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| Source: Document 5A/TEMP/88 | | **Annex 26 to Document 5A/298-E** | |
| **21 November 2016** | |
| **English only** | |
| Annex 26 to Working Party 5A Chairman’s Report | | | |
| WORKING DOCUMENT TOWARDS A PRELIMINARY DRAFT NEW REPORT ITU-R M.[AGGREGATE RLAN MEASUREMENTS] | | | |
| Use of aggregate RLAN measurements from airborne and terrestrial platforms to support studies under WRC-19 agenda item 1.16 | | | |

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# 1 Introduction

Agenda item 1.16 was put under the responsibility of ITU-R WP 5A. The following ITU-R Report introduces new airborne measurement methods and a methodology for comparing RLAN measurement results in both the 2.4 GHz and 5 GHz bands with RLAN aggregate interference modelling over a defined geographical area. The Report also includes the results of various airborne measurement campaigns looking at measurement of RLAN usage in the 2.4 GHz and 5 GHz bands in various parts of the world. Due to the lack of evidence being available, there has been a lot of debate on how aggregate interference from a mature rollout of WAS/RLAN would look like in the future to satellite and airborne platforms. This has led to a large range of results being predicted when looking at possible aggregate interference models to predict possible future RLAN usage across the 5 GHz range. This is due largely to the number of variables that can be introduced into the models to be studied which makes it is difficult to come to any conclusions for results of studies to an acceptable range of accuracy.

This report highlights one possible way forward to address this uncertainty by looking at the results of airborne measurements campaigns that attempt to compare actual RLAN use with the predicted results from the different models proposed for a defined geographical area.

# 2 Relevant ITU-R Recommendations and Reports

TBD

# 3 Background on models used to estimate aggregate RLAN interference

*[****Editor’s note****: To be developed by taking some information from the Report on technical characteristics and operational requirements of WAS/RLAN in the 5 GHz frequency range   
(ITU-R M.[RLAN REQ-PAR]).]*

# 4 Relationship between measurements and interference predicted based on models

## 4.1 Relationship between 2.4 GHz measurements and interference models

[Measurements carried out in the 2.4 GHz band can be used to provide a baseline to demonstrate what a mature RLAN rollout looks like in various parts of the world in either urban, suburban and/or rural environments; these results could also be extrapolated to give an estimate of what aggregate emissions may look like in the future with a mature rollout in the 5 GHz frequency range to airborne/satellite platforms.]

## 4.2 Relationship between 5 GHz measurements and interference models

Measurements carried out in the 5 GHz band can be used to provide a baseline to demonstrate what initial trends in RLAN rollout looks like in each of the current sub bands of the 5 GHz band: can be used to identify and estimate any trends and what their effect may be based on any different rules and restrictions we may place on RLANs in the future.

# 5 Comparing Airborne Measurements with the Theoretical Emissions Model

*[****Editor’s note****: To be developed using relevant parts of the content from UK documents contained in Annex A Appendix 1]*

## 5.1 Comparing 2.4 GHz Airborne Measurements with theoretical Emissions Models

### 5.1.1 Adapting the theoretical RLAN/satellite coexistence models for airborne measurements

### 5.1.2 Adapting the existing RLAN aggregate emissions models to accommodate 2.4 GHz airborne measurements

### 5.1.3 Estimating the measurement footprint using the antenna pattern and further calibration measurements

### 5.1.4 Comparison of the results of Wi-Fi emissions predicted by the model with those measured

## 5.2 Extrapolation of the 2.4 GHz measurements results and analysis to 5 GHz theoretical Emissions Models

*Editor’s note: To be developed using relevant parts of the content from UK documents contained in Annexes A and B Appendix 1*

## 5.3 Comparing 5 GHz Airborne Measurements with the Theoretical Emissions Model

*Editor’s note: To be developed using relevant parts of the content from UK documents contained in Annex B Appendix 2*

### 5.3.1 Adapting the theoretical RLAN / satellite coexistence model for airborne measurements

### 5.3.2 Adapting the existing RLAN aggregate emissions model (including various sub‑band estimated load) to accommodate 5 GHz airborne measurements

### 5.3.3 Estimating the measurement footprint using the antenna pattern and further calibration measurements

### 5.3.4 Comparison of the results of RLAN emissions predicted by the model with those measured, including sub-band analysis

# 6 Measurements and Preliminary Observations

TBD

## 6.1 2.4 GHz Measurement comparison results and Preliminary Observations

## 6.2 5 GHz Measurement comparison results and Preliminary Observations

Annex 1

2.4 GHz Measurement Campaigns

*Editor’s note: current elements in this annex were not discussed at May 2016 WP 5A meeting and should not be considered as agreed WP 5A elements.*

In this Annex we document various measurements carried out of aggregate WiFi emissions in the 2.4 GHz band as seen from an airborne platform. The measurements were carried out for the 2.4 GHz band in order to provide a baseline for future analysis under WRC-19 agenda item 1.16 studies to demonstrate: what we think a mature RLAN rollout looks like; what aggregate emissions may look like in the future with a mature rollout in the 5 GHz frequency range to airborne/satellite platforms. Further measurement campaigns are encouraged so ITU-R could add to the data needed to refine the comparison process. Such data would also provide an avenue to gain more confidence and some agreement on an appropriate model to be used for studies looking at aggregate interference from WAS/RLAN.

Appendix 1 – UK 2.4 GHz Measurement Report



Annex 2

5 GHz Measurement Campaigns

*Editor’s note: current elements in this annex were not discussed at May 2016 WP 5A meeting and should not be considered as agreed WP 5A elements.*

In this Annex we document various measurements carried out of aggregate WiFi emissions in the 5 GHz band as seen from an airborne platform. The measurements were carried out for the 5 GHz band in order to provide a baseline for future analysis under WRC-19 agenda item 1.16 studies to demonstrate: what we think initial trends in each of the 5 GHz sub-bands look like; what the current aggregate emissions look like in the in the 5 GHz frequency range to airborne/satellite platforms; how these trends may be able to guide future decisions on regulations and restrictions on 5 GHz RLANs. Further measurement campaigns are encouraged so ITU-R could add to the data needed to refine the comparison process. Such data would also provide an avenue to gain more confidence and some agreement on an appropriate model to be used for studies looking at aggregate interference from WAS/RLAN.

Appendix 1 – UK 5 GHz measurement Report

