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Investigation of Detection Circuits for Fast Level Detection within a SDARS Diversity System

In the paper is presented a proposal solution to use in the Diversity System SDRAS for realized a fast detection of transmitted signal through this system at reception.

1. The Antenna Diversity-System Principle

The basic principle of a multi signal antenna diversity system is displayed in Fig.1. The diversity system comprises a signal level detection of the IF signal and a signal selector switch, switching of which is synchronized by the data stream.

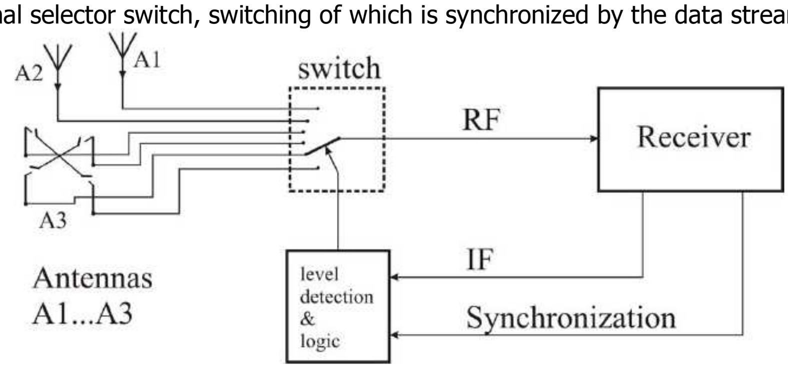


Figure 1: Basic principle of a multi antenna diversity system for mobile digital broadcast reception

Figure 2, 3 and 4 shown the essential elements for understanding the function SDARS Diversity System.

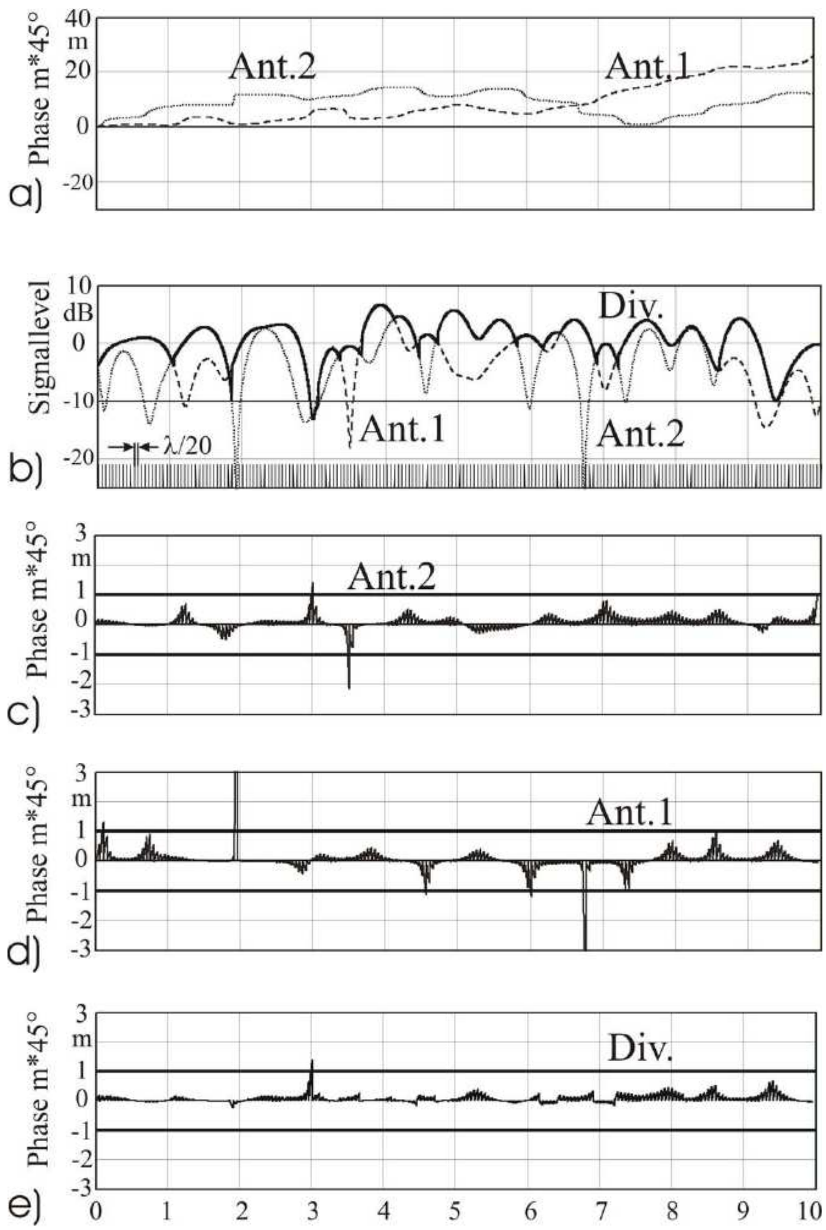


Figure 2: Amplitude and phases of antenna signals and diversity, updating the ref. phase in intervals of λ/20.

