



International Amateur Radio Union Region 1 2011 Regional Conference – Sun City, South Africa 12 to 19 August 2011



Subject	Use of CTCSS Sub Audio Tones for Analogue Repeater Control		
Society	DARC	Country:	Germany
Committee:	C5	Paper number:	SC11_C5_39
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Introduction

CAVTAT 2008 conference agreed that new Digital Voice Repeaters can share the repeater duplex frequencies with old analogue repeaters. A coordination process and control by sub audio tones (CTCSS) could help to avoid interference between users of analogue and digital repeaters on the same channel.

Background

In future more DV-repeaters and older FM repeaters will operate, even on the same channel. Avoiding interferences when both types of repeaters are planned to operate on a common channel, a “Coordination and Compatibility Verification Process” can be done and may result in a change of the channel of one of the repeaters involved. Unfortunately, in many areas there are not enough duplex frequencies available.

A serious problem will occur if one station is using high power and non-directional antennas and is located between two FM repeaters (of nearly equal distance) on the same channel. Such a distant station can even block out a portable or mobile station quite near to a local repeater. A method to cope with this problem is to control both FM repeaters by sub tones and force the individual station to reduce their power.

Such a technique would be also useful when the operation of DV and FM repeaters are planned to operate on the same channel. A FM repeater will open the squelch only when it receives a defined sub tone on the uplink frequency, an FM receiver squelch will only be opened if the appropriate sub tone is set and received from the repeater.

To facilitate knowing the right sub tone needed for reception on the user or repeater side, three methods could be used at the FM repeater station:

- 1) The activated repeater permanently transmits the sub tone.
- 2) In addition to the call sign the letter indicating the sub tone is transmitted during identification (e.g. DB0VR / B, if sub tone B is used according to Table FM 2.1)
- 3) In regular short intervals, the sub tone in use could be announced by voice.

Key Point and Proposal

Sub tone control of FM repeaters and receivers would reduce interference problems

with DV repeaters on the same channel. The introduction of sub tone control is appropriate for congested urban areas, a transition period could be defined; other areas might follow later. With the sub tone control technique a multiple use of a channel would be more frequently possible.

RECOMMENDATION

That after a transition period all FM repeaters in congested urban areas are equipped and operated with sub tone control.