12.4 Spectrum sensing results

Introduction

When the cognitive radio mode is activated, SEAMCAT resturns the output vector shown in Figure 251 and described in Table 52.

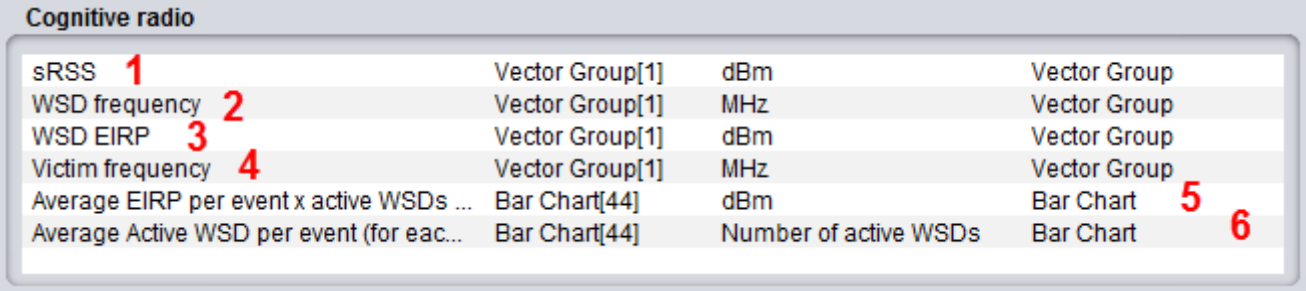


Figure 251: Output vector for the CR

Table 52: Output results for CR simulation

#	Item	Description
1	sRSS	sRSS value calculated at the selected WSD frequency (i.e. where the WSD is allowed to transmit) for each of the event
2	WSD frequency	The actual selected frequency at which the WSDs are allowed to transmit as the result of the spectrum sensing algorithm
3	WSD e.i.r.p.	The actual selected e.i.r.p. at which the WSDs are allowed to transmit as the result of the spectrum sensing algorithm
4	Victim frequency	frequency at which the victim device transmits per event
5	Average e.i.r.p. per event x active WSDs (for each frequency)	average e.i.r.p. per event for all the active WSDs transmitting at a certain frequency
6	Average Active WSD per event (for each frequency)	

At the end of the simulation, SEAMCAT provides a set of output vectors as above. Then you can perform the interference probability calculation as previously described.

12.4.1 sRSS vector

The sRSS vector (dBm) is merely the sRSS value calculated at the selected WSD frequency (i.e. where the WSD is allowed to transmit) for each of the event. Figure 252 displays the vector for each WSD. You can select any or all of the WSD (**#1**). The same applies to the CDF and density graphs (**#2**).

