Second Consultation on the Technical Standards Framework for FM Radio Broadcasting in The Bahamas

ECS 08/2018

Issue Date: 13 July 2018

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1. Introduction

1.1 Background of this Second Consultation

On 22 December 2015 the Utilities Regulation and Competition Authority (URCA) published its consultation document "*Technical Standards Framework for FM Radio Broadcasting in The Bahamas – ECS 07/2015*"[1] (the First Consultation), setting out proposed technical standards mainly aimed at reducing harmful interference and improving the quality of reception in FM radio broadcasting. The First Consultation closed on 12 February 2016.

In the First Consultation, URCA invited comments from interested parties on the matters set out therein, and URCA received three (3) responses to that consultation. URCA has reviewed the comments of the respondents to the First Consultation and URCA has again engaged expert technical consultants to undertake further technical work which is intended to address the substantive technical concerns raised by the respondent to the First Consultation.

This Second Consultation on the Technical Standards Framework for FM Radio Broadcasting in The Bahamas – ECS 08/2018 (the Second Consultation) document advances technical work conducted by URCA and provide members of the public, licensees and interested parties with a further opportunity to comment on the proposed technical standards for FM radio broadcasting in The Bahamas and related matters.

1.2 Objectives of this consultation process

In the First Consultation, URCA stated the importance of establishing technical standards for FM radio broadcasting in The Bahamas. URCA has considered the views of the respondents and has revised the proposed standards. URCA is again seeking the views of FM radio broadcast licensees, interested parties and members of the public in relation to the revised set of proposed technical standards for FM radio broadcasting in The Bahamas. The proposed technical standards are mainly aimed at significantly reducing the occurrence of harmful interference in FM radio broadcasting band and improving the spectral efficiency and fidelity of FM radio. This Second Consultation process also has the following as its core objectives:

(i) to further the interest of consumers by promoting the optimal use of the radio spectrum as a state asset;

(ii) to improve the quality of FM Broadcasting in The Bahamas by establishing technical standards to govern:
   (a) RF emissions for radio stations operating in the FM radio frequency band;
   (b) RF carrier performance;
   (c) equipment used in FM radio broadcasting;

[1] https://www.urcabahamas.bs/consultations/technical-standards-framework-fm-broadcasting-bahamas/

(d) FM sound transmission;
(e) FM broadcast station physical separation;

(iii) to provide a framework for low power (community) FM radio broadcasting; and

(iv) to maximise the number of assignments in each geographical area.

URCA notes that, under the First Consultation, most of the respondents broadly agreed with these objectives.

In this Second Consultation document, individual questions have also been placed next to the corresponding explanatory sections. URCA is mainly repeating the questions that were set out in the First Consultation for the benefit of first-time respondents to this consultation process and to give previous respondents the opportunity to submit additional comments, if necessary. URCA also considers that some of the questions under the First Consultation may not have been clearly understood by all of the respondents and has therefore modified those questions for greater clarity. Also, for the convenience of the respondents, a consolidated list of the questions contained in this consultation document is also set out in Annex G.

All of the responses under this Second Consultation process will be carefully considered and used by URCA for the development of the appropriate technical standards for FM broadcasting in The Bahamas.

Question 1(a): Do you agree with the core objectives of this consultation?
Question 1(b): If you responded 'No' to question 1(a), please explain and provide any additional objectives that URCA should consider.

1.3 Structure of the remainder of this document

The remainder of this document is structured as follows:

Section 1: Continues by outlining how persons may respond to and participate in this consultation process;

Section 2: Outlines the legal basis and framework under which URCA is conducting this consultation and will intervene in the FM radio broadcast market;

Section 3: Describes the FM radio broadcast market in The Bahamas;

Section 4: Describes the FM radio frequency band allocation for The Bahamas;

Section 5: Explains Low Power (Community) FM radio broadcasting in The Bahamas;

Section 6: References the FM radio broadcast Technical Standards in The Bahamas;

Section 7: Sets out technical considerations for FM Radio Broadcast Equipment;

Section 8: Describes the Public Health and Safety considerations for FM Broadcasting in The Bahamas;

Section 9: Details URCA's preliminary thinking regarding the introduction of Digital Sound Broadcasting in The Bahamas;

Section 10: Describes URCA's "Next Steps" in the consultation process;

Annex A: Provides the proposed Technical Standards for FM Radio Broadcasting in The Bahamas;

Annex B: Sets out the relevant International Standards for RF Radiation Exposure;

Annex C: Sets out proposed technical standards for Low Power FM stations;

Annex D: Provides minimum separation distances between transmitters;

Annex E: Describes interference considerations for channel spacing of 600 KHz and 800 KHz;

Annex F: Provides the definitions for Digital Audio Broadcasting System IBOC system; and

Annex G: Provides a consolidated list of the questions raised in this consultation.

1.4 Responding to this Second Consultation

URCA invites written comments and submissions from members of the public, licensees and interested parties on the issues set out in this consultation document. Comments and submissions may be shared on any aspect of this consultation document, and in so far as it is possible, each section has been numbered to facilitate easy reference. Persons may deliver their written comments or submissions to the Chief Executive Officer of URCA either:

- by hand, to URCA's office at Frederick House, Frederick Street, Nassau, Bahamas; or
- by mail, to P. O. Box N-4860, Nassau, Bahamas; or
- by fax, to (242)-393-0237; or
- by email, to info@urcabahamas.bs.

All comments and submissions to this consultation document should be **submitted on or before 13 August 2018**.

URCA's preferred format for written responses is as follows:

- Respondent's name;
- Name of organisation (or state whether the respondent is a consumer);
- Email address or other address of respondent;
- Response to Question 1;
- Response to Question 2;
- Response to Question [next question]; and
- Any other matters that a respondent believes URCA should consider under the instant consultation process.

URCA reminds respondents that the questions asked in this Second Consultation document have also been listed at Annex G herein for ease of reference. Full explanation to the answers submitted or views held by respondents on any of the issues raised or proposals made in this consultation would also be helpful. **URCA advises that it may give greater weight to comments that are supported by appropriate evidence.**

1.5 Confidentiality

URCA believes that, as a matter of transparency and good regulatory practice, it is important for the public and interested parties to this consultation process to have sight of the views and positions expressed by all respondents. As such, as soon as reasonably practicable after the close of the response date for this Second Consultation, URCA intends to publish all responses on the URCA website at www.urcabahamas.bs.

However, URCA may treat as confidential responses that are marked (in part or full) as being confidential. An explanation should be provided to justify any information that is submitted on a confidential basis. In such circumstances, a redacted version should also be submitted to URCA. URCA has the sole discretion to determine whether to publish any submission marked as confidential.

1.6 Intellectual property

Copyright and all other intellectual property that forms any part of a response to this consultation document will be assumed to be licensed to URCA for its use during this consultation process.

1.7 Interpretation

Except insofar as the context otherwise requires, words or expressions shall have the meaning assigned to them in this consultation document, and otherwise words and expressions shall have the same meaning assigned to them under the Comms Act, and otherwise the Interpretation and General Clauses Act, Chapter 2.[2]

2 Regulatory framework of this Second Consultation

URCA's role in the regulation of FM radio broadcasting in The Bahamas is in the context of URCA's statutory duties and responsibilities under the Comms Act, the Electronic Communications Sector Policy (ECSP)[3] and the relevant licence conditions established under the Individual Spectrum Licence (ISL) issued to FM radio broadcasters.

Under section 11 of the Comms Act, when issuing regulatory or other measures, URCA is required to allow persons with sufficient interest a reasonable opportunity to comment on the proposed regulatory or other measures which in URCA's opinion are of public significance. Pursuant to section 13(2)(b) of the Comms Act, technical rules and standards have been designated regulatory or other measures of public significance. As such, URCA has a statutory duty to conduct a public consultation in order to allow persons with sufficient interest a reasonable opportunity to comment on the matters contained herein.

Under section 4 of the Comms Act, one of the key policy objectives URCA is mandated to carry into effect is to further the interest of consumers by promoting competition and "*to promote the optimal use of state assets, including radio spectrum*".

Under section 32 of the Comms Act, URCA along with the Minister charged with the responsibility for the electronic communications sector must ensure that radio spectrum is managed and used in a manner that is, *inter alia*, economically efficient and facilitates the evolution of new technologies and electronic communications services whilst taking into account investment in existing equipment configured for specific radio spectrum and the cost of migration to other radio spectrum.

Under section 35(2) of the Comms Act, URCA can establish (a) requirements for authorisation of use of radio equipment, including technical requirements and standards in relation to radio interference; and (b) procedures, conditions and restrictions applicable to the use of radio spectrum and radio equipment.

Regarding "technical equipment", under section 83(3) of the Comms Act, URCA may recognise and apply technical rules, standards, conditions and approval processes of other countries.

[2] Statute Laws of The Bahamas

[3] As published from time to time in the Official Gazette of The Bahamas.

URCA must have regard to the ECSP when issuing a regulatory or any other measure in relation to spectrum. The ECSP prescribes that spectrum must be managed to avoid undue interference between competing services and to ensure that it is allocated efficiently.

FM radio broadcasters in The Bahamas are required to firstly obtain an ISL from URCA to use assigned radio spectrum for radio broadcasting and must, therefore, comply with conditions thereunder relating to, *inter alia*, spectrum use and radiocommunications equipment. Condition 5 of the ISL licensing framework generally obligates an ISL licensee to take all necessary steps to ensure that the use of assigned radio spectrum is safe and does not cause harmful interference to other existing radiocommunications stations and networks in the same geographical area or radio frequency band. The licensee must also take all necessary steps to comply with any technical standards and specifications established by URCA or published by relevant International Standards Bodies. Under Condition 6 of the ISL, the licensee must comply with any relevant compulsory standards and specifications established by URCA and/or relevant International Standards Bodies for emissions, non-ionising radiation safety and electromagnetic compatibility in connection with any of its radiocommunications equipment.

URCA considers that the cumulative effect of the foregoing requires it to conduct this public consultation and to exercise its regulatory powers under the Comms Act to intervene in the FM radio broadcasting market to the extent of establishing comprehensive technical standards for FM radio broadcasting in The Bahamas.

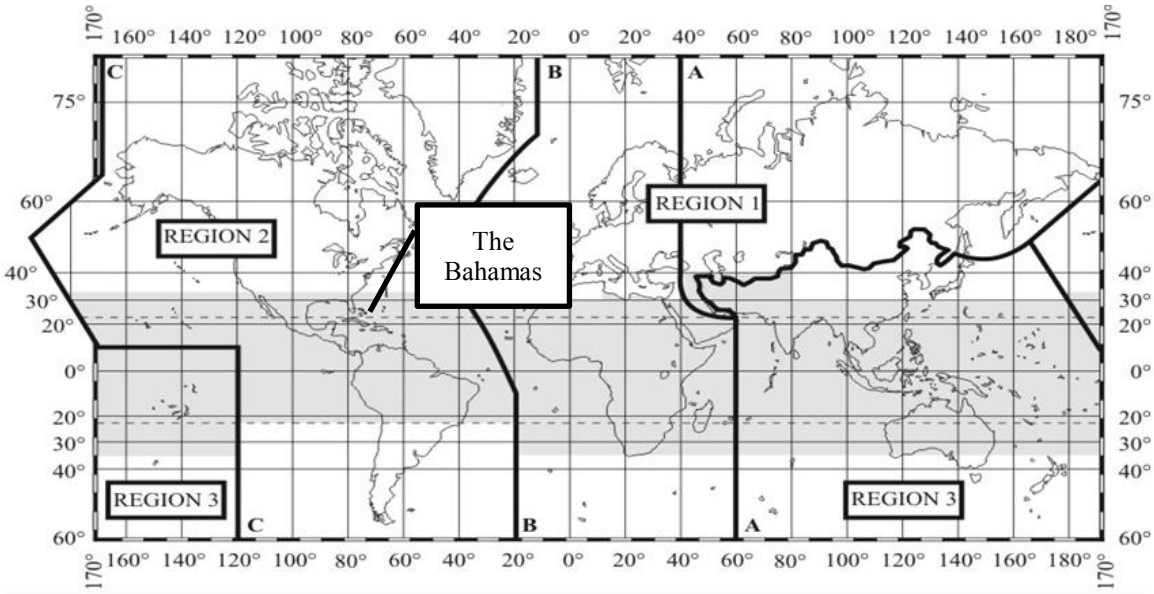
3 FM Radio Broadcasting in The Bahamas

Prior to the establishment of the Comms Act and the current regulatory regime for the electronic communications sector in The Bahamas, regulatory responsibility for FM radio broadcasting was the remit of the Government of The Bahamas and licences for FM broadcasting stations were assigned by various Government Ministries and Departments from time to time. On September 1, 2009, URCA was given a statutory mandate under the Comms Act to regulate broadcasting in The Bahamas which, *inter alia*, includes FM radio broadcasting. All FM radio broadcast stations that existed in the market up to September 2009 were consequently required under the Comms Act to transition to an URCA issued licence and thereby became subject to URCA's regulatory jurisdiction.

Under the current regulatory regime, URCA's approach to determining and regulating the technical parameters under which FM radio broadcasters transmit throughout The Bahamas has been guided by technical standards published by regional telecommunications regulators in compliance whose standards comply with the technical standards published by the International Telecommunication Union[4] (ITU), the United Nation's specialised agency for information and communication technologies of which The Bahamas is a member country.

[4] Specifically the Radiocommunications Sector of the ITU (ITU-R)

One of the core functions of the ITU is the allocation of radio spectrum. The ITU has divided the world into three (3) regions: Region 1, Region 2 and Region 3. The Bahamas is located in ITU Region 2[5]. Regionalisation allows the countries in the same region to harmonise spectrum utilization and thus create economies of scope and scale, which significantly reduce the cost of equipment and technical standardisation. The allocation of spectrum by URCA for FM radio broadcast in The Bahamas has therefore been aligned with the overall recommendations by the ITU for Region 2. Specifically, the proposed technical standards for The Bahamas under this consultation process are informed by Recommendation ITU-R BS.412-9, which set out planning standards for terrestrial VHF FH sound broadcasting[6] and Recommendation ITU-R BS.450-3, which provides transmission standards for FM sound broadcasting. The chart below illustrates the global regions as determined by the ITU:



Source: ITU

URCA has also been guided by technical standards as issued from time to time by other International Standards Bodies, such as the Federal Communications Commission (FCC) and Industry Canada, when it considered technical standards for FM radio broadcasters in The Bahamas. In this regard, URCA has been guided by Part 73 Subparts B and C of the Radio and Television Broadcast Rules 47, Code of Federal Regulations (CFR) as published by the FCC and

[5] ITU Region 2 Countries: Antigua and Barbuda, Argentina, Bahamas, Barbados, Belize, Bolivia, Brazil, Canada, Chile, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Ecuador, El Salvador, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, St. Vincent and the Grenadines, Suriname, Trinidad and Tobago, United States of America, Uruguay, Venezuela.

[6] International Telecommunications Union. (2018). *Planning standards for terrestrial FM sound broadcasting at VHF*. Retrieved from https://www.itu.int/dms_pubrec/itu-r/rec/bs/R-REC-BS.412-9-199812-I!!PDF-E.pdf.

the Technical Standards and Requirements for FM Broadcasting Transmitters (BETS-6) as issued by Industry Canada[7].

In the first Consultation on the FM broadcasting standards, URCA stated that consequential to an appreciable growth in the number of FM radio broadcasters in The Bahamas, the need for the implementation of comprehensive technical standards for FM radio broadcasting by URCA, specific to The Bahamas, has become more acute. With the aforesaid growth in the number of FM radio broadcasters in The Bahamas, the availability of spectrum for FM radio broadcasting in New Providence is near exhaustion. Additionally, URCA received an increased amount of complaints from FM radio broadcasters regarding harmful radio frequency interference. URCA also noted comments from members of the public regarding the degradation of the quality and fidelity of FM radio. URCA's proposed regulatory action aims to address these concerns.

3.1 Field Measurements

URCA has analyzed the FM radio spectrum band. The results of the analysis allowed URCA to understand the nature and structure of the FM broadcast band and indicated the need for regulatory intervention through the implementation of FM radio technical standards in The Bahamas.

