Digital Radio Mondiale (DRM) – The most flexible standard for Digitizing the FM Band

New Delhi/Jaipur Trial 2021 – Results Overview

DRM Consortium (www.drm.org) – CONFIDENTIAL INFORMATION

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Introduction

In February and March 2021, the DRM Consortium, its members and supporters in India and internationally, conducted an extensive demo/trial of the global, ITU recommended DRM Digital Radio Mondiale standard applied for local/regional services in the FM band. This demo was carried out at the request of the AIR (All India Radio) as part of an evaluation of two digital radio options for the FM band to choose from and recommend for adoption to the Ministry of Information and Broadcasting.

The demo period started with a 2-day workshop at the AIR headquarters in Delhi with demonstrations of DRM key features, functionality, and on-air signal flexibility. This was followed by on-the-road measurements in New Delhi as well as Jaipur with a professional DRM receiver and a selection of commercial DRM receivers and mobile phones upgraded for DRM reception in the FM band.

The measurements were carried out based on a pure-digital single DRM signal (block) as well as multi-DRM configurations (placing multiple DRM blocks side-by-side from a single transmitter). DRM is a pure digital standard. However, simulcast operation (DRM and analogue FM signals side-by-side from a single transmitter) was also conducted from the same transmitter. DRM was also shown to work in FM white spaces without affecting ongoing analogue FM transmissions.

While the AIR R&D team carried out measurements on behalf of the evaluation Committee, the DRM Consortium in parallel undertook its own set of professional-grade measurements, both with a professional DRM monitoring receiver as well as with consumer-grade radio sets, car receivers and mobile phones.

While the final official recommendation of the AIR Committee is still awaited, the DRM Consortium has gathered and visualized the data and measurements it recorded in parallel with AIR in New Delhi and Jaipur. This document presents a first overview of the documented key findings.

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1. Presentation of Measurement Results for DRM in the FM-Band

1.1 Explanation of Results

All measurements were taken with DRM transmissions at 100 W transmitter power (in various on-air signal compositions including pure-DRM and multi-DRM configurations).

The "**DRM signal measurement maps**" shown below represent the professional-grade measurements of the DRM signal and audio performance using the DRM Monitoring Receiver RF-SE along a range of individual test routes/street sections with the receiver mounted in a car. The coloured dots (strings) represent the individual measurement paths. The overall graphics are a combination of multiple individual measurements taken over multiple days.

For the coverage measurements, the following colour codes apply:

- green: perfect un-interrupted audio playback
- red: audio with audible drop-outs, or no DRM signal reception

The "**receiver performance indicators**" on the other hand represent the subjective performance of a set of randomly selected consumer receiver types and models at select individual locations. The specific locations are marked by coloured dots indicating the reception quality of the specific receiver model at the given location at the time of measurement.

For the receiver performance indicators, the following colour codes apply:

- green: DRM signal reception with perfect un-interrupted audio playback
- yellow: DRM signal reception, audio playback with audible drop-outs
- red: no DRM signal reception

The observed audio drop-outs occurred e.g. due to the local terrain, or shadowing of the low-power DRM signal by buildings.

