FORUM SBTVD

BRAZILIAN DIGITAL TERRESTRIAL TV FORUM

Call for Prototypes: MIMO Indoor Antennas TV 3.0 Project

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Brazilian Digital Terrestrial Television System Forum

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1 Introduction

The SBTVD Forum issued a Call for Proposal (CfP) for its Second Generation Digital Terrestrial TV System, which was denoted as TV 3.0 Project, on July 17th, 2020.

The CfP document (available at https://forumsbtvd.org.br/wp-content/uploads/2020/07/SBTVDTV-3-0-CfP.pdf) presents the Requirements for the TV 3.0 Project. In Section 4.2 - Over-the-air Physical Layer, there is a mention of the reception antenna system, repeated here for the convenience of the reader:

Reuse-1 broadcast requires C/N ≤ 0 dB. Taking advantage of such robustness, the new physical layer is also meant to target both mobile outdoor and fixed indoor reception with the same signal, with a single modulation, encoding, and quality, maintaining the current network topology (High-Power, High-Tower), so as not to increase the cost of distributing the signal. The indoor reception target implies that the C/N target is to be considered in a Rayleigh channel. The reason to change the traditional fixed outdoor reception target to a fixed indoor reception target is that the outdoor antenna at 10 meters high with 10 dBd of gain, currently used as a reference in network planning, is becoming less and less representative as the population moves predominantly to apartments instead of houses and many buildings have no communal antenna system. Indoor antennas are also easier to install, and, as they are not directional, new TV transmitters can be added in different locations without the need to repoint antennas. In the future, antennas could be built-in the TV sets, for an even more "plug and play" user experience.

The over-the-air physical layer candidate technologies proposed will be tested and evaluated according to the procedures established in the “TV 3.0 CfP Phase 2 / Testing and Evaluation” document (available at https://forumsbtvd.org.br/wp-content/uploads/2021/01/SBTVD-TV_3_0-P2_TE_2021-01-28.pdf). The field test will require the use of MIMO indoor antennas. The physical layer candidate technologies proponents shall provide antennas for the test, but the SBTVD Forum may use MIMO indoor antennas of other providers, as reference. The inclusion of additional antennas in the test is important to verify the reception performance using antennas with characteristics closer to what would be obtained in the end-user consumer electronics products. This information would also assist the determination of the minimum required field strength for indoor reception of the candidate technologies.

In this opportunity, the SBTVD Forum issues a Call for Prototypes of MIMO indoor antennas, for which commercial product implementations are still practically non-existent, as this innovative new technology has not yet begun to be used in Digital Terrestrial Television (DTT) transmission, except in research and development activities.

Due to the use of MIMO, the introduction of TV 3.0 will require the introduction of a new antenna at each DTT reception point, creating a great potential market for the new reception antennas.

Further information regarding the TV 3.0 Project can be obtained at https://forumsbtvd.org.br/tv3_0/.

2 Requirements for prototype submission

Section 3 of this document presents the “Technical Requirements” of the MIMO Indoor Antennas, subject of this document. There are variations of antenna types specified, but it is left to the submitter of the prototype antenna(s) the implementation and delivery of all the options or any subset thereof.

At least two samples of each model of prototype antenna chosen by the submitter should be delivered to the Forum, free of charge. The SBTVD Forum recommends the submitter to conduct complete characterization and evaluation tests, considering the specifications established in Section 3, and submit their results to the SBTVD Forum. The SBTVD Forum will analyze the conformance of the prototypes submitted to the specifications established in Section 3 based on the test results submitted. The results of the TV 3.0 Project field tests using the prototype antennas are going to be made publicly available by the SBTVD Forum, without mentioning the name of the manufacturers.

3 Technical requirements

3.1 General Requirements

Two types of MIMO indoor antennas will be accepted: passive antennas and active antennas with RF Amplifier integrated.