The following are key findings of the analysis which informed URCA's decision to propose FM radio technical standards for The Bahamas:

(i) the technical parameter sampling of the existing FM broadcast transmitters indicated that radio stations have a wide variation in many key technical parameters that affect station co-existence in an interference-free RF environment (i.e. Carrier Power, Carrier Frequency Deviation and Occupied Bandwidth) and the quality of service parameters by listeners of the FM band (i.e. Stereo Pilot Levels and Carrier Deviation); and

(ii) the data/signals that were observed and measured during the manual analysis showed that some radio stations have, amongst other things, technical issues with frequency deviation and pilot levels;

It was generally observed that some radio stations' pilot carrier deviation levels were significantly above or below optimal international standards for FM radio broadcasting.

The findings of the Field Measurements under the First Consultation are still valid and URCA, therefore, considers that regulatory intervention through establishing technical standards that are consistent with international industry standards should permit users of the FM band to

[7] Issue 2, August 2005

enjoy interference free and quality signal with FM receivers easily obtained in the market today. Moreover, listeners should experience a higher quality of service from FM radio broadcast stations.

4 FM Radio Frequency Allocation for The Bahamas

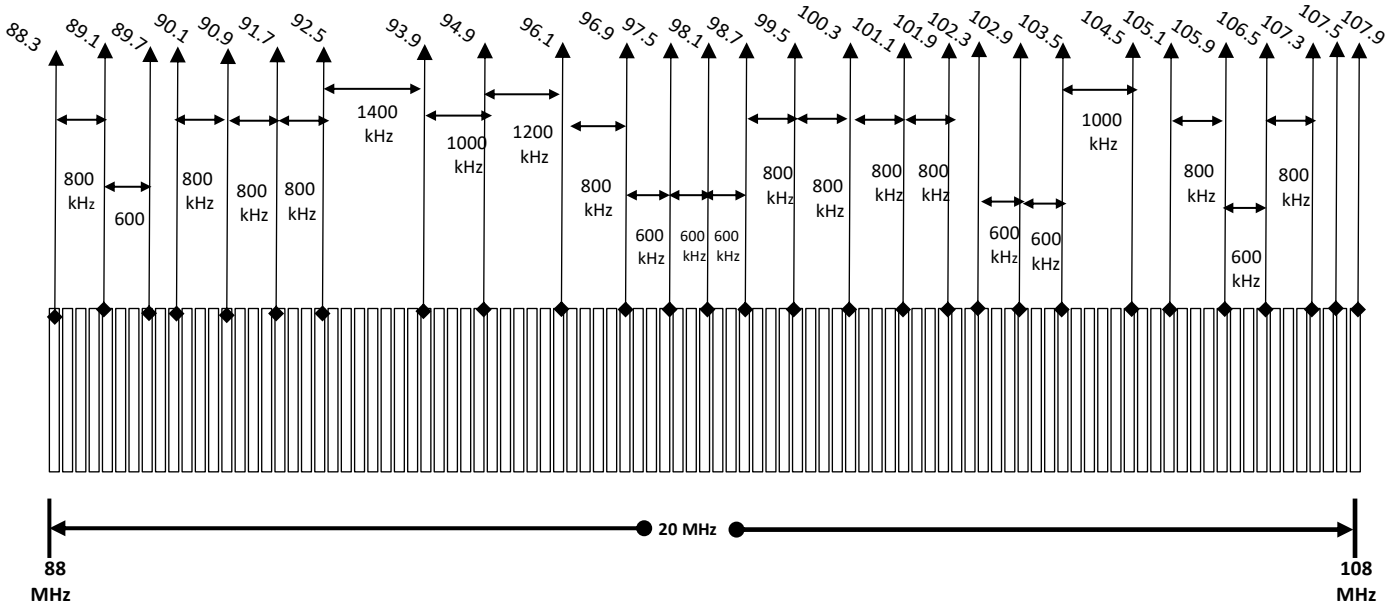
Under the National Spectrum Plan, ECS 03/2014 as published by URCA April 10, 2014, the FM band for The Bahamas lies between 88 MHz and 108 MHz[8]. This is broadly consistent with the band utilised by other countries in ITU Region 2, although there is some minor variation between countries in the lower frequency limit. This broad consistency ensures that a wide choice of radio equipment from world markets is compatible for use in The Bahamas. More importantly, in order to minimise the effect of harmful interference, FM radio broadcasting stations require an inversely related combination frequency and spatial separation between same and adjacent frequency assignments. On small islands in The Bahamas, spatial separation is impractical, therefore greater frequency separation is necessary. Hence, the maximum number of possible assignments on an island is determined by its geographic dimensions, amongst other things.

URCA noted in the First Consultation that the channel spacing of the frequencies in the FM band in The Bahamas has developed into what can best be described as an ad hoc manner. This was due in large measure to the absence of established technical standards for FM radio broadcasting specific to The Bahamas at the time when URCA was given responsibility for the FM broadcasting industry but was required to issue radio frequencies to FM radio broadcasters. On the island of New Providence, with its geographical dimensions of twenty-one (21) miles long by seven (7) miles wide, establishing distance separation for frequency assignments and transmission stations that were already in operation to co-exist with new radio stations presented peculiar challenges. URCA nevertheless endeavoured to issue such frequencies in a manner that would minimize harmful interference between FM radio broadcasters.

The FM band consists of 20 MHz of radio frequency spectrum and most countries in ITU Region 2 have adopted consistent or standard channel spacing of 400 KHz, 600 KHz or 800 KHz when allocating the standard 200 KHz of spectrum for FM radio broadcasting in conjunction with the implementation of spatial requirements. However, The Bahamas has non-standardized channel spacing in the FM band ranging from 400 KHz to 1400 KHz, as seen in Table 1 below:

[8] See particularly section 6, “The Spectrum Allocation Table”.

Table 1:



URCA recognizes that 600 kHz frequency spacing has been mainly adopted in countries such as Canada and the US with land mass more expansive than that in The Bahamas. URCA also considers that the 600 kHz frequency spacing may be appropriate for the islands of The Bahamas provided that maximum effective radiated power does not exceed 10 kW. Notwithstanding that, URCA reserves the right to determine the maximum limits on a case by case basis. In this regard, URCA has considered the "Grandfathered short-spaced stations" as set out under Part 73.213 of the Code of Federal Regulations[9] (CFR) that prescribes the minimum geographical distance separation required to achieve the appropriate spectrum mask while taking into account the effective radiated power (ERP) proposed for FM radio broadcasting stations. The CFR establishes that for transmission powers of less than 6 kilowatts (kW), the minimum frequency separation required for a FM radio station with frequency spacing of 600 kHz is 19 miles. However, URCA believes that 800 KHz channel spacing may be preferred for the topography of the smaller islands of The Bahamas. URCA considers that the required 19 mile geographical separation distance would not be practical on smaller islands such as New Providence, which is only 21 miles long and 7 miles wide. As such, a frequency spacing of 800 kHz would further the electronic communications policy objective to ensure optimal use of radio spectrum.

Under the First Consultation, it was URCA's preliminary position that there should be standardized channel spacing of 600 KHz for islands in The Bahamas that are greater than 19 miles wide and channel spacing of 800 KHz for islands in The Bahamas that are less than 19

[9] Revised as of October 1, 2006

miles wide. Under the Second Consultation, URCA further analysed the different standard frequency spacing and the preliminary findings are as follows:

- 400 kHz spacing grant the most efficient usage of the spectrum, but suppose a very high effort in spectrum engineering and management, also the probability of low quality reception at the edge of the coverage area is high, sustained spectrum monitoring effort is necessary;

- 800 kHz spacing supposes a lighter effort in spectrum engineering and management; the adjacent channel interferences are practically zero, the distance between two transmitters can be as low as 19 miles and up to 25 FM transmitters in an area (island). This would not be consistent with the existing frequency allocation in New Providence; and

- The adoption of 600 kHz spacing, also the most preferred standard in ITU Region 2 and is the most appropriate standard for The Bahamas, representing a balanced option robust enough against adjacent channelling interferences and assuring sufficient resources for the existing broadcasters.

In light of the foregoing and based on additional technical advice provided to URCA under this Second Consultation, it was recommended and URCA now proposes that FM broadcast station to be established in The Bahamas are to be separated by a minimum channel spacing of 600 kHz for islands in The Bahamas greater than 19 miles long. In cases of islands in The Bahamas less than 19 miles long, FM radio stations are to be separated by a minimum of 800 kHz.

URCA considers that the adoption the aforementioned 600 kHz and 800 kHz channel spacing should facilitate co-existence in the RF environment. It should also reduce the technical complexity of filtering co-sited stations, allowing for the possibility of multiplexing stations on the same antenna. The mitigation of potential interference is also made easier.

URCA further considers that another advantage of establishing as 800 kHz spacing for Full Service (power/coverage) FM broadcast stations is that it will give the regulator more flexibility to allow for un-protected 400 kHz spacing assignments for LPFM operations in smaller markets for special programming or for temporary special events.

4.1 Frequency channel spacing in New Providence

As explained above, channel spacing for FM radio stations in New Providence is less than optimal. URCA stated under the First Consultation that standardized channel spacing for The Bahamas as a whole should result in greater spectrum efficiency and reduced harmful interference between radio broadcasters. URCA also said that the improved spectrum efficiency

is consistent with its mandate under section 32 of the Comms Act to ensure that radio spectrum is managed and used in a manner that is, *inter alia, "economically efficient*".

URCA signaled its intent to standardize channel spacing for The Bahamas as a whole, but was cognizant that, due to the number of existing radio broadcasters in New Providence, adjustments to FM band frequencies issued by URCA to FM radio broadcasters in New Providence would be necessary. URCA stated that consequential to its technical investigations and field trials of the FM band, adjustments to FM band frequencies as issued by URCA to FM radio broadcasters in New Providence would require the migration of certain FM radio broadcast stations from the existing frequency from which they now broadcast/transmit. URCA however recognized that it must balance the objective to achieve spectrum efficiency in New Providence with the potential harm to such radio broadcast stations.

Regarding potential harm to radio broadcast stations in New Providence, URCA was particularly mindful of critical issues specific to radio broadcast stations that would be consequential to a requirement to migrate. URCA is also cognizant that radio stations have expended significant resources on product branding, "good will" and the general recognition by the public of the radio station. URCA is further aware that radio stations affected by a requirement to migrate would realize a cost to change trademarks, stationery, logos, business paraphernalia and other related material. The cost for radio stations to migrate to another frequency must therefore be considered against any resulting benefit consequential to the proposed migration.

URCA particularly notes that the objection by respondents under the First Consultation to URCA's proposal to standardize the channel spacing was grounded primarily in the commercial interest of radio stations as opposed to technical reasons that would militate against the objective of achieving spectrum efficiency and the potential reduction of harmful interference in the FM radio band. Having considered the comments received, URCA believes that the preferred approach to the reduction of potential harmful interference between FM radio stations in New Providence may be achieved through compliance by radio broadcast stations to the proposed FM radio technical standards, but will consider further responses to the questions below under this Second Consultation before a final determination is made.

Question 2 (a): Do you agree with URCA's proposed standard channel spacing of 600 KHz for islands in The Bahamas greater than 19 miles long and minimum 800 kHz in cases where the islands in The Bahamas are less than 19 miles long?

- Yes
- No
- Don't Know

Please provide full reasoning in support of your answer.

Question 2(b): What are your views regarding URCA's proposed approach to standardizing the channel spacing for FM radio broadcasting in The Bahamas and the requirement to migrate?

5 Low Power (Community) FM Radio Broadcasting in The Bahamas

URCA stated under the First Consultation that it had seen a growing interest Low Power or Community FM broadcasting stations, which seeks to target a local community or demographic in a community. Low power broadcasting is intended for small-scale, localized coverage with specific technical standards to restrict wide-scale coverage. However, since the First Consultation, URCA has seen a significant decrease in interest for this type of radio broadcast service, but considers it necessary to proactively establish technical standards for Low Power or Community broadcasting.

If this "middle tier" of potential broadcasters is to be facilitated, it is necessary for URCA to determine the extent of the coverage area and the technical parameters that will allow for effective radio transmissions to the listening community without causing harmful interference to other high power FM broadcasters that are operating in close proximity. In this regard, URCA proposes that the coverage area of Low Power FM broadcasting stations should not exceed a one (1) mile radius from the station[10], particularly for the smaller Islands[11] of The Bahamas. As such, the effective radiated power (ERP) and transmission antenna height must be determined by URCA on a "per station" basis to permit high quality broadcasting in the specific coverage area. URCA has considered technical standards implemented for regional and international Low Power FM (LPFM) stations such as the US, Canada, the United Kingdom and Trinidad and Tobago. URCA has provided the ERP limits used in these countries in Annex C of this consultation document. In this regard, URCA proposes a maximum ERP limit of 100 Watts for LPFM stations in The Bahamas.

[10] The geography (i.e. land mass) of each Island must be considered when establishing the broadcasting parameters for Low Power FM broadcasting stations. For example, Rum Cay has land mass of 30 square miles while Abaco has land mass of 775.7 square miles. As such, URCA may consider extending the coverage area for Low Power FM broadcasting on the larger islands.

[11] Islands with land mass of 80 square miles or less.

LPFM stations are required to firstly obtain a licence under the Comms Act from URCA to operate and use spectrum for LPFM broadcasting. As such, LPFM stations would not be exempt from licensing and spectrum issued to such stations will be on the basis that the stations do not cause harmful interference to commercial FM broadcasting stations and will not claim protection from these stations.

Respondents to the First Consultation were broadly supportive of establishing technical standards for LPFM stations. However, there was a concerned that LPFM broadcast stations must have their antennas and transmitters "close to people" because they transmit at low power. Further, that LPFM stations are not viable because they cannot amass sufficient listenership to generate the necessary revenue and are therefore destined to fail as it is not practical for such stations to sell sufficient commercial time to sustain operation. It was also stated that this situation is exacerbated by the engineering compliance and proof requirements proposed under the First Consultation.

Consequential to URCA's further technical review and technical analysis, URCA believes that the technical standards proposed under this Second Consultation process, as detailed in Annex A herein, should *mutatis mutandis* apply to Low Power FM broadcasting in The Bahamas. URCA will however make its final determination having considered responses to the questions below in this regard.

Question 3(a): What are your views regarding the licensing of Low Power FM broadcasting in The Bahamas?

_____

_____

Question 4(a): Do you agree with URCA's proposal that the coverage area for Low Power FM broadcasting stations should not exceed a one (1) mile radius from the station?

- Yes
- No
- Don't Know

Please provide reasons for the support of your answer.

_____

_____

Question 4(b): If your response to 4(a) is a 'No', what do you consider a reasonable coverage area for LPFM stations? Please provide reasons for the support of your answer.

_____ _____
Question 4(c): What are your views regarding the maximum ERP limit for those stations that are licensed on 'no interference and no protection' basis? _____ _____

6 FM Radio Technical Standards and Compatibility Considerations

As stated under section 3 of this consultation document, the proposed technical standards for The Bahamas would be informed and guided by the technical standards published by the ITU for Region 2. URCA has considered the technical standards for FM broadcast as published by other countries in ITU Region 2 such as Canada, US and within the region[12]. URCA is therefore satisfied that the proposed technical standards for FM broadcasting in The Bahamas are appropriate and compatible with ITU Region 2 standards.

URCA considers it important to emphasize that the technical standards proposed by URCA for FM radio broadcasting in The Bahamas are the minimum requirements for the design and operation of FM radio broadcasting networks.

A Respondent to the First Consultation did not believe that the proposed technical standards are appropriate and that the standards are based upon flawed and misleading content that are untenable for various technical reasons. The Respondent considered the technical standards to also be at variance with the established rights and legal protections afforded to legacy broadcast licensees. Details of the propagation model and software used by the Respondent were not provided in its response.

URCA used detailed parameters as well as an internationally-recognized propagation model (Langley–Rice Model) and the software developed by the Canadian Communications Research Centre of Canada (CRC) in the process of developing the proposed technical standards.

Under this Second Consultation, URCA has restated its questions below and will consider all comments prior to making its final determination.

The technical standards proposed by URCA for FM radio broadcasting in The Bahamas are comprehensively set out in Annex A of this consultation document.

[12] Particularly Barbados, Jamaica, Trinidad and Tobago and the Organisation of Eastern Caribbean States (OECS)

Question 5 (a): Do you believe that the technical standards proposed by URCA for FM radio broadcasting in The Bahamas are appropriate?

- Yes
- No
- Don't Know

Question 5(b): Please provide full reasoning in support of your answer.

_____

6.1 Effective Radiated Power

In section 4 of the Draft FM Technical Standards for FM Radio Broadcast Transmission and Reception document, as contained in Annex A of this consultation document, URCA again proposes the effective radiated power (ERP) or power levels to be used by FM broadcast stations when transmitting. URCA has conducted further technical investigations and analyses in this regard and considers that the proposed ERPs would minimize harmful interference between radio stations while simultaneously permitting high quality ubiquitous coverage by such stations, **including in-building penetration** (emphasis added). URCA sets out below its approach to determining the proposed ERP/power levels. For the purposes of this Second Consultation, URCA states that a maximum value for EHAAT of 100 meters was considered.

