



Reconfigurable Radio Systems (RRS); Use Cases for Operation in White Space Frequency Bands

(<https://standards.iteh.ai>)

Document Preview

[ETSI TR 102 907 V1.1.1 \(2011-10\)](https://standards.iteh.ai/catalog/standards/etsi/11b918ab-9b19-4bfd-83f4-ad99cf5123b0/etsi-tr-102-907-v1-1-1-2011-10)

<https://standards.iteh.ai/catalog/standards/etsi/11b918ab-9b19-4bfd-83f4-ad99cf5123b0/etsi-tr-102-907-v1-1-1-2011-10>

ReferenceDTR/RRS-01004

Keywords

radio, use case, white space

ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

(<https://standards.iteh.ai>)
Document Preview

Important notice

Individual copies of the present document can be downloaded from:

<http://www.etsi.org>

The present document may be made available in more than one electronic version or in print. In any case of existing or perceived difference in contents between such versions, the reference version is the Portable Document Format (PDF). In case of dispute, the reference shall be the printing on ETSI printers of the PDF version kept on a specific network drive within ETSI Secretariat.

Users of the present document should be aware that the document may be subject to revision or change of status. Information on the current status of this and other ETSI documents is available at

<http://portal.etsi.org/tb/status/status.asp>

If you find errors in the present document, please send your comment to one of the following services:

http://portal.etsi.org/chaicor/ETSI_support.asp

Copyright Notification

No part may be reproduced except as authorized by written permission.
The copyright and the foregoing restriction extend to reproduction in all media.

© European Telecommunications Standards Institute 2011.
All rights reserved.

DECT™, **PLUGTESTS™**, **UMTS™** and the ETSI logo are Trade Marks of ETSI registered for the benefit of its Members.
3GPP™ and **LTE™** are Trade Marks of ETSI registered for the benefit of its Members and
of the 3GPP Organizational Partners.
GSM® and the GSM logo are Trade Marks registered and owned by the GSM Association.

Contents

Intellectual Property Rights	5
Foreword.....	5
Introduction	5
1 Scope	6
2 References	6
2.1 Normative references	6
2.2 Informative references.....	6
3 Definitions and abbreviations.....	7
3.1 Definitions.....	7
3.2 Abbreviations	7
4 Motivation, goals.....	9
5 Use Cases	9
5.1 Overview	9
5.2 Mid-/long range wireless access over white space frequency bands.....	10
5.2.1 General Use Case Description	10
5.2.2 Stakeholders.....	12
5.2.3 Scenarios.....	13
5.2.3.1 Mid-/long range, no mobility	13
5.2.3.2 Mid-/long range, low mobility	13
5.2.3.3 Mid-/long range, high mobility	14
5.2.4 Information Flow	14
5.2.4.1 Spectrum allocation when base station powers on	16
5.2.4.2 Incumbent protection (Switch from TVWS frequency band to licensed TD-LTE frequency band or candidate TVWS frequency band).....	17
5.2.4.3 Radio Resource Optimization (Switch from licensed TD-LTE frequency band to TVWS frequency band).....	18
5.2.5 Derived potential System Requirements.....	19
5.3 Short range wireless access over white space frequency bands	20
5.3.1 General Use Case Description	20
5.3.2 Stakeholders.....	21
5.3.3 Scenarios.....	21
5.3.3.1 Networks without coexistence management	21
5.3.3.2 Networks with distributed coexistence management	21
5.3.3.3 Networks with centralized coexistence management.....	22
5.3.3.4 Hybrid of networks with distributed and centralized coexistence management	23
5.3.4 Information Flow	24
5.3.5 Derived potential System Requirements.....	28
5.4 Ad-hoc networking over white space frequency bands	29
5.4.1 General Use Case Description	29
5.4.2 Stakeholders.....	29
5.4.3 Scenarios.....	30
5.4.3.1 Device-to-device connectivity.....	30
5.4.3.2 Ad-hoc networking.....	30
5.4.3.3 Infrastructure supported ad-hoc networking	31
5.4.4 Information Flow	31
5.4.5 Derived potential System Requirements.....	31
5.5 Combined Ad-hoc networking and wireless access over white space frequency bands.....	32
5.5.1 General Use Case Description	32
5.5.2 Stakeholders.....	33
5.5.3 Scenarios.....	33
5.5.3.1 Expanding the coverage of the infrastructure.....	34
5.5.3.2 Resolving cases of congested access to the infrastructure	34
5.5.3.3 Direct device-to-device links in TVWS managed by access points or femto cells	34

