

High energy radiation from aircraft-triggered lightning and thunderstorm

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In-flight Lightning Strike Damage Assessment System (ILDAS <http://ildas.nlr.nl/>) was developed in an EU FP6 project to provide information on threat that lightning poses to aircraft. The system contains one E-field and eight H-field sensors distributed over the fuselage. It has recently been extended to include two LaBr₃ scintillation detectors. The scintillation detectors are sensitive to x-ray photons above 30 keV. The entire system is installed on an A-350 aircraft. When triggered by lightning and digitizes data synchronously with 10 ns intervals. Twelve continuously monitoring photon energy channels were implemented for X-ray detectors operating at slower rate (15 ms, pulse counting).

In spring of 2014 and 2015 the aircraft flew through thunderstorm cells recording the data from the sensors. Total of 93 lightning strikes to the aircraft are recorded. Eighteen of them are also detected by WWLLN network. One strike consists of six individual strokes within 200 ms that were all synchronously identified by WWLLN. The WWLLN inter-stroke distance is much larger than the aircraft movement. Three of these strokes generated X-ray bursts. One exceptionally bright X-ray pulse of more than 8 MeV has been detected in association with another strike; it probably saturated the detector's photomultiplier. Neither long gamma-ray glow, nor positron annihilation have been detected during the campaign. An explanation is sought in the typical altitude profile of these test flights.