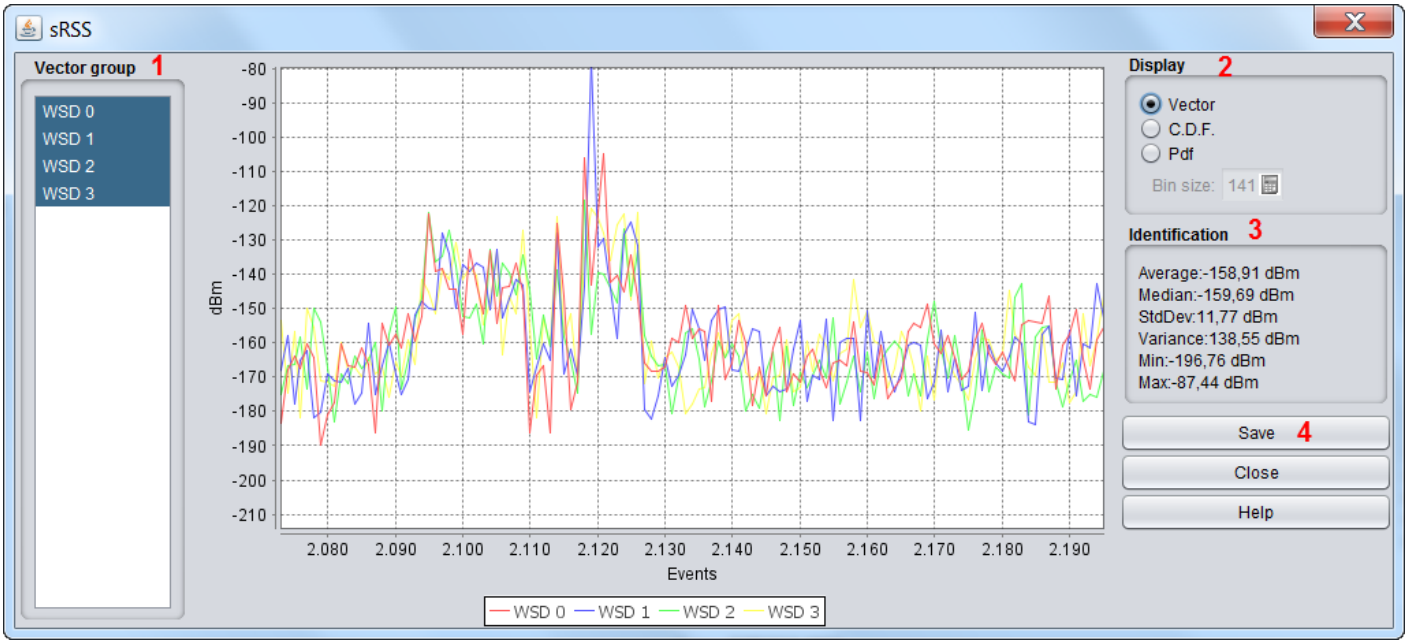


Figure 252: sRSS vector output

You are able to save the results (**#4**) as .txt file for further post-processing.