5.5.4	Information Flow	34
5.5.5	Derived potential System Requirements	36
5.6	Sporadic use of TV white space frequency bands	36
5.6.1	General Use Case Description	36
5.6.2	Stakeholders	37
5.6.3	Scenario Case Description	37
5.6.3.1	Lighter infrastructure deployment through larger cell sizes	37
5.6.3.2	Increased spectral efficiency through reduced propagation loss	38
5.6.3.3	Increased spectral efficiency through extended macro diversity	39
5.6.3.4	TVWS Band-Switch in case that incumbent user re-enters	39
5.6.3.5	Carrier Aggregation between IMT bands and TV WS band	40
5.6.4	Information Flow	42
5.6.4.1	Adding a New RAT Component Carrier into UHF TVWS Band	42
5.6.4.2	UHF TVWS Band Component Carrier Reconfiguration	43
5.6.4.3	Incumbent protection	44
5.6.5	Derived potential system requirements	45
5.7	Backhaul link using TV white space frequency bands	45
5.7.1	General Use Case Description	45
5.7.2	Stakeholders	46
5.7.3	Scenarios	46
5.7.3.1	Relay node backhaul link	46
5.7.4	Information Flow	47
5.7.4.1	Information Flow for Backhaul Link Initial Work Procedure	47
5.7.4.2	Information Flow for Incumbent Protection on Backhaul Link	48
5.7.5	Derived potential System Requirements	49
5.8	MBMS operating in TV white space frequency bands	49
5.8.1	General Use Case Description	49
5.8.2	Stakeholders	49
5.8.3	Scenarios	50
5.8.3.1	LTE MBMS in TV white space frequency bands	50
5.8.4	Information Flow	51
6	Potential System Requirements	52
7	Technical challenges	54
7.1	Coexistence	55
7.2	The role of sensing	55
7.3	Challenges derived from TVWS propagation characteristics	56
7.4	Challenges in regard to co-existence with RF Cable Systems	56
Annex A:	Summary of current regulatory status	57
A.1	FCC regulation on White Space in the UHF TV bands	57
A.2	Current activities in CEPT on White Space Usage in the UHF TV bands	57
Annex B:	Using white space frequency bands through temporary exclusive access rights	59
B.1	Concept of temporary exclusive access rights	59
B.2	Information Flow	60
History		62

Intellectual Property Rights

IPRs essential or potentially essential to the present document may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: *"Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards"*, which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (<http://ipr.etsi.org>).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

Foreword

This Technical Report (TR) has been produced by ETSI Technical Committee Reconfigurable Radio Systems (RRS).

Introduction

The present document describes how radio networks can operate, on a secondary basis, in frequency bands assigned/licensed to one (or several) incumbent user(s).

iTeh Standards
(<https://standards.iteh.ai>)
Document Preview

[ETSI TR 102 907 V1.1.1 \(2011-10\)](https://standards.iteh.ai/catalog/standards/etsi/11b918ab-9b19-4bfd-83f4-ad99cf5123b0/etsi-tr-102-907-v1-1-1-2011-10)

<https://standards.iteh.ai/catalog/standards/etsi/11b918ab-9b19-4bfd-83f4-ad99cf5123b0/etsi-tr-102-907-v1-1-1-2011-10>

1 Scope

The present document describes Use Cases for the Operation of Reconfigurable Radio Systems within White Spaces in the UHF 470 MHz to 790 MHz frequency band and gives an overview on methods for protecting the primary/incumbent users like TV broadcasts and wireless microphones.

2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the reference document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at <http://docbox.etsi.org/Reference>.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

2.1 Normative references

The following referenced documents are necessary for the application of the present document.