Under this Second Consultation, URCA has revised the factors[13] that were considered when calculating coverage for radio frequency propagation are as follows:

(i) tower height;
(ii) terrain (natural features of the land);
(iii) antenna and tower heights above the average terrain (HAAT);
(iv) radio frequency (RF) energy generated directly from the transmitter output port of the transmitter;
(v) location of the transmitter;
(vi) antenna gain;
(vii) the ERP and the receive signal levels at the fringes for an acceptable quality of service to the customer;
(viii) signal radiation patterns;
(ix) the climate zone (Tropical - in the case of The Bahamas); and
(x) recommended receiving antenna height (30ft above ground).

[13] These factors are based on landmass and the physical layout of the land.

All calculations were done using coverage prediction RF planning software namely: the Longley-Rice[14] propagation model 20 MHz to 40 GHz, which encompasses the band spread for FM radio broadcast frequencies (88 MHz – 108 MHz).

During the propagation modelling and calculation exercise, the frequency 108 MHz was used for all locations. This was done to give greater assurance that the signal levels being recommended for the service area(s) to be covered are strong enough for listeners to receive a good quality signal, since the higher frequencies in the band provide a shorter range and the coverage area is lessened. As a result, operators operating below 108 MHz should experience signals beyond the average coverage area. The Table below shows a sample of the islands used in the propagation modelling and calculations exercise and the parameters used for each island (taking into consideration the nine (9) factors stated above):

Table 1:

	ISLAND	TOWER HEIGHT		TX: OUTPUT POWER		ANTENNA GAIN		E(i)RP	MINIMUM RX SIG. LEVEL	COVERAGE
	-	100 ft	150 ft	2KW	5KW	1.6dB	3.2dB	-	Guaranteed reception to cover 62 miles	
1	Berry Islands	√		√			√	5kW	"	100%
2	Bimini Islands	√		1kW			√	1kW	"	100%
3	Inagua	√		√			√	5kW	"	100%
4	New Providence	√		√			√	5kW	"	100%
5	Ragged Island	√		√		√		2kW	"	100%
6	Rum Cay	√		1kW		√		1kW	"	100%
7	San Salvador	√		√			√	2kW	"	100%

URCA believes that along with proper channel spacing and engineering layout, the proposed power levels should assist with minimizing the effect of harmful interference that numerous stations, particularly in New Providence, are currently experiencing. URCA also believes that

[14] The software used to produce the results was provided by the Communications Research Centre of Canada (CRC), the Canadian government's primary laboratory for research and development (R&D) in advanced telecommunications.

the proposed power levels will mitigate hazardous radiation to the general public from the extremely high radiating signals being emanated from relatively low installed antennas and tower heights (especially those located in densely populated communities of New Providence).

Under the First Consultation URCA stated that the power levels of the transmitter were determined on the basis that the ERP power and antenna height above average terrain (HAAT) employed, provides a minimum signal level of 70 dB above 1 uV/m over the coverage area. URCA now clarifies that this is at 9.1 meters (30ft above ground)[15]. This ensures that the 1mV/m contour encompasses the population centre that is being served. The level of coverage considering a field strength of 70 dBuV/m evaluated outdoor at 30 feet (9.1 meters) above the ground (measured with a real outdoor antenna or evaluated using dedicated spectrum engineering tools) is internationally accepted to ensure satisfactory service quality inclusive of indoor/in-building penetration, in the presence of interference from industrial and domestic equipment in normal reception conditions. The minimum usable field strength at a particular point, in the absence of interferences from industrial and domestic equipment, measured at 10 m above the ground using an outdoor antenna is 48 dBuV/m. No "indoor" or "interferences from industrial and domestic equipment" corrections are to be applied to the 70 dBuV/m fieldstregth value (evaluated at 30 feet or 9.1 meters).

URCA used omni-directional antennas in each case during the calculations to achieve the desired results for each island. However, URCA believes that radio broadcast stations can maximize the results beyond the proposed power levels, which can also assist in minimizing the effects of harmful interference by proper signal pattern engineering. That is, in instances where omni-directional antennas are used, directional antennas can be utilized in the alternative for more robust results. This should also have the effect of narrowing the radiation pattern beam, achieving greater range and also greatly minimizing the effects of harmful interference.

Under this Second Consultation, URCA has revised the Tables to Figures 1 and 2 below that illustrate the area coverage maps each transmitter should achieve on New Providence and Grand Bahama, respectively, using the technical specifications shown in the associated tables.

Table 2: Technical Specifications

Antenna Type	Omni
Frequency	108 MHz
Power at the output port of the transmitter	2500W
Antenna gain	2.2dbd
Effective Radiated Power (ERP)	4149W[16]

[15] Reference: BPR-3, Part 3: Application Procedure Rules for FM Broadcasting Undertakings, Chapter 3.9.1 Prediction of Coverage.

[16] Note that ubiquitous coverage for New Providence is achieved with an ERP of under 5000W.

Elevation	60-ft
Height of antenna above elevation	40-ft
Receiving antenna height	30-ft

Figure 1:

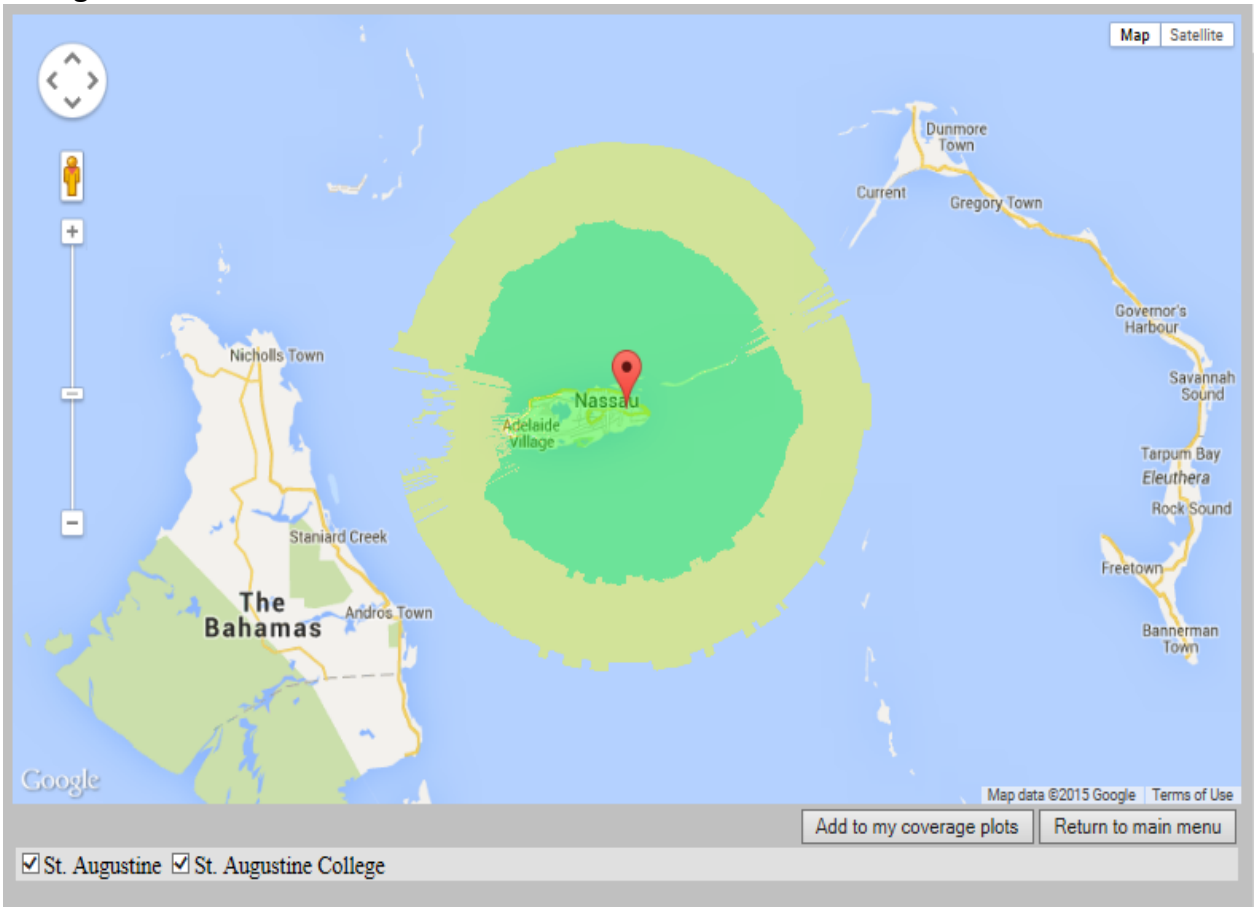
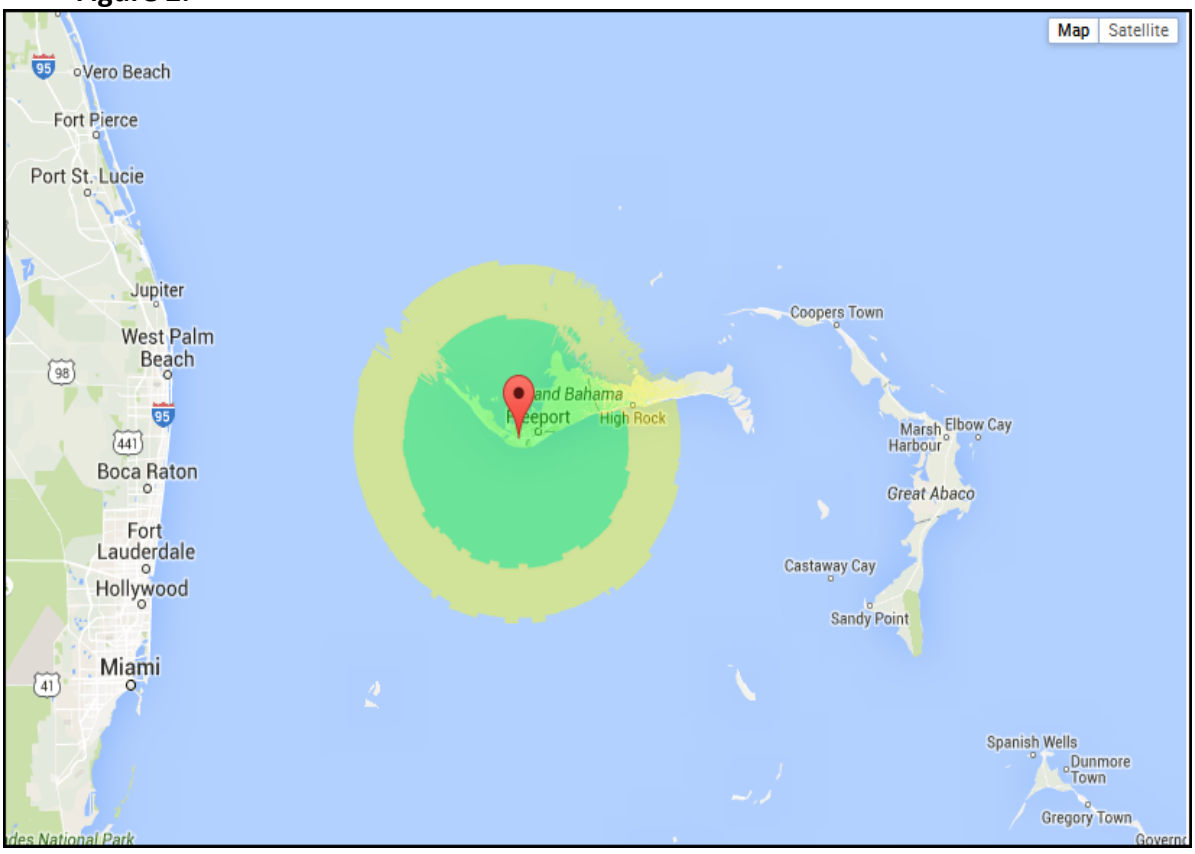


Table 3: Technical Specifications

Antenna Type	Omni
Frequency	108 MHz
Power at the output port of the transmitter	5000W
Antenna gain	2.2dbd
Effective Radiated Power (ERP)	8300W
Elevation	120-ft
Height of antenna above elevation	100-ft
Receiving antenna height	30-ft

Figure 2:



6.2 FM/NavCom Compatibility

Under the First Consultation, URCA stated that the proposed technical standards for FM radio broadcasting in The Bahamas are also intended to safeguard against interference to aeronautical radio-navigation and communications (NavCom) services. NavCom in ITU Region 2 are assigned in the frequency band 108 - 137 MHz upper adjacent to the FM band. As a result, there exists a potential for interference to these aeronautical services.

URCA considers that an application for FM radio broadcasting (commercial or low power) should be subject to an FM/NavCom compatibility analysis. Depending on the result of such analysis, the following may take place:

a) if no interference is predicted, it is presumed that compatibility exists and the application may be approved;

b) if the potential for interference is low, a conditional approval of the licence is granted subject to:

(i) monitoring during on-air testing of the station, or occasionally;

(ii) flight tests during on-air testing of a station in complex electromagnetic environments; and

c) if the potential for interference is high, the application is not approved.

Compatibility analysis and interpretation of the results will be performed by URCA in consultation with any other relevant regulatory authority and agency.[17]

Internationally established protection criteria for NavCom interference prediction models would be used by URCA for assessing FM and aeronautical frequency assignment compatibility. It may be possible to establish distance separation criteria between the FM and NavCom stations beyond which compatibility analysis may not be required.

Further, because FM broadcasting stations transmit at much higher power than NavCom facilities, it is important to limit spurious signals from FM stations to prevent interference to NavCom reception. It is proposed that all FM stations suppress spurious emissions in the band 108-137 MHz to -85 dB. This suppression level, which is measured off-air, is more stringent than the suppression level specified in Annex A for equipment approval, which is a bench test standard. External filtering may be employed by the licensee in order to comply.

URCA notes that a Respondent to the First Consultation is of the view that the issues with NavCom are practically non-existent due to the avionics radios and instruments found in modern planes. It stated that the 85 dB specification is meaningless without an applied distance figure (vector) and that airplanes in fact contain basic VHF FM broadcast receive radios as an additional means of navigation and communication. URCA is sympathetic to this view and has modified its question below.

URCA maintains its position that the safeguard against interference to aeronautical radio-navigation and communications (NavCom) services in The Bahamas is necessary. URCA proposes to conduct its analysis of an application to provide FM radio broadcast services in The Bahamas in accordance with international practice based, inter alia, on Report ITU-R M.2147 (05/2009) "*Assessment of potential interference between FM broadcasting stations operating in the band around 87-108 MHz and aeronautical VDL Mode 4 systems in the band 112-117.975 MHz operating in the AM(R)S*" and Report ITU M.929-2 (1990) "*Compatibility between the broadcasting service in the band of about 87-108 MHz and the aeronautical services in the band 108-137 MHz*".

Question 6: URCA Invites comments on any additional suitable approaches to protect NavCom operations in The Bahamas.

[17] For example, the Ministry of Transport and Aviation and/or the Civil Aviation Department.

7 FM Radio Broadcast Equipment

Equipment used for establishing, operating, prototyping, demonstration, exhibition, or testing purposes for an FM radio station will be required to comply with the technical standards established by URCA under this consultation process. In this regard, URCA will monitor and enforce compliance through its review and analysis of technical information and equipment specifications for the design and operation of FM radio broadcasting networks submitted by applicants for a licence to provide FM radio broadcast services in The Bahamas.

7.1 Towers and Antenna-Supporting Structures

URCA considers it is the responsibility of licensed FM radio broadcasters and persons who wish to establish and/or operate an FM radio station in The Bahamas to ensure that towers and antenna-supporting structures are designed, manufactured, and erected in accordance with established standards in The Bahamas. URCA has considered international standards (e.g. Canadian Standards Association (CSA)-S37) regarding towers and antenna-supporting structures for radio stations. URCA proposes that an application submitted for a spectrum licence to provide FM radio broadcast services in The Bahamas must evidence approval from the relevant regulatory agency[18] that the towers and antenna-supporting structures meet established standards.

