies are divided into two bands: 868 and 434 MHz.**
- **TATAWIN/MIDOUN allows 40 or 80 main stations in the direct neighborhood. That means TATAWIN has 40 or 80 operating frequencies/base channels each with 6 alternative frequency channels in case of Interference. Therefore altogether,  $40 \times 32$  or  $80 \times 32 = 1280$  or  $2560$  Substations/detectors work in direct neighborhood.**

# Introduction

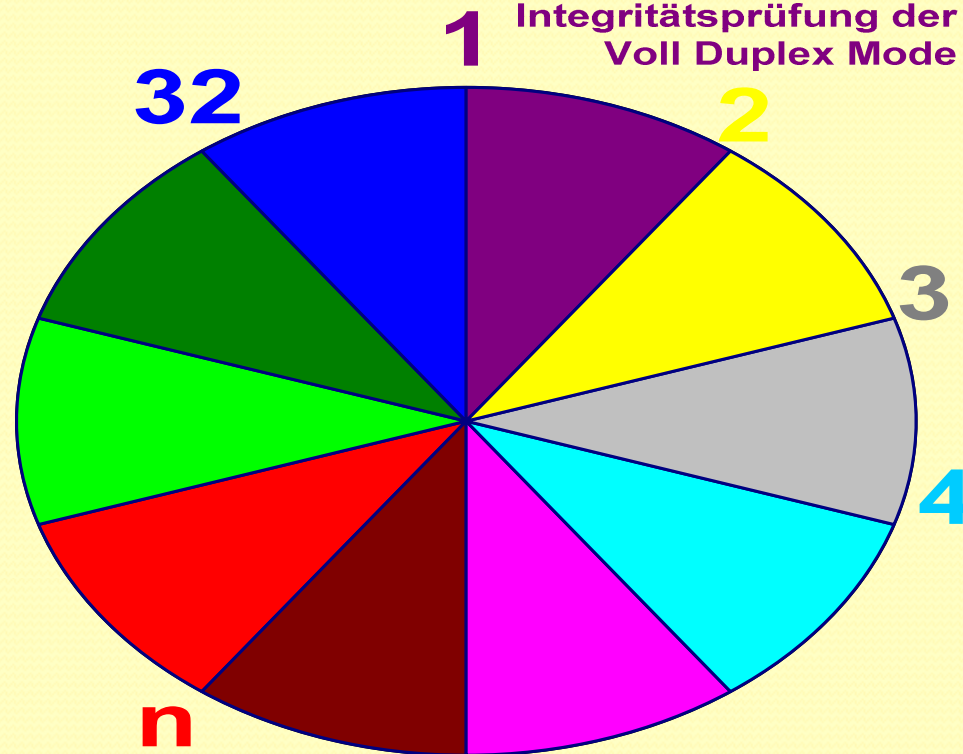
- In case of sabotage, interference or in the case of channel allocation, the master and the detector will automatically hop at the same time, up to six times to find a free channel and thus a secure communication.
- Tatawin / MIDOUN - RF signal is narrow-band (12.5 and 25 kHz channel spacing) and is allowed to work in the standard well-protected alarm channels. It switches automatically between 12.5 to 25 kHz IF bandwidth.
- If the RF field (RSSI) becomes weaker, then it will be switched to the second possible stronger antenna in both transmitting (TX) and receiving (RX). Then follows a change to an alternative channel, where more transmission power is allowed. It will automatically search for the ideal combination regularly and selectively.
- In the extreme case, where there is no possible direct connection between master and slave, 4 selected adjacent detectors are provided, which maintain the communication to the master. To avoid the disadvantages of the Mesch-Swig systems, an entirely new method for the neighborhood (**adjacency**) support was developed and patented: See **Patent specification 5**. The new method is currently used in the aerospace technology.
- The Communication in TATAWIN/MIDOUN is coded (encrypted and Turning code) and is replicated if necessary.



# Introduction

TATAWIN/MIDOUN is a strict synchronous bidirectional radio (wireless) system. Each module in the system has two transceivers operating in FULL-DUPLEX mode: Patent specification 3. In each time interval the radio master communicates regularly with the radio (wireless) sensors (substations).