Not applicable.

2.2 Informative references

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

- [i.1] CEPT Report 24: "A preliminary assessment of the feasibility of fitting new/future applications/services into non-harmonised spectrum of the digital dividend (namely the so-called 'white spaces' between allotments)", July 2008.
 - [i.2] CEPT ECC Report 159: "Technical and operational requirements for the possible operation of cognitive radio systems in the 'White spaces' of the frequency band 470-790 MHz", January 2011.
 - [i.3] FCC Report 10-174: "Second memorandum opinion and order - in the matter of unlicensed operation in the TV Broadcast bands - additional spectrum for unlicensed devices below 900 MHz and in the 3 GHz band", 23. Sept. 2010.
 - [i.4] FCC Erratum: "Corrections to FCC Report 10-174", DOC-302279A1, 19. Oct. 2010.
- NOTE: See http://www.fcc.gov/Daily_Releases/Daily_Business/2010/db1019/DOC-302279A1.pdf.
- [i.5] "Implementing Geolocation", Ofcom UK, 9. Nov. 2010.
- NOTE: See <http://stakeholders.ofcom.org.uk/consultations/geolocation/>.
- [i.6] "Combination of Centralized & Decentralized Database and Terminal-based Spectrum Sensing for Secondary Spectrum Access, Markus Mueck, Marco Di Renzo, Mérouane Debbah and Tobias Renk", IEEE International Conference on Wireless Information Technology and Systems (ICWITS), Hawaii, USA, 2010.
 - [i.7] "Opportunistic relaying for Cognitive Radio enhanced cellular networks: Infrastructure and initial results", Mueck, Markus Dominik; Di Renzo, Marco; Debbah, Merouane; Wireless Pervasive Computing (ISWPC), 2010 5th IEEE International Symposium on, 2010, Page(s): 556 - 561.
 - [i.8] IEEE 802: "Standard for Local and Metropolitan Area Networks: overview and architecture".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

cognitive Radio: radio, which has the following capabilities:

- to obtain the knowledge of radio operational environment and established policies and to monitor usage patterns and users' needs;
- to dynamically and autonomously adjust its operational parameters and protocols according to this knowledge in order to achieve predefined objectives, e.g. more efficient utilization of spectrum; and
- to learn from the results of its actions in order to further improve its performance.

incumbent radio service: radio service authorized for operation on a given frequency band with a regulatory priority

NOTE: In the frequency band 470 MHz to 790 MHz, the following radio services are considered as incumbent radio services:

- Terrestrial Broadcasting Service (BS) including DVB-T in particular.
- Program Making and Special Event (PMSE) services including radio microphones in particular.
- Radio Astronomy Service (RAS) in the 608 MHz to 614 MHz band.
- Aeronautical Radio Navigation Service (ARNS) in the 645 MHz to 790 MHz band.

radio System: system capable to communicate some user information by using electromagnetic waves

NOTE: Radio system is typically designed to use certain radio frequency band(s) and it includes agreed schemes for multiple access, modulation, channel and data coding as well as control protocols for all radio layers needed to maintain user data links between adjacent radio devices.

reconfigurable radio systems: generic term for radio systems encompassing Software Defined and/or Cognitive Radio Systems

use case: description of a system's behaviour as it responds to a request that originates from outside of that system

NOTE: In other words, a use case describes "who" can do "what" with the system in question. The use case technique is used to capture a system's behavioural requirements by detailing scenario-driven threads through the functional requirements.

White Space (WS): part of the spectrum, which is available for a radiocommunication application (service, system) at a given time in a given geographical area on a non-interfering/nonprotected basis with regard to primary services and other services with a higher priority on a national basis.

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

3GPP	3 rd Generation Partnership Project
AP	Access Point
ARNS	Aeronautical Radio Navigation Service
BCCH	Broadcast Control Channel
BS	Base Station
BS	Broadcasting Service
CA	Carrier Aggregation
CAPEX	Capital expenditures
CC	Component Carrier
CCC	Cognitive Control Channel