Section 4 of the Comms Act requires URCA to further the interests of persons in The Bahamas in relation to the electronic communications sector, among other things, by limiting public nuisance through electronic communications and limiting any adverse impact of networks and carriage services on the environment. URCA therefore seeks to discourage the arbitrary and indiscriminate erection of FM radio towers and antenna-supporting structures throughout communities in The Bahamas by FM radio broadcasters. URCA proposes that any existing FM radio broadcaster or a person who wishes to establish and/or operate a new FM radio station in The Bahamas must demonstrate that every effort has been exhausted to share an existing tower or antenna-supporting system before erecting new towers or antenna-supporting structures. URCA believes that, due to the robust level of competition in the FM broadcast industry, tower sharing for FM radio broadcasting in The Bahamas should be consequential to a commercial agreement between the parties and subject to URCA's *ex post* competition powers.

URCA considers that owners and operators of existing towers or antenna-supporting systems for FM radio broadcasting should respond to a request to share FM radio tower or antenna-supporting systems in a timely manner and to negotiate in good faith to facilitate sharing where technically and economically feasible. URCA believes that thirty (30) calendar days is reasonable time for owners/operators of existing towers or antenna-supporting systems to reply to such requests.

[18] Particularly the Ministry of Public Works

URCA believes that FM radio broadcasters should not erect a new tower or antenna supporting structure unless the broadcaster has received "Certificate of No Objection" from URCA and approval from the relevant regulatory agency. URCA therefore proposes to require owners/operators of an FM radio station to firstly submit an application to URCA prior to the modification of an existing tower or the erection of a new tower or antenna supporting structure for FM radio broadcasting in The Bahamas.

In light of the foregoing, URCA signals its intent to consult with interested parties to develop a tower/antenna sharing framework for FM radio broadcasting in The Bahamas separate to this consultation process, if necessary.

Question 7(a): URCA invites comments on the feasibility of sharing existing sites by new applicants or existing FM radio broadcast licensees. _____ _____ _____
Question 7(b): URCA invites comments on whether the requirement of sharing existing sites by new applicants or existing FM radio broadcast licensees should be made mandatory. _____ _____ _____

7.2 Auxiliary Transmitting Systems[19]

In order to maintain an appropriate engineering standard of equipment and installations, the requirements as outlined in this section are proposed regarding FM radio Auxiliary Transmitting Systems (ATS).

There are some FM radio broadcast stations that find it expedient to provide ATS to ensure continuity of service in the event of main transmitting system failure or for maintenance periods. This action is in the public interest and every encouragement is given to licensees to equip their radio broadcast stations in this manner. URCA considers the installation and use of any ATS, including emergency transmitting, as part of the licensed network of FM radio broadcast stations. Unless otherwise approved by URCA, the maximum power for these emergency operations for various broadcasting services shall be the lesser of the licensed station power or 1 kW ERP.

[19] Refer to Annex A for definitions

Nothing under the proposed technical standards for FM radio broadcasting in The Bahamas regarding ATS is intended to or relieves an FM radio licensee of any obligation in a national emergency[20].

8 Public Health and Safety

As part of the development of technical standards for FM broadcasting in The Bahamas, URCA has considered potential public health and safety implications consequential to RF transmission by radio broadcast stations. Under the Comms Act, URCA may by determination or regulation establish technical rules and standards in relation to technical equipment to ensure against damage to public health, safety or the environment[21]. Where URCA does not establish such rules or standards it may recognize and apply technical rules and standards of other countries in this regard.

Condition 6 of the Individual Spectrum Licence (ISL) issued to FM radio broadcasters generally obligates the licensee to comply with relevant compulsory standards and specifications published by International Standards Bodies for emissions, non-ionising radiation safety and electromagnetic compatibility in connection with any of its radiocommunications equipment. In the absence of such standards, the licensee must take into account any other standard specified by URCA.

URCA recognizes that exposure to radio frequency energy may pose significant public health and safety risks. URCA also believes that it should be the responsibility of the operators of FM radio broadcast stations to ensure that all broadcasting installations comply with the internationally accepted radiation limits at all times, including the consideration of combined effects of nearby installations within the local radio environment. Radio station operators must therefore design and operate their network to meet requirements to ensure the protection of the general public from harmful exposure to RF radiation.

URCA strongly believes that a multi-agency approach to the development of comprehensive public health and safety standards specific to the electronic communications sector in The Bahamas is required[22]. In the interim, however, URCA proposes to recognize and apply technical rules and standards of other countries in this regard. URCA has set out in Annex B of this consultation document references to international public health and safety standards for RF radiation exposure applicable to the band 88-108 MHz.

Under the First Consultation, URCA proposed to require FM radio broadcasters in The Bahamas

[20] The National Emergency Management Agency (NEMA) may require emergency broadcasts via ATS from time to time and it is URCA's expectation that radio stations will be able to provide such services.
[21] Section 83 of Comms Act
[22] Particularly with the Ministry of Health

take account of these standards in accordance with Section 83 of the Comms Act and Condition 6 of the ISL. Having considered the comments by Respondents, URCA has reviewed its proposal and now proposes the adoption of the single Standard for RF Radiation Exposure by FM radio stations namely the International Commission on Non-ionizing Radiation Protection (ICNIRP) that is formally recognized as an official collaborating non-governmental organization by the World Health Organization (WHO), the specialized agency of the United Nations that is concerned with international public health. URCA is aware that the ICNIRP limits are also recommended by the ITU through Recommendation ITU-T K.52, "SERIES K: PROTECTION AGAINST INTERFERENCE, Guidance on complying with limits for human exposure of electromagnetic fields".

Question 8(a): URCA invites comments regarding:

i) The extent to which existing licensees have historically followed the international standards as set out in Annex B.

_____
_____
_____
_____

ii) What evidence could be submitted to URCA to demonstrate such compliance?

_____
_____
_____
_____

Question 8(b): Any comments regarding the proposed process to verify compliance to the international standards related to RF exposure should be included.

_____
_____
_____

Question 8(c): Do you agree with the adoption of a single Standard for RF Radiation Exposure by FM radio stations namely the International Commission on Non-ionizing Radiation Protection (ICNIRP)?

_____
_____

Question 8(d): What do you consider is a reasonable timeframe within which FM broadcast licensees should be required to be fully compliant with the Standard for RF Radiation Exposure?

_____
_____

9 Digital Sound Broadcasting in The Bahamas

Under the First Consultation, URCA adopted the National Radio Systems Committee (NRSC) terminology Digital Radio Broadcasting (DRB). URCA has now adopted the ITU terminology Digital Sound Broadcasting (DSB), which will be used under this Second Consultation. DSB has evolved across the world creating what can be described as an efficient platform on which to broadcast existing radio services and has heralded the growth of many new related services. Globally, the digital transition in the FM band is still in various stages of development and implementation. Nevertheless, pursuant to its mandate under the Comms Act to further the interest of consumers and to ensure that radio spectrum is managed and used in a manner that is economically efficient and facilitates the evolution of new technologies and electronics communications services, URCA considers that the technological advances of digital technology and the potential impact of such technology on the radio broadcast market in The Bahamas should receive some attention as a part of this consultation process.

9.1 What is Digital Sound Broadcasting?

Digital Sound Broadcasting (DSB) is the technology used in the transmission and reception of sound that has been processed using technology comparable to that used in compact disc (CD) players. In short, a digital radio transmitter processes sounds into patterns of numbers, or "digits" – hence the term "digital radio". In contrast, traditional analogue radios process sounds into patterns of electrical signals that resemble sound waves. Currently, local Sound Broadcasting stations predominantly use analogue technology to transmit FM radio signals which have been subject to various types of interference ranging from local electrical interference to atmospheric and weather conditions. Unlike analogue systems, digital broadcasting is resistant to noise and interference. As such, DSB is now the new broadcasting medium for the 21st Century which uses the most modern methods of radio transmission to produce a much more robust signal.

DSB is well established in many countries around the world such as the United States, Europe, and Australia; whereas in Canada, DSB is mostly experimental. Because of the facilities that digital radio offers, it is now being more readily accepted and listeners are switching to digital radio transmission in countries where it is available. URCA believes that the introduction of DSB to the radio broadcast market in The Bahamas should further the interests of consumers.

9.2 The key benefits of Digital Sound Broadcasting

DSB offers a significantly better sound quality and "presence" of the new radio system. Digital radio reception is more resistant to interference and eliminates many imperfections of analogue transmission and reception. It does not suffer from the multi-path effects often experienced on FM transmissions and as the system can use what is known as a single

frequency network (SFN) there is no retuning required when moving from one coverage area to the next.

Additionally, there are many new services (such as multiple audio programming channels, audio-on-demand and interactive features) carried on digital radio transmissions which can directly benefit consumers. The digital radio signal carries data alongside the audio, and this enables text and images to be transmitted alongside the audio to enhance the listening experience. In this way, it is possible to transmit the title of a track and a picture of the artist while the music is being transmitted. It is also possible to have news scrolling across the screen with digital radio technology. Digital radio generally offers consumers the following:

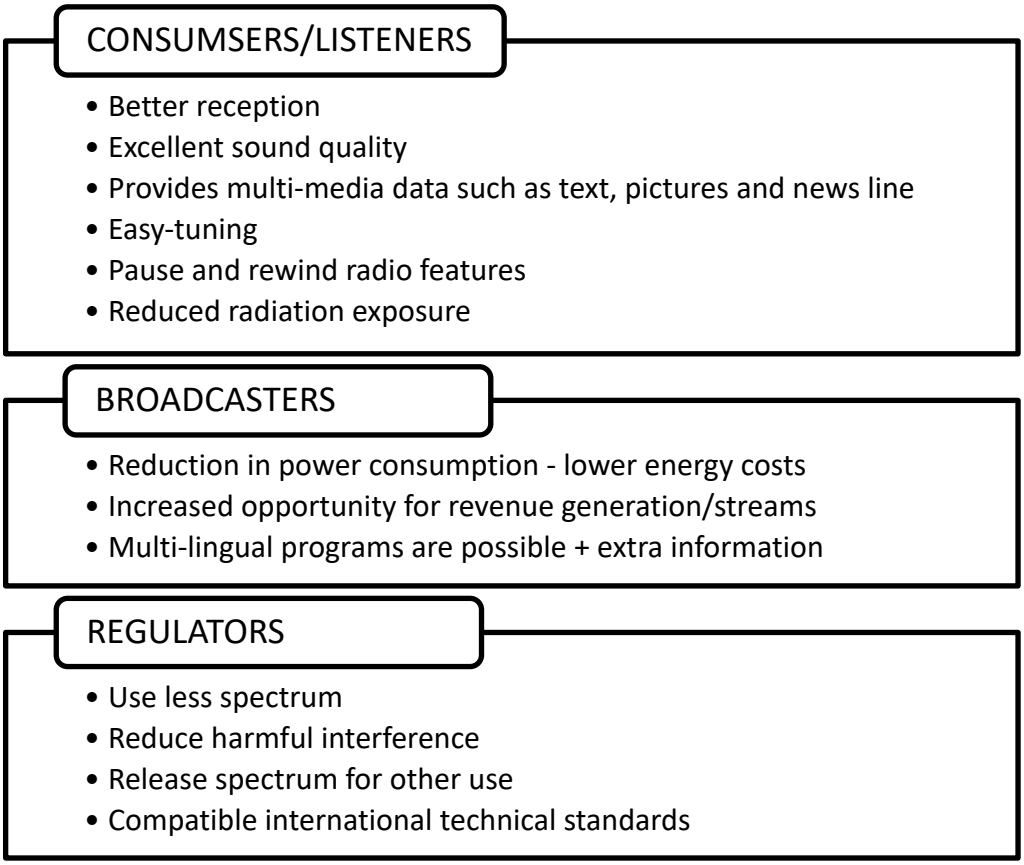
(i) much easier navigation between stations;
(ii) the ability to pause and rewind live radio;
(iii) the opportunity to listen at a time of an individual's choice;
(iv) access to programmes that have been missed;
(v) the ability to download and store songs on personal players; and
(vi) access to supplementary data regarding the current track or programme.

URCA believes that a significant advantage of DSB is that it requires less power than the more traditional analogue transmitters. The cost of the energy may be a significant factor in the operating costs of FM radio broadcast stations in The Bahamas and power reductions should bring notable savings consequential to the reduction in energy use.

From a technical standpoint, DSB is more spectrally efficient than the current analogue broadcasting and therefore offers the potential to carry many more services/programmes within the channel bandwidth. As such, more new services/programmes could be made available to consumers. This will benefit consumers by enhancing competition in the market, improving service quality and widening programme choice. URCA believes that the release of spectrum in the FM radio broadcast band means that the available spectrum could have potential use for other services in the future.

URCA is aware that other key advantages of DSB is that the digital systems generate lower level of interferences and the channels can be reused closer (co-channeling) due to the lower power necessary for transmission. The lower emission levels required for DSB will grant lower values from the exposure to the non-ionizant radiations of the general population and industry professionals. Table 3 below details a non-exhaustive list of potential benefits for key stakeholders in the FM radio broadcast market through DSB.

Table 3:



Question 9(a): Do you believe that the introduction of DSB will benefit consumers and stakeholders in the radio broadcast market in The Bahamas?

- Yes
- No
- Don't know

_____

_____

Question 9(b): Please provide full reasoning in support of your position.

_____

_____

9.3 The process for the implementation of Digital Sound Broadcasting in The Bahamas

The switchover from analogue to digital broadcasting can be a complex process with social and economic implications that go beyond the pure technical migration. Whether and when digital radio migration will in fact occur in The Bahamas will be market driven and depend heavily on market demand through the development of digital technology globally. It is important to emphasize that any regulatory changes or migration to DSB will not happen without full public consultation which considers the costs and benefits to consumers and takes into account the needs of all stakeholders relying on FM radio services. URCA will particularly consider the economic efficiency and switching costs for operators and consumers.

URCA also believes that global developments should be monitored before finally deciding on whether migration to digital technology for FM broadcasting in The Bahamas should be implemented. One of the main challenges with the launch of digital radio broadcasting in The Bahamas is the availability of the equipment. A large investment in suitable equipment may be required by radio broadcasters, and consumers will need digital compliant radios to experience the full benefit of DSB.

URCA will also consider the implementation of a hybrid system of digital and analogue radio broadcast transmissions through an in-band-on-channel (IBOC) system as an alternative to full digital[23]. IBOC uses the method of transmitting a digital radio broadcast signal centered on the same frequency as the FM station's existing frequency (e.g. 97.9 MHz). The transmission of the digital signal will occupy the sidebands above and below the center FM frequency. Under a hybrid system, existing receivers continue to receive the analogue (non-digital) signal. New receivers being developed are expected to incorporate both modes of reception, where receivers will automatically switch to the analogue signal if the digital signal cannot be decoded or is lost by the receiver. IBOC digital radio provides near CD quality reception for stations operating in the FM broadcast band and minimal impact is anticipated on reception of existing service. URCA believes that this hybrid approach to improving the consumer experience regarding FM radio broadcasting may be a viable option to the implementation of full digital broadcasting.

Question 10(a): Do you agree with URCA's view that a "hybrid" approach to FM radio broadcasting may be a viable option to the implementation of full digital FM broadcasting in the Bahamas?

- Yes
- No
- Don't know

[23] Refer to Annex G for definitions

Question 10(b): Please provide full reasoning in support of your position.

URCA however anticipates that FM analogue broadcasting will remain the mainstream radio transmission technology in the near future and focus on improving the existing analogue broadcasting situation in The Bahamas in accordance with international technical standards and best practices should prevail at this stage. URCA therefore signals its intent to conduct a public consultation in the future to fully consider, *inter alia*:

(i) the possible impact of digital technology on consumers within the context of FM radio broadcasting in The Bahamas;
(ii) the possible impact of digital technology on spectrum allocation, management and use within the context of FM radio broadcasting in The Bahamas;
(iii) the migration to digital technology by FM radio broadcasters; and
(iv) any other related matter the public suggests URCA should consider.

Following full consideration of all responses to this component of the consultation document, URCA will aim to develop a range of proposals regarding DSB in The Bahamas at a time it deems appropriate.

Question 11(a): Do you agree with the assessment that it may be premature to focus on digital migration of FM broadcasting in the Bahamas at this stage?

- Yes
- No
- Don't know

Question 11(b): Kindly provide reasoning in support for your position.

Question 12(a): What are your general views on (future) Digital Sound Broadcasting?