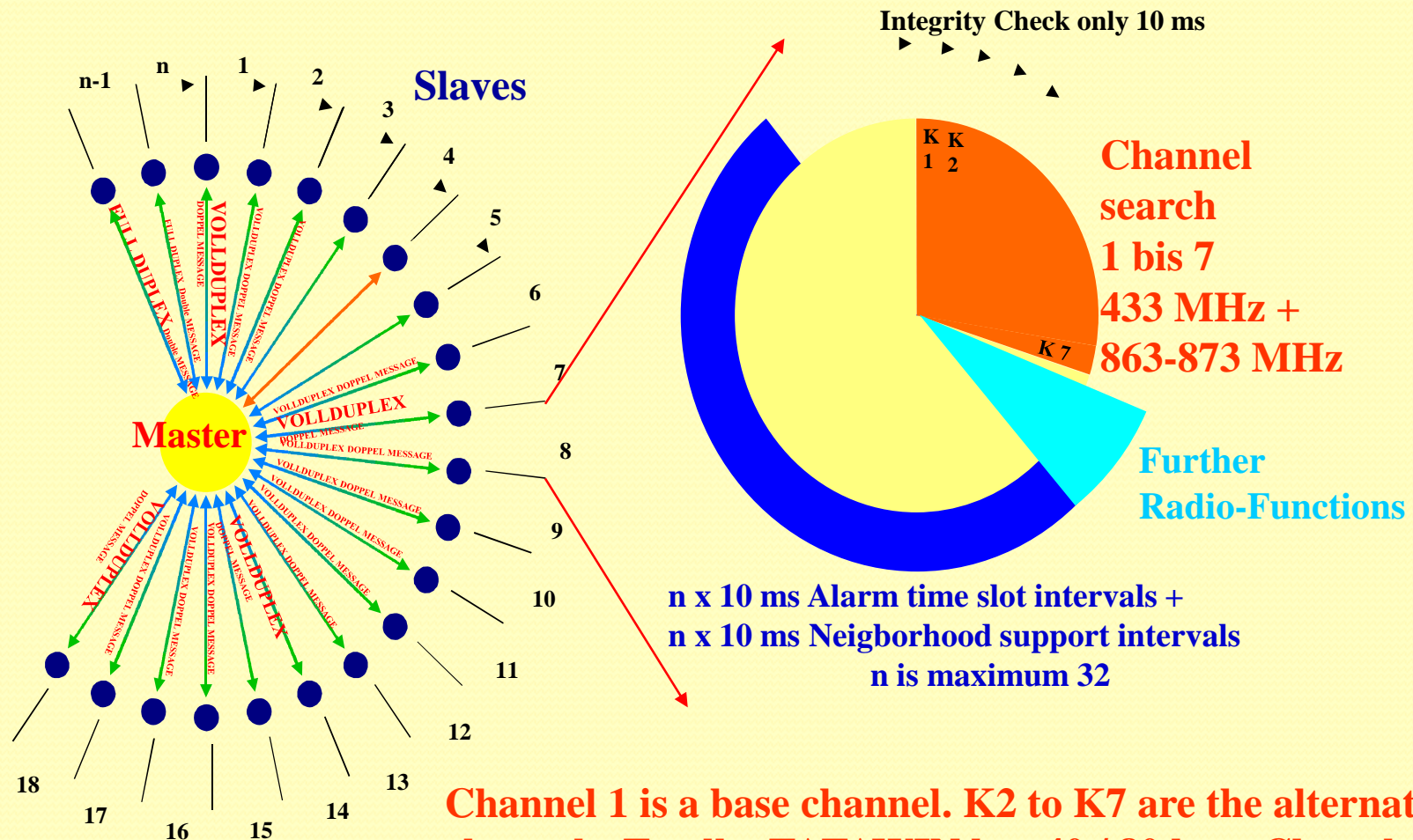
Im Zeitintervall 1, typisch eine Sekunde, werden, in den typisch ersten 20 mS, die Integritätsprüfung der Nebenstation 1 im Voll Duplex Mode durchgeführt.



Im Zeitintervall n, typisch eine Sekunde, werden, in den typisch ersten 20 mS, die Integritätsprüfung der Nebenstation n, im Voll Duplex Mode, durchgeführt.