The antennas should operate with linear dual-polarization, with Vertical/Horizontal and/or Skew (+45º/-45º) orientation. It is left to the submitter to choose an implementation that allows one physical antenna to operate with both types of polarizations or to provide separate samples for each type of polarization.

3.2 Technical Specifications

3.2.1 Main Features

feature subset		feature			condition
AN1	Antenna main features	**AN1.1**	Compact mechanical form for indoor installation.		required
		AN1.2	People without any technical knowledge should be able to install and adjust.		required
		AN1.3	Multiple Input and Multiple Output - MIMO 2x2 Operation		required
		AN1.4.1	Linear Polarization*	Vertical/Horizontal	required
		AN1.4.2		Skew (+45º/-45º)	

**It is left to the submitter to choose an implementation that allows one physical antenna to operate with both types of polarizations or to provide separate samples for each type of polarization.*

3.2.2 Passive Antenna

feature subset		feature			condition
AN2	Passive Antenna Characteristics	**AN2.1**	Antenna Diagram	Omnidirectional (-1dBi)	recommended
		AN2.2.1	Antenna Gain	VHF (174-216 MHz) ≥ -4dBi	recommended
		AN2.2.2		UHF (470-698 MHz) ≥ -1dBi	recommended
		AN2.3	Connector type	2x F Female (one for each polarization)	required
		AN2.4	Impedance	75Ω	required
		AN2.5.1	Frequency range*	VHF (174-216 MHz)	recommended
		AN2.5.2		UHF (470-698 MHz)	recommended
		AN2.6	Return Loss	≥ 10 dB (VHF & UHF)	required
		AN2.7	Cross Polarization Discrimination	≥ 15 dB (VHF & UHF)	required

** It is left to the submitter to implement an antenna to cover both VHF and UHF range or separate antenna for VHF and UHF range.*

3.2.3 Active Part

feature subset		feature			condition
AN3	RF Amplifier Characteristics	**AN3.1**	FM Trap	Simple FM analog radio in the 76 to 108 MHz range signal trap to avoid amplifier saturation (as specified below)	recommended
		AN3.2	LTE Filter	LTE signal (Up Link in 703 to 748 MHz and Down Link in 758 to 803 MHz) filter (as specified below)	recommended
		AN3.3	Input and Output impedance	75Ω	required
		AN3.4.1	Noise Figure	≤ 2 dB	recommended
		AN3.4.2		≤ 4 dB	required
		AN3.5	Minimum Gain	18 dB	recommended
		AN3.6	Third Order Intercept Point	≥ + 30 dBm	required
		AN3.7	Output Return Loss	≥ 20 dB	required

FM Trap Specifications:

FM Radio Band Rejection: ≥ 30 dB in 76 to 108 MHz

LTE Filter Specifications:

TV Passband Insertion Loss: ≤ 4 dB in 174 to 698 MHz
LTE Band Rejection:
≥ 6 dB at 703 to 708 MHz
≥ 15 dB at 708 to 748 MHz
≥ 20 dB at 758 to 803 MHz

3.2.4 Integrated Antenna

feature subset		feature			condition
AN4	Overall Characteristics	**AN4.1**	Frequency Response for each TV channel	≤2 dB peak to peak in each 6 MHz band	required
		AN4.2.1	Band-wise Frequency Response	≤3 dB peak to peak for VHF (174-216 MHz)	recommended
		AN4.2.2		≤3 dB peak to peak for UHF (470-698 MHz)	recommended

4 Confidentiality

The SBTVD Forum members commit themselves to maintain the confidential nature of confidential information, marked as such at the time of disclosure, which they may have access to because of their participation and attributions with the SBTVD Forum, and may be held responsible for the unauthorized disclosure of confidential information, and should also undertake all appropriate measures to protect this information, especially the representatives and employees, among other persons involved in the execution of activities related to their participation in the SBTVD Forum.

§1. The following information is excluded from the confidentiality obligation contained in this Section: (a) publicly available; (b) who are already in the possession of the member as a result of its own research, provided that the member can prove this fact; (c) the disclosure of which is required of an associate as a result of the law, judicial determination or any governmental body; and, (d) received from third parties, without breach of the obligation of confidentiality provided herein.