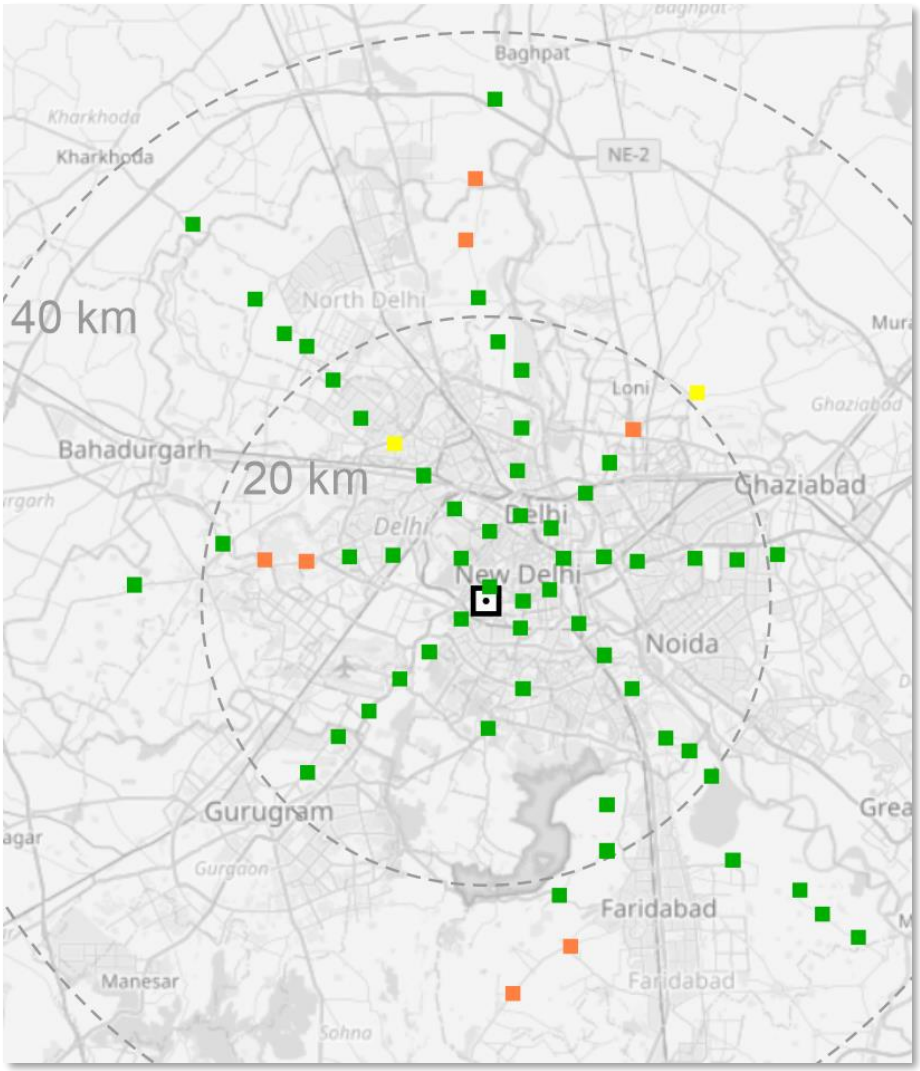
Note that neither the selected signal measurement paths nor the selected receiver performance locations indicate the maximum achievable coverage area of the DRM signal. Instead, they represent the signal performance at the presented measurement paths and locations, respectively.

1.2 Trial Results Delhi

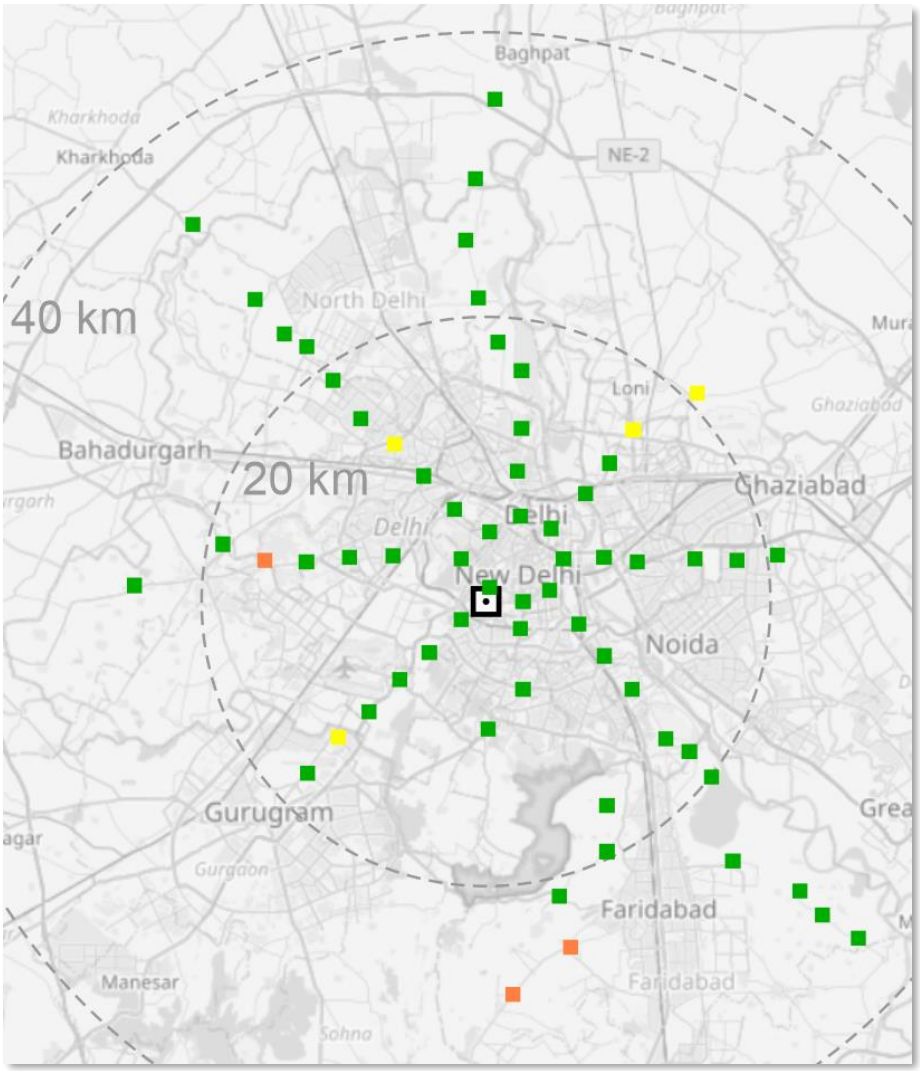
1.2.1 DRM Signal Measurement with Professional DRM Monitoring Receiver