# Introduction

## FULL DUPLEX Without Handshaking (Acknowledgment)



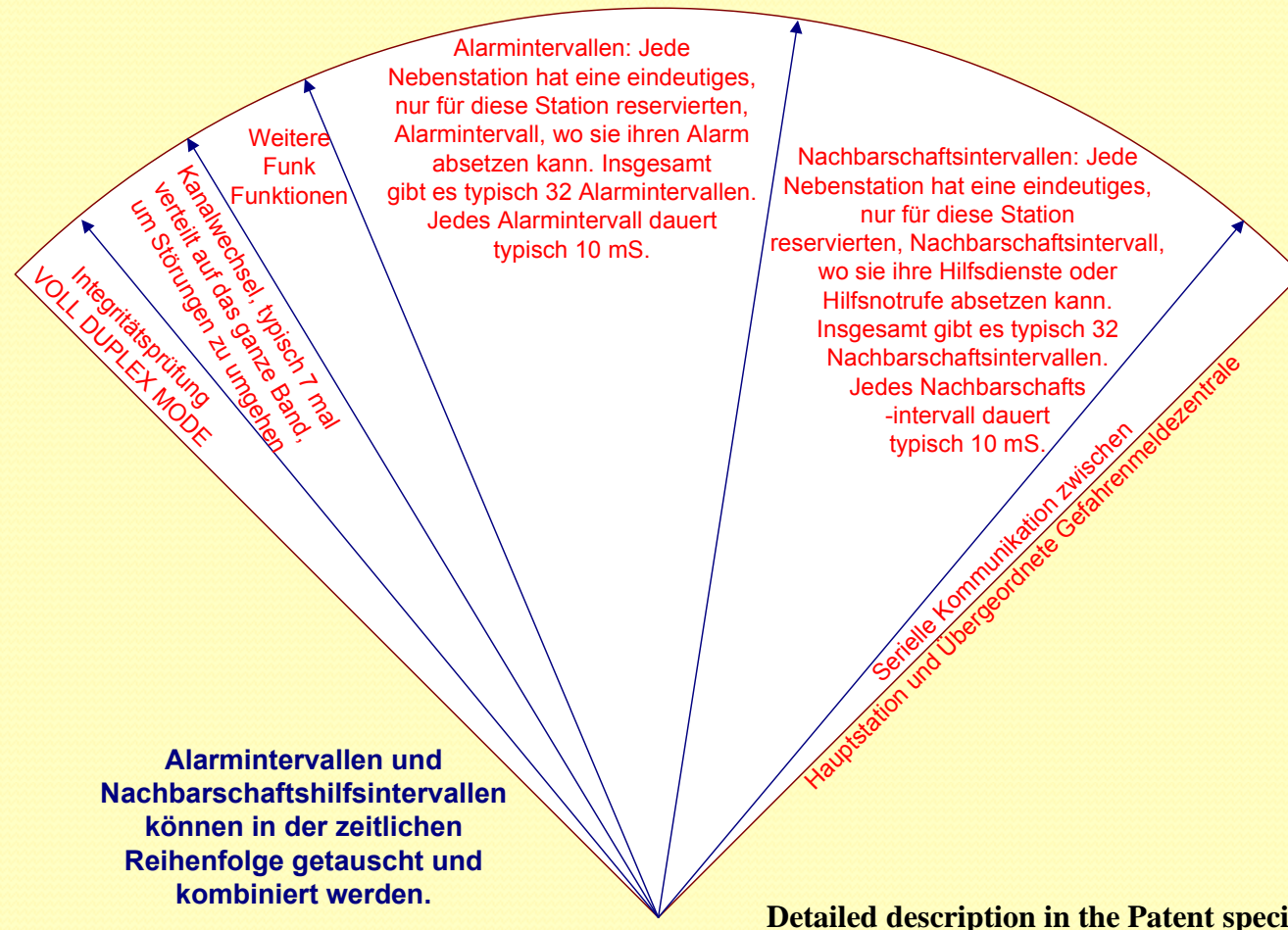
Channel 1 is a base channel. K2 to K7 are the alternative channels. Totally TATAWIN has 40 / 80 base Channels + (6 x 40/80) alternative channels.

