A Light-weight Planar Ultra-wideband UHF Monopole Mills Cross Array for Ice Sounding

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An electrically large ultra-wideband UHF monopole antenna array has been designed to sound up to 3 km of ice and meet the logistical requirements of transportation to artic regions. The monopole array is comprised of sixteen planar sub-array modules, which in combination form a 16 m by 17 m Mills cross array configuration to maximize sensitivity and spatial selectivity in both cross-track and along-track directions. Each planar sub-array module is 1 m by 2 m in size with a 6.35 cm thick rigid insulation foam panel separating the individual monopole elements from metal foil ground plane on the top such that the maximum radiation is directed to nadir. Each sub-array panel consists of 4 by 8 circular monopole antenna elements with a spacing of 0.25 m. Each monopole element is printed on a 130 mm by 80 mm 62 mil FR4 board. The total weight of each sub-array panel is 9 kg, making for a very lightweight and low-profile antenna construction. The antenna array together with the radar system was deployed to the East Greenland Ice-coring Project (EGRIP) site in August 2018 for demonstrating surface-based ice sounding at UHF band.