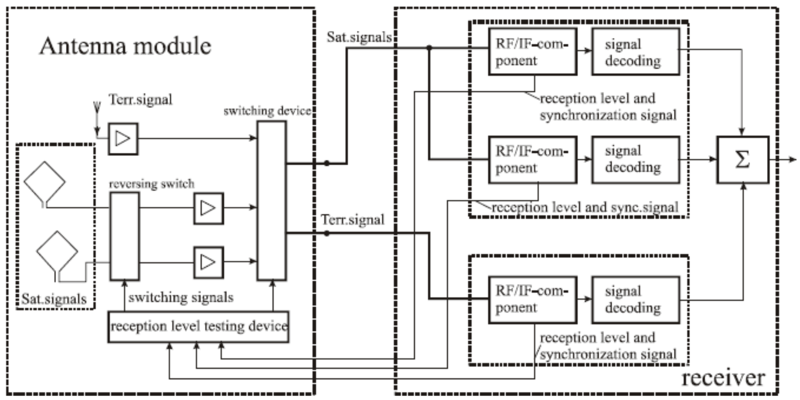


Figure 3: Schematic diagram of a diversity reception system for receiving satellite and terrestrial signals having an antenna module according to fig. 2

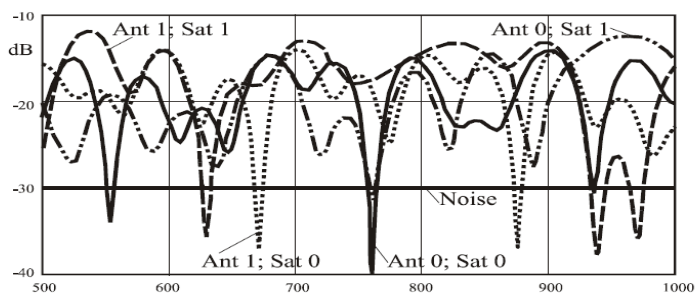


Figure 4a: Receiving signals of satellite signals 0 and 1 in antenna 0 and of satellite signals of satellite 0 and 1 in antenna 1

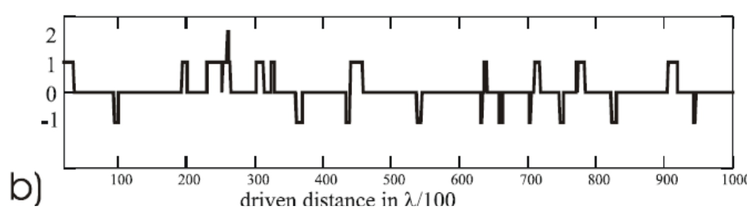


Figure 4b: Difference between satellite signals received by antenna 1 and antenna 0 over driven distance

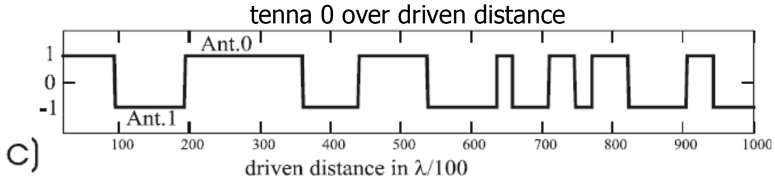


Figure 4c: Switching function of antenna 0 and antenna 1 over driven distance

All level curves shown in Fig. 4a thus are uncorrelated and the drops below the minimum reception level (noise in Fig. 4a) required for safe symbol identification largely occur independently of one another.

If the number of the satellite reception signals worthy of reception received with the antenna 1 is deducted from the corresponding number of satellite reception signals worthy of reception received with the antenna 0, the curve over the driven distance shown in Fig. 4b is obtained for this difference. If for example the logic circuit is designed in a way that it selects the antenna 0 in points of positive difference values, and the antenna 1 in points of negative difference values, but with the restriction that no further switching of logic circuit is initiated when the difference is disappearing, the curve of the switched-on antenna shown in Fig. 4c over the driven distance is obtained. The logic 1 denotes the switch-on of the antenna 0 and the logic -1 denotes the switch-on of the antenna 1.

2. Investigation of Detection Circuits for Fast Level Detection within a SDARS Diversity System

Basically, we are talking about detecting the amplitude of a signal given by a receiver at a frequency of 21.4 MHz.