The following graphic presents the map of the wider Delhi area along with distance indicators relative to the location of the DRM transmitter.

1.2.2 Receiver Performance Indicators – Gospell GR-216



1.2.3 Receiver Performance Indicators – Android Mobile Phone with DRM MultimediaPlayer Radio App

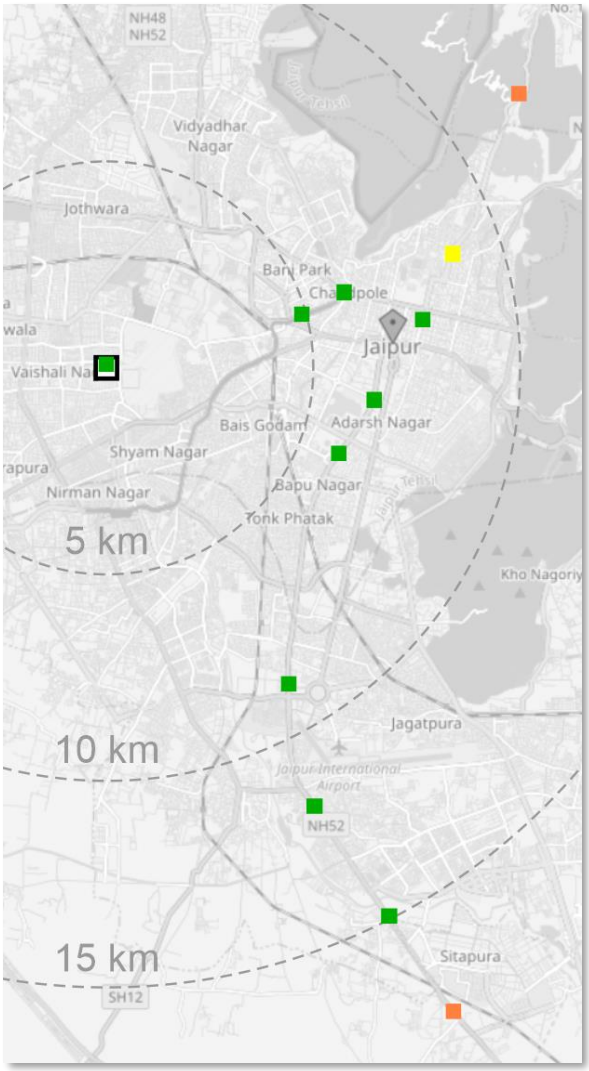


1.3 Trial Results Jaipur

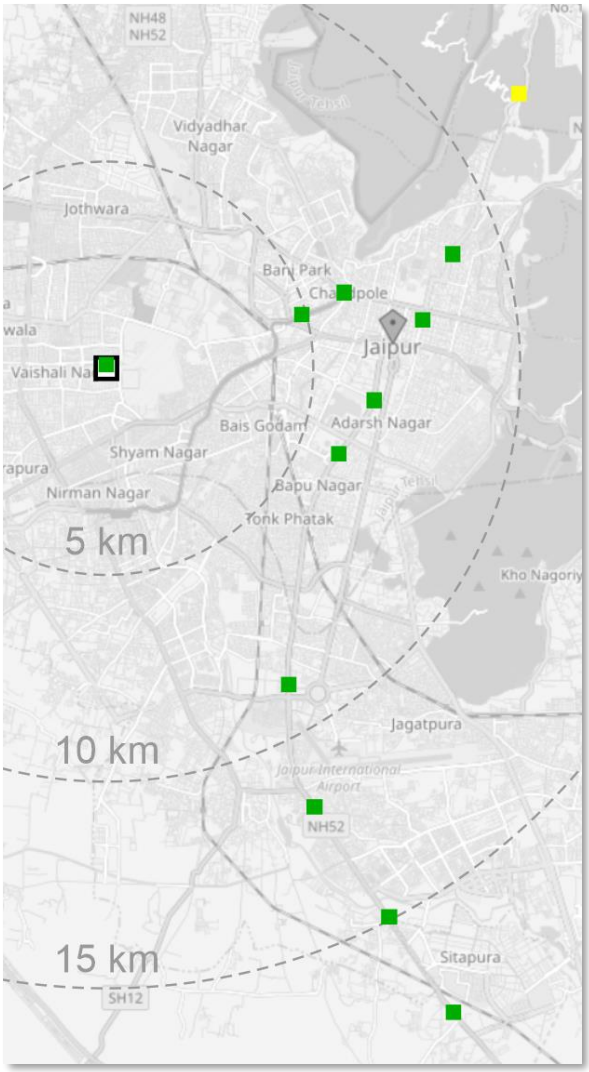
1.3.1 DRM Signal Measurement with Professional DRM Monitoring Receiver

The following graphic presents the map of the wider Jaipur area along with distance indicators relative to the location of the DRM transmitter.

1.3.1 Receiver Performance Indicators – Gospell GR-216



1.3.1 Receiver Performance Indicators – Android Mobile Phone with DRM MultimediaPlayer Radio App



2. Executive Summary / Conclusion

In conclusion, the presented results of the collected measurement data from the DRM FM-band trial in New Delhi and Jaipur are both extremely positive and very encouraging.

The measurements clearly demonstrate that DRM as the global all-bands digital radio standard can deliver an unmatched number of digital audio services in the given spectrum (up to 3 audio plus 1 multimedia service per DRM signal block), while allowing for maximum utilisation of the FM-band spectrum (with every DRM signal occupying only 96 kHz spectrum bandwidth, half the bandwidth analogue FM requires for a single audio service).

