Title: Personal Handy-phone System - Fixed Wireless Access (PHS-FWA) : General Description

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1. Introduction

PHS-FWA System (Personal Handy-phone System based Fixed Wireless Access) is designed for plain ordinary telephone or ISDN wireless access facilities, which utilizes PHS (Personal Handy-Phone System) basic technologies standardized in Japan and eliminate some mobile functions. Since PHS adopts 32kbps TDMA scheme, PHS-FWA is also expected for high speed data. PHS-FWA is applicable to not only low traffic rural area but also comparatively high traffic suburban area because a cell size can be adapted to ground design from hundreds meters to five thousands meters. Therefore PHS-FWA system provides a way to construct telecommunication infrastructure at low cost and in a short time for developed countries as well as developing countries.

While this PHS-FWA System remains the mobility function which is not necessary for fixed telephone system, the PHS-FWA grants telephone terminals to move in a certain area within a cell, so it is also called limited mobile telephone system.

(NOTE)
The primary purpose of this system is to provide fixed subscriber services by wireless access facilities, instead of copper cable. For this reason, this system is classified into FWA system according to ITU-R Recommendation F.1399 and is called ‘PHS-FWA’. In the basic usage the user-network interface (UNI) is wired as in the ordinary wired services, but it is also possible that the UNI is wireless using wireless subscriber terminals similar to mobile PHS terminals. In the latter case, the system has the limited mobile capability.

2. PHS-FWA (PHS Fixed Wireless Access) system

A PHS-FWA network model is shown in Figure 2-1/C-GN0.00. The PHS-FWA System model consists of FWA Access Controllers (WACs), FWA Cell Stations (WCSs), FWA Personal Stations (WPSs), and FWA Subscriber Units (WSUs).

There are two types in PHS-FWA system. The definitions are as follows. In Type 1 system, public PHS interface is fully applied. In Type 2 system, the communication channels are set up by using public PHS interface, and those channels are used to construct the whole network. Control information of layer 2 and layer 3 is transparently conveyed through these channels. ISDN and leased line services are realized by Type 2 system.

WACs are located between the Service Node (SN) and the WCSs, and function to implement concentration, authentication and so on. The interface between WAC and WCS which are used several kinds of cables or radio are outside MoU scope at the moment. The air interface between WCSs and WSUs is standardized as PHS air interface in RCR STD-28 of the Association of Radio Industries and Businesses (ARIB). WCSs are usually installed outdoors in locations such as at the top poles. One WCS can cover an area within a cell having a radius of approximately 5 km. WSUs are installed in customers’ house and are connected to telephone terminals or network terminations and the antennas are set at its roof or wall. WPSs are PHS terminals which are equivalent to telephone terminals with WSU functions.
Figure 2-1/C-GN0.00 PHS-FWA Network Model

2.1 Basic Functional Architecture of FWA

Figure 2-1/C-GN0.00 also shows a PHS-FWA interface reference points. Definitions of these interfaces are as follows.

(i) WIF1 which is an interface between TE (Terminal Equipment) and WSU (FWA Subscriber Unit), or NT and WSU is recommended in C-IF1.00 series.

(ii) WIF2 which is a radio interface between WSU (FWA Subscriber Unit) or WPS (FWA Personal Station) and WCS (FWA Cell Station) and so on is recommended in C-IF2.00 series.

(iii) WIF3 which is the interface between WAC (FWA Access Controller) and SN (Service Node) is recommended in C-IF3.00 series.

2.2 WIF1 Interface

PSTN: The interface between TE and WSU is two-wire analogue interface described in C-IF1.01.

ISDN: The interface between TE and WSU is ITU-T Recommendation I.430 interface, and between NT and WSU is ITU-T Recommendation G.961 interface. Layer 2 and layer 3 interfaces are ITU-T Recommendation Q.921 and Q.931 (and other ITU-T Recommendations referenced by the network operator), respectively.

Their interfaces are described in C-IF1.02.

Leased line interface depends on operator implementation.
2.3 WIF2 Interface

The interface between WSU or WPS and WCS and so on which is a radio interface based on RCR STD-28 is described in C-IF2.01.