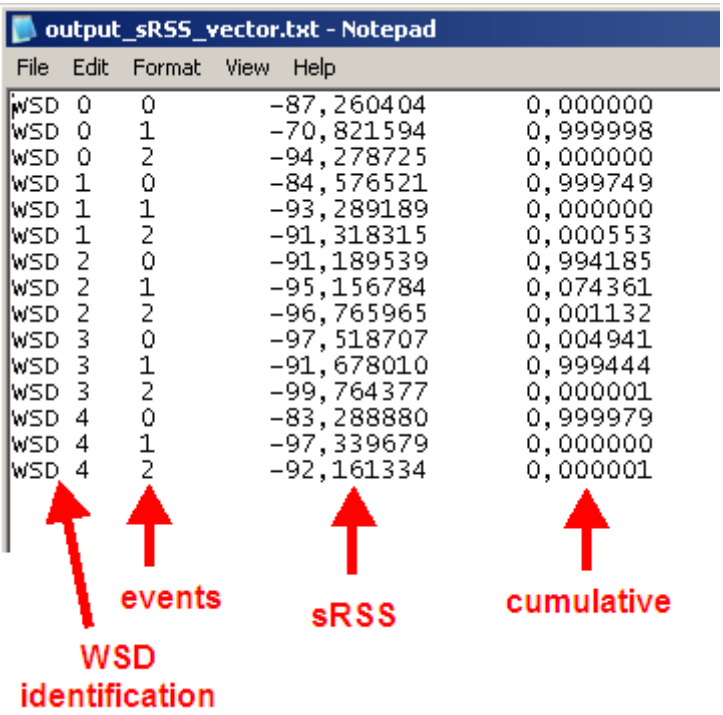
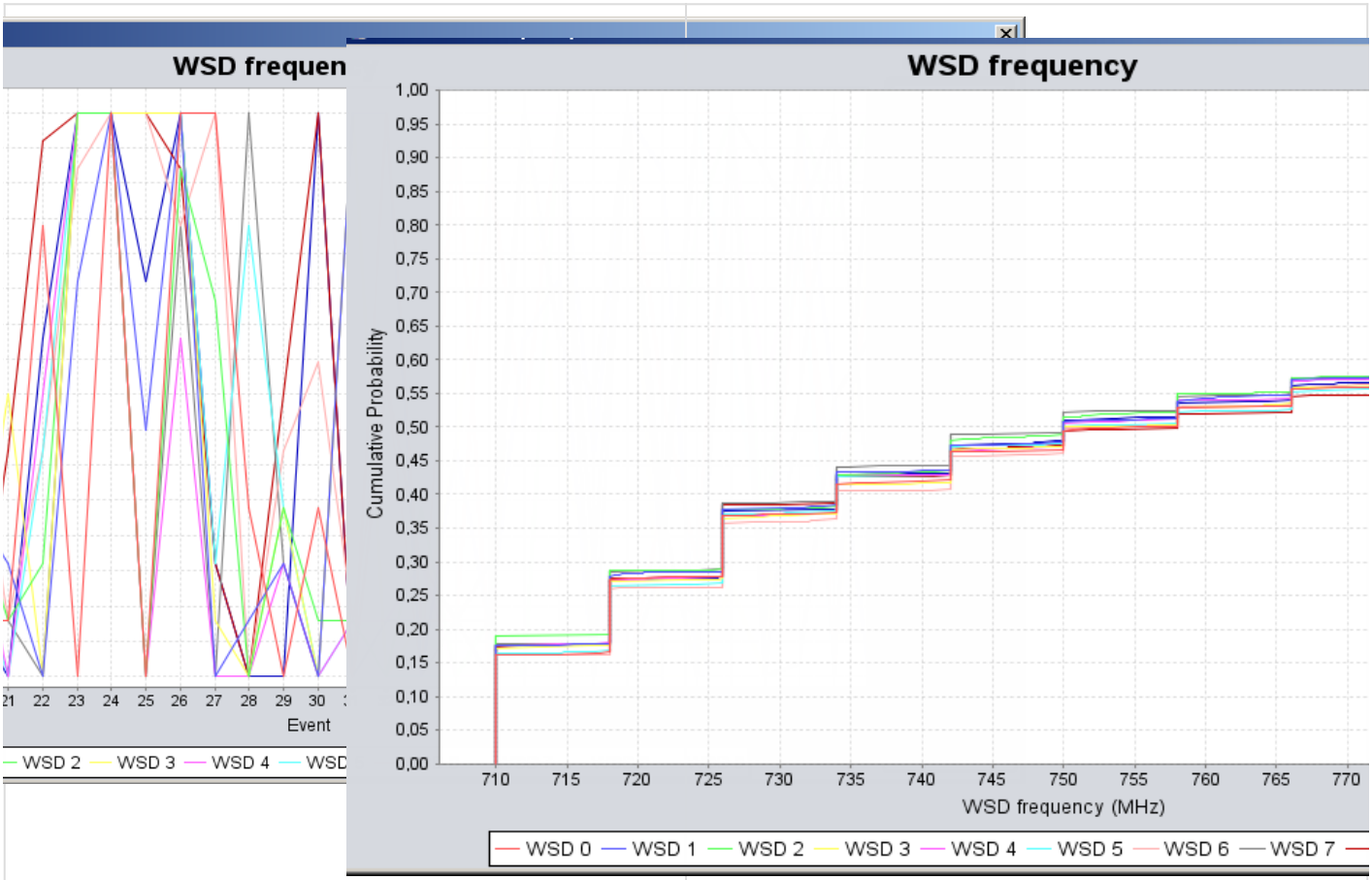


Figure 253: Saving format of the sRSS vector for post-processing

12.4.2 WSD frequency

This vector represents the actual selected frequency (MHz) at which the WSDs are allowed to transmit as the result of the spectrum sensing algorithm.



