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RADIO SPECTRUM AND TECHNICAL STANDARDS ADVISORY COMMITTEE

International Development of Automotive Radars Operating in the 76-81 GHz Band

Introduction

This paper covers a brief on the international development of automotive radars operating in the 76-81 GHz band.

Background

2. The application of information and communications technologies within intelligent transport systems, such as the use of automotive radars, would contribute to the goal of improving road safety. The availability of spectrum for automotive radar operations is key to achieving this goal. At present, automotive radars operating in the 24 GHz band are in use in some territories/countries such as Europe and the United States. However, the 24 GHz band is also used by other radiocommunications services that would suffer interference if there are too many automotive radars in operation simultaneously in the same area. The 76-81 GHz band is now generally considered as the most suitable frequency band for long-term and permanent operation of automotive radars. When technology in the 76-81 GHz band becomes cost effective, implementations in the 24 GHz band will gradually migrate to the 76-81 GHz band. In fact, the European Commission has already set out a plan to cease the use of 24 GHz automotive radars progressively after year 2018.

3. The 76-81 GHz automotive radar systems, which are still under development, are essentially of two categories according to bandwidth and operating ranges –

(a) narrowband systems operating in the 76-77 GHz band for long range radar (LRR) applications such as adaptive cruise control and collision avoidance with operating range of 250-300 metres; and

(b) ultra-wideband (UWB) systems operating in the 77-81 GHz band for short range radar (SRR) applications such as obstacle avoidance, collision warning, blind spot detection, lane-change assistance,

rear-traffic-crossing alert, parking aid, etc. with operating range up to 100 metres.

Development in International Telecommunication Union (ITU)

4. At present, the global allocation of the 76-81 GHz band under the Radio Regulations is as follows –

76-77.5 GHz	RADIO ASTRONOMY RADIOLOCATION Amateur Amateur-satellite Space research (space-to-Earth)
77.5-78 GHz	AMATEUR AMATEUR-SATELLITE Radio astronomy Space research (space-to-Earth)
78-79 GHz	RADIOLOCATION Amateur Amateur-satellite Radio astronomy Space research (space-to-Earth)
79-81 GHz	RADIO ASTRONOMY RADIOLOCATION Amateur Amateur-satellite Space research (space-to-Earth)

5. Within the 76-81 GHz band, there is 500 MHz in the band 77.5-78 GHz that is not yet allocated to radiolocation service. ITU will consider a primary allocation of this band to radiolocation service in the coming World Radiocommunication Conference 2015 (WRC-15), taking into account the results of studies on sharing and compatibility between radiolocation service and other services such as radio astronomy and amateur in the 76-81 GHz band. A possible global primary allocation to radiolocation in the 77.5-78 GHz band will provide a harmonised and contiguous band of 76-81 GHz for automotive radar applications.

6. In May 2012, ITU published the ITU-R recommendation M.1452-2 which recommends the operational and technical characteristics of automotive radars operating in the 76-77 GHz and the 77-81 GHz bands for use as guidelines for system design objectives. In February 2014, ITU published

another ITU-R recommendation M.2057-0 which proposes the system characteristics for automotive radar systems operating in the 76-81 GHz band to be used for sharing and compatibility studies. Both recommendations consider the two categories of automotive radar systems (i.e. LRR and SRR) as mentioned in paragraph 3 above. Sharing and compatibility studies between radiolocation service and other services in the 76-81 GHz band are underway within ITU to prepare for the discussion in WRC-15.

Development in Europe

7. In Europe, the 76-77 GHz band is already designated for automotive LRR applications. In March 2004, the European Conference of Postal and Telecommunications of Administrations (CEPT) announced a decision which identifies the 77-81 GHz band as the most suitable frequency band for long-term and permanent deployment of high resolution automotive SRR. However, the 77-81 GHz SRR technology in this band is still under development and the corresponding product is not yet available on a cost effective basis.

8. Studies have also been conducted by CEPT on the compatibility between automotive SRR, and the radio astronomy and amateur/amateur-satellite services operating in the 77-81 GHz band. The conclusions given in the report published by CEPT in October 2004 are summarised below –

(a) there may be potential interference between automotive SRR and radio astronomy service, regulatory measures are required to enable their co-existence; and

(b) there may be incompatibility between automotive SRR and amateur/ amateur-satellite services in the worst case scenario (i.e. SRR antenna main lobe into amateur antenna main lobe), but the probability of interference arising from this scenario is considered very low.

9. European harmonised standards have been developed for automotive radars operating in the 76-81 GHz band with a view to ensuring effective use of spectrum so as to avoid harmful interference. There are applicable standards for the 76-77 GHz LRR and the 77-81 GHz SRR. These standards impose control on the operating frequency range, power, out-of-band and spurious emissions of the automotive radars.

Development in the United States

11. In the US, the allocation of the 76-81 GHz band essentially follows the ITU allocation. The Federal Communications Commission (FCC) now allows the unlicensed operation of vehicular radar systems in the 76-77 GHz band. As for the 77-81 GHz band, the current applicable FCC rules are for amateur radio service. In the meantime, FCC is reviewing a petition for rulemaking to permit vehicular radars operating in the 77-81 GHz band. It is expected that FCC will propose to allow unlicensed operation of such radars, but there is not yet a definite date as to when this will occur.

Allocation and Existing Utilisation of 76-81 GHz Band in Hong Kong

12. The allocation of the 76-81 GHz band and the existing utilisation in Hong Kong are as follows –

	Hong Kong Allocation	**Existing Utilisation**
76-77.5 GHz	RADIOLOCATION Amateur Amateur-satellite	Amateur Amateur-satellite Licence-exempted telecommunications apparatus (76-77 GHz)
77.5-78 GHz	AMATEUR AMATEUR-SATELLITE	Amateur Amateur-satellite
78-81 GHz	Amateur Amateur-satellite	Amateur Amateur-satellite

13. The 76-77 GHz band is a licence-exempt one in Hong Kong, thus allowing the use of automotive radars operating in this band by the public without a licensing requirement. As for the 77-81 GHz band, there is no pressing demand for the use of this band for automotive radars up to now. Accordingly, the 78-81 GHz band is not allocated to radiolocation service in Hong Kong now, despite its inclusion under the Region 3 Allocation of the Radio Regulations (allocation of 77.5-78 GHz to radiolocation is pending decision of WRC-15).

Way Forward

14. If the use of 76-81 GHz automotive radars in Hong Kong is to be considered, the prerequisites are to allocate the 77.5-81 GHz band to

radiolocation service and to develop the relevant regulatory framework, taking into account the following –

(a) the WRC-15 decision on the proposed allocation of the 77.5-78 GHz band to radiolocation;

(b) any necessary mitigation measures to be considered in relation to the potential interference between automotive radars and other services (e.g. radio astronomy and amateur in the Mainland) operating in the 76-81 GHz band;

(c) development in frequency planning and regulatory arrangements in relation to the use of the 76-81 GHz band by automotive radars in other administrations; and

(d) the availability of the relevant products on the mass market.

15. OFCA will continue to keep in view the international development. Comments from Members about this subject are welcome.

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