Per Master one Base channel + 6 Alternative Channels

Detailed description in the patent specifications 3, 4 and 5

# Introduction

## TATAWIN = Radio and Network



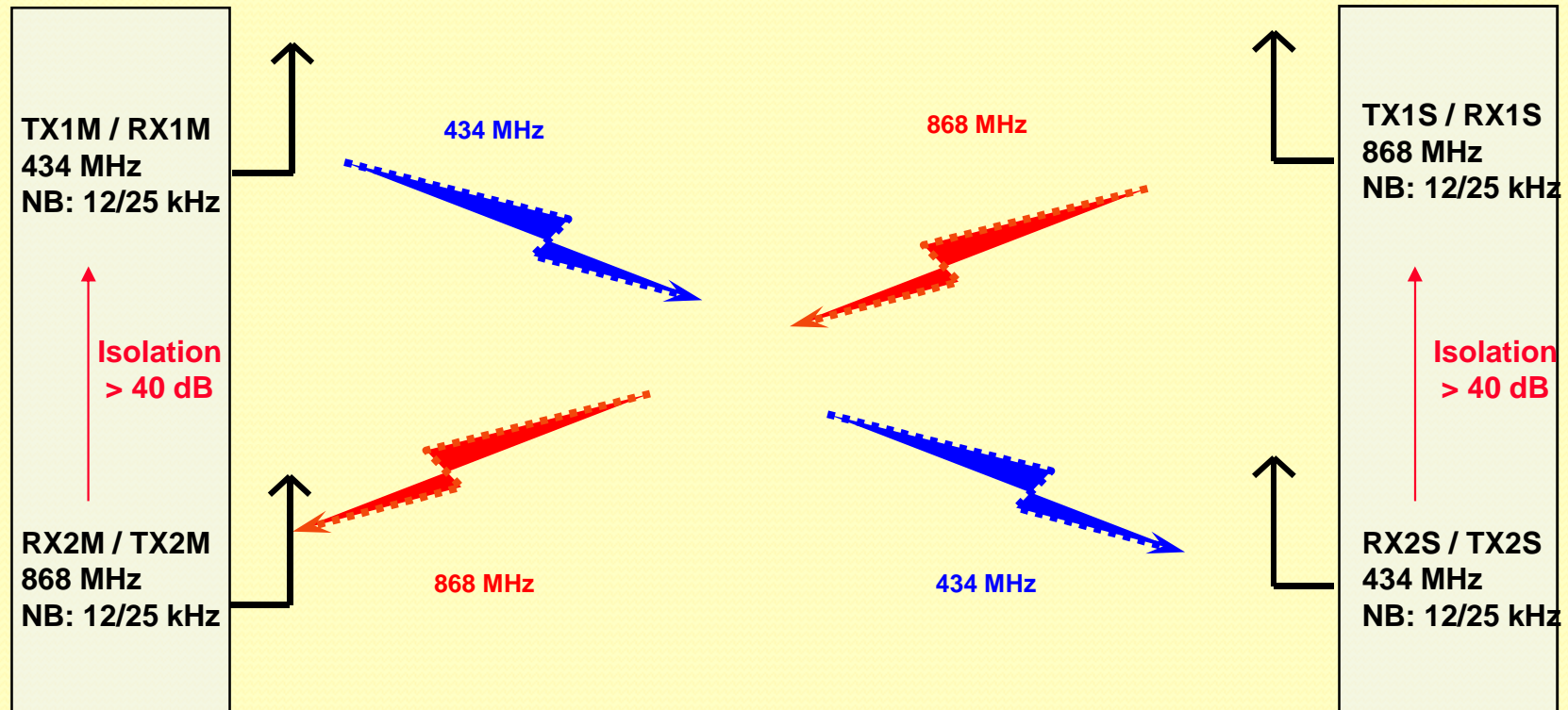
**Zeitablauf einer periodischen Zeiteinheit der Hauptstation, typisch eine Sekunde.**

