1153-35-52 **Hanna E. Makaruk*** (urzedowe@hughes.net), MS H810, P-21 LANL, Los Alamos, NM 87545, and **Robert Owczarek**. *Nonlinear Differential Equations: Constructive, Lie-group Symmetry Based Method for Finding Analytical Solutions. Examples from 4 and 5-Dimensional Einstein Equation of Gravity; Maxwell Equation.* Preliminary report.

Search for new types of analytical solutions of nonlinear differential equations is difficult. It practically stopped during the last few decades, since numerical methods of solving such equations are extremely successful and easy to apply. Currently, in applied physics, new question arose – we do not only want to know what the solution to a physical problem is, we want to know also uncertainty on its value. Physics Uncertainty Bounds (PUBs) theory develops rapidly. One of the best methods to investigate total uncertainty of a numerical solution in PUBs is to compare it to a known analytical solution. In the standard language of coordinate basis, Einstein equation is an example of nonlinear differential equation. It can be formulated in a language of differential forms, in the coreper basis. Then, assuming local structure of a Lie group, it becomes an algebraic tensor equation. In each dimension (3, 4, 5 ...) there is a known, usually not big, set of possible Lie groups. Checking, which of these corepers, forming appropriate Lie algebras, fulfill the tensor equation, is a constructive method of finding solutions of related nonlinear differential equation. We also explain how to translate a nonlinear differential equation to its coreper equivalent on example of Maxwell equation. (Received August 22, 2019)