_____ _____
Question 12(b): Which technology and devices (e.g. digital handsets) do you (as a broadcaster/ consumer etc.) expect to use in the future? _____ _____

Question 13: Are there any other matters URCA should consider as part of its public consultation regarding DSB in The Bahamas? Kindly provide full explanation for your suggestions. _____ _____

10 Next Steps

URCA will carefully consider all comments and submissions received within the prescribed timeline for responding to this consultation document. Subject to section 1.4 of this consultation document, all comments and submissions received within the prescribed timeline will be published on the URCA website. URCA intends to issue a Statement of Results and Final Decision to this Second Consultation document within thirty (30) calendar days following the end of the consultation period unless extenuating circumstances dictate otherwise (in which case URCA will duly notify the public). URCA will give full reasons for its decisions.

The Final Decision will, *inter alia*, notify FM radio broadcast licensees of (and specify) the regulatory and other measures, in the form of technical standards, required to be complied with consequential this consultation process. Existing FM radio broadcast licensees will thereafter be expected to become fully compliant with the technical standards. URCA proposes that all FM radio broadcast licensees in The Bahamas become compliant with the technical standards no later than ninety calendar (90) days from the date of publication of the Final Decision. In this regard, URCA is particularly seeking the views and comments from respondents regarding a reasonable time frame within which existing FM radio broadcast licensees should be required to be fully compliant with such technical standards.

Going forward, it is URCA's intent to work closely with all FM radio broadcast licensees to ensure a seamless implementation of and compliance with the technical standards.

Question 14: What do you consider is a reasonable time frame within which FM broadcast licensees should be required to be fully compliant with the Technical Standards issued by URCA consequential to this consultation process? Please give reasons in support of your position.

_____

_____

Annex A: Draft Technical Standards for FM Radio Broadcast Transmissions

TABLE OF CONTENTS

1 Definitions, Symbols, Abbreviations and Designators

1.1 Definitions

For the purposes of this Technical Standards document, the following terms and definitions shall apply:

Antenna Port: means the port of an apparatus which is designed, in normal operation, to be connected to an antenna using coaxial cable;

Channel L: means left hand channel of a stereophonic signal;

Channel R: means right hand channel of a stereophonic signal;

Cabinet Radiation: means radiation from enclosure containing, equipment, excluding radiation from connected antennas or cables;

Carrier Power: means the average power supplied to the antenna port by a transmitter during one cycle taken under the condition of no modulation;

Class of Emission: means the set of characteristics of an emission, designated by standard symbols, e.g. type of modulation of the main carrier, modulating signal, type of information to be transmitted, and also, if appropriate, any additional signal characteristics;

Composite: See "Multiplex (MPX) Signal";

Coverage Area: means radio communication service area in which the transmissions are intended for direct reception by the general public;

dBc: means the decibels relative to the un-modulated carrier power of the emission (in the cases which do not have a carrier, for example in some digital modulation schemes where the carrier is not accessible for measurement, the reference level equivalent to dBc is decibels relative to the mean power P);

Mean Power: means the average power supplied to the antenna port by a transmitter during an interval of time sufficiently long compared with the lowest frequency encountered in the modulation envelope taken under normal operating conditions;

Multi-Plex (MPX) Signal: means all information, including the pilot tone and any supplementary signal used to frequency modulate the VHF FM transmitter;

Necessary Bandwidth: means the width of the frequency band which is sufficient to ensure the transmission of information at the rate and with the quality required under specified conditions for a given class of emission;

Pilot Tone: means the 19 kHz tone used to recover the stereo subcarrier in the stereo-receiver;

Radio Data System (RDS): means the signal containing information on programmes and broadcasting networks;

Signal L: corresponds to the information in the left channel of the stereophonic or monophonic signal;

Signal R: corresponds to the information in the right channel of the stereophonic signal or monophonic;

***Spurious Emissions:** means the emission on a frequency which is outside the necessary bandwidth and the level of which may be reduced without affecting the corresponding transmission of information. Spurious emissions include harmonic emissions, parasitic emissions, intermodulation products and frequency conversion products [but exclude out of band emissions];

Stereo Subcarrier means the 38 kHz subcarrier used to carry the difference signal;

1.2 Symbols

For the purposes of the present document, the following symbols shall apply:

*Ω ohms (unit of impedance)
µ micro, 10^{-6}

_____

***** Modified under this Second Consultation

1.3 Abbreviations

For the purposes of this Technical Standards document, the following abbreviations shall apply:

AC Alternating Current
AF Audio Frequency
AM Amplitude Modulation
dB decibel, logarithmic ratio (tenths of a "Bel")
dBm Db relative to one milliwatt
DC Direct Current
EMC Electromagnetic Compatibility
ERM Electro-Magnetic Compatibility and Radio spectrum Matters
FM Frequency Modulation
Hz Hertz (cycles per second)
kVA Kilovolt-Amp

LV	Low Voltage
MPX	Multi-PleX
R&TTE	Radio equipment and Telecommunications Terminal Equipment
RDS	Radio Data System
RF	Radio Frequency
RMS	Root Mean Square
SNR	Signal to Noise Ratio
VHF	Very High Frequency
V	Volts
W	Watt

1.4 Designators

*F3E - FM analogue sound
G – Monophonic broadcast- quality sound
N – Un-modulated carrier
F8E or F8EH - Normal FM stereo broadcast - as found on public VHF band
H - Stereophonic or quadraphonic broadcast-quality sound
F – Frequency Modulation (e.g. FM Broadcast Radio)

_____

* Modified under this Second Consultation

1.5 Main Transmitter

A broadcasting transmitter with radiated power output as authorized and which is primarily used to provide the service for which the undertaking is licensed.

1.6 Auxiliary Transmitters

(a) Alternate Transmitter:

A broadcasting transmitter with the same radiated power and electrical characteristics as the main transmitter and which is used alternately with the main transmitter to provide the service for which the undertaking is licensed.

(b) Standby Transmitter:

A broadcasting transmitter which is used to maintain continuity of service in the event of main or alternate transmitter failure. This transmitter may also be used during specified periods while maintenance is being carried out on the main transmitter.

(c) Emergency Transmitter:

An unplanned broadcasting transmitter installation used to provide continuity of service necessitated by unforeseen circumstances beyond the control of the licensee. The operation of such systems shall normally be limited to a duration of two (2) weeks, however a longer period may be authorized when warranted due to extraordinary circumstances.

2 General

2.1 The Technical Standards contained herein are issued by URCA for FM radio broadcasting and are the minimum requirements for the design and operation of FM radio broadcasting networks in The Bahamas.

2.2 The Technical Standards contained in this document are the pre-requisite conditions for the establishment of audio broadcasting in the FM radio frequency band 88 MHz to 108 MHz.

2.3 URCA shall issue a spectrum licence to provide FM radio broadcast service only where it is satisfied that the transmission network has met the Technical Standards as set out in this document.

2.4 URCA shall conduct necessary equipment tests, technical investigations and field trials in order to determine whether the FM radio broadcast transmission network meets the Technical Standards set out in this document.

2.5 URCA may require technical adjustments be made to FM radio broadcast equipment should harmful interference occur to neighbouring FM radio broadcast station(s), having determined the source of the harmful interference.

2.6 Changes to the technical and/or physical operating parameters of a FM radio broadcast transmission network without prior written approval by URCA, which may result in a breach of these Technical Standards, may result in enforcement action taken by URCA under the Comms Act and/or spectrum licence.

2.7 FM radio broadcast stations are not permitted to operate the same programming in multiple sub-bands, i.e. other broadcast frequencies within the band spread of 88 MHz to 108 MHz[24].

[24] This is to ensure that links between radio transmitter sites and broadcasts studios are only established by using allotted Studio to Transmitter Link (STL) frequencies and not FM broadcast frequencies.

2.8 The use of any of the prime FM radio broadcast frequencies (88 MHz -108 MHz) for program rebroadcast is strictly prohibited.

3 Labeling

3.1 All certified FM radio broadcasting equipment[25] must display in a conspicuous location:

(a) The manufacturer's name or brand name;
(b) The model identification number;
(c) The serial number; and
(d) Country of Origin: "Made in ……."

3.2 The identification label containing the above information must be displayed prominently and affixed permanently to the equipment so that the information can be seen throughout the life of the equipment.

3.3 The identification label must be indelible, tamper-resistant and affixed permanently or stamped in such a manner as not to be removable except by destruction or defacing.

4 Effective Radiated Power (ERP)

4.1 ERP is determined by subtracting system losses and adding system gains to the actual electrical power output of a transmitter.

*4.2 Transmitters shall be authorized for power levels which will provide the minimum internationally accepted field strength of 70 dBu (3.16mV/m) [at the limit of coverage area] but shall not exceed the prescribed ERP as detailed for each island territory as contained in Table 1 below:

***Table 1[26]:**

	ISLAND	MAXIMUM EFFECTIVE RADIATED POWER[27]
1	Abaco	10,000-watts
2	Acklins	10,000-watts
3	Andros - North (Morgan's Bluff to	10,000-watts

[25] FM radio broadcasting equipment which has been certified for operation in ITU Region 2 by an International Standards Body (e.g. FCC).

[26] The column "Maximum Output Power at Transmitter Port" as contained in the First Consultation was deleted consequential to URCA's further technical analysis. URCA believes that it is only necessary to limit the Effective Radiated Power (ERP) and allow each broadcast station the liberty to determine its combination of transmitter, antenna and connection cable to achieve the ERP value.

[27] Determined by applying prediction coverage overlay for each island.

	Behring Point)	
4	Andros - South (Moxey Town to Mars Bay)	5,000-watts
5	Berry Islands	5,000-watts
6	Bimini Islands	1,000watts
7	Cat Island	10,000-watts
8	Crooked Island	10,000-watts
9	Exuma	10,000-watts
10	Eleuthera	10,000-watts
11	Grand Bahama	10,000-watts
12	Inagua	5,000-watts
13	Long Island	10,000-watts
14	Mayaguana	10,000-watts
15	New Providence	5,000-watts
16	Ragged Island	2,000-watts
19	Rum Cay	1,000-watts
18	San Salvador	2,000-watts

* Modified under this Second Consultation

5 Minimum Distance Separation Between Transmitters

5.1 The transmitters for FM radio broadcast stations broadcasting on the same frequency/channel shall be separated by a minimum distance of 61 Miles/100 km. Other factors shall also be considered in order to avoid harmful interference between such stations (such as the station ERP, coverage area and design radiation patterns). Refer to Annex D for information on station classification used in Canada and the United States and separation distances used domestically and those for cross border coordination.

5.2 All FM broadcast station frequencies shall be separated by a minimum channel spacing of 600 kHz for islands in The Bahamas that are greater than 19 miles long and channel spacing of 800 KHz for islands in The Bahamas that are less than 19 miles long.

6 Transmitter Location

6.1 Location of the transmitter must be determined on the basis that the ERP power and antenna height above average terrain (HAAT) employed, provides a minimum signal level of 70 dB above 1 uV/m (dBu) or 3.16 mV/m over the coverage area. The transmitter location must ensure that the 1mV/m contour encompasses the population center that is being served.

7 Transmitting Equipment

7.1 An FM broadcasting station network consists of all the apparatus necessary to convert the modulating input signal to a frequency modulated carrier at the center frequency of a standard FM channel in the 88 MHz to 108 MHz frequency band.

7.2 The transmitting equipment shall produce F3EGN emission for monophonic operation and F8EHF emission for stereophonic operation. The transmitting equipment shall be capable of operating with a frequency deviation of ±75 kHz, which is equivalent to 100% modulation.

7.3 Emissions shall not exceed 100% modulation (±75 kHz deviation) except for the following conditions:

(i) FM multiplex sub-carrier using any modulation may operate if the multiplexed sub-carrier and its sidebands are maintained within the range 20 kHz to 99 kHz; and

(ii) Total peak modulation may be increased 0.5% for each 1.0% sub-carrier injection modulation.

7.4 The transmitting equipment shall be capable of operation in accordance with these standards on any channel in the specified carrier frequency range without change in construction other than changing frequency-determining components.

7.5 The AC voltage input shall be at a frequency of 60 Hz. Voltage, Frequency and maximum kVA requirement shall be indicated on the transmitting equipment as established by the manufacturer.

7.6 The transmitting equipment, if rated above 10 kVA, shall present a balanced load to the AC mains such that the current in each phase shall be 10% of the average of all three currents.

*7.7 Operating power and mode tolerances – the transmitter output power of an FM station which is authorized for output power more than 10 watts must be maintained as near to practicable to the authorized transmitter output power and may not be less than 90% or more than 105% of the authorized power.

*7.8 Operating carrier frequency tolerance – Departure of the carrier frequency of an FM radio broadcast station with an authorized power greater than 10 watts may not deviate more than ±2000 Hz (±2 KHz) from the authorized carrier.

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* Added under this Second Consultation

8 RF Carrier Performance

8.1 The transmitter rated output power shall deliver at its antenna port such rated output power continuously into the test load in accordance with the manufacturers specified conditions of operation.

8.2 Method of measurement

(i) Test frequencies:

a) the lowest operating frequency of the transmitter;

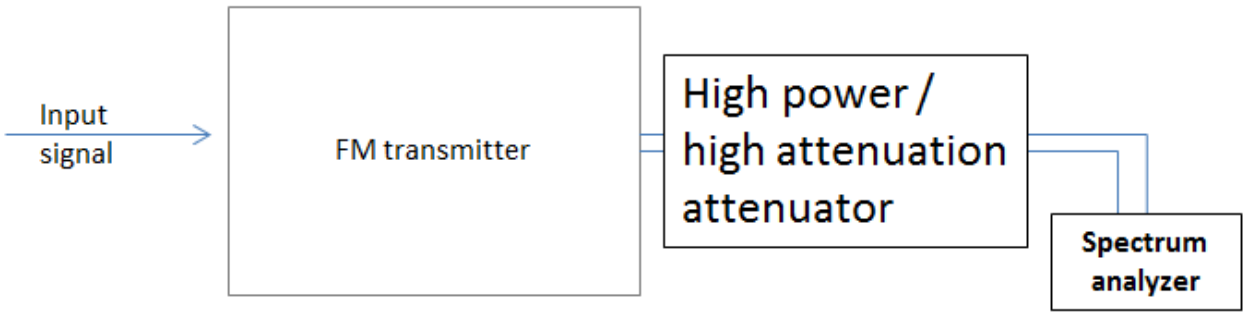
b) the highest operating frequency of the transmitter; and

c) a frequency mid-way between "a" and "b" above.

(ii) Test arrangement steps (see also Table 2 below):

- connect the transmitter to the Spectrum analyser via a "high power/high attenuation" attenuator;
- alternative 1: a cascade set of attenuators may be used or a high attenuation couple device and a test load.

*Table 2:



* Modified under this Second Consultation[28]

[28] URCA considered the original diagram under the First Consultation to be complex for the defined tests and potentially confusing. For example, the two redundant Demodulator and Deviation meters were included on the same path. The necessary test bed is described in the modified Table.

8.3 The standard rating of power output for the transmitting equipment shall be as specified by the individual manufacturer. The transmitting equipment shall be capable of being adjusted to deliver the power output when the AC input voltage varies by 5% from the rated value.

9 Carrier Frequency Stability

9.1 The carrier frequency stability is the ability of the transmitting equipment to maintain a mean test frequency.

9.2 The frequency of the carrier shall remain within ± 1000 Hz of the mean test frequency.

10 Spurious Emission

10.1 Spurious emission is a radio frequency signal appearing at the transmitting equipment output terminal on a frequency other than the specified frequency and modulation products. It includes harmonic emissions, parasitic emissions and intermodulation products but exclude out of band emissions.

10.2 A spurious emission from any part of the FM radio broadcast transmitter installation, other than the antenna and its transmission line, shall not have an effect greater than what occurs should the antenna system were supplied with the maximum permitted power at that spurious emission frequency.

*10.3 The unwanted emissions of the FM radio broadcast transmitter shall not exceed the values given in Table 3 below and shown additionally in Figure 1 below.

