Abstract Submitted
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Digital Interferometry for Studies of Leaders in Natural Lightning[1] RICHARD SONNENFELD, JEFF LAPIERRE, MIKE STOCK, PAUL KREHBIEL, Langmuir Laboratory, New Mexico Tech, MANABU AKITA, The University of Electro-Communications, Tokyo — Fully digital broadband (20-80 MHz) radio interferometers (DITFs) optimized to study lightning are a new development. They overcome the "phase-wrap" problem of earlier narrow-band analog interferometers and can locate a source in a lightning channel as often as every 10 nanoseconds. DITFs show phenomena long suspected, but not previously visible. For example, K-changes, (millisecond steps in electric field after a cloud-to-ground discharge), are shown by the DITF to be recoil streamers along a previously formed channel. Used in concert with a lightning mapping array and slow-antenna (1-50000 Hz) electric field sensors, DITFs are also allowing discovery and understanding of new features of lightning. For example, on 8/12/2012, at 21:45:42 UT, a "bolt-from-the-blue" negative leader emerged from a cloud-top 30-miles Southeast of Langmuir Laboratory in New Mexico. Slow-antenna measurements showed electric field steps of 0.001 s duration looking much like K-changes, but occurring BEFORE the first return-stroke of this long leader. We speculate that these steps (which we call U-changes – U for "unknown") are (like K-changes) reionization waves that feed the growing channel and keep it hot enough to proceed all the way to ground. During a U-change, the DITF shows channels reilluminated over several kilometers of altitude.

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