112 年委託研究報告

「電信設備審驗規定接軌國際標準及測試程序委託研究採購案」

精簡英文版本

委託機關：國家通訊傳播委員會

執行單位：財團法人電信技術中心

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112 年委託研究報告

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電信設備審驗規定接軌國際標準及測試程序委託研究採購案

精簡英文版本

受委託單位

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計畫摘要

關鍵詞：低功率射頻器材、LP0002、進階行動定位、AML、水上倖存者定位設備、MSLD、NR 增波器、5G Repeater

一、 研究緣起

鑒於通訊科技日新月異，為確保我國電信設備技術規範能順利與國際接軌，可以預見電信設備之智慧標準化檢測技術，能加速國內各項通傳產業之健全發展。為了建立接軌國際測試標準及測試程序之相關資訊，彙整與編輯一致性會議，並充分了解案例國家針對進階行動定位、水上倖存者定位設備及 NR 增波器技術管理規定，並完善國內發展相關法規環境與建立治理機制。

二、 研究方法及過程

本研究依據各委託辦理工作項目，採用文獻分析法、個案研究與比較分析法，並規劃辦理座談會議蒐集國內現況及產官學等意見，最終整合各研究方法與工作項目的產出，建立接軌國際測試標準及測試程序之相關資訊，彙整與編輯一致性會議，並提出進階行動定位、水上倖存者定位設備及 NR 增波器草案具體建議。

三、 重要發現

(一) 建立接軌國際測試標準及測試程序之相關資訊

本研究研析並提出我國低功率射頻器材技術規範所對應之國際檢測標準，該檢測標準主要參考美國國家標準協會 IEEE/ANSI C63.10 與 IEEE/ANSI C63.26 所訂定之檢測程序標準，其他則包含歐盟 ETSI 與日

本 ARIB STD 相關國際檢測標準，值得注意的是本研究亦補充相對應的 FCC KDB 檢測標準文件於對應表內，用以完善我國電信管制射頻器材檢測程序，而本研究所建立之低功率射頻器材技術規範國際檢測標準對應表，於未來亦可供通傳會建置知識庫之用。

(二) 調適、彙整與編輯一致性會議

本研究研析並提出我國第 71 次至第 81 次一致性會議決議彙整、編輯與調適結果，其中失效之決議經判斷後共有 2 案，另經修正之決議數量共有 19 案；詳細第 71 次至第 81 次一致性會議決議彙整與調適可參考第二章第二節一至十一中所示，除相關修正外，本研究亦提出一致性會議標籤索引之設計，該標籤設計可用以分類各決議所屬應遵守之我國電信監理規定與相關技術規範，並加入有效性項目，以及該決議所引用之相關過往決議或最新決議，本研究所彙整、編輯與調適之我國一致性會議決議，於未來亦可供通傳會建置知識庫之用。

(三) 進階行動定位（Advanced Mobile Location, AML）

國內現行對於緊急通信的定位方式由使用者自行描述，可透過基地臺定位（Cell-ID），有精確度不夠的問題，而近年來警政署與消防署開發之應用程式報案，也可即時傳送定位至救災單位，但應用程式普及度不夠，還需網路才能傳送，然而目前先進國家，尤其是歐盟正積極推廣 AML 技術，在使用者緊急通信時，透過 GNSS 及 Wi-Fi 更精確的定位技術，自動使用簡訊傳送位置訊息至公用安全應答站（Public-Safety Answering Point, PSAP）。

(四)　水上倖存者定位設備（Maritime Survivor Locating Device, MSLD）

海事無線電技術委員會（Radio Technical Commission for MaritimeServices, RTCM）是一個國際非營利性的科學、專業和教育組織。RTCM 制定了 MSLD 的最低要求功能和技術性能。允許使用 RTCM 認證的 MSLD 將提供更快速、更有效的早期警報和救援，從而增強水上或附近人員的安全。美國針對 MSLD 的規範主要依據 FCC 47 CFR Part 95 Subpart K 的個人定位無線電示標（Personal Locator Beacons, PLB）與 MSLD 規範，MSLD 可使用 121.5 MHz、156.525 MHz、156.750 MHz、156.800 MHz、156.850 MHz、161.975 MHz 或 162.025 MHz 頻率進行傳輸。

(五)　NR 增波器（Repeater）

為因應 3GPP 於 2023 年所最新發布的 NR 增波器最新檢測標準，本研究參考並研析 3GPP TS 38.115-1 與 3GPP TS 38.115-2 等最新檢測標準相關文件，提出 NR 增波器之技術規範草案建議，該草案建議增修訂於我國行動通信基地臺射頻設備技術規範中，該增波器檢測項目包含 Repeater type 1-C（FR1 頻段－傳導式檢測標準）、Repeater type 2-O（FR2 頻段－輻射式檢測標準），增波器類型則包含廣域範圍、中程範圍與區域範圍增波器，本研究所提出之 NR 增波器草案建議可供通傳會參考使用，未來可有助提升補充我國行動通信業務覆蓋率。