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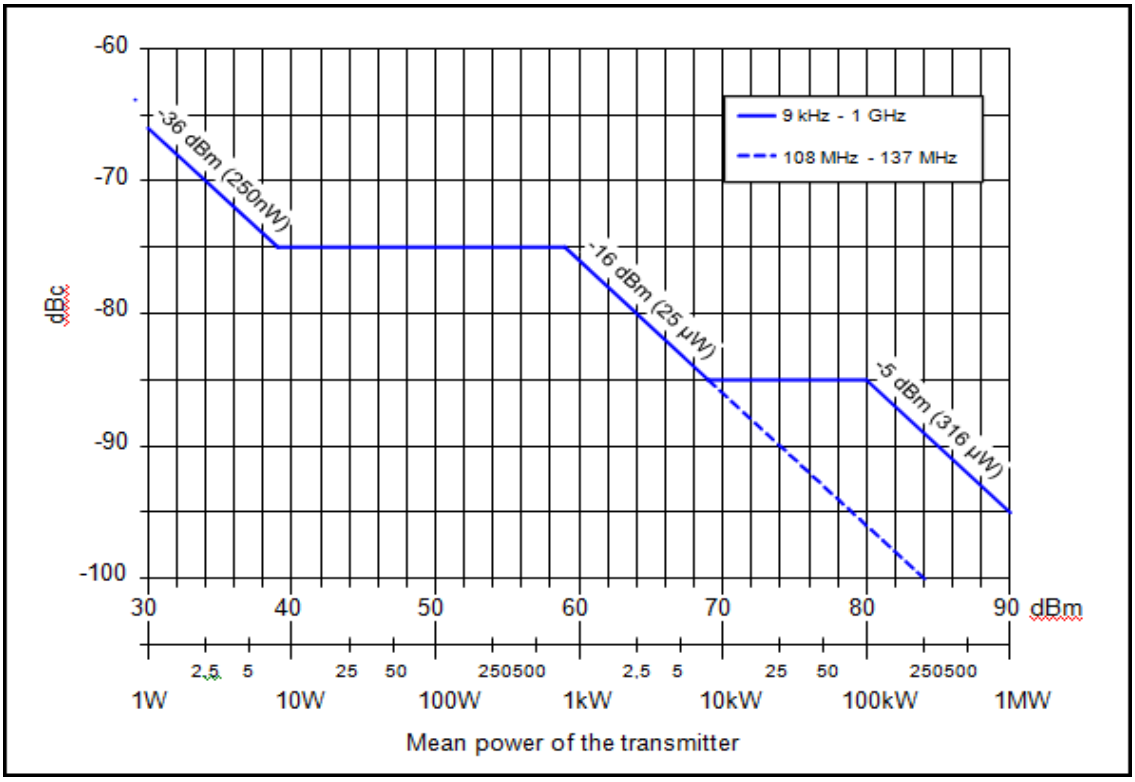
* Modified under this Second Consultation

Table 3:

Spurious Emission	**Maximum Value**
Between 120 kHz and 240kHz from the carrier frequency.	-25 dB*
More than 240 kHz and up to and including 600 kHz from the carrier frequency.	-35 dB*
More than 600 kHz from the carrier frequency whichever is the stronger.	-(43 +10 log P)* or –80 dB*

* Referred to the power level of the un-modulated carrier.

Figure 1:



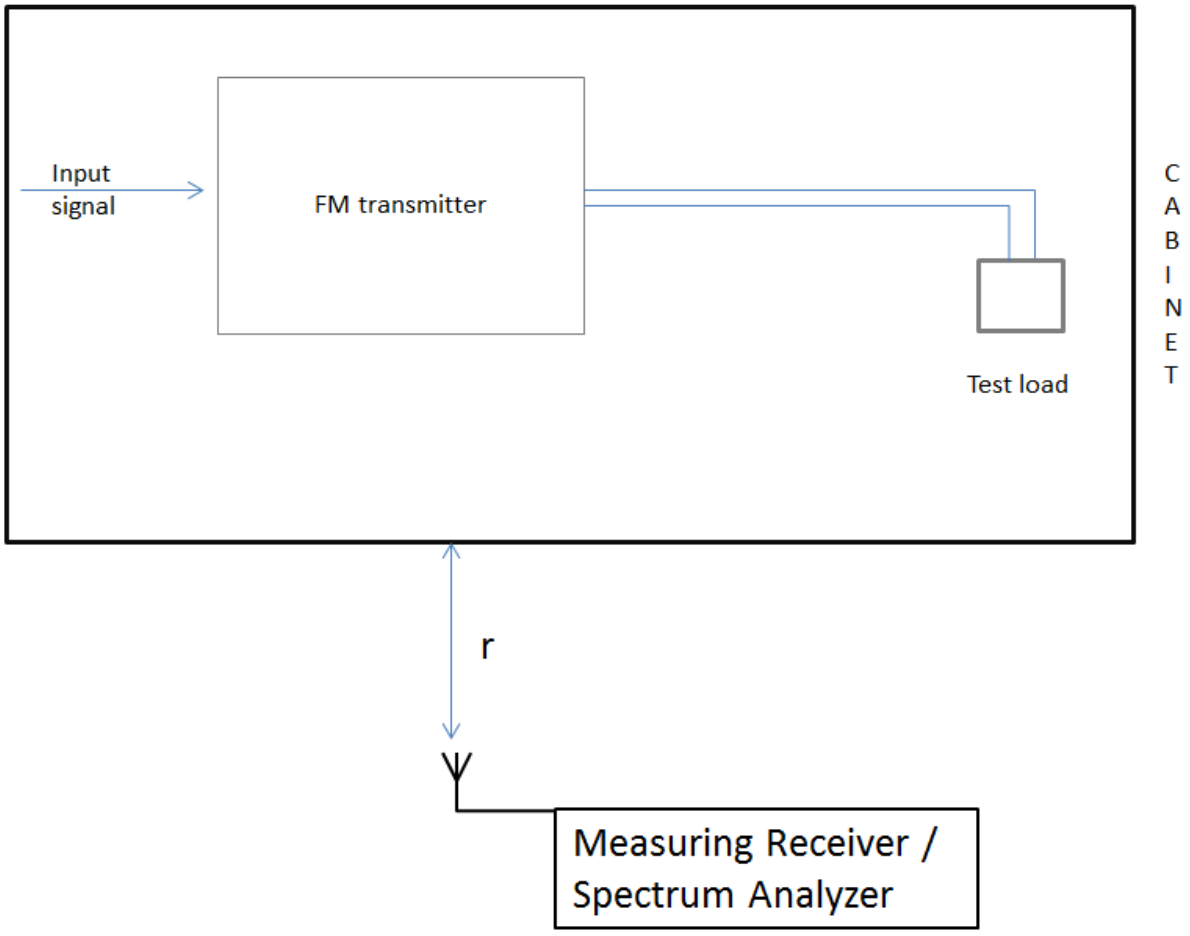
11 Cabinet Radiation

11.1 Cabinet radiation is any emission from the transmitting equipment housing or enclosure from sources other than a normal output port.

11.2 Such emissions at any frequency shall be at least 54 dB below the calculated field strength reference level.

11.3 Test arrangement for cabinet radiation is shown in Figure 2 below:

***Figure: 2**



* Modified under this Second Consultation

*11.4 The transmitting equipment shall be operated at rated power output and at a suitable frequency. A receiving antenna, located alternately at a known distance between three and ten meters from at least three sides of the transmitting equipment (i.e. front, back, left or right hand side), shall be connected to a calibrated field strength meter or frequency-selective voltmeter. Field strength measurements shall be made and the results recorded for all emissions (including the fundamental and harmonics of the carrier frequency) up to the third harmonic of the carrier frequency. For the measurement, the receiving antenna shall be rotated in all three planes and the

maximum received field shall be noted (allowance shall be made for antenna factor and transmission line loss of the measuring equipment). Using the free space formula below, calculate the reference field strength.

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* Section added under this Second Consultation

***12 Receiver-generated Intermodulation Interference**

12.1 Receiver-generated intermodulation interference can take place in the vicinity of an FM station and the severity of the interference potential depends on the broadcasting radio environment. Consequently, URCA requires that applicants requesting a new station or changes to an existing station submit an estimate of the population within the 115 dBµV/m contour.

The location of the contours shall be determined using the appropriate F(50,50) field strength curves and shown on a suitable map. For distances of less than 1 mile, the free space formula should be utilized (refer to Section 12.2 for contour calculation).

Every attempt shall be made to keep the population within the 115 dBµV/m contours to a minimum. URCA reserves the right to request changes to the antenna site, to the antenna height, to the antenna itself, or to the radiated power to reduce the population within these high signal level contours.

12.2 Method for Calculating High Field Strength Contours

The antenna radiation patterns, vertical and horizontal (if antenna is directional), are normally supplied by the antenna manufacturer. In predicting high field strength contours, the ERP should be based on the appropriate antenna vertical plane radiation pattern for the azimuthal direction concerned.

For distances of less than 1.5 km from the transmitting site, the field strength should be determined from the following free space formula:

$F = 137 + 10 \log (ERP) - 20 \log(d)$

where:

“F” is the field strength in dBuV/m (decibels above one microvolt per metre);

“ERP” is the effective radiated power in watts at the pertinent depression angle; and

"d" is the slant distance (in metres) between the centre of radiation of the antenna and the receiving location.

For distances between 1 and 2.5 miles, the field strength should be determined from the F(50,50) curves using the height of the antenna radiation centre with respect to the location under consideration.

For distances beyond 2.5 miles, the field strength should be determined from the F(50,50) curves using the pertinent HAAT.

Whenever F(50,50) curves are being used, the antenna height and the distance from the tower should be used to determine the depression angle as per Figure C1 of Annex C. The ERP for that direction shall be determined.

High field strength prediction may involve nulls in the vertical radiation pattern which shall be taken into consideration. The distances (di) along the ground where the field strength is at minimum due to a vertical pattern null can be calculated using the following relationship:

$$di = \frac{H}{\tan(\theta i + A)}$$

where:

A and θi are the beam tilt angle and the angles corresponding to the different nulls in the vertical pattern respectively (both in degrees);

H is the height (in metres) to radiation centre of antenna; and

di is the distances in metres along the ground.

For values of θi + A ≤ 10°:

$$di = \frac{57.3 * H}{\theta i + A}$$

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* Section added under this Second Consultation

13 FM Stereophonic Sound Transmission and Multiplex Operation

13.1 An FM broadcast station shall not use 19 kHz ± 20 Hz, except as the stereophonic pilot frequency in a transmission system meeting the following criteria (see also Figure 3 below):

(i) the modulating signal for the main channel shall consist of the Left and Right (L+R) signals;

(ii) the stereophonic subcarrier shall be the second harmonic of the pilot subcarrier (38 kHz);

(iii) for L-R channel, double sideband, suppressed carrier amplitude modulation of the stereophonic subcarrier at 38 kHz shall be used; The band frequencies from 23 to 53 kHz containing the stereophonic subcarrier and its associated sidebands;

(iv) the pre-emphasis characteristic of the L-R channel shall be identical with those of the L-R channel with respect to phase and amplitude at all frequencies;

(v) the stereophonic subcarrier at 38 KHz shall be suppressed to a level at least 40 dB below the total modulation of the carrier;

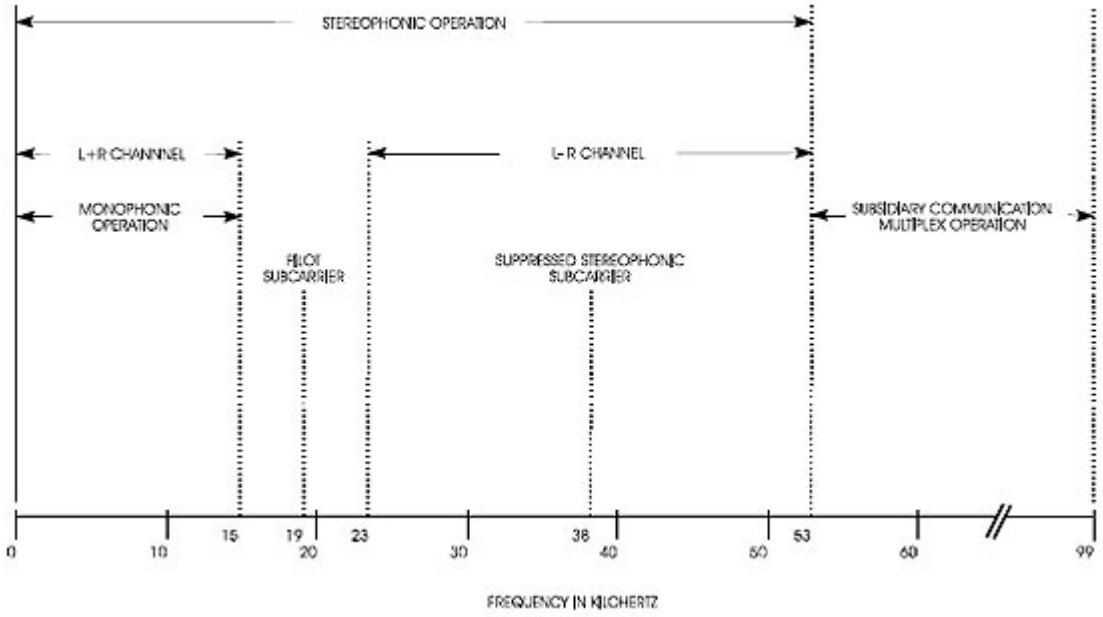
(vi) the stereophonic subcarrier shall be capable of accepting audio frequencies from 50 to 15,000 Hz;

(vii) the modulating signal for the required subcarrier shall be equal to the difference of the Left and Right signal;

(viii) the applicable modulating levels:

- the sum of the sidebands resulting from amplitude modulation of the stereophonic subcarrier shall not cause a peak deviation of the carrier in excess of 45% of the total modulation when only left (or right) signal exists in the L-R channel;
- when only a left (or right) signal exists in the L + R channel, the deviation of the main carrier shall not exceed 45% of the total modulation;
- the pilot subcarrier at 19 kHz ± 20 kHz shall frequency modulate the main carrier between the limits of 8 and 10 percent for monophonic operation;
- when a signal exists in only one channel of a stereophonic sound transmission having more than one stereophonic subcarrier in the baseband, the modulation of the carrier by audio components within the audio baseband range of 23 kHz to 99 kHz shall not exceed 53% with total modulation not to exceed 90%. A station not transmitting stereo with a method above shall limit the main carrier deviation caused by any modulating signals to occupying the band 19 kHz ± 20 kHz to 125 Hz.

***Figure: 3**



* Modified under this Second Consultation

13.2 Subsidiary Communications Multiplex Operation channel (SCMO)

13.2.1 Any form of modulation may be used on any multiplex subcarrier.

13.2.2 More than one multiplex subcarrier may be used. During periods of no program transmission, the multiplex subcarrier and its significant sidebands shall be within the frequency range of 20 to 99 kHz. During monophonic or stereophonic program transmission, the multiplex subcarrier and its significant sidebands shall be within the frequency range of 53 to 99 kHz.

13.2.3 During periods of no program transmissions, the modulation of the carrier by the arithmetic sum of all subcarriers above 76 kHz may not exceed 10%, and modulation of the carrier by the arithmetic sum of all subcarriers may not exceed 30% referenced to ± 75 kHz deviation. During monophonic or stereophonic program transmissions, the modulation of the carrier by the arithmetic sum of all multiplex subcarriers above 76

kHz may not exceed 10%, and modulation of the carrier by the arithmetic sum of all multiplex subcarriers may not exceed 20% referenced to ± 75 kHz deviation.

13.2.4 Without subsidiary communications, the total modulation of the FM carrier by the sum of all baseband signals may not exceed 100% (75 kHz peak deviation). When subsidiary communications services are provided, using subcarrier concurrently with the broadcasting of stereophonic or monophonic programs, the peak modulation deviation may be increased as follows:

With more than one subcarrier, the total peak modulation may be increased by 0.5% for each 1.0% subcarrier injection modulation; and

Under no circumstances may the modulation of the FM carrier exceed 110% (82.5 kHz peak deviation).

13.3 All FM radio broadcast stations, regardless of the stereophonic transmission, shall not exceed the maximum modulation limits of 100 % on peaks on frequency recurrence to 75 kHz deviation. Stations providing subsidiary communications services using subcarrier standards concurrently with the broadcasting of stereophonic or monophonic programs may increase the peak modulation deviation as follows:

(i) the total peak modulation may be increased 0.5% for each percent subcarrier injection modulation; and
(ii) the modulation shall not exceed 110 per cent (82.5 kHz peak deviation).

14 Stereophonic Separation

14.1 Method of Measurement

Modulate the carrier to a level of 90% with a standard test signal applied to the L channel only. Measure the demodulated output of the L and R channels and determine the separation at frequencies of 100, 400, 1,000, 2,500, 5,000, 7,500 and 10,000 Hz. Repeat the above with a test signal applied to the R channel only.

14.2 The stereophonic separation between channels shall be 30 dB or better.

15 Frequency Stability of Subcarrier

15.1 Method of Measurement

The pilot subcarrier frequency shall be 19,000 Hz ± 2 Hz and any multiplex subcarrier

shall be within 500 Hz of the operating frequency selected by the manufacturer as noted in the test report.

