Coherent and incoherent radiation from ultra-intense laser interaction with nanostructured nickel nanowire ('velvet') targets\textsuperscript{1} ROBIN MARJORIBANKS, MARINA SERVOL\textsuperscript{2}, PAUL FORRESTER, HART LEVY, LUKE MCKINNEY, BRETT TEEPLE, YVES CANDELA\textsuperscript{3}, University of Toronto, JEAN-CLAUDE KIEFFER, INRS-EMT, SIMON LE MOAL\textsuperscript{4}, GABOR KULC-SAR, JOHN SIPE, University of Toronto, PATRICK AUDEBERT, JEAN-PAUL GEINDRE, LULI, CEA/CNRS/Ecole Polytechnique, ANNE HERON, JEAN-CLAUDE ADAM, CPhT, CEA/CNRS/Ecole Polytechnique — Nickel nanowires ('velvet') are a pure metallic anisotropic nanostructured material, averaging as much as one-quarter of solid density, that does not support material polarization- or current-densities required for Fresnel reflection. Since they present > 90\% absorption and an effective skin-depth on the order of 1\,\mu m for intense laser light, they have been shown to be efficient x-ray converters. We show theoretical and experimental results of their behaviour under a range of irradiation conditions, from small-signal up to very clean pulses of relativistic-intensity laser light, including their transition from an effective dielectric to an effective metal, as the result of the generation of relativistic Brunel electrons.

\textsuperscript{1}Supported by NSERC.
\textsuperscript{2}& INRS-EMT
\textsuperscript{3}& Institut d’Optique
\textsuperscript{4}& Ecoles des Mines de Paris

Robin Marjoribanks
University of Toronto

Date submitted: 23 Jul 2007 Electronic form version 1.4