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Foreword

This Technical Specification (TS) is elaborated to define the new PHS frequency band allocation extending from 1880 MHz to 1930 MHz in place of the original PHS band (1895 – 1918.1 MHz), in order to cover most TDD bands allocated especially in European and Latin American countries where they need for TDD access based on PHS systems.

1. Scope

This document is a standard regulating the minimum required functions and parameters necessary for implementation and test of PHS systems operated in the band of 1880 –1930 MHz.

The purpose of this document is to define the new PHS frequency band and to provide technical requirements which will be the basis for making specifications and related tests for PHS operators as a part of the PHS MoU Specifications.

2. Brief Guide to PHS Services and Applications

PHS is a wireless access system based on digital micro-cell technology operating in the 1.9 GHz frequency band. It provides high capacity with good voice quality and a broad range of data transmission including ISDN services. PHS systems are easily implemented in the short term and at low cost, covering high-density to low-density areas. It is also equipped with dynamic channel assignment that allows coexistence of public and private PHS systems in the same area and same frequency band without any frequency re-arrangement.

The standards for the PHS Common Air Interface were established by the Association of Radio Industries and Businesses (ARIB) as RCR STD-28. Other standards for the PHS Public Cell Station to Network and Network to Network Interfaces were formulated by the Telecommunication Technology Committee (TTC) based on ITU-T Recommendations, while the end-to-end multimedia protocol was standardized as the PHS Internet Access Forum Standard (PIAFS). These standards are to be applied in Japan.

To deploy PHS services commonly throughout the world, the PHS MoU

Group has been elaborating PHS MoU Technical Specifications (PHS MoU TSs) which are based on the above mentioned standards and global standards such as ITU-T Recommendations.

Due to its well designed system structure, the PHS system can be deployed in several fields of public (mobile and fixed) and private communication services as follows:

(1) Mobile Public Digital Telephony

PHS provides mobile public and personal communication services with low mobility by using a micro-cell architecture ranging from 200 m to 400 m in radius depending on the transmitted power and environment. It efficiently covers urban, suburban and indoor areas such as public halls, department stores, theaters, subway stations etc.

PHS uses 32 kbps ADPCM for voice coding, TDMA/TDD for multiple access and a transmission rate of 384 kbps. It is able to support high speed data transmission and is robust against delay spread due to multi-path interference in urban areas and in mobile environments.

(2) Wireless Local Loop (WLL)

WLL is a generic term for a radio access network connecting a local exchange and its subscribers instead of using conventional copper cable. This type of access is also known as FWA (Fixed Wireless Access). WLL has several advantages such as a flexible network plan, quick deployment of telephone networks, low system cost, easy maintenance, and cordless telephones in a limited range of cells.

With these features and considering open standards technologies, there are mainly two kinds of WLL applications, namely those based on micro-cell technology (PHS, DECT) and those based on cellular technology (GSM, TDMA IS-136, and CDMA IS-95). As WLL is used for fixed access networks, it should satisfy several requirements, such as data/ISDN services allowing access to the Internet and G3 fax with good quality. PHS WLL systems can meet these essential requirements.

PHS based WLL systems can cover different density areas with many base stations from urban to rural areas and, if necessary, employ entrance transmission lines between local exchange/control stations and base stations.

(3) Wireless PBX

PHS-based wireless PBX systems provide convenient mobile wireless extension at any place such as inside an office building. It also allows relocation of offices without moving the telephones in the business environment. The systems offer sufficient circuit quality and capacity for computer communication and G3 fax.

(4) Home Digital Cordless Telephone

A PHS terminal can be used outside as a public telephone or inside as a home digital cordless telephone. If necessary, it can also be used in the office as a PBX terminal. For these features, a subscriber can keep only one telephone handset by using address memories in common.

The PHS digital cordless telephone is made highly secure from illegal use and wire-tapping by means of the latest digital technology.

As mentioned before, the PHS technology is well designed and has several advantages in various fields of applications. Recently, many countries have taken advantage of PHS systems to expand subscribes lines.

The Technical Working Group under the PHS MoU Group has amended the Technical Specifications to extend the PHS frequency band down to 1880 MHz and up to 1930 MHz for the sake of countries where the original PHS frequency band is not available, such as European and Latin American countries. They will be able to enjoy the PHS services and applications based on the PHS MoU Technical Specifications and this Technical Specification.

3. Technical Requirements

This part clarifies the minimum requirements of functions and parameters necessary as reference for operators' specifications and equipment tests on PHS systems operated in the new frequency band 1880-1930MHz.

3.1 Carrier Numbers and Carrier Positions

Carrier numbers and carrier positions in the new PHS frequency band are given in Annex A.

3.2 General requirements

A summary of the minimum technical requirements of Functions & Parameters is given in Table 1.

Table 1. Required Functions and Parameters

Parameter	Characteristic/Value
Modulation method	π/4 shift QPSK Transmission side filter
Transmission rate	384 Kbps
Frame length	5 ms
Packet length	625μs
Bit length	2.6μs
Transmission rate accuracy	<±5 ppm
Transmission timing	±5.6μs (±1 symbol)
Transmission jitter	±0.7μs (±1/8 symbol)
Frequency stability	<±3 ppm (±5.75 kHz)
Transmission power (peak)	Private: 80 mW, Public: 4000 mW
Modulation accuracy	<12.5 %
Adjacent channel power (modulation)	Standardized at transient
Adjacent channel power (transient)	2×Δf (600kHz offset): <0.8μW 3×Δf (900kHz offset): <0.25μW
Allowed value for occupied bandwidth	288 kHz
Inter-modulation	Not standardized
Transmission spurious	Within band: <250 nW Outside of band: <2.5μW
Carrier off time leakage power	<80 nW
Cabinet radiation	<2.5μW
Antenna gain	Private : <2.14 dBi (Cabinet built in) Public : <10 dBi

The above technical requirements are based on the PHS MoU specifications.