16 Stereophonic Subcarrier Suppression

16.1 Method of Measurement

Using a stereo modulation monitor or other suitable method, determine the level of the stereo subcarrier.

16.2 The stereo subcarrier shall be at least 40 dB below the total modulation of the carrier.

17 Crosstalk (Stereophonic)

17.1 Crosstalk is the presence of an undesired signal occurring in one channel (L or R) caused by the signal in the other channel (R or L).

17.2 Method of Measurement - Stereophonic Crosstalk
Using the standard test input signal to produce 90% modulation of the carrier by the L + R channel, measure the components of the signal appearing in the L - R channel. With 90% modulation of the carrier by the L - R channel, measure the components of the signal appearing in the L + R channel.

17.3 Crosstalk into either channel shall be at least 40 dB below 90% modulation.

18 Multiplex Operation

Audio Frequency Response

18.1 The audio frequency response is the inverse ratio of input voltages relative to the voltage at 400 Hz, expressed in dB, required to maintain a constant percentage of modulation across the audio frequency range.

*18.2 The standard test set-up shall be used. The normal 75 microsecond pre-emphasis shall be employed. The audio input to maintain a constant modulation level of 25%, 50% and 100% shall be determined at a sufficient number of points over the frequency range 50 to 15,000 Hz to enable curves to be plotted.

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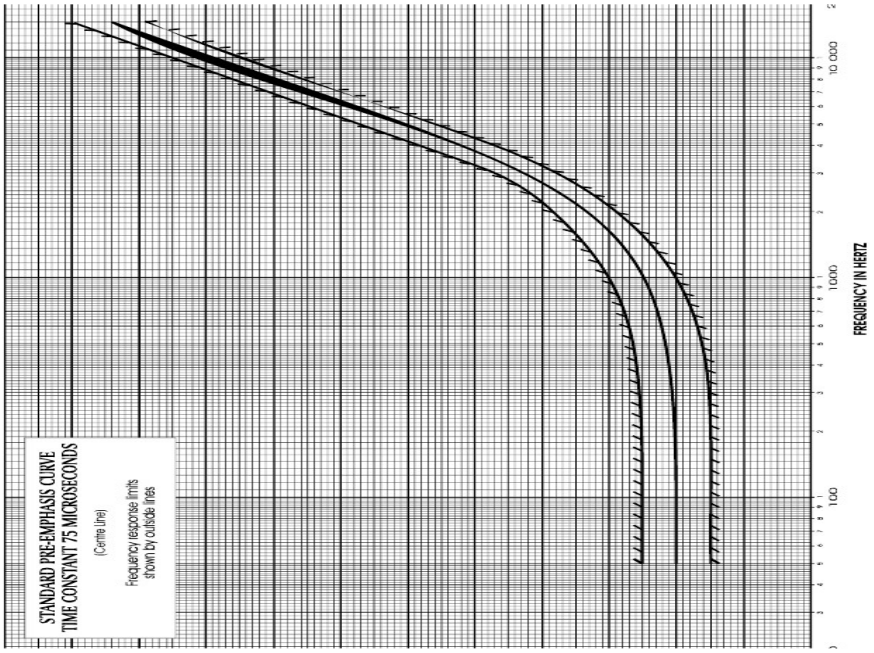
* Section added under this Second Consultation

18.3 The audio frequency response curves shall lie on or between the dashed curves as shown in Figure 4 below:

Figure 4:



19 Audio Frequency Harmonic Distortion

19.1 The audio frequency harmonic distortion is the harmonic content of the audio signal contributed by the transmitting equipment.

*19.2 The L and R channels shall meet the requirements of section 25.2 below.

* Modified under this Second Consultation

20 Frequency Modulation Noise Level on Carrier

20.1 The frequency modulation noise on the carrier is the residual frequency modulation resulting from disturbances produced in the transmitting equipment itself within the band of 50 Hz to 15,000 Hz.

*20.2 The requirements of section 26.2 below shall apply.

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* Modified under this Second Consultation

21 Amplitude Modulation Noise Level on Carrier

21.1 The amplitude modulation noise level of an FM carrier is the ratio of the RMS value of the amplitude modulation component (50 to 15,000 Hz) of the carrier envelope to the RMS carrier value during the absence of applied modulating voltage.

*21.2 The requirements of 27.2 below shall apply.

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* Modified under this Second Consultation

22 Crosstalk (Multiplex)

22.1 Crosstalk is the presence of an undesired signal occurring in one channel (L or R) caused by the signal in the other channel (R or L).

22.2 Method of Measurement - Multiplex Crosstalk

Modulate any multiplex subcarrier at the maximum level and at the maximum modulating frequency for which it is designed to operate. If more than one such subcarrier is provided, modulate them simultaneously. The frequency level should be recorded in the test report. With no modulation on the L + R or the L - R channels, measure the output of the L + R and the L - R channels.

With no modulation on the multiplex subcarrier or subcarrier, apply the standard input signal to both L + R and L - R channels, measure the level of the crosstalk in the output of the multiplex sub-channel and record this level in the test report.

22.3 Crosstalk from multiplex channels into the L + R or L - R channels shall be at least 60 dB below maximum modulation level. There is no standard for crosstalk from the L + R or L - R channels into the multiplex sub-channels.

23 FM Monophonic Sound Transmission

Audio Input Impedance

23.1 The audio input level for 100% modulation is the audio input, expressed in dBm (0

dBm = 1 mW), necessary to produce a frequency deviation of ±75 kHz.

23.2 The audio input impedance shall be a nominal 600 ohm balanced to ground. Additional impedances may also be provided.

23.3 The standard test signal shall be adjusted to produce 100% modulation.

23.4 The standard audio input level for 100% modulation shall be 10 dBm, ±2 dBm.

24 Audio Frequency Response

24.1 The audio frequency response is the inverse ratio of input voltages relative to the voltage at 400 Hz, expressed in dB, required to maintain a constant percentage of modulation across the audio frequency range.

24.2 Method of Measurement

The standard test set-up as described in Table 2 (under Section 8.3 above) shall be used. The normal 75 microsecond pre-emphasis shall be employed. The audio input to maintain a constant modulation level of 25%, 50% and 100% shall be determined at a sufficient number of points over the frequency range 50 to 15,000 Hz to enable curves to be plotted.

25 Audio Frequency Harmonic Distortion

25.1 The audio frequency harmonic distortion is the harmonic content of the audio signal contributed by the transmitting equipment.

*25.2 Method of Measurement

The standard test set-up as described in Table 2 (under Section 8.3 above) shall be used and the demodulated output fed to a wave or distortion analyzer. The normal 75 microsecond pre-emphasis shall be employed and the demodulator shall include a 75 microsecond de-emphasis. Measurements at 90% modulation shall be taken at a sufficient number of frequencies in each range of frequencies to plot a distortion versus frequency curve.

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* Modified under this Second Consultation

25.3 The audio frequency distortion including all harmonics up to 30 kHz shall not exceed 1% in the range of frequencies from 50 Hz to 15,000 Hz.

26 Frequency Modulation Noise Level on Carrier

26.1 The frequency modulation noise on the carrier is the residual frequency modulation resulting from disturbances produced in the transmitting equipment itself within the band of 50 Hz to 15,000 Hz.

*26.2 Method of Measurement

Using the normal 75 microsecond pre-emphasis, a sample of the RF output of the transmitting equipment shall be fed to a distortion and noise meter, via a suitable demodulator. The frequency response characteristic of the demodulator shall be within ±1 dB of the normal 75 microsecond de-emphasis curve from 50 Hz to 15,000 Hz. Readings shall be taken of the output levels with standard test modulation of 90% and without modulation, with the input terminated in 600 ohms. Their ratio shall be expressed in dB below 100% modulation (±75 kHz deviation).

*26.3 The ratio shall be at least 60 dB below 90% modulation.

* Modified under this Second Consultation

27 Amplitude Modulation Noise Level on Carrier

27.1 The amplitude modulation noise level of an FM carrier is the ratio of the RMS value of the amplitude modulation component (50 Hz to 15,000 Hz) of the carrier envelope to the RMS carrier value during the absence of applied modulating voltage.

27.2 Method of Measurement

Measurement of the carrier amplitude modulation noise level may be accomplished by the use of a linear peak carrier responsive AM detector coupled to the output of the transmitting equipment. Readings are made of the DC voltage and the RMS value of the AC component across the detector load resistor. The DC voltage must be multiplied by 0.707. The measurement shall be made in the absence of modulating voltage, with the audio input terminated in 600 ohms.

27.3 The ratio shall be at least 50 dB below carrier level within the band of 50 Hz to 15,000 Hz.

Annex B: International Standards for RF Radiation Exposure

1. Health Canada's guidelines entitled "Limits of Human Exposure to Radiofrequency Electromagnetic Energy in the Frequency Range from 3 kHz to 300 GHz - Safety Code 6"

2. Health Canada's Technical Guide for Interpretation and Compliance Assessment of Health Canada's Radiofrequency Exposure Guidelines.

3. FM Model for Windows, available at: https://www.fcc.gov/oet/info/software/fmmodel/

4. FCC Maximum Permissible RF Exposure Regulations, available at: **http://www.rfcafe.com/references/electrical/fcc-maximum-permissible-exposure.htm**

5. IEEE C95.3, Recommended Practice for Measurements and Computations of Radio Frequency Electromagnetic Fields with Respect to Human Exposure to Such Fields, 100 kHz-300 GHz.

6. **National Council on Radiation Protection & Measurements**

7. UK Health Protection Agency Radiation Protection Division

8. International Commission on Non-ionising Radiation Protection (ICNIRP)

Table C.1 – Field Strength/Power Density Limits for the Uncontrolled Environment From 10 MHz to 300 GHz

Frequency Range	**Electric Field Strength (V/m RMS)**	**Magnetic Field Strength (A/m RMS)**	**Power Density (W/m^2)**	**Reference Period (minutes)**
10 - 20 MHz 20- 48 MHz	27.46 $58.07/f^{0.25}$	0.0728 $0.1540/f^{0.25}$	2 $8.944/f^{0.5}$	6 6
48 - 300 MHz 300 – 6 000 MHz	22.06 $3.142\ f^{0.3417}$	0.05852 $0.008335\ f^{0.3417}$	1.291 $0.02619\ f^{0.6834}$	6 6
6 000 – 15 000 MHz 15 000 – 150 000 MHz 150 000 – 300 000 MHz	61.4 61.4 $0.158\ f^{0.5}$	0.163 0.163 $4.21 \times 10^{-4}\ f^{0.5}$	10 10 $6.67 \times 10^{-5}\ f$	6 $616000/f^{1.2}$ $616000/f^{1.2}$

Note: Frequency, f, is in MHz

Table C.2– Contact Current Limits for the Uncontrolled Environment

Frequency Range (MHz)	**Contact Current (mA, RMS) for Finger-Touch**	**Reference Period**	**Note**
0.003 - 0.1	200 f	Instantaneous	Based on Nerve Stimulation
0.1 – 10	20	Instantaneous	Based on Specific Absorption Rate
10 – 110	20	6 min	Based on Specific Absorption Rate

Note: Frequency, f, is in MHz

If the applicant can demonstrate that the general public cannot access the area surrounding the transmitting antenna delimited by the distance given in the Table C.3, said applicant will be exempt from the analysis required in Section 7. This Table is based on the following two assumptions:

- Single polarization was used in deriving values
- "Distance" is the distance from the centre of radiation of the antenna to any point

Table C.3

Broadcasting Service	**Distance from Antenna in Metres**
Low-power FM	5.1
Very Low-power FM	2.3

Note: Calculated distance is based on 50% of Health Canada's SC6 limits for uncontrolled environments using the modified free space propagation model.

Annex C: Low Power FM Stations

	Canada	US	UK
Low Power FM radio stations	Two classes: 1. Very low power (VLPFM) (up to 10 W) 2. Low power (LPFM) (up to 50 W) E-1.2.1 LPFM stations will be considered as secondary assignments. In other words, except as provided for in Section E-1.4, LPFM stations shall not create interference to primary FM broadcasting stations, whether established before or after them. Conversely, an LPFM station is not entitled to protection from interference by normally functioning primary FM stations. LPFM stations are assigned on a protected basis from each other according to their date of notification.[29]	LPFM stations (allow up to 100 W) LPFM are authorized for noncommercial educational broadcasting only. Not protected from interference from other FM stations. An LPFM station will not be authorized initially unless the minimum distance separations in the following table are met with respect to authorized FM stations	Community radio stations typically cover a small geographical area with a coverage radius of up to 5km and run on a not-for-profit basis

Canada:

In Canada, there are two classes of low-power FM broadcasting stations:

- very low-power FM (up to 10 W ERP), and
- Low-power FM (allows up to 50 W ERP).

The ERP is equal to the transmitter power supplied to the antenna multiplied by the relative gain (dipole) of the antenna in a given direction in consideration of the transmission line losses. Generally, VLPFMs are only allowed in remote areas.[30]

- LPA can be divided into two categories: low-power auxiliary equipment and wireless cameras. Low-power auxiliary equipment refers to wireless microphones, cue and control communications and synchronization of video camera signals. FM transmitters may also be included in that category, but they are restricted and may only be authorized under certain conditions described in Client Procedures Circular CPC-2-1-28[31]

[29] Industry Canada, BPR 3. http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf09954.html
[30] https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf02087.html#q2
[31] https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf10933.html

Industry Canada has not exempted **any** 5 W FM broadcasting transmitters from authorization requirements, regardless of the equipment manufacturer, purpose of the transmission or the affiliation of the operator. The FM broadcasting radio frequency spectrum, at 88-108 MHz, is adjacent to the aeronautical navigation and communications (NavCom) spectrum at 108-137 MHz.[32]

The CRTC has exempted from licensing certain low-power AM and FM broadcasting undertakings, for example, **Limited Duration Special Event Facilitating Undertakings** and P**ublic Emergency Radio Undertakings**, provided that certain conditions are met.[33],[34]

The regulation of spectrum space is strict in Canada, as well having restrictions on second and third adjacent channels, along with other protections for AM and FM commercial radio. In addition, because there have been a few cases that found that FM frequencies have caused interference to the aeronautical navigation and communications (NavCom) spectrum (though evidence is not very concrete presently), pirate radio regulation has remained very strict as well. However, the two regulating bodies do have certain exemptions. For example, low-power announcement transmitters that meet the requirement of Broadcasting Equipment Technical Standards 1, Limited Duration Special Events Distribution Undertakings, Temporary Resource Development Distribution Undertakings, and Public Emergency Radio Undertakings are a few instances, which according to certain criteria, may be exempt from certificate/license requirements.[1]

Requirements permitting license exempt operation in Canada[35]

Requirements permitting **licence-exempt operation** of field disturbance sensors in the frequency bands shown in the table below.

Interference to and from VLPFM: VLPFM stations are not protected from interference caused by primary FM stations and by LPFM stations. VLPFM stations shall not cause interference to any new or existing stations, and such stations are only entitled to protection from other very low-power stations established in accordance with this section. Protection of VLPFM stations applies at the 3 mV/m contour.

Remedy: Should the operation of a VLPFM established in accordance with this section cause interference to existing broadcasting stations or to other radio services, remedial measures

[32] https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf02087.html
[33] https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf02087.html
[34] http://www.rac.ca/en/rac/services/bandplans/allband.php
[35] https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf01320.html?Open&pv=1

shall be taken by the licensee even to the extent of closing down the station if another suitable channel cannot be found.

Interference to and from LPFM: LPFM stations will be considered as secondary assignments. In other words, LPFM stations shall not create interference to primary FM broadcasting stations, whether established before or after them. Conversely, an LPFM station is not entitled to protection from interference by normally functioning primary FM stations. LPFM stations are assigned on a protected basis from each other according to their date of notification.

US:
LPFM stations (allow up to 100 W)

In the US, LPFM are authorized for noncommercial educational broadcasting only. LPFM are not protected from interference from other FM stations.

An LPFM station will not be authorized initially unless the minimum distance separations in the following table are met with respect to authorized FM stations.

US Local Community Radio ACT 2010[36]:

a) The Federal Communications Commission shall modify the rules authorizing the operation of low-power FM radio stations, as proposed in MM Docket No. 99-25, to--
   1. prescribe protection for co-channels and first- and second-adjacent channels; and
   2. prohibit any applicant from obtaining a low-power FM license if the applicant has engaged in any manner in the unlicensed operation of any station in violation of section 301 of the Communications Act of 1934 (47 U.S.C. 301).

b) Any license that was issued by the Federal Communications Commission to a low-power FM station prior to April 2, 2001, and that does not comply with the modifications adopted by the Commission in MM Docket No. 99-25 on April 2, 2001, shall remain invalid.''. SEC. 3. MINIMUM DISTANCE SEPARATION REQUIREMENTS.

