3GPP TSG-RAN Meeting #81 **5G-ACIA-LS-2018-002**
Gold Coast, AU, 10-13 Sept 2018

Title: LS on Channel Model for Indoor Industrial Scenarios
Response to: -
Release: Release R16
Work Item: -

Source: 5G-ACIA ("5G Alliance for Connected Industries and Automation")

To: 3GPP RAN
Cc: -

Contact Persons: Dr. Andreas Mueller, 5G-ACIA Chair (Andreas.Mueller21@de.bosch.com)
Dr. Afif Osseiran, 5G-ACIA Deputy-Chair (Afif.Osseiran@ericsson.com)
Alexander Bentkus, 5G-ACIA Secretary (Bentkus@zvei.org)
Attachments: -

---

1. Overall Description:

Within the Channel Modelling work conducted for 5G, an indoor scenario was also considered and described in the TR 38.901. The industry initiative 5G-ACIA (www.5g-acia.org) has reviewed this TR and has identified the need to extent the scope for indoor scenarios. This extension shall cover indoor industrial facilities that differ significantly from office environments where use cases are executed requiring e.g. URLLC/eURLLC enhancements that are within the study scope of Rel-16.

Indoor Industrial Scenario:

The indoor industrial scenario description included in this paper stems from existing production facilities of discrete manufacturing companies. As there does not exist a standard unique facility environment a model scenario is presented that depicts typical sizes, topology, and environmental characteristics.
Typical for indoor industrial scenarios is:

- The space of 1 – 5 meters below the building's ceiling is occupied with metallic large objects (like cranes, cooling, supply-pipes, lighting, etc).
- The facilities can be considered to be built of concrete walls and ceiling, glass windows (if any) are considered to be metal-coated for heat and direct sunlight protection. Concrete columns are placed each 20-30 meter to support the ceiling. Additionally metal walls may be installed to separate (hazardous) domains from each other and floors may be covered with metallic chequer plates for slipping prevention.
- The facility's topology consists of a variety of areas such as
    - alleys (corridors), where the space up to a height of some 5-8 meters above ground must stay clear of any fixed mounted object (such as antennas) to give way for tugger trains, fork lifts, AGV, etc.
    - Objects in the alleys are metallic, moving slowly and of medium size (typical small to large fork lifts, tugger trains with 2-3 four-wheeled carriages)
    - Assembly lines, where the space up close to the ceiling is considered occupied with medium to small metallic objects that have moving parts (conveyer belts, robots, handlers, chassis, etc).
    - Production Area for discrete manufacturing, where the space up close to the ceiling is considered occupied with medium to small metallic objects. The area itself is structure with metallic fences as well as metallic blocking objects such as shelves, frames, pillars, etc.

- Warehouse/ storage, where the complete space up close to the ceiling is occupied with long narrow metallic shelves with gangways between them. Radio equipment may also not occupy gangways to allow access to the top-level of all shelves.
- Commissioning area, an open space for slow moving trains, fork lifts and AGVs and scarce small stationary metallic objects.
- Office space, consisting of gypsum plasterboard walls separating the offices/cubicles, coffee corners and conferencing spaces from the actual production area.

The below figure depicts such an indoor industrial scenario with a factory hall topology reflecting a large variety of production plants. This model resembles a hall of 180 m 80 m with a height of 25 m – no additional separating walls are included.
Depending on frequency bands (2 – 4 GHz or 24 – 30 GHz) and depending on concrete factory layouts only a few antennas may be deployed e.g. attached to walls/columns or a dense mesh of antennas (mmWave) may be attached to the ceiling or attached to the non-moving assembly line infrastructure.

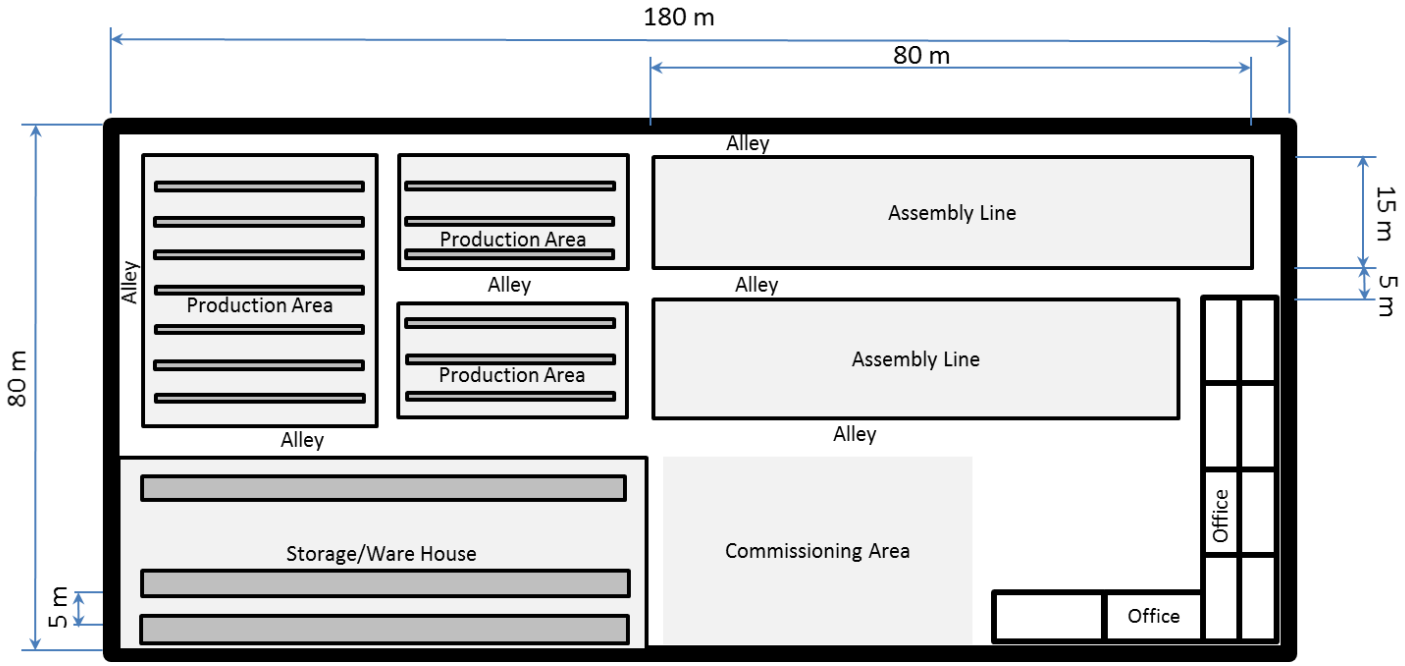

Figure 1: Indoor Industrial Scenario

<u>Spectrum Considerations</u>

5G-ACIA is interested in deployments in both the sub-6GHz and mmWave bands. Though the specific bands used for indoor industrial scenario can depend on national availability, the members of 5G-ACIA have identified the 3.4-3.8 GHz band as a good candidate for indoor industrial scenarios.

2. Actions:

To RAN Plenary group**.**

ACTION: 3GPP RAN is kindly asked to analyze and develop a Channel Model for the described industrial indoor scenarios.

3. Date of Next 5G-ACIA Plenary Meeting

October 8th-9th, 2018 Frankfurt/M Germany