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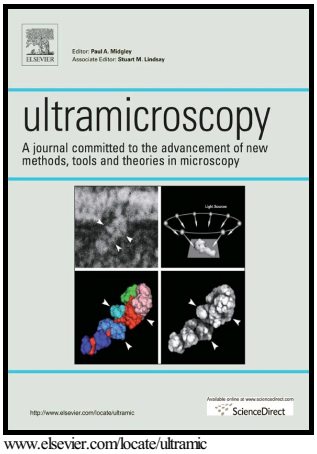


www.elsevier.com/locate/ultramic

PII: S0304-3991(16)30341-2
DOI: http://dx.doi.org/10.1016/j.ultramic.2016.11.020
Reference: ULTRAM12250

To appear in: *Ultramicroscopy*

Received date: 7 January 2016
Revised date: 16 November 2016
Accepted date: 20 November 2016

Cite this article as: Michael Stöger-Pollach, Lukáš Kachtík, Bernhard Miesenberger and Philipp Retzl, Transition Radiation in EELS and Cathodoluminescence, *Ultramicroscopy*, http://dx.doi.org/10.1016/j.ultramic.2016.11.020

# Transition Radiation in EELS and Cathodoluminescence

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**Abstract**

The excitation probability of transition radiation is measured for varying beam energies in a transmission electron microscope once using optical spectrometry of the emitted light and second using electron energy loss spectrometry. In both cases similar results are found being in good agreement with theory. The knowledge about this probability enables us to judge whether or not transition radiation has to be considered in EELS and CL data interpretation. Additionally it is shown that the emission of transition radiation happens at the sample surfaces only, when the electron passes the vacuum/sample interface and thus feeling the change of its dielectric environment. We demonstrate that in the case of Aluminum the influence of transisiton radiation on the low loss EELS spectrum is only minor and conclude that it might be negligible for many other materials.

*Key words:* transition radiation, EELS, cathodoluminescence



## 1 Introduction

When a charged particle passes an interface between two media its field has to be readjusted. This readjustment is governed by the charge of the moving particle, its velocity and the optical refractive index of the two media [1,2]. Assume that a fast electron enters a metal from vacuum. Electron-magnetic radiation at optical frequencies are usually absorbed over a path length being comparable to their wave lengths in most metals. Hence, the optical components of the field of the moving charge are disappearing almost immediately

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