§2. The obligation of confidentiality will be fully valid for 5 (five) years, counted from the date of disclosure of the information marked as confidential.

5 Responding to this Call for Prototypes

This Call for Prototypes on MIMO Indoor Antennas is open for any interested organization to submit its prototypes according to the specifications established in this document. The prototypes shall be delivered between 24 May 2021 and 25 June 2021 in the SBTVD Forum office, at the following address:

Rua Manoel da Nóbrega, 211 – Paraíso – São Paulo – SP – Brazil – 04001-081

The TV 3.0 Project Test Labs will be responsible for picking up these prototypes in the SBTVD Forum office between 28 June 2021 and 02 July 2021 and returning them after the tests, between 06 and 10 December 2021.

The submitter shall collect the prototypes in the SBTVD Forum office between 13 and 17 December 2021.

The following responsibilities shall be borne by the submitter, regarding the logistics of the prototypes:

- The submitter is responsible for all its inbound and outbound logistic costs, including, but not limited to, customs clearance, fees, taxes, charges, duties, international and/or local freight, as well as hiring cargo agents, customs brokers, local and qualified importers, if applicable.
- The submitter is responsible for the proper packaging of the equipment. The packaging shall be adequate and sufficient to protect the goods, according to their nature, against impact and handling, during the entire way from submitter premises to the SBTVD Forum and on its return (for local or international shipments).
- In the case of equipment coming from abroad, it is recommended to have a local and qualified importer in Brazil to fill all the customs and fiscal procedures in Brazil. The SBTVD Forum shall not be named as the importer.
- The submitter shall deliver the equipment completely free and released and with all applicable Brazilian tax rules and with local documentation for evaluation covering the whole period of tests. The SBTVD Forum will not accept any equipment delivered without the Brazilian local documentation (named as “Nota Fiscal”).
- Any extra costs or taxes due to incorrect filling of this local documentation will be the responsibility of the submitter and/or its intermediaries named as the sender mentioned on the document. Therefore, we strongly recommend that the submitter uses qualified companies to fill that in case the submitter is unable to comply with Brazilian tax rules.
- The submitter is responsible for the transport insurance (local and/or international) as well as the equipment permanence insurance throughout the testing period from delivery to the moment of return. Such insurance must cover any risks of losses and material damages resulting from external causes, as well as, but not limited to, fire, flooding, theft, falls, breaks, dents, and electrical damage.
- All equipment will be repacked in their original cases or crates, but it shall be the responsibility of the submitter to check and attest to the safety of the packaging at the time of collection. The SBTVD Forum shall have no responsibility in case of poorly packed equipment.
- The SBTVD Forum will provide, according to the Brazilian tax rules, the local documentation for returning the equipment, naming on the document the submitter and/or its intermediaries as the new recipients.
- After the collection of the equipment, the submitter attests to the “proof of receipt” of the equipment and local documentation.

The Test Lab shall inform the submitter (through SBTVD Forum intermediation) if any prototype does not work properly, to enable arranging its replacement, if necessary.

All the deadlines refer to 23:59 UTC-3 time zone.

SBTVD Forum will notify the submitters upon receiving the prototypes.

Submitters may be required to provide clarifications deemed necessary by the SBTVD Forum regarding their prototypes, the provided documentation, specifications, and/or evaluation test results, or in case of unexpected test results involving their prototypes.

Submitters may be invited to participate remotely in specific SBTVD Forum meetings, on mutually agreed dates and times, to present and discuss their prototypes.

Questions related to this document should be directed to:

Luiz Fausto, Chair, Technical Module, SBTVD Forum: luiz.fausto@forumsbtvd.org.br

Doris Guardia, Secretary, SBTVD Forum: secretaria@forumsbtvd.org.br

6 SBTVD Forum Disclaimer

SBTVD Forum reserves the right to modify or withdraw this document without notice.