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IMMEDIATE OBSERVATIONAL ACCESS TO THE POST-MERGER ENVIRONMENT OF A NEUTRON STAR COLLISION

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The rich EM phenomenology in the first few hours after a compact object merger encodes the nature of the post-merger remnant, the neutron star equation of state, the velocity distribution of the fastest moving ejecta, and a wide array of other compelling physics. Unfortunately, the requirement to search, find, and classify a counterpart within the large GW localization regions before targeted follow-up with sensitive instruments can begin, excludes access to these first few hours, even for the most well localized GW sources. The ability to promptly localize a GW source to within the field-of-view of a narrow field sensitive facility, would enable extraordinary science. I will discuss the science cases that require extremely early time observations, and the coordination, instruments, and infrastructure necessary to achieve it. This includes, all-sky GRB imagers with arcminute localization capabilities, novel data analysis techniques, early warning GW detection, fast response space telescopes, and the infrastructure to coordinate them.