During the trial it was confirmed that adding DRM transmissions to the FM band is fully compatible and does not interfere with on-going analogue FM services. Also, DRM as a pure-digital radio standard proved its ability to efficiently broadcast multiple DRM signals side-by-side from a single transmitter (multi-DRM transmitter configuration), and for operating in flexible configurations alongside an analogue FM signal from the same transmitter (simulcast transmitter configuration).

During the workshop DRM was demonstrated to deliver additional Journaline advanced text service in multiple Indian languages, to be ready for delivering Emergency Warning Functionality (EWF with CAP interface), and to efficiently enable traffic, travel and online teaching services over broadcast, without requiring Internet connectivity.

Reception of DRM services in the FM band was demonstrated on various consumer receivers of various types, on car receivers, and on mobile phones. It was proven that existing receiver models, already supporting DRM in the AM bands as adopted by India, can support DRM in all bands by a simple firmware upgrade without hardware modifications.

The trial also confirmed that DRM is fully compliant with the regulator’s (TRAI) recommendations and existing analogue FM spectrum licensing. Broadcasters could experience first-hand the great commercial potential of extending and eventually upgrading analogue FM services to DRM Digital Radio, enabled through added revenue by Journaline, and using the additional radio slots per DRM transmission to cater to the so far un-tapped audiences and temporary pop-up stations.

DRM in FM-band is the natural extension of the digital radio standard already deployed in the AM bands in India. DRM is made for today's and tomorrow's FM environment and radio services in India.

