System Requirements for Extended Cell HRPD (xHRPD)
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Revision History

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FOREWORD

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

Normative References
The following specification contains provisions which, through reference in this
text, constitute provisions of this specification. At the time of publication, the
duration 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

Services
1 INTRODUCTION

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

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

2 DEFINITIONS AND ABBREVIATIONS

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

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
3  GENERAL FEATURE DESCRIPTION

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

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

4.1 System Requirements

xHRPD-SYS-01: xHRPD system shall be able to operate in limited link budget environments.
One example of such environments is characterized by 170 dB combined path loss and base station receiver sensitivity performance (G/T) in the reverse link, assuming a typical user terminal with 23 dBm EIRP. Other operation environments shall also be supported as far as the combination of terminal EIRP, path loss and base station receiver sensitivity in link budget is comparable. The example link budget does not mandate user terminal power of 23 dBm. Lower power devices can be supported within the stated link budget constraints.

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

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

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

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

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

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

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

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

4.2 Radio Requirements

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

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

xHRPD-RAD-03: xHRPD system should maximize transmission efficiency for small packets.
4.3 Mobility Requirements

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