# Introduction

## TATAWIN = Radio and Network FULL DUPLEX OPERATION

MAIN STATION/  
MASTER

SUBSTATION/  
SLAVE



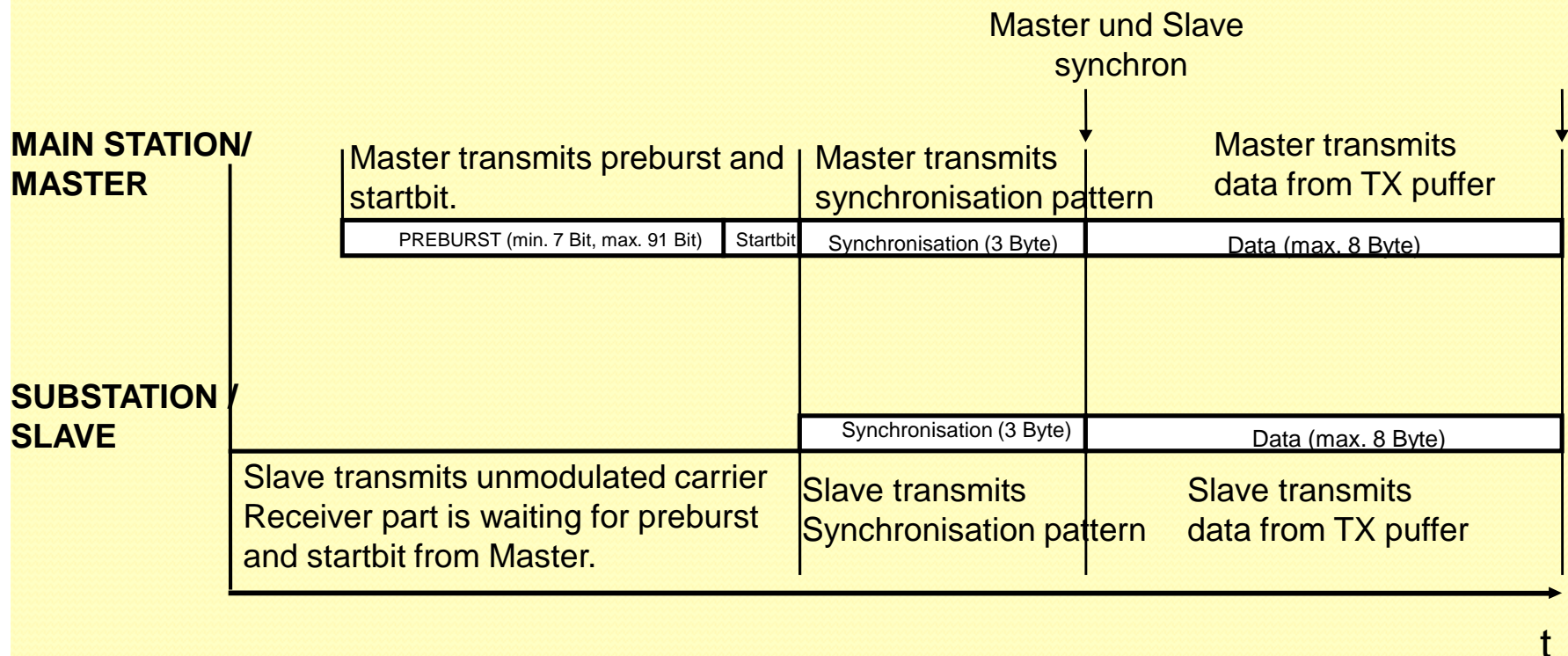
Detailed description of the advantages of the Full Duplex over handshaking in the Patent specification Nr. 3

# Introduction

## TATAWIN = Radio and Network

### FULL DUPLEX OPERATION

Synchronisation Timing Full-Duplex Mode:



Detailed description of the advantages of the Full Duplex over handshaking in the Patent specification Nr. 3

# Introduction

- TATAWIN/MIDOUN is already integrated in various sensors. Since 2008 in the aerospace industry and in the fire and intruder detection technology since 2009
- TATAWIN/MIDOUN provides 16 kROM for the pure sensor firmware and 1024 free EEPROM-Bytes for the pure sensor calibration and manufacturing data.
- TATAWIN/MIDOUN provides 11 digital inputs and outputs and 5 analog inputs, for all kinds of sensor applications.
- The precise analog battery voltage is passed regularly through TATAWIN/MIDOUN to the control unit. The control unit always knows about the battery level of all the detectors.
- TATAWIN/MIDOUN works not only as usual between -10 to 55 degrees, but also between -40 and +110 degrees (online temperature compensation + frequency correction)

## What are the advantages of TATAWIN/MIDOUN?

- TATAWIN is the first and so far, as at March 2010, still the only radio system for the industrial security fire alarm technology, which passed all over Europe the new EU standard CEN/TC72 / WG19/EN 54-25.
- TATAWIN is the only radio system for the fire detection technology that conforms to the Receiver Class 1: ETSI 300220, RECEIVER CLASS 1. There are big devices like spectrum analyzer and network analyser, that meet the demands of the RECEIVER CLASS 1, but so far there is no small radio module that can be integrated into a sensor. The receiver class 1 is the flagship of Munich Wireless Technology. This allows us to work with the aerospace and aircraft (aviation) industries. The receiver class 1 makes extreme high demands on the receiver.

