

3GPP2 S.R0143-0

Version 1.0

Version Date: September 2010



3RD GENERATION
PARTNERSHIP
PROJECT 2
"3GPP2"

System Requirements for Extended Cell HRPD (xHRPD)

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6 **REVISION HISTORY**

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REVISION HISTORY		
Ver. 1.0	<i>Publication Draft</i>	<i>13 September, 2010</i>

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FOREWORD

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This standard was prepared by Technical Specification Group S of the Third Generation Partnership Project 2 (3GPP2).

REFERENCES

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Normative References

The following specification contains provisions which, through reference in this text, constitute provisions of this specification. At the time of publication, the edition indicated was valid. If the specification version number is included, the reference is specific. Parties implementing this specification should use the specific version of the indicated specification. If the specification version number is not included, the reference is non-specific. Parties implementing this specification are encouraged to investigate the possibility of applying the most recent edition of the indicated specification.

- [1] *Rec. ITU-R M.1034-1 Requirements For The Radio Interface(s) For International Mobile Telecommunications-2000 (Imt-2000)*

Informative References

The following documents do not contain provisions of the specification. They are listed to aid in better understanding this specification.

- [2] *3GPP2 C.S0024-B cdma2000 High Rate Packet Data Air Interface Specification*
- [3] *3GPP2 C.S0063 cdma2000 High Rate Packet Data Supplemental Services*

1 1 INTRODUCTION

2 As compared to a HRPD cell, an extended cell is characterized by
 3 increased radio path loss between the base station and a user terminal,
 4 increased radio path delay between the base station and a user terminal,
 5 a larger geographical cell coverage area and highly overlapping coverage
 6 with another extended cell. Extended cell HRPD (or xHRPD) is considered
 7 as an enhancement to the HRPD standards [2] and [3].

8 An example of xHRPD application is serving as a component of integrated
 9 satellite terrestrial network. The terrestrial network component (e.g., a
 10 HRPD cellular network) provides economical and high quality services to
 11 areas of high user densities yet its coverage area is geographically
 12 limited. On the other hand, the satellite network component, using
 13 xHRPD, provides a much broader coverage area and can be used to
 14 complement the limited coverage offered by the terrestrial network. This
 15 integrated system can provide “anywhere” and “anytime” type of coverage
 16 and allows handsets and data cards with the same form factor as the
 17 current commercial (cellular) devices to operate in either satellite or
 18 terrestrial mode. Another potential application of xHRPD is to provide
 19 access to telemetry devices located in remote areas.

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21 2 DEFINITIONS AND ABBREVIATIONS

22 The terms and abbreviations which are used within this specification are
 23 defined as follows:

24

ARQ	Automatic Repeat Request
EIRP	Effective Isotropic Radiated Power
EVRC	Enhanced Variable Rate Codec
G/T	Ratio of antenna gain over equivalent system noise temperature
HRPD	High Rate Packet Data
MAC	Medium Access Control
Round Trip Delay	Twice the propagation delay from the user terminal to the base station plus the processing delay
SMS	Short Message Service
VoIP	Voice over IP
xHRPD	Extended Cell High Rate Packet Data

1 3 GENERAL FEATURE DESCRIPTION

2 xHRPD extends the application of HRPD to extended cell environments,
3 which are characterized by large path loss, possibly long path delay and
4 large cell size. xHRPD can provide additional low bit-rate voice and data
5 services in such environments to different user terminals, including
6 handsets and data cards with form factor comparable to current mass-
7 market commercial devices. The design objective of xHRPD is to extract
8 all possible radio link margins to allow closing the link over such an
9 extended cell with as few changes as possible to HRPD, such that
10 incremental device and radio network complexity to support the
11 operation in extended cell environments is minimized. The reverse link
12 typically limits the range of xHRPD due to handset power constraints.

13 xHRPD also needs to adapt to long path delay. For example, for
14 geostationary satellite communication system the round trip delay is in
15 the order of 500 milliseconds. This requires re-visiting some of the MAC
16 protocols as well as the power and rate control schemes of HRPD. For
17 example, the xHRPD precludes the application of hybrid ARQ feature of
18 HRPD to the extended cell systems. The next section elaborates the key
19 requirements for xHRPD.

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1 **4 DETAILED REQUIREMENTS**

2 **4.1 System Requirements**

3 xHRPD-SYS-01: xHRPD system shall be able to operate in limited link budget
4 environments.

5 One example of such environments is characterized by 170 dB
6 combined path loss and base station receiver sensitivity
7 performance (G/T) in the reverse link, assuming a typical user
8 terminal with 23 dBm EIRP. Other operation environments
9 shall also be supported as far as the combination of terminal
10 EIRP, path loss and base station receiver sensitivity in link
11 budget is comparable. The example link budget does not
12 mandate user terminal power of 23 dBm. Lower power devices
13 can be supported within the stated link budget constraints.

14 xHRPD-SYS-02: xHRPD system shall support operation in long path delay
15 environments with a round trip delay of up to 600 ms.

16 xHRPD-SYS-03: xHRPD system shall support voice call with inherent delays
17 associated with large radio propagation time. Existing speech
18 codec (EVRC-B family of vocoders and transcoding capability)
19 should be reused with as little modification as possible.

20 xHRPD-SYS-04: xHRPD system shall support SMS.

21 xHRPD-SYS-05: xHRPD system shall support packet data services.

22 xHRPD-SYS-06: xHRPD system should support position location services.

23 xHRPD-SYS-07: xHRPD system should support other 3GPP2 services such as
24 broadcast and multicast when the data rates required by these
25 services are supported by over the air link condition.

26 xHRPD-SYS-08: Changes to the HRPD air interface should be minimized.

27 xHRPD-SYS-09: Changes to the Access Network (HRPD protocols) should be
28 minimized and any changes to the and Core Network should be
29 avoided.

30

31 **4.2 Radio Requirements**

32 xHRPD-RAD-01: Support of lower data rate set than HRPD rate set should be
33 considered, so that the system can operate within the extended
34 cell link budget constraints.

35 xHRPD-RAD-02: xHRPD system should minimize intra-cell interference.

36 xHRPD-RAD-03: xHRPD system should maximize transmission efficiency for
37 small packets.

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1 **4.3 Mobility Requirements**

2 xHRPD-MOB-01: xHRPD system shall support all vehicular speeds as
3 specified in ITU-R IMT-2000 requirements[1].

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