



## **Executive Summary**

### **Analysis of FM Interference Issues on Grand Cayman Island**

The Cayman Information and Communications Technology Authority (ICTA) engaged Broadcast Signal Lab of Cambridge, Massachusetts to evaluate FM broadcasting interference issues on Grand Cayman Island. The recent addition of three FM broadcasts, operated by DMS Broadcasting, to a government tower in Georgetown prompted a flurry of interference complaints from radio listeners. Particularly affected were listeners to Radio Cayman's 105.3 MHz station and Radio Cayman personnel whose studios are housed at the base of the Georgetown tower. Radio Cayman transmits from a remote site about eight miles east of Georgetown.

ICTA was also interested in the potential interference from several radio stations that are operating with temporary facilities as a result of Hurricane Ivan. These facilities are significantly closer to the ground than those presently operating from towers and are likely to project significant signal levels into their neighborhoods. In Broadcast Signal Lab's review of these issues, ICTA also sought input on future licensing and placement of FM facilities.

ICTA accepts applications for radio facilities and requires applicants to perform the necessary diligence to determine that their facilities will comply with ICTA policy and the tenets of good engineering practice. Among these requirements are the obligations to cause no harmful interference and to provide service to the entire island.

Broadcast Signal Lab visited the island, performed measurements, and met with licensees and government radio representatives, on April 28 through May 1, 2005. In a technical report Broadcast Signal Lab made the following observations and conclusions:

The interference from the addition of the DMS FM stations is "blanketing interference" in which the signal levels of the new stations are not compatible with the characteristics of many common types of radios. These radios get "overloaded" by the strong signal levels from the nearby tower. This interference is a common phenomenon in the vicinity of FM broadcast facilities, particularly those in populated areas with low antenna heights. In the USA and Canada blanketing interference is a consequence of FM broadcasting that is discouraged, but tolerated when necessary. FM stations are required to address certain interference complaints within a certain

distance of new radio stations. However, FM stations are also encouraged to transmit from locations that are less populated and thus less sensitive to blanketing interference.

If ICTA determines the interference is “harmful” under its policies, shutting off the DMS stations will resolve this specific interference problem in the vicinity of the Georgetown government tower. Alternatively, severely reducing the DMS stations’ power (to perhaps 200 watts per station) should significantly reduce or eliminate blanketing interference in this area

The stations that are operating with temporary facilities on building rooftops are unreasonably close to the ground. Consequently, they are exacerbating potential blanketing interference while shortchanging themselves on coverage area. As a temporary condition in the wake of Hurricane Ivan, this is an understandable and acceptable means to keep the affected stations on the air. These facilities should be restored to tower installations as soon as possible.

A particular interference mechanism called “intermodulation” occurs in some receivers near the DMS transmission site beside the Radio Cayman studios. Blanketing sometimes induces this intermodulation in radios in a manner that more severely affects reception of Radio Cayman’s 105.3 than of its other station, 89.9. However, many radios are unable to receive most stations within the DMS blanketing area, so it would not be very productive to make changes to mitigate just the intermodulation phenomenon on some radios.

Requiring the new FM stations to resolve interference complaints is a reasonable remedy, if it is employed in conjunction with other remedies or prevention. Blanketing interference is never fully resolved by responding to complaints. Many people don’t complain, or do not even understand that they are experiencing such interference. Those who seek resolution by making a complaint are often forced to deal with imperfect remedies that limit their mobility, their choice of radio, or the resulting quality of their FM service. It is best to prevent blanketing as much as possible.

In addition to blanketing interference, there is the issue of desired-to-undesired signal levels. That is, a radio might not be suffering from overload due to blanketing, but it may still have difficulty picking up the weaker, more distant station’s signal. This is a situation where an undesired signal on one channel is so much stronger than the signal on the desired channel that the radio can’t receive the desired signal very well, if at all. This occurs in proximity to each

station. The farther apart geographically each station is, the more this disparity in signal levels promotes reception problems near one station and away from others.

Because of its remoteness and small size, Grand Cayman has an opportunity to provide better FM service than on the mainland. Mainland stations are interlocked geographically and always produce a wide disparity of signal strengths. With a mission to serve the entire island, each station has an interest in being more or less centrally located in order to put out the optimum power level to serve the highly populated areas well while providing reliable service to the less populated areas. An optimum power level is also one that minimizes blanketing. Further, a more central location on the island is likely to be less populated, further reducing the potential for the public to experience blanketing interference.

Broadcast Signal Lab determined that licensed stations might not be providing full coverage to the island, based on ITU (International Telecommunications Union) recommendations for good signal levels. A shared FM transmission facility with enhanced antenna height would further the goals of good coverage and minimal blanketing. Power consumption could also be reduced with a greater antenna height, saving broadcasters money and reducing the load on island power resources. The general concept is if the antenna height is doubled, the power required may be reduced by three quarters to obtain the same coverage. Thus with a, say, 400-foot antenna height versus 200, the height and the power reduction combine to further reduce blanketing while enhancing coverage.

The emissions of each radio station should conform to good engineering practice to minimize noise and interference on the FM band, as well as in adjacent bands, such as air navigation. The DMS facility appeared to have a reasonably clean signal spectrum, with relatively minor spurious emissions off their assigned channels. In contrast preliminary results on the test of the Paramount emissions suggest these two transmitters have insufficient filtering because there appear to be substantial spurious emissions on 90.9 and 102.9 (Paramount transmits on 94.9 and 98.9). While it may be tempting to let these emissions remain unless complaints are received, it is good engineering practice to conform to clean emissions recommendations in order to reduce the probability of actual interference, to make it easier to find an interfering source in the future if the band is not polluted with other spurious emissions, and to make it easier for new licensees to occupy channels without having to force other licensees to clean up first.

If FM stations were assigned every fourth channel, a total of 25 channels could be assigned to licensees. With the current configuration of channel assignments in use, a total of 22 stations (14 existing and 8 new) could be assigned. Future station assignments should be mapped onto the spectrum for maximum efficiency. The existing assignments might be revisited to improve spectrum efficiency, resulting in a gain of 3 additional frequencies, for the 25 total.

If a more aggressive approach were taken to frequency assignment, a station could be assigned to every third-adjacent channel, for a total of 34 possible signals. Since third adjacent assignments are generally not made in the same community, for instance in the USA, this closer spacing of stations should be evaluated more carefully prior to adoption. ITU protection ratios and work previously conducted by Broadcast Signal Lab suggest that third-adjacent channel spacing would work if all facilities were at the same or nearby locations.

Going forward, the ICTA is advised:

- Determine what preventions and remedies to blanketing interference are most in the public interest.
- Action on the DMS/Radio Cayman issue should be taken accordingly.
- Further action on Paramount's emissions in particular, and on all stations displaced by Ivan in general, should be considered. Each should be making measurable progress toward relocating appropriately.
- ICTA should monitor and approve station relocations to the degree necessary to assure interference-free, island-wide coverage from each station.
- Other existing broadcast facilities could be included in an overall plan to improve the quality and reliability of FM service to the island.
- Station co-location at a central site, possibly with a higher tower, should be considered.
- A map for new frequency assignments should be developed prior to issuance of further licenses.

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