# What are the advantages of TATAWIN/MIDOUN?

- New fields and applications of the security sensor networks: Sensitive containers, where the lading must be constantly monitored, in the military cargo planes and in the ships
- Assembly and installation of the sensors is now possible in buildings where you want to avoid building work (museums, historical buildings, etc.).
- Quick and easy installation in minutes. The cabling between the containers in the cargo area of the aircraft and the control unit near the cockpit previously took hours.
- Simple change in the detector position: Moving the wireless sensors from one container to another container in the airplane takes now minutes due to TATAWIN.
- Positioning of the detector exactly as the customer wishes and not by the laying possibilities of the cable.



# What are the advantages of TATAWIN/MIDOUN?

- TATAWIN/MIDOUN is unique due to the sensitivity **-125 dBm** and the noise immunity **30 V/m** in the working channel, i.e. in the same frequency channel. See the official report from the testing laboratory/ Notify Body under PATENTS & DOCS
- The range of TATAWIN/MIDOUN in the open field is more than 2400 or 3800 meters! This long range is very valuable for the easy and trouble-free installation of the radio system. If a radio system has a short range, serious problems automatically will arise and a "SPY TOOL" must be used over and over again to find out the cause of the problems. A robust system must work simply at all times. How would a mobile phone or a GPS / NAVI user react, if you were to tell him that he always needs a "SPY TOOL" to locate/identify the problems ? In a good and robust radio system the installer must be able to install it easily and blindfolded.

# Why is TATAWIN better than the competition?

- TATAWIN/MIDOUN is a double band system 433 and 863-870 or soon 863-873 MHz . It's hard to interfere such a radio system, if it is possible to hop from the disturber in the far away frequency.
- TATAWIN/MIDOUN is a FULL DUPLEX system. Due to the two integrated transceivers in each module that are active at the same time, TATAWIN solves with its FULL DUPLEX method, the well-known problems of the acknowledgment and mesh operation. **See patent specification 3 + 4 (PATENTS & DOCS).**
- TATAWIN has a new patented synchronization and registration mechanism. A new algorithm: **Patent specification 6 + 7**
- TATAWIN/MIDOUN has a sensitivity of -125 dBm including **ON BOARD NOISE** . The competition is far from this value. The best competitor achieves only **-103 dBm** with **ON BOARD NOISE** :! 19 dB difference equivalent to **6 times the range** (conservative calculation).

# Why is TATAWIN better than the competition?

- TATAWIN/MIDOUN has a variable and adjustable transmission power of up to +14 dBm depending on what is maximum allowed in each frequency channel based on the ETSI standard. The competition has a fixed constant transmission power of less than 5 mW (7 dBm).
- The receiver class 1 of TATAWIN/MIDOUN was certified by the **tougher and the older** ETSI-Norm EN 300 220-2 **V2.1.1** dated **04/2006**; test results: **Adjacent Channel Selectivity 62 dB** at a channel spacing of 25 or 12.5 kHz. Blocking at a distance of **+ /- 1 MHz: 89 dB** or **93 dB at + / - 5 MHz**. See the test report of laboratory test/Notify Body in PATENT & DOCS
- TATAWIN/MIDOUN can handle 32 alarms simultaneously that occur at the same  $\mu$ S. The collision resolution is much faster than what the new standard EN 54-25 required: **See patent specification 4: (PATENT & DOCS)**.

# Why is TATAWIN better than the competition?

- The competition has a range around 200 meters in the open field. TATAWIN has more than 2400 meters! Midoun achieves even 3800 meters in the open field. So it's no surprise that TATAWIN/MIDOUN reaches inside the buildings multiples of the range of the competition.
- The new pattern recognition mechanisms of TATAWIN/MIDOUN RF signal gives an important advantage in both the amplitude sequence and in the frequency sequence. Very weak TATAWIN signals, also at -125 dBm can be detected quickly and clearly, and above all not to be affected by the interference: **see patent specification 6** (PATENT & DOCS).
- Due to the low power consumption, provides TATAWIN/MIDOUN a long lifetime: 5 to 10 years depending on the sensor.
- The antennas of TATAWIN/MIDOUN have resonance at 433 MHz, and at 868 MHz. Using a patented process, the antenna matching is drawn online into the center of the antenna resonance curve, depending on the frequency (433 or 868) and the temperature (-40 ... +110 ° C).

