Field Test and Evaluation of DAB, DAB+ and T-DMB Audio: Outdoor and Indoor Fixed Reception Environments

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Abstract

This paper presents the field trial result of DAB, DAB+ and T-DMB audio systems in fixed reception environment. In the trial, both outdoor and indoor reception environments are considered. These test results are able to give basic information for the choice of digital radio standard in many countries.

Keywords: DAB, DAB+, T-DMB Audio, field trial, fixed reception performance, outdoor/indoor reception test

1. Introduction

Since digital radio broadcasting techniques can give highly enhanced performance and quality (e.g. CD like audio quality, single frequency network, slide show, etc), many countries pay attention to converting their analog radio broadcasting services into digital services. In Korea, to digitize radio broadcasting service, various trials have been executed since 2009 [1]-[2]. This paper deals with the field trial results of digital audio broadcasting (DAB), DAB+ and terrestrial digital multimedia broadcasting (T-DMB) technologies [3]-[5]. The objective of this field trial is to measure and analyze the reception performance and service coverage in various practical reception environments. The reception environments of the field trial can be classified into two major parts; one that is outdoor reception environment, and another that is indoor reception environment. Through the test results, the performance difference can be compared with each other. And the test results can be efficiently used for many countries considering adoption of digital radio service.

2. Test Bed and Points for Field Trial

For the field trial, test bed has been built in Gangwon-do, Korea. The transmitter is located at the Gangwon Television Broadcasting (GTB) tower in Mt. Gwebang of Gangneung-City, Gangwon-do, Korea (37°42'29.8"N, 129°00'62"E). The DAB, DAB+ and T-DMB audio signals are transmitted through band III CH. 10B with 100W. In this transmitter, the DAB, DAB+ and T-DMB audio signals are multiplexed in one ensemble and transmitted simultaneously.

Three measurement points are considered at 10km interval from transmitter (F1 point ~ F3 point). The F1 point, F2 point and F3 point has 10km distance, 20km distance and 30km distance from transmitter, respectively.
3. Field Test Parameters and Routes

Received field strength (dBμV/m) is evaluated for checking the RF characteristics. And main service channel (MSC) character error rate (CER) is used to measure audibility. CER means the corrected bit rate after Viterbi decoding. Through the laboratory test, the CER threshold values are determined for each system as follows:

- DAB: CER = 0.06
- DAB+: CER = 0.084
- T-DMB Audio: CER = 0.09.

If the CER value of each system is higher than its threshold, sound loss is occurred. And to check the robustness of each method, attenuation value is measured. After receiving the signal, the attenuation value is increased until the CER = threshold value for each system, and the attenuation value is recorded. Therefore, the attenuation value means the performance margin. The high attenuation value means that the system has good receiver sensitivity. The digital radio method with higher attenuation value may be more robust than others.

4. Field Trial Results

Fig. 1 depicts the test results. In the figure, the received field strength follows left side Y-axis (dBμV/m), and the attenuation value of each system follows right side Y-axis (dB). The power difference between indoor and outdoor is more than 10dB in all cases. In the case indoor F3, the all systems cannot receive the digital radio signal. In the points with low field strength (outdoor F3 and indoor F2), the DAB+ and T-DMB audio have higher attenuation values than that of DAB, since both DAB+ and T-DMB Audio use powerful error correcting code which is Reed and Solomon (RS) code.

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**Fig. 1. Field test results of each system according to the test result**
5. Conclusions

This paper depicts the field trial results of DAB, DAB+ and T-DMB Audio. Since the test results include both indoor results and outdoor results, the performance difference between two reception environments can be easily compared. Furthermore, comparison of three digital radio performances can be executed by the results. The test results can be a reference results to many countries considering digitization of radio broadcasting.

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7. References