Annex A:

Extension of PHS Frequency Band

1. General

Public benefits would be significant if PHS services would be distributed equally to most countries in the world. However, frequency allocations are generally different between countries. The present PHS MoU Technical Specifications have been elaborated based on the ARIB Standard, RCR STD-28, that prescribes the PHS air interface in the frequency band of 1895 to 1918.1 MHz. In view of this, this document describes a proposed extension of the PHS frequency band as PHS MoU Technical Specification to cover most of the allocated TDD bands in the world, especially European and Latin American countries.

2. Proposed Extension of PHS Frequency Band

Considering the allocated TDD bands as shown in section 3, the PHS MoU Group has decided to extend the frequency band down to 1880 MHz and up to 1930 MHz from the original PHS band of 1895 to 1918.1 MHz. The extended PHS band can accommodate 166 carriers within 50 MHz band width.

The carrier numbers and their center frequencies (Fc) in the extended PHS band are given by:

(1) For 1895 – 1930 MHz

$Fc = Fo - 0.15 + 0.3N$

Where, N = 1, 2, 3, . . to 116 (N : Carrier numbers)

$Fo = 1895$ MHz

(2) For 1880 – 1895 MHz

$Fc = Fo - 76.65 + 0.3N$

Where, N = 206 to 255 (N : Carrier numbers)

$Fo = 1895$ MHz

The carrier numbers and the center frequencies are shown in Table 1.

3. Example of Frequency Bands allocated for TDMA-TDD

The TDMA/TDD bands are regulated differently by countries as follows:

1880 - 1900 MHz : Most of European countries and Australia
1895 - 1918 MHz : Japan (the original PHS band) and many Asian countries
1900 - 1920 MHz : China
1910 - 1930 MHz : Most North and South American countries

Also, some other countries are studying the frequency allocation for this kind of applications.

Table 1. PHS Carrier Numbers and Center Frequencies

Carrier Numbers	Carrier Frequency [MHz]	Carrier Numbers	Carrier Frequency [MHz]	Carrier Numbers	Carrier Frequency [MHz]
206	1880.15	7	1896.95	63	1913.75
207	1880.45	8	1897.25	64	1914.05
208	1880.75	9	1897.55	65	1914.35
209	1881.05	10	1897.85	66	1914.65
210	1881.35	11	1898.15	67	1914.95
211	1881.65	12	1898.45	68	1915.25
212	1881.95	13	1898.75	69	1915.55
213	1882.25	14	1899.05	70	1915.85
214	1882.55	15	1899.35	71	1916.15
215	1882.85	16	1899.65	72	1916.45
216	1883.15	17	1899.95	73	1916.75
217	1883.45	18	1900.25	74	1917.05
218	1883.75	19	1900.55	75	1917.35
219	1884.05	20	1900.85	76	1917.65
220	1884.35	21	1901.15	77	1917.95
221	1884.65	22	1901.45	**78**	1918.25
222	1884.95	23	1901.75	**79**	1918.55
223	1885.25	24	1902.05	**80**	1918.85
224	1885.55	25	1902.35	**81**	1919.15
225	1885.85	26	1902.65	**82**	1919.45
226	1886.15	27	1902.95	**83**	1919.75
227	1886.45	28	1903.25	**84**	1920.05
228	1886.75	29	1903.55	**85**	1920.35
229	1887.05	30	1903.85	**86**	1920.65
230	1887.35	31	1904.15	**87**	1920.95
231	1887.65	32	1904.45	**88**	1921.25
232	1887.95	33	1904.75	**89**	1921.55
233	1888.25	34	1905.05	**90**	1921.85
234	1888.55	35	1905.35	**91**	1922.15
235	1888.85	36	1905.65	**92**	1922.45
236	1889.15	37	1905.95	**93**	1922.75
237	1889.45	38	1906.25	**94**	1923.05
238	1889.75	39	1906.55	**95**	1923.35
239	1890.05	40	1906.85	**96**	1923.65
240	1890.35	41	1907.15	**97**	1923.95
241	1890.65	42	1907.45	**98**	1924.25
242	1890.95	43	1907.75	**99**	1924.55
243	1891.25	44	1908.05	**100**	1924.85
244	1891.55	45	1908.35	**101**	1925.15
245	1891.85	46	1908.65	**102**	1925.45
246	1892.15	47	1908.95	**103**	1925.75
247	1892.45	48	1909.25	**104**	1926.05
248	1892.75	49	1909.55	**105**	1926.35
249	1893.05	50	1909.85	**106**	1926.65
250	1893.35	51	1910.15	**107**	1926.95
251	1893.65	52	1910.45	**108**	1927.25
252	1893.95	53	1910.75	**109**	1927.55
253	1894.25	54	1911.05	**110**	1927.85
254	1894.55	55	1911.35	**111**	1928.15
255	1894.85	56	1911.65	**112**	1928.45
1	1895.15	57	1911.95	**113**	1928.75
2	1895.45	58	1912.25	**114**	1929.05
3	1895.75	59	1912.55	**115**	1929.35
4	1896.05	60	1912.85	**116**	1929.65
5	1896.35	61	1913.15		
6	1896.65	62	1913.45		

Note: Additional carriers in the expanded PHS band are shown in bold.