# Why is TATAWIN better than the competition?

- A time **asynchronous** mesh system (the competition) has (as in the literature) known disadvantages (see. document 10.): It is already proved in the simulation that the required 10 seconds alarm response can not always be maintained under certain conditions/ circumstances/collision. The problems in the field were even greater: between 2003 and 2010 there were 4 Mesh systems on the BMT and EMT market (a system which had a double band). By 2011, all four systems were stopped!
- In collaboration with other suppliers MWT has developed and built a test system in order to test many different asynchronous radio systems according to the reaction time, the freedom from interference and the lifetime under real conditions. Conclusion of the long-term development for BMT / EMT and the aerospace technology: for demanding security sensor networks, such as BMT EN54-25, an **asynchronous** Mesh system can not always follow the fast alarm response time. Other problems include: frequent, almost regular interference as soon as the "router tree" changes and the very short lifetime of the sensor nodes that are closest to the control unit. To pass the EN54-25, it must be switched to the "POWER CHAIN" mode (chain mode), which the admission office forbids, because it contradicts the norm.
- A strict time-**synchronized** Mesh system is as well as TATAWIN/MIDOUN. TATAWIN is limited to a maximum of 4 neighbors, otherwise an alarm reaction of **two seconds** will not be guaranteed under all circumstances. The higher control panel claimed the remaining 8 or 6 seconds for itself for the further data processing.

# Why is TATAWIN better than the competition?

- For the first time, " TATAWIN/MIDOUN " gives the opportunity to prepare the installation of the radio cell in the factory and to put it into operation on site.
- With the help of the "sleep mode ", it is possible with TATAWIN/MIDOUN to install all the detectors completely on site. Accordingly the detectors are set into the sleep mode. The panel must not be on-site. It can be installed days or weeks later. This possibility seems to be favored specially for the new building : **see Patent specification 9.**
- TATAWIN/MIDOUN has a total of 40 or 80 basic channels. Thus a maximum of  $32 \times 80 = 2560$  wireless sensors can exist in direct neighborhood. The competition has a maximum of 16 basic channels. Overall, only  $16 \times 30 = 480$  sensors can exist in a factory. Numerous construction projects need more than 480 sensors. To use a base channel doubled in a building can have serious negative consequences according to previous experience.

# Why is TATAWIN better than the competition?

- TATAWIN/MIDOUN has a 12.5 or 25 kHz channel spacing and thus it is more narrow banded than the competition. In this way a full-duplex operation is possible both in two frequency bands (433 + 868 MHz) and also in the band (863-870/873 MHz).
- TATAWIN/MIDOUN offers a high installation reserve, which is clearly needed if the field environment changes and if the field between the gateway and the sensor attenuates: The reserve is composed of 27 dB net reserve + 10 dB Antenna diversity + 7 dB increase in the transmission power if required + at least 20 dB for the neighborhood support using one from 4 selected neighbors. No single competitor has such a high field reserve (only repealed when required or in extreme cases). No wonder that TATAWIN since 2009 in the field is much better than its competitors.
- A regular periodic field reserve (margin) check is automatically performed every 12 hours: The optimal transmission power, the ideal neighbors (currently 4 maximum) and the best antenna combinations, both in transmitting or receiving, are constantly optimized according to the field strength.

## Why is TATAWIN better than the competition?

- TATAWIN/MIDOUN can guarantee the transmission of the first alarm within two seconds due to the full-duplex operation, even with ten or 32 times collision: **See patent specification 3 + 4**
- The new patented method for the collision resolution of 32 alarm messages simultaneously (in the same  $\mu$  second exactly) is what makes TATAWIN/MIDOUN unique and is a novelty in the fire and intrusion alarm technology: **patent specification 4**
- Also what new is, when and how the neighboring sensors can provide support in an emergency case and what information they actually pass. **See patent specification 5: (PATENT & DOCS).**



# Why is TATAWIN better than the competition?

- TATAWIN/MIDOUN has the possibility to change the base channel as soon as it notices that the initially selected base channel is constantly disturbed and constantly had to be hopped on alternative channels, which would lead to higher power consumption and shorter lifetime. In the background the master searches using the dual receiver technology for a better undisturbed base channel and informs the participants at the right time: **Patent specification 7**. Such a procedure is necessary in order to respond to the disturber in a meaningful way specially with the today's massive increase of the wireless products. The competition does not have this method. It is naive to hope that the initially selected base channel remains free 5 to 10 years after the first registration.
- The registration of the brand new wireless sensors in the central unit runs on a given frequency channel (service channel). If this channel is disturbed, which occurs in practice, such a registration is not possible. The new patented process for the registration with TATAWIN/MIDOUN (**See Patent specification 7**) solves this problem. This new method prevents also the wrong registration of a wireless sensor in the wrong central unit.
- From 10,000 units a year, the TATAWIN/MIDOUN solution is not only the best qualitative solution on the market, but also the **lowest price compared to the competition**