We need a high speed signal level detector where the level range variation should cover as much as possible the 0-5 V range, so that to ease the settings of the device which realizes the decision algorithm and the matching of the signal variation level to be as sensitive as possible. Starting from our two requirements, we has obtain a good detector which should attain our goals. The result with the old and the new equipment is presented in fig.5 respectively fig.6.

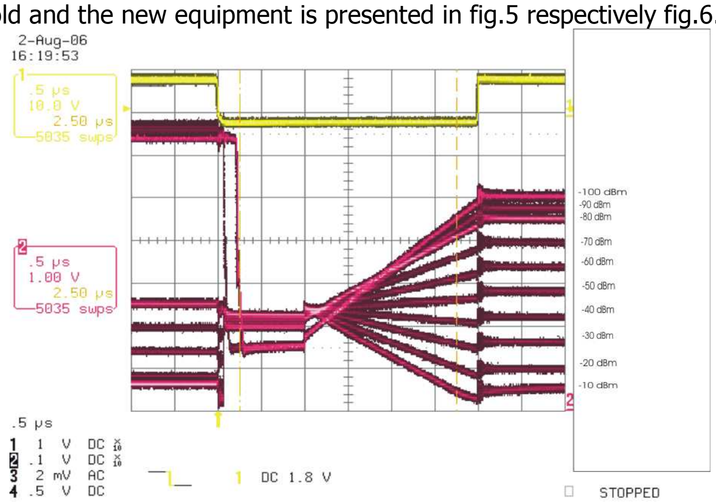


Figure 5: 21.4 MHz; Range -100 to -10 dBm at the old version of detection circuit

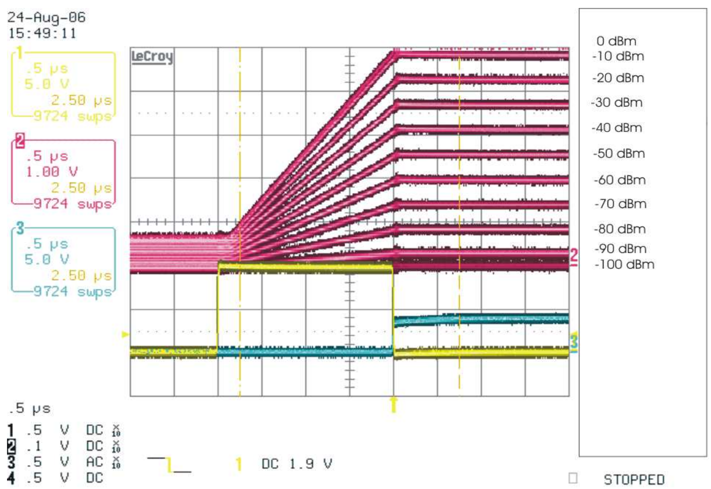
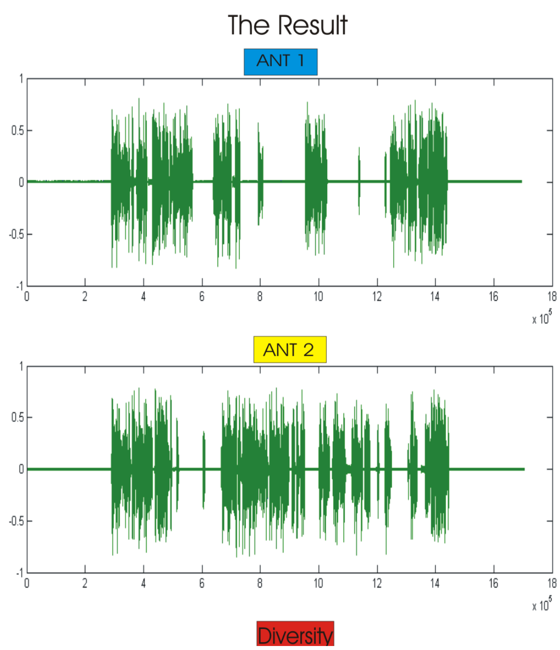


Figure 6: 21.4 MHz, Range -100 to -10 dBm at the new version of detection circuit

Conclusion



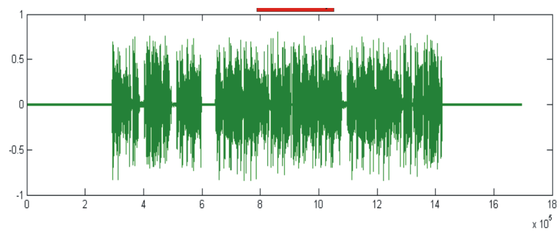


Figure 7 The result for 2 antennas and for SDARS Diversity System

In figure 7 to observe the result for 2 antennas and for SDARS Diversity System after the Investigation of Detection Circuits for Fast Level Detection at f= 21,4 MHz.

The performance of radio reception of SDARS satellite radio is increased drastically by using antenna diversity

References

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