Magnetron Operation Status Influence the Performances of Polarimetric Radar

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Because of the technology for coherent-on-receive was not perfect, magnetron based weather radar had been once snubbed in China. In fact, many companies have developed and produced polarimetric Doppler weather radars based on magnetron, and many customers using this kind of radars for their weather observations in the world. Since the ratio of performance to cost is high enough, we have developed one set of this kind radar named MaXPol, with X-band magnetron (not coaxial), and installed in Weining weather bureau of Guizhou province. For several month operations, we found that the magnetron operation status can influence the performances of the dual-polarization weather radar. By test, analysis and research, the reason may be the frequency dither and drift responded the magnetron operation status. Experiments shown the negative high voltage pulse for magnetron cathode plays an important part in magnetron operation status. Its rate of rise, top flatness, pulse magnitude, etc. not only determinate the oscillation frequency but also frequency stable, phase dither, and etc. The spectra of radiation signals of magnetron transmitter with difference operation status are shown in figure 1. One conclusion for these influences is the frequency drift or phase dither should increase in the case of without enough high power supply. Frequency drift or phase dither make processing difficult for coherent-on-receive. So the radar system maybe degrades as incoherent. Then all detections with phase, such as mean radial velocity, velocity spectrum width, and differential propagation phase shift, etc. will be fault. The good the magnetron operation status, the perfect performance the radar has.

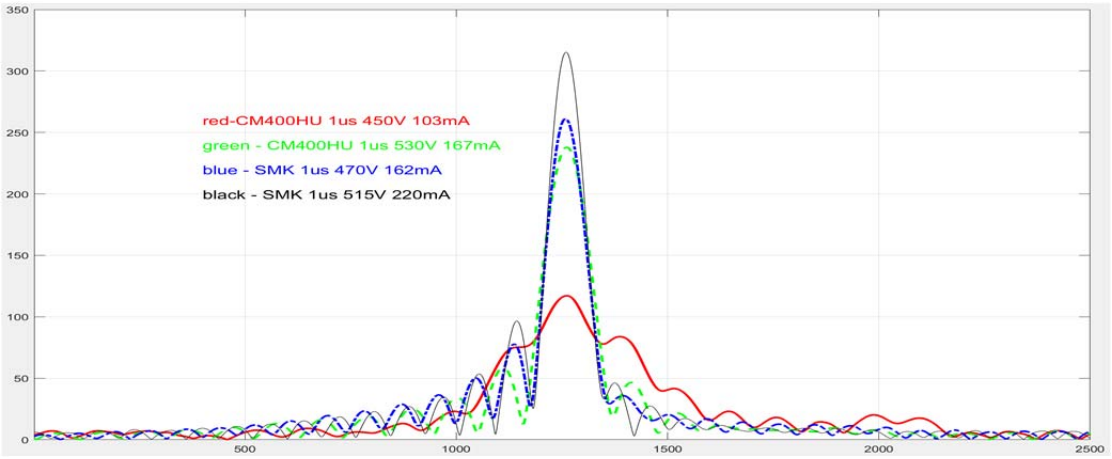

Figure 1. Spectra of radiation signals of magnetron transmitter with difference operation status.

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