(a) In General
The Federal Communications Commission shall modify its rules to eliminate third-adjacent minimum distance separation requirements between-

(1) low-power FM stations; and
(2) full-service FM stations, FM translator stations, and FM booster stations.

(b) Restriction

[36] Local Community Radio Act 2010, available at: http://www.gpo.gov/fdsys/pkg/PLAW-111publ371/html/PLAW-111publ371.htm

(1) In general, The Federal Communications Commission shall not amend its rules to reduce the minimum co-channel and first- and second-adjacent channel distance separation requirements in effect on the date of enactment of this Act between--

(A) low-power FM stations; and

(B) full-service FM stations.

Waiver:

(A) In general: Notwithstanding paragraph (1), the Federal Communications Commission may grant a waiver of the second-adjacent channel distance separation requirement to low-power FM stations that establish, using methods of predicting interference taking into account all relevant factors, including terrain- sensitive propagation models, that their proposed operations will not result in interference to any authorized radio service.

(B) Requirements:

(i) **Suspension**: Any low-power FM station that receives a waiver under subparagraph (A) shall be required to suspend operation immediately upon notification by the Federal Communications Commission that it is causing interference to the reception of an existing or modified full-service FM station without regard to the location of the station receiving interference.

(ii) **Elimination of interference**: A low-power FM station described in clause (i) shall not resume operation until such interference has been eliminated or it can demonstrate to the Federal Communications Commission that the interference was not due to emissions from the low-power FM station, except that such station may make short test transmissions during the period of suspended operation to check the efficacy of remedial measures.

(iii) Notification: Upon receipt of a complaint of interference from a low-power FM station operating pursuant to a waiver authorized under subparagraph (A), the Federal Communications Commission shall notify the identified low-power FM station by telephone or other electronic communication within 1 business day.

UK:

For LPFM licenses, a single frequency (usually 87.7 MHz) on the FM waveband will be allocated. The usual maximum radiated power is 50 mW e.r.p., using a vertically polarized antenna. However, Ofcom may consider allocating a higher power level, up to a usual maximum of 500 mW e.r.p. if this is considered necessary to provide coverage to the boundary of the establishment. Requests will be considered on a case-by-case basis. (For services already licensed, a request for an increased power level must be accompanied by full details of the site, the reason for a request, and a £200 amendment fee. Such licensees may be asked to supply a coverage map and/or evidence to support a request for a higher power allocation. These must show the building/establishment boundary.)

Low-powered FM (LPFM) licenses are generally available in pre-defined, sparsely populated, areas of England, Wales and Scotland.

At Ofcom's discretion FM may also be available in areas where there has been no short-term RSL (SRSL) activity over a long period (normally three years or more). LPFMs allow for freely-radiating transmission on the FM (VHF) waveband at a usual maximum radiated power of 50 mW, however up to 500 mW of radiated power may be available depending on the coverage required. (This will be considered on a case by case basis.

For both AM and FM licenses, there is likely to be some overspill of the signal into areas beyond the licensed site during daylight hours. However, it is a condition of the license that this overspill area is not acknowledged, either on-air or in off-air promotion and publicity. No service should be directed at listeners living outside the licensed site.

Spectrum Licensing in the UK

The main legislation is the Wireless Telegraphy Act 2006 (the '2006' Act'). This empowers Ofcom to:

1. Issue and charge for licenses for the installation and use of radio;
2. Make and enforce regulations on the requirements to be met by users;
3. Make and enforce regulations on the requirements to be met by manufacturers and importers of radio apparatus and of equipment which could cause radio interference; and
4. Restrict manufacture, sale, import and possession of specified radio apparatus.

The 2006 Act also contains a number of criminal offences prosecuted by Ofcom. Some offences relating to unauthorized use of radio can attract fines of up to £5000 and/or two years' imprisonment.

Licenses are usually granted subject to terms, provisions and limitations, which must be complied with. These may include:

1. Use only on a certain frequency;
2. Use only with a certain power and certain level of emission;
3. Use must not cause undue interference;
4. Use only within a certain geographical area;
5. Use only of apparatus which meets specified requirements; and
6. Access for inspection by ofcom staff and close down in the event of interference being caused.

Licenses **usually expire automatically on non-payment of fees** and where there is a frequency assignment attached to a licence it may not be possible to reassign the same frequency if a new licence is subsequently taken out.

Licenses **may be revoked if** a user has demonstrated an unsuitability for the responsibility of holding a licence (e.g. by persistently contravening their licence or causing interference). Again those affected would be given a chance to comment on a revocation.

Annex D: Minimum separation distances between transmitters

Table E.1

Class A1: a maximum ERP of 250 W with an EHAAT of 100 metres
Class A: a maximum ERP of 6 kW with an EHAAT of 100 metres
Class B1: a maximum ERP of 25 kW with an EHAAT of 100 metres

Note: In The Bahamas, the proposed Maximum ERP is 10 kW, so class B1 is only noted here for comparison purposes of the minimum separation distance used for this class with what actually exists with respect to the islands where 10KW maximum ERP is permitted.

Table E.2: Table of Minimum Domestic (Canada) Separation Distances (km)

Class A1	Co-channel	78		
	200 kHz	45		
	400 kHz	22		
Class A	Co-channel	131	151	
	200 kHz	78	97	
	400 kHz	42	47	
Class B1	Co-channel	164	184	197
	200 kHz	98	118	131
	400 kHz	55	60	63
	Relationship	Class A1	Class A	Class B1

Table E.3: FCC classes of stations

Station class	Maximum ERP	Reference HAAT in meters (ft.)	Class contour distance in kilo- meters
A	6 kW (7.8 dBk)	100 (328)	28
B1	25 kW (14.0 dBk)	100 (328)	39

FCC's minimum separation distance

TABLE E.4: MINIMUM DISTANCE SEPARATION REQUIREMENTS IN KILOMETRES (MILES)

Relation	Co-Channel	200 kHz	400/600 kHz	10.6/ 10.8 MHz
A to A	115 (71)	72 (45)	31 (19)	10 (6)
A to B1	143 (89)	96 (60)	48 (30)	12 (7)
A to B	178 (111)	113 (70)	69 (43)	15 (9)
B1 to B1	175 (109)	114 (71)	50 (31)	14 (9)

Table E.5: Minimum Distance Separation Requirements (In kilometers) (Ref: Canada/US Agreement)

Relation	Co-Channel	Adjacent Channels			I.F.
	0 kHz	200 kHz	400 kHz	600 kHz	10.6/10.8 MHz
Al-A l	78	45	24	20	4
Al –A	131	78	44	40	7
Al-Bl	164	98	57	53	9
A-A	151	98	51	42	10
A-Bl	184	119	64	55	12
Bl -B l	197	131	70	57	24

Annex E: Interference Considerations for Channel Separations of 600 and 800 KHz (Ref BPR-3)

Channels Separated by 600 and 800 kHz

F1 FM stations separated by 600 or 800 kHz and operating in the same area may interfere with each other if not co-sited and therefore co-siting is strongly recommended if possible. For co-sited proposals, there are no interference remedying responsibilities; however, the ERP shall not exceed the ERP of the incumbent station by more than 20 dB in any direction. For the purposes of this section, co-siting is defined as being located within 100 m of an incumbent station.

F2 A new station may be implemented within the F(50,50) 100 dBuV/m contour of an incumbent station, separated by 600 or 800 kHz if the new station's 100 dBuV/m contour is completely enclosed within the 100 dBuV/m contour of the incumbent station. As interference is considered highly unlikely in such a situation, no particular interference remedying responsibilities will be prescribed for the applicant.

F3 If a new station is located such that its calculated 100 dBuV/m contour intercepts or overlaps the geographical zone between the 100 dBuV/m contour and the protected 54 dBuV/m contour of an incumbent station with frequency separation of 600 or 800 kHz, an estimate of the population inside this zone is required. This area shall be plotted on an appropriately scaled map and submitted to URCA.

The new station shall be responsible for remedying any valid complaints of third- or fourth-adjacent channel interference (whichever is applicable) related to the reception of the incumbent station during the on-air testing period. If the new station is proposing the use of an allotment and the incumbent station has already accepted interference, this requirement shall not apply in the previously identified interference zone to the incumbent station.

Complaints shall be considered valid where all the following criteria are met:

- listener must be inside the authorized service contour of the incumbent station;
- listener must have reception equivalent to ITU quality grade 3 or better when the new station is not transmitting;
- listener must experience impaired reception defined as one level (or greater) reduction on the ITU quality grade scale that is attributed to the emissions of the new station.

Quality
5 Excellent
4 Good
3 Fair
2 Poor
1 Bad

A complete definition of the above grades is given in the ITU-R Recommendation BS-1284, which may be found at this address:
http://www.itu.int/rec/R-REC-BS.1284-1-200312-I/en.

*Should harmful interference occur, available remedies, at the new station's expense, include but are not limited to:

- receiver replacement;
- receiver filters;
- selection of an alternative transmit frequency for either station;
- change of site;
- co-siting with the incumbent; and
- reduction of parameters.

_____

* Modified under this Second Consultation

F4 In all cases, the incumbent station(s) shall be notified of the proposed operation in accordance with Section C-1.5.5. It should be noted that the Department will not deny technical acceptability due to an objection from an incumbent station in a situation as described in Section C-1.6.3. The Department will, however, advise the CRTC of the objection, with details of the population count and location likely to be affected.

F5 New stations are not protected against interference from incumbent stations separated by 600 kHz or 800 kHz with overlapping service contours, except for the requirements under Section F-5.5.

F-5.5 Resolving Issues C-5.5.1 Responsibilities

The broadcaster will accept responsibility to:

(A) In the case of intermodulation-type interference

(a) remedy valid complaints of receiver-generated intermodulation interference within the 115 dBuV/m contour (refer to Section F-5.6 for the list of complaints judged not valid by the Department),
(b) provide technical advice to complainants, located between the 115 dBuV/m contour and the service contours of the station, concerning appropriate action to resolve interference problems of this type attributed to the station, and
(c) keep the appropriate district office of the Department fully informed of all complaints received and action taken, and
(d) assume their appropriate share of responsibility to immediately remedy the problem when more than one FM station is involved in transmitter-generated intermodulation products.

(B) In the case of immunity-type interference

The broadcasters will be responsible for remedying valid immunity-type interference[37].

F-5.5.2 Complaints Judged Not Valid by URCA

The following are the types of complaints judged not valid by URCA and for which the broadcaster is not responsible for remedial action:

(a) where the complaint is attributed to the use of a malfunctioning or mistuned receiver or an improperly installed or defective antenna system;
(b) where the complaint is attributed to the desired signal being received at a location outside the coverage area of the station;
(c) where the complaint is attributed to the desired signal not being favourably received because of adverse local propagation conditions or building penetration losses;
(d) *where the complaint involves the reception of signals originating from outside of The Bahamas;
(e) where the complaint involves a high gain receiving antenna and/or an antenna booster amplifier intended for reception of distant stations which, as a consequence, overloads the receiver or creates intermodulation in the amplifier output;
(f) where the complaint involves intermodulation interference inside the 115 dBuV/m contour, if the devices were introduced within the contour after the station started operating with the new facilities;

[37] The guidelines on resolving immunity issues related to radio-sensitive equipment are outlined in Industry Canada's Client Procedures Circular CPC-3-14-01, *Determinations of Harmful Interference with respect to Radio-Sensitive Equipment*. CPC-3-14-01 can also be used as a guide for resolving immunity-related interference to broadcast receivers and associated equipment.

(g) where the complaint is attributed to immunity-type interference to broadcast receivers and associated equipment that are located in an area where the measured field strength does not exceed 125 dBuV/m;
(h) where the complaint is attributed to immunity-type interference to radio-sensitive equipment that is located in an area where the measured field strength does not exceed 130 dBuV/m;
(i) any other complaint which, in the judgment of the Department, is considered not valid.

_____

* Modified under this Second Consultation

Annex F : Definitions for IBOC System

- *In Band On Channel DSB System*. A technical system in which a station's digital signal is broadcast in the same spectrum and on the same channel as its analog signal.

- *Hybrid DSB System.* A system which transmits both the digital and analog signals within the spectral emission mask of a single AM or FM channel.

- *Extended hybrid operation.* An enhanced mode of FM IBOC DSB operation which includes additional DSB subcarriers transmitted between the analogue FM signal and the inner edges of the primary DSB sidebands.

Annex G – Summary of Consultation Questions

Question 1: Do you agree with the core objectives of this consultation? (Please check off the appropriate response below)

- Yes_____
- No _____
- Don't know _____

Question 1(b): If you responded 'No' to question 1(a), please explain and provide any additional objectives that URCA should consider.

_____

_____

Question 2 (a): Do you agree with URCA's proposed standard channel spacing of 600 KHz for islands in The Bahamas greater than 19 miles long and minimum 800 kHz in cases where the islands in The Bahamas are less than 19 miles long?

- Yes
- No
- Don't Know

Please provide full reasoning in support of your answer.

_____

_____

Question 2(b): What are your views regarding URCA's suggestion to that the assignments with channel spacing equal to or greater than 1000KHz should be addressed on a priority basis first?

_____

_____

Question 3(a): What are your general views regarding the licensing of Low Power FM broadcasting in The Bahamas?

_____

_____

_____

_____

Question 4(a): Do you agree with URCA's proposal that the coverage area for Low Power FM broadcasting stations in the smaller Family Islands should not exceed a one (1) mile radius from the station?

- Yes
- No
- Don't Know

Please provide reasoning for the support of your answer.

_____

_____

Question 4(b): If your response to 4(a) is a 'No', what do you consider a reasonable coverage area for LPFM stations located in the larger Family Islands? Please provide reasoning for the support of your answer.

_____

_____

Question 4(c): What are your views regarding the maximum ERP limit and authorization for those stations that are licensed on 'no interference and no protection' basis?

_____

_____

Question 5 (a): Do you believe that the technical standards proposed by URCA for FM radio broadcasting in The Bahamas are appropriate?

- Yes
- No
- Don't Know

_____

_____

Question 5(b): Please provide full reasoning in support of your answer.

Question 6: URCA invites comments on any additional suitable approaches to protect NavCom operations.

Question 7(a): URCA invites comments on the feasibility of sharing existing sites by any new applicants or existing FM broadcast licensees.

Question 7(b): URCA invites comments on whether the requirement of sharing existing sites by new applicants or existing FM broadcast licensees should be made mandatory.

Question 8(a): URCA invites comments regarding:

(i) The extent to which existing licensees have historically followed the international standards as set out in Annex B.

(ii)What evidence could be submitted to URCA to demonstrate such compliance?

Question 8(b): Any comments regarding the proposed process to verify compliance to the international standards related to RF exposure should be included.

Question 8(c): Do you agree with the adoption of a single standard RF Radiation Exposure by FM radio stations namely the International Commission on Non-ionizing RadiationProtection (ICNIRP)?

_____

_____

Question 8(d): What do you consider a reasonable time frame within which FM radio broadcast licensees should be required to by fully compliant with the Standard for RF Radiation Exposure?

_____

_____

Question 9(a): Do you believe that the introduction of DSB will benefit consumers and stakeholders in the radio broadcast market in The Bahamas?

- Yes
- No
- Don't know

_____

_____

Question 9(b): Please provide full reasoning in support of your position.

_____

_____

Question 10(a): Do you agree with URCA's view that a "hybrid" approach to FM radio broadcasting may be a viable option to the implementation of full digital FM broadcasting in the Bahamas?

- Yes
- No
- Don't know

_____

_____

Question 10(b): Please provide full reasoning in support of your position.

_____

_____

Question 11: Do you agree with the assessment that it may be premature to focus on digital migration of FM broadcasting in the Bahamas at this stage?

- Yes
- No
- Don't know

Question 11(b): Kindly provide reasoning in support for your position.

Question 12(a): What are your general views on (future) Digital Sound Broadcasting?

Question 12(b): Which technology and devices (e.g. digital handsets) do you (as a broadcaster/ consumer etc.) expect to use in the future?

Question 13: Are there any other matters URCA should consider as part of its public consultation regarding DSB in The Bahamas? Kindly provide full explanation for your suggestions.

Question 14: What do you consider is a reasonable time frame within which FM broadcast licensees should be required to be fully compliant with the Technical Standards issued by URCA consequential to this Consultation process? Please give reasons in support of your position.