(a) (b)

Figure 254: Frequencies where the WSDs are transmitting as (a) vector display and (b) CDF

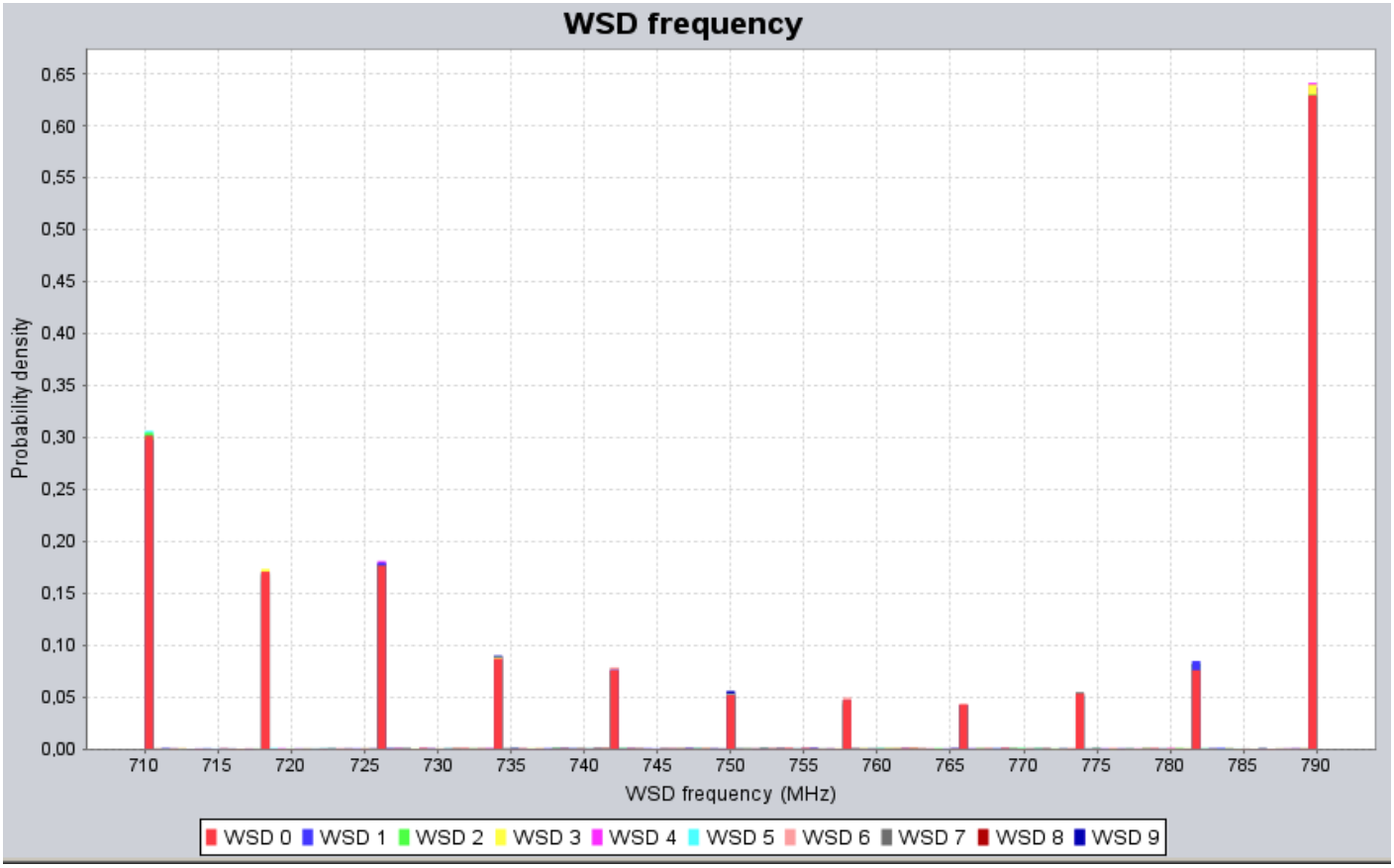


Figure 255: Density of the frequencies used by the WSDs

12.4.3 WSD e.i.r.p.

The actual selected e.i.r.p. (dBm) at which the WSDs are allowed to transmit as the result of the spectrum sensing algorithm. This vector displays the e.i.r.p. for each of the WSD for all the events. In the example presented in Figure 256, the WSDs are transmitting with a e.i.r.p. between -10 and 20 dBm and -1000 dBm (equivalent to WSD switch off).

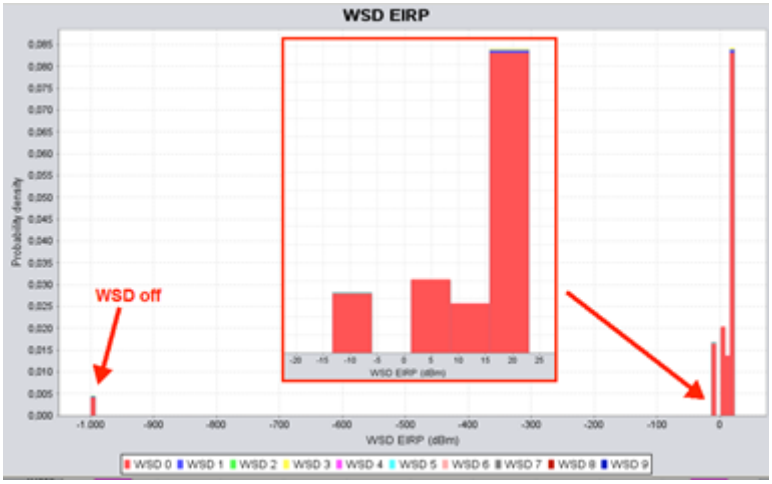


Figure 256: Example of the density of the e.i.r.p. per WSD

12.4.4 Victim frequency vector

The victim frequency vector (MHz) represents the frequency at which the victim device transmits per event.

12.4.5 Average e.i.r.p. per frequency

It presents the average e.i.r.p. per event (dBm vs MHz) for all the active WSDs transmitting at a certain frequency such that:

$$AvgEIRP_{f_j} = 10 \times \log_{10}\left[\frac{1}{N_{activeWSD} \times N_{events}} \sum_{i=1}^{N_{activeWSD} \times N_{events}} 10^{\frac{EIRP_i}{10}}\right]_{f_j} \quad \text{(Eq. 68)}$$

Let us assume a different example from above, where 4 channels have been identified for the WSD to operate. Figure 257 shows that on average 33 dBm, for one event, was transmitted by the active WSDs at 1000.5 MHz , 8.82 dBm at 1001.5 MHz etc...