## What are the advantages of TATAWIN/MIDOUN over cable

- **More robust:** the main problem of the wired sensor networks is the weak immunity to electromagnetic interference. The major industrial sensor network installations are public and industrial buildings where the number of sensors is more than 200. There, the length of the sensor wiring is sometimes couple of kilometers. The longer the cable, the greater are the EMC shortcomings.
- Considering that the EMC disturbance will multiply in the future and the cable length will increase even more through new sensors and sensor types, then the EMC shortcomings will evolve into a serious problem. The EMC interference have become even stronger, more diverse and more frequent. It is impossible to protect the wiring circuitry-wise against all known and unknown interferers. The best provision against EMC interference is to avoid it by hopping in the far away frequency and as often as possible. A cable cannot hop!! but TATAWIN/MIDOUN can: 7 times and in two different bands. In order to block TATAWIN/MIDOUN, the bands 868 (863 to 873 MHz) and 433 to 434.7 MHz must be completely reserved at the same time. In this case, the Master of TATAWIN/MIDOUN will inform the higher central unit: SABOTAGE ALARM. Additionally TATAWIN/MIDOUN has at least 30V/m noise immunity. The 30 V/m are valid also in the working channel: in the 868 or 433 MHz band.

## What are the advantages of TATAWIN/MIDOUN over cable

- **More flexible:** It is obvious that in terms of flexibility and any relocation options of the sensors, the wiring is inferior to the wireless solution. Especially TATAWIN offers the installers a free hand where they would like to place their new sensors because of its long range. A relocation of the sensors within a building is done without extra costs or construction work, and it takes maximum few minutes. Flexible and highly customizable buildings and thus flexible and simple installation will determine the future of the building technology. Rigidity, cabling and inflexibility will soon be a thing of the past also in the building technology.

## What are the advantages of TATAWIN/MIDOUN over cable

- **Lower in price:** If you want to upgrade an existing building with sensors, it is obvious that the construction work and any related costs will exceed the costs of the wireless solution.
- But if you want to equip a building from the beginning with sensors, so you would think that the cable solution is always the cheaper solution. This is certainly the case, if you install only 10,000 wireless sensors per year. But if you would give the radio solution the chance and you would like to install 200 or 300,000 wireless sensors per year, the conditions will be different. From 300,000 units costs TATAWIN/MIDOUN less than the cable solution.

## What are the advantages of TATAWIN/MIDOUN over cable

- **Environmentally-friendly!** Considering that today's cable installations per building consume several kilometers of copper cable. Thus the cable solution is not necessarily the best way to save the environmental and natural resources, without regard to the construction work. With a view to the fact that all the batteries for the wireless solution, without exception, must be recycled by law by the operator and that the lifetime in TATAWIN/MIDOUN is 5 to 10 years, depending on the sensor. Therefore the environmental balance by the radio solution is better than the cable.

# What does TATAWIN/MIDOUN have, what the competition does not?

## Summary

<b>FULL DUPLEX method: Fixes the disadvantages of acknowledgement and enables faster response times in case of collision and interference</b>	<b>A new routing method (patented) provides a faster and more reliable neighborhood support than the mesh system. The number of the routers is currently limited to 4, in order to guarantee in all circumstances 2 seconds alarm response time.</b>
<b>Receiver Class 1</b>	<b>Installation reserve 44 or 52 dB</b>
<b>Faster and interference-free registration and synchronization method(patented).</b>	<b>Lower power consumption and longer lifetime</b>
<b>Sensitivity:-125 dBm/10kBits</b>	<b>Free field range 2400/3800 Meter</b>
<b>7 dB more TX-Power: Adaptive.</b>	<b>Up to 1280 / 2560 radio sensors in direct neighborhood</b>
<b>Higher Antenna gains and better Antennena diversity/decoupling</b>	<b>Base channel including alternative channels are changed when it comes to permanent frequency interference.</b>
<b>-40 °C to +110 °C</b>	<b>For each sensor application there are 16 kROM, 1024 Byte EEPROM, 11 I/Os and 5 analoge inputs available.</b>
<b>Noise immunity 30 V/m even in the working channel(863-873&amp; 433MHz)</b>	<b>EN 54–25 first certified and unique system in EU</b>
<b>With the „Sleep mode“ method (patented), any installation can be prepared in the production and mounted on site.</b>	