International Civil Aviation Organization

Fifth Meeting of the Frequency Management Working Group (FM WG/5)

(Doha, Qatar, 10 – 11 May 2026)

Agenda Item 2: Frequency Congestion in the MID Region

FREQUENCY SPECTRUM CONGESTION AFFECTING ATS SERVICES

(Presented by Saudi Arabia)

SUMMARY

This paper presents the challenges associated with VHF frequency congestion affecting ATS communication services within the Jeddah FIR. It outlines the operational impacts, contributing technical factors, and the mitigation measures implemented by Saudi Air Navigation Services (SANS), including enhanced filtering, frequency re-assignment based on ICAO spectrum allocations. The paper also highlights the need for regional harmonization to ensure sustainable spectrum management and usage.

Action by the meeting is at paragraph 3 of this WP.

REFERENCES

- ICAO Annex 10, Volume V – Aeronautical Radio Frequency Spectrum Utilization
- ICAO Annex 10, Volume II – Communication Procedures
- ICAO Doc 9718 – Handbook on Radio Frequency Spectrum Requirements for Civil Aviation
- ICAO Doc 9750 – Global Air Navigation Plan (GANP)
- MID eANP, Volume II – Communications, Navigation and Surveillance
- Park Air Spectrum Study (SANS).
- CNS SG/14-WP 20

1. INTRODUCTION

1.1 The growth in air traffic in Jeddah FIR is resulting from an increased domestic and international operations, major airport expansion projects, and the introduction of advanced operational concepts such as Simultaneous Operations on Parallel or Near-Parallel Runways (SOIR) leading to the increase of Runways throughputs.

1.2 This growth has resulted in high ATS communication exchanges across several ATC sectors, particularly within the OEJN CTA/TMA, leading to congestion on assigned VHF frequencies and reduced communication efficiency.

1.3 This paper provides an overview on the current situation, identifies the root causes of frequency congestion, and describes the technical and operational mitigation measures implemented by SANS, along with recommendations for regional activities on aeronautical spectrum management and allocations.

2. DISCUSSION

2.1 The continuous growth in air traffic within the Jeddah FIR is increasing pressure on the aeronautical VHF communication spectrum. The aeronautical VHF band (117.975–137 MHz) is a limited and highly regulated band. The OEJN CTA/TMA, in particular, has become one of the busiest terminal areas within JED FIR, resulting in high ATC communications density and frequent frequency saturation during peak operational periods, due to the number of flights and the introduction of new operational concepts which increase the ATC capacity.

2.2 The congestion in the VHF aeronautical band has a direct operational impact on ATC communications. Air Traffic Controllers increasingly experience **intermittent radio signals, stepped-on transmissions, blocked calls, and delayed readbacks**, particularly during high-traffic periods, which increase the overall workload and reduce the traffic management efficiency. The ATS communication disruptions reduce situational awareness, especially during **critical phases of the flights, such as approaches, taxiing, and take-off operations**, where timely and accurate voice communication exchange is essential for maintaining safety and efficiency of the air traffic.

2.3 The technical assessments conducted at certain airports within the Jeddah FIR have identified multiple contributing factors to VHF communication degradation. These include:

- **co-channel interference** originating from nearby ground VHF radio stations,
- **intermodulation effects** caused by the physical proximity of the transmitter siting; and
- **insufficient separation** between adjacent frequency assignments.

2.4 These technical issues collectively reduce Communication signal clarity and reliability, particularly in high-density operational environments.

2.5 The current VHF communication system within the Jeddah FIR operates using **25 kHz channel spacing**, which limits the number of available VHF frequencies in high-density areas. While the transition to **8.33 kHz channel spacing** is expected to significantly increase the number of assignable channels. This is due to the early stage of implementation, the need for system upgrades across several ATC sectors, and the requirement for coordinated regional planning to prevent cross-border interference. Implementing 8.33 kHz channel spacing on a purely national basis without synchronization and harmonization with adjacent FIRs risks significant co-channel interference.

2.6 In addition to the limitations associated with the current 25 kHz channel spacing, the continued reliance on **voice communication** for routine ATS Communications further contributes to VHF frequency congestion. Although **CPDLC service is available for the en-route environment** (in alignment with ICAO GANP ASBU modules for digital communication), its operational use within terminal areas remains limited for safety purposes, as it is considered one-to-one communication. Consequently, Air Traffic controllers and pilots continue to depend heavily on VHF voice

communications for clearances and coordination, increasing ATS communication load and reducing the potential benefits that digital communication systems could provide in alternative means in alleviating congestion.

2.6 To address the increasing VHF frequency congestion within the Jeddah FIR, a combination of **technical** and **operational** measures is required. These measures aim to enhance ATS communication reliability, increase available spectrum capacity, and ensure harmonized implementation across JED FIR and the MID Region.

2.7 The proposed Technical Measures can be summarized as follows:

- **Transition to 8.33 kHz Channel Spacing**

  1) The implementation of 8.33 kHz channel spacing will lead to systematically increasing the available VHF frequencies for operational use.
  2) Recalibrate and adjustment of the ground radio equipment, controller working positions (CWPs).
  3) Coordinate with adjacent FIRs to ensure compatibility and avoid cross-border interference.
  4) Conduct post-implementation monitoring to verify frequency and channel compatibility and confirm that VHF assignments are interference-free.

- **Frequency Re-Engineering and Interference Protection (SANS Implementation):**

  To avoid the large-scale infrastructure upgrades, Saudi Air Navigation Services (SANS) adopted this mitigation strategy recommended in the Park Air Spectrum Study. This approach focuses on engineering new frequencies with enhanced interference-protection measures, including:

  1) Improved Frequency Spacing

  (i) Optimized spacing between channels to reduce overlap and intermodulation risks.

  (ii) Use of the SANS Frequency Management Database and ICAO Frequency Finder Software to ensure compliance with ICAO spectrum planning criteria.

  2) **Enhanced Filtering and Shielding:** Three types of filters were added to the radio chain to improve signal purity and reduce unwanted emissions:

  (i) Double Cavity Filters

  (ii) Band Reject (Notch) Filters

  (iii) Crystal Filters

  However, these multiple filters introduce some power loss and distortion, this configuration was assessed currently as the optimal solution for introducing new frequencies within the Jeddah TMA/TWR environment. The approach prioritizes interference protection and operational reliability, consistent with the Park Air Spectrum Study recommendations. This resulted in significantly improved interference protection and required additional infrastructure and integration, increasing cost and system complexity.

2.8 The Proposed Operational Measures

- **Enhanced Use of CPDLC/DCL:**

  1) Expand CPDLC service and usage for en-route operations to reduce reliance on VHF voice channels where the communications are not time critical.

  2) Use digital communication DCL for not-time-critical instructions and routine coordination.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) Take note of the frequency of congestion challenges affecting the provision of ATS services within Jeddah FIR;
b) Review the proposed technical and operational mitigation measures;
c) Discuss a regional transition plan and timeline to introduce 8.33 kHz Channel Spacing in the MID region;
d) Invite MID States to share information on spectrum management, and to contribute to regional spectrum optimization activities;
e) Discuss and agree on the need to review the regional frequency allotment plan; and to set a dedicated Task Force under the FM WG to submit a proposal for this revision during the upcoming FM WG/5 meeting.

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