2.4 WIF3 Interface

The interfaces between WAC and SN which are two-wire analogue interface, ITU-T Recommendation G964:V5.1 interface, ITU-T Recommendation G965:V5.2 interface, Bellcore GR-303, or ITU-T Recommendation G.961, Q.921, Q.931 (and other ITU-T Recommendations referenced by the network operator) interfaces are described in C-IF3.01, C-IF3.02, C-IF3.03, C-IF3.04, and C-IF3.05 respectively.

Leased line interface except V5.1 and V5.2 interface depends on operator implementation.

3. Service Aspects

PHS-FWA System provides various services, such as ordinary telephone service, pay-phone service, PBX service, high speed data service, ISDN service, limited mobilephone service and so on.

The detail specification of the PHS-FWA services is described in C-SV1.00.

4. System Aspects

PHS-FWA System is a new wireless access system for ordinary telephone network, ISDN, or sometimes for limited mobilephone network.

The detail of the PHS-FWA system configuration is described in C-NW1.00.
Annex A  Glossary/Abbreviation

**ADPCM** : Adaptive differential pulse code modulation
A speech coding method which calculates the difference between two consecutive speech samples in standard PCM coded telecom voice signals.

**ARIB** : Association of Radio Industries and Businesses
An institute which promotes the development of new radio systems in the communication and broadcasting field and the national standardization of the technology level.

**Cell** :
a radio zone covered by a WCS

**DQPSK**
Differential Quadrature Phase Shift Keying

**DTMF**
Dual Tone Multi Frequency used for dialing number signal

**G.964**
ITU-T recommendation for V interface at the digital Local Exchange (LE) / V5.1 interface (based on 2048kbit/s) for the support of Access Network (AN)

**G.965**
ITU-T recommendation for V interface at the digital Local Exchange (LE) / V5.2 interface (based on 2048kbit/s) for the support of Access Network (AN)

**GR-303**
GR-303 which is a defacto standard published by Bellcore is for Integrated Digital Loop Carrier System Generic Requirements, Objectives and Interface.

**Group Control**
A control scheme that multiple WCSs commonly share a single control channel.

**Handover**
Handover is an action of switching a call in progress from one cell to another or between radio channels in a same area. It is used to allow established calls to continue when PS moves from one cell to another.

**ISDN**
Integrated Services Digital Network

**ITU-T**
International Telecommunication Union -Telecommunication Standardization Sector

**NT** : Network Termination
NT, which terminate network and connect to terminal equipment (TE)
PBX : Private Branch Exchange
PBX is a one of Terminal Equipment.

PHS : Personal Handyphone System
Second generation digital cordless telephone system. PHS (RCR STD-28) was standardized by RCR.

PHS-FWA : Personal Handyphone System based Wireless Local Loop
PHS-FWA is designed for plain ordinary telephone or ISDN wireless access network using PHS air-interface (RCR STD-28) technology.

PSTN : Public Switched Telephone Network
Public Switched Telephone Network. It provides analogue-channel to user.

RCR : Research and Development Center for Radio System.
PHS (RCR STD-28) was standardized here. It is called Association of Radio Industries and Businesses (ARIB) now.

SN : Service Node
SN which is same as Local Exchange, or telephone network, in this paper terminates subscriber line signal and network signal.

TE : Terminal Equipment
TE, which is same as Customer Premises Equipment, is a user terminal such as a telephone terminal, FAX/DATA modem and Terminal Adapter (TA).

V5
V5 is ITU-T Recommendation standards for the connection of an Access Network (AN) using the 2048kbit/s ports.

WAC : FWA Access Controller
An equipment that has SN interface and WCS interface, controls call connection, performs location registration, authentication, and so on.

WCS : FWA Cell Station
WCS, which is a radio communication equipment, communicates with WPS or WSU using PHS based air interface (RCR STD-28).

WPS : FWA Personal Station
WPS, which is a mobile subscriber communication terminal, communicates with WCS using PHS based air interface (RCR STD-28).

WSU : FWA Subscriber Unit
WSU, which has two-wire/four-wire analogue interface or G.961 interface for TE, converts signals between TE and WCS.