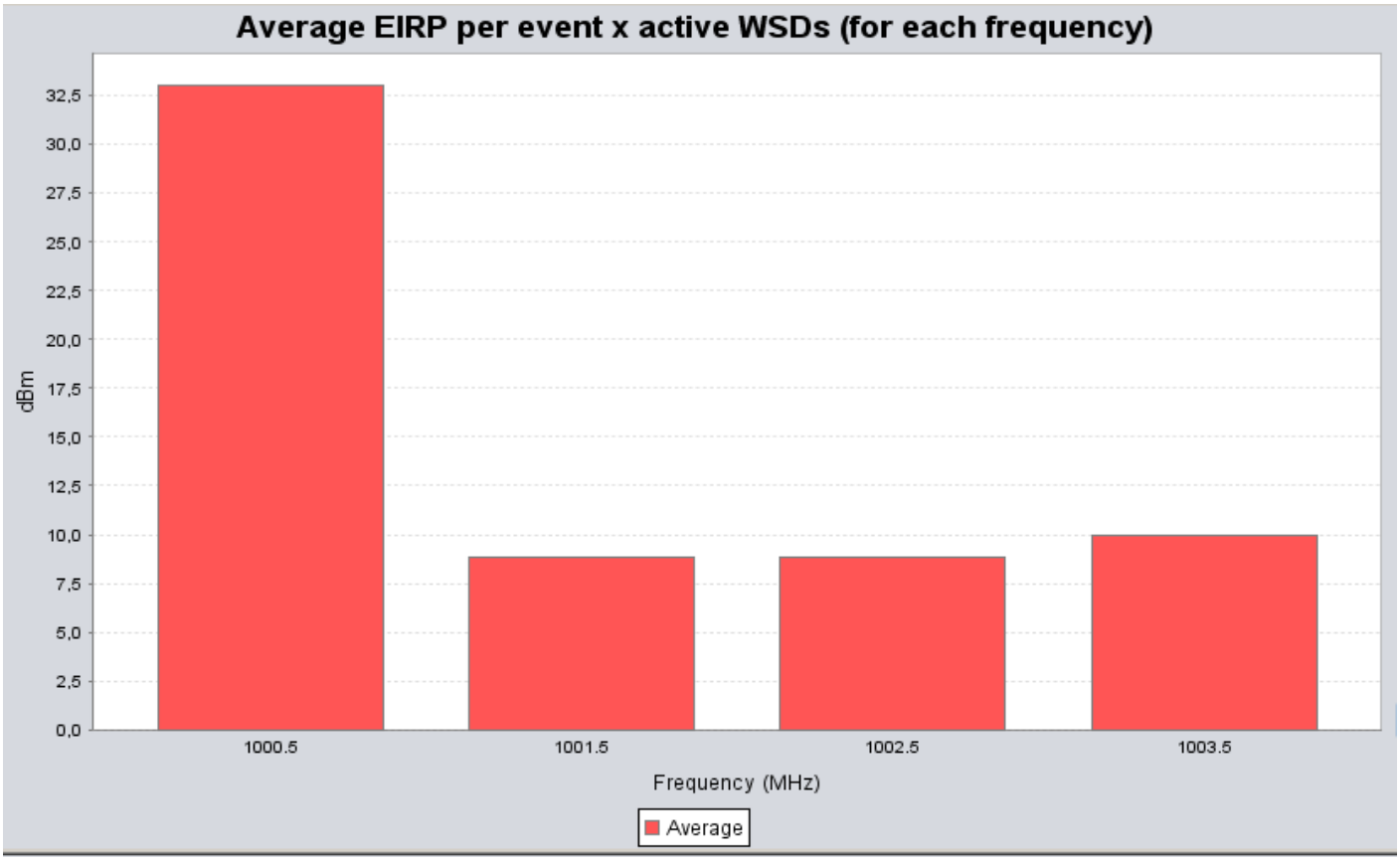


Figure 257: Average e.i.r.p. per frequency

12.4.6 Average active WSDs per frequency vector

It provides the average number of active WSD per event for a specific frequency:

$$NactiveWSD_{f_j} = \left[\frac{1}{N_{events}} \sum_{i=1}^{N_{events}} activeWSD_i \right]_{f_j} \quad \text{(Eq. 69)}$$

Re-using the example of Figure 257, Figure 258 indicates that, with for instance 5 WSDs set as input parameters, an average of 0.63 WSDs were active at 1000.5 MHz (with 33 dBm e.i.r.p. Figure 257), 1.29 WSDs were active at 1001.5 MHz (with 8.82 dBm e.i.r.p. Figure 257), 1.57 active WSDs at 1002.5 MHz and 1.51 active WSDs at 1003.5 MHz. It can also be noted that in this particular example, the sum of the active WSDs across the selected frequencies is 5, meaning that all the simulated WSDs have been active and none have been turn off.