四、 主要建議事項

(一) 立即可行建議

1. 水上倖存者定位設備草案建議

為保障我國離岸與船舶相關工作人員之生命安全，本研究經研析國際海運事業無線電技術委員會相關檢測標準後，提出水上倖存者定位設備之草案建議，該草案建議亦已於 112 年 11 月 14 日之公開說明會進行說明，初步各界專家、廠商與實驗室並無嚴格之建議；由於該器材射頻特性與限制值為國際通用標準，且我國無線電頻率分配表亦將相關頻段列為水上業務使用，故建議通傳會可視水上倖存者定位設備使用相關規定之需求，開放該器材予國人使用。

2. NR 增波器（Repeater）草案建議

本研究參考並研析 3GPP TS 38.115-1 與 3GPP TS 38.115-2 等最新檢測標準相關文件，並於我國行動通信基地臺射頻設備技術規範增修訂最新 NR 增波器之技術規範草案建議，該草案建議亦已於 112 年 11 月 14 日之公開說明會進行說明，初步各界專家、廠商與實驗室並無嚴格之建議；本研究附件亦提供依據所提出 NR 增波器草案所施作之測試報告以確定其可行性，故建議通傳會可將 NR 增波器草案建議列為立即可行之建議，該增波器草案未來可有助提升補充我國行動通信業務覆蓋率。

(二)　中長期性建議

1. 進階行動定位草案建議

目前智慧型手機作業系統 Android 與 iOS 皆已經在現行的版本中配置 AML，因此為使我國緊急電話與救災系統更完善，本研究參考歐盟（EU）2019/320 法規的合規指南及 AML 技術規範 ETSI TS 103 625，針對我國行動通信終端設備技術規範（PLMN ALL）提出 AML 草案建議，草案內容包含終端設備之 GNSS 測試，以及 AML 訊息應傳送格式及屬性數值規範。

ABSTRACT

Keywords: Low-power RF Devices, LP0002, Advanced Mobile Location, AML, Maritime Survivor Locating Device, MSLD, NR Repeater, 5G Repeater

1. Background of the Study

With the rapid development of modern communication technology, we can foresee that smart standardized testing technology for telecommunications equipment can accelerate the sound development of various domestic communication industries, so as to ensure that the technical specifications of Taiwan's telecommunications equipment can seamlessly integrate with international standards. We aim to establish an associated information base in line with international testing standards and procedures, compile and edit the conformance meeting minutes, fully acknowledge the technical management regulations for advanced mobile location, maritime survivor locating device, and NR repeater in the exampled nations, and improve associated domestic regulatory environment development as well as establish governance mechanisms.

2. Research Methods and Processes

This study is based on various commissioned work items. We employed literature analysis, case studies, and comparative analysis methods. We also planned seminars to understand the current domestic situation and collect opinions from industry, government, and academia. The goal of such efforts is to establish an associated information base in line with international testing standards and procedures, to compile and edit the conformance meeting minutes, and to propose drafts of concrete recommendations concerning

advanced mobile location, maritime survivor locating device, and NR repeater.

3. Important Findings

(1) Establishing Associated Information Base in Line with International Testing Standards and Procedures

This study analyzes and proposes the international testing standards corresponding to the technical specifications of Taiwan’s low-power RF devices. The testing standard mainly references the testing procedure standards set by the IEEE/ANSI C63.10 and IEEE/ANSI C63.26 of the American National Standards Institute, as well as associated international testing standards established by ETSI of EU and ARIB STD of Japan. It is noteworthy that our research team also supplements the corresponding FCC KDB testing standard documents in the corresponding table to further complete Taiwan's telecommunications regulatory RF devices testing procedures. As for the corresponding table of international testing standards for low-power RF devices technical specifications established in this study, it can also be employed by NCC for building a knowledge base in the future.

(2) Adjusting, Compiling and Editing the Conformance Meeting Minutes

This study analyzes and proposes the compiling/editing/adjusting results of the resolutions from Taiwan’s 71st to 81st Conformance Meetings. After assessment, there are a total of 2 cases of resolutions deemed ineffective, 4 cases of resolutions only applicable to individual cases, and 19 cases of resolutions modified for correction. For detailed information, please refer to Subsections 1 to 11, Section 2, Chapter 2 of the minutes of the 71st to 81st Conformance Meetings. In addition to associated amendments, this study

also proposes the design of a label index for conformance meetings. Such designs can be applied to categorizing the Taiwanese telecommunications regulations and related technical specifications that each resolution should correspond to, while also incorporating items such as validity and individual cases, as well as relevant past or latest resolutions cited in this resolution. This study also compiled/edited/adjusted resolutions from Taiwan’s 71st to 81st Conformance Meetings, which can be employed by NCC for building a knowledge base in the future.

