1.1 Contention Based Protocol

1.1.1 Definition of Contention-based protocol

A protocol that allows multiple users to share the same spectrum by defining the events that must occur when two or more transmitters attempt to simultaneously access the same channel and establishing rules by which a transmitter provides reasonable opportunities for other transmitters to operate. Such a protocol may consist of procedures for initiating new transmissions, procedures for determining the state of the channel (available or unavailable), and procedures for managing retransmissions in the event of a busy channel. Contention-based protocols shall fall into one of two categories:
(1) An unrestricted contention-based protocol is one which can avoid co-frequency interference with devices using all other types of contention-based protocols.

(2) A restricted contention-based protocol is one that does not qualify as unrestricted.

1.1.2 Type of Contention-based protocol used by SCRT-1-365T-1

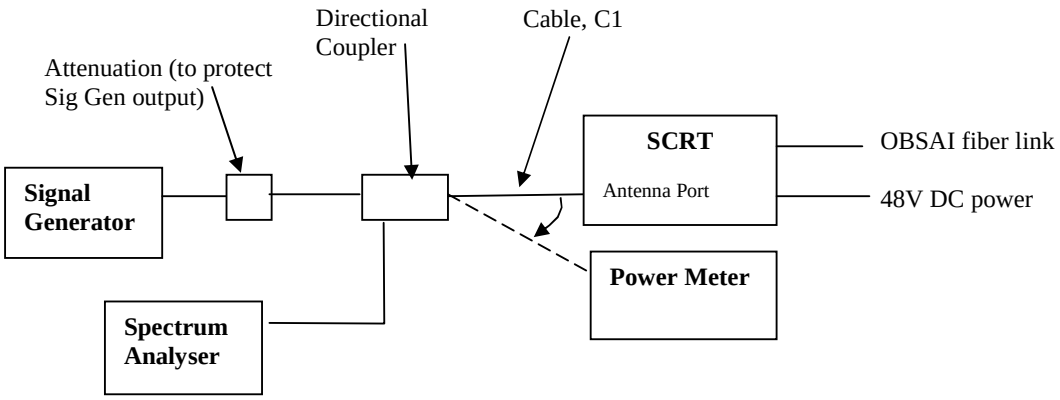
Airspan Communications are that the SCRT-1-365T-1 uses an unrestricted contention based protocol as the SCRT operates in a "listen before transmit" mode:

Following receipt of uplink traffic from Subscriber Stations and immediately prior to transmission of WiMAX pre-amble the SCRT checks level of received signal across it full transmit bandwidth. Should a signal be present above a pre-determined level set during basestation commissioning, then the SCRT will not transmit any signal during the next timeslot allowing the other spectrum user to transmit unimpeded.

As other users of the spectrum are likely to be operating in TDD modes with differing frame lengths it is quite likely that they will not be transmitting when the SCRT checks for other signals prior to transmitting in the next scheduled timeslot a few milliseconds later.

1.1.3 Demonstration of compliance of the "listen before transmit" mode

The SCRT was set-up as shown below



Test Procedure was as follows:

1. Set SCRT to specified bandwidth and transmit frequency, F_{TX}, from the table below.
2. Connect cable C1 to Power Meter, set the Signal Generator to transmit at offset F_{OS} from F_{TX} and set power so that level received on power meter is the desired switch-off level P_{TXOFF} corresponding to the carrier detect level set on the SCRT. Disable Signal Generator output
3. Connect cable C1 to SCRT and verify on the Spectrum Analyser that the SCRT is transmitting
4. Enable Signal Generator output and check on Spectrum Analyser that SCRT transmit stops.
5. Reduce Signal Generator output by a 5 dB and check that SCRT transmission re-starts.
6. Repeat at levels and offsets in the table below

To show that the SCRT contention based protocol operates across the signal bandwidth, across the allocated band and at different set levels the above test will be done with the following settings:

SCRT Transmit Frequency, F_{TX} (MHz)	**SCRT Bandwidth (MHz)**	**SCRT Carrier Detect turn-off level**	**Interferer Frequency relative to SCRT, F_{OS} (MHZ)**	**Carrier Detect Level, P_{TXOFF} (dBm)**	**Should Transmit be disabled**
3655	10	-60	-5	-60	Yes
3655	10	-60	-5	-65	No
3655	10	-65	0	-65	Yes
3655	10	-65	0	-70	No
3655	10	-70	+5	-70	Yes
3655	10	-70	+5	-75	No
3695	10	-60	+5	-60	Yes
3695	10	-60	+5	-65	No
3652.5	5	-60	-2.5	-60	Yes
3652.5	5	-60	-2.5	-65	No
3672.5	5	-65	0	-65	Yes
3652.5	5	-65	0	-70	No
3672.5	5	-70	+2.5	-70	Yes
3652.5	5	-70	+2.5	-75	No
3652.5	5	-70	-5	-45	No
3652.5	5	-70	+5	-45	No

As can be seen from the results in section 7.12 of report RP49355JD02A, the SCRT only stops transmitting when presented with an RF signal within the band of operation and at or above a threshold level set in the management software. Signal at lower levels or on different frequencies are ignored.

A subsequent test was done whereby the interferer was manually applied for approximately 130 ms, the SCRT started transmitting at the start of the next 8ms frame, 136ms after it last transmitted.