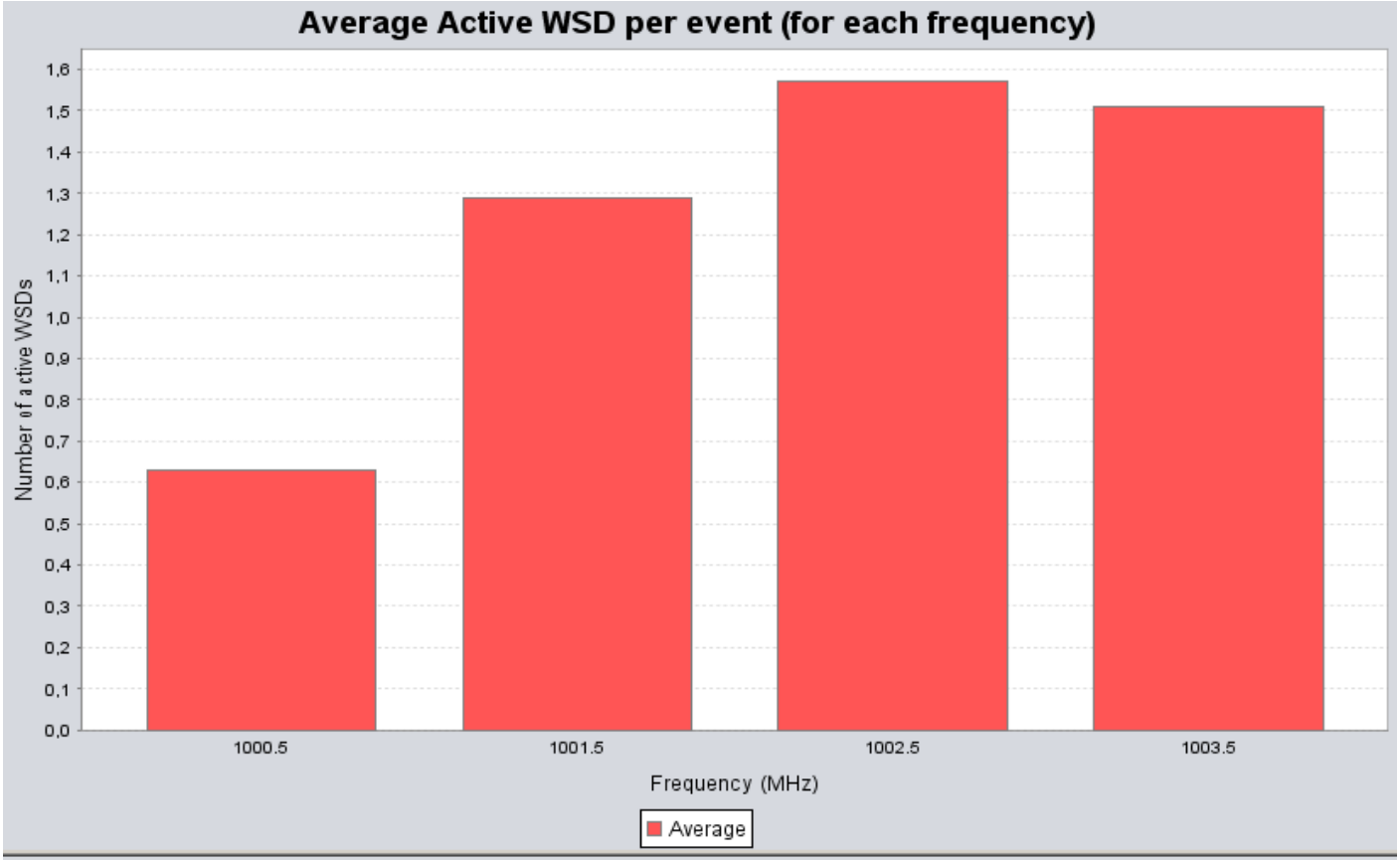


Figure 258: Average active WSDs per frequency