(3) Advanced Mobile Location (AML)

Taiwan’s current location method for emergency communications relies on user description and positioning through the base station (Cell-ID), but such methods pose insufficient accuracy. In recent years, the emergency reporting mobile apps developed by the National Police Agency and National Fire Agency can transmit real-time location information to emergency response units, but mobile apps are subject to low popularity and rely on Internet transmission. However, the advanced developed countries, especially EU members, have been proactively promoting AML technology in this field. For emergency communication, this technology will automatically send the location information of the user to a Public-Safety Answering Point (PSAP) by SMS through the location technologies of GNSS and Wi-Fi, ensuring results with better accuracy.

(4) Maritime Survivor Locating Device (MSLD)

Radio Technical Commission for Maritime Services (RTCM) is an international non-profit scientific, professional, and educational organization. RTCM has stipulated the minimum functional requirements and technical performance standards for MSLD. Permitting the RTCM-certified MSLDs

will provide faster and more effective early warning and rescue, thereby enhancing the safety of personnel around or near the water areas. The MSLD specifications in the US are primarily based on the Personal Locator Beacons (PLB) and MSLD specifications of FCC 47 CFR Part 95 Subpart K. MSLDs can transmit on frequencies including 121.5 MHz, 156.525 MHz, 156.750 MHz, 156.800 MHz, 156.850 MHz, 161.975 MHz, or 162.025 MHz.

(5) NR Repeater

To comply with the latest NR repeater testing standards released by 3GPP in 2023, this study referenced and analyzed the associated testing standards documents such as 3GPP TS 38.115-1 and 3GPP TS 38.115-2, and proposed a recommendations draft regarding the latest NR repeater technical specifications amendments. The proposed draft suggested the addition and amendments of RF device test items in the Taiwanese technical specifications for mobile communication base stations, including the NR repeaters testing items of Repeater type 1-C (FR1, frequency range 1 - conducted testing standard) and Repeater type 2-O (FR2, frequency range 2 - radiated testing standard). The types of repeaters include wide-range, mid-range, and local-range repeaters. The proposed draft for NR repeaters presented in this study can serve as a reference for the NCC, and may contribute to improving and supplementing the mobile communication services coverage in Taiwan.

4. Main Recommendations

(1) Immediately Feasible Recommendations

A. Maritime Survivor Locating Device Recommendations Draft

After analyzing the associated testing standards of RTCM (Radio Technical Commission for Maritime Services), this study has proposed a

maritime survivor locating device recommendations draft to ensure personnel safety for those performing offshore and maritime tasks in Taiwan. The recommendations draft has also been explained at the public briefing on November 14, 2023, with no strict suggestions from experts, businesses, and laboratories initially. Since the RF characteristics and limit values of the devices comply with international standards, and Taiwan’ s RF allocations table has also designated the relevant frequency range for maritime use, it is recommended that the NCC allow the civil use of maritime survivor locating devices according to the related regulations.

B. NR Repeater Recommendations Draft

This study references and analyzes the latest documents concerning testing standards such as 3GPP TS 38.115-1 and 3GPP TS 38.115-2, and proposes a draft of the latest NR repeater technical specifications amendments recommendations for the RF devices technical specifications at mobile communication base stations in Taiwan. The recommendations draft has also been explained at the public briefing held on November 14, 2023, with no strict suggestions coming from experts, manufacturers, and laboratories initially. The attachment of this study also provides a test report based on the proposed NR repeater draft to confirm its feasibility. Therefore, it is recommended that the NCC deem the NR Repeater draft as an immediately feasible recommendation. This repeater draft can contribute to improving and supplementing the mobile communication services coverage in Taiwan.

(2) Medium to Long-Term Recommendations

A. Advanced Mobile Location Recommendations Draft

AML has been configured in the current versions of both Android and iOS. Therefore, to enhance Taiwan’ s emergency call and disaster relief systems, this study references the EU compliance guideline 2019/320 and AML technical specification ETSI TS 103 625, and proposes AML recommendations draft for Taiwan’ s mobile communication terminal devices technical specifications (PLMN ALL). The content of the draft includes GNSS testing of terminal devices, as well as the proper transmission format and attribute value specifications for AML messages.