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Application of PSK Modulation in ADS-B 1090 Extended Squitter Authentication

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Abstract : Since the presence of Next Generation Air Transportation System (NextGen), Automatic Dependent Surveillance-Broadcast (ADS-B) has raised specific concerns related to the privacy and security, due to its vulnerable, low-level of security and limited payload. In this paper, the authors introduce and analyze the combination of Pulse Amplitude Modulation (PAM) and Phase Shift Keying (PSK) Modulation in conventional ADS-B, forming Secure ADS-B (SADS-B) avionics. In order to demonstrate the potential of this combination, Hardware-in-the-loop (HIL) simulation was used. The tests' results show that, on the one hand, SADS-B can offer five times the payload as its predecessor. This additional payload of SADS-B can be used in various applications, therefore enhancing the ability and efficiency of the current ADS-B. On the other hand, by using the extra phase modulated bits as a digital signature to authenticate ADS-B messages, SADS-B can increase the security of ADS-B, thus ensure a more secure aviation as well. More importantly, SADS-B is compatible with the current ADS-B In and Out. Hence, no significant modifications will be needed to implement this idea. As a result, SADS-B can be considered the most promising approach to enhance the capability and security of ADS-B.

Keywords : ADS-B authentication, ADS-B security, NextGen ADS-B, PSK signature, secure ADS-B
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