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Dr Neil Mathur
Reader in Materials Physics
Department of Materials Science and Metallurgy
University of Cambridge
Pembroke Street
Cambridge
CB2 3QZ

Dated: 15th May 2013

Dear Dr Mathur

Re: EPSRC Capital for Great Technologies Advanced Materials Call

The National Physical Laboratory (NPL) through the Functional Materials Group would like to support the application of Dr Neil Mathur for his EPSRC "Capital for Great Technologies" application for the acquisition of a low-temperature Scanning Probe Microscope (SPM). The Functional Materials Groups interest lies in all forms of functional materials, including ferroelectric, magnetoelectric and electrocaloric, and this aligns well with the research proposed by Dr. Mathur in imaging low-temperature phase transitions of electrocalorics and electrically driven magnetic changes in magnetoelectrics near phase transitions away from room temperature.

NPL has extensive capability and know-how in the use of and *atomic force microscopy (AFM)* type systems, including the magnetic and piezoelectric variants, however low temperature AFM systems represent a gap in our capabilities. This is an area of increasing importance, since most of the novel materials only exhibit interesting functional properties at low temperatures. The low temperature capability would greatly enhance the scope of such an instrument allowing imaging of low-T phase transitions (electrocalorics), imaging electrically driven magnetic changes near phase transitions away from room temperature (magnetoelectrics), and imaging spin-polarized transport (graphene spintronics).

NPL would benefit greatly from having access to such a facility and would envisage using it within joint projects between NPL and Cambridge, such as working together to improve the quantification and traceability of magnetoelectric and electrocaloric measurement through cross comparisons. In particular, our team is leading a collaborative EMRP project which aims to develop traceable metrology for direct measurement of electrocaloric effect and nanoscale modelling. The proposed research will complement our work by the application of NPLs analysis to Cambridge SPM results to provide reliable nanoscale electrocaloric measurements.

Should Cambridge be successful in this call, then through a separate agreement, Cambridge would look to granting NPL in-kind access to the system and facilities as part of its wider collaboration and support. At this stage NPL envisages this in-kind access being up to 10 days

a year. However, it is understood by both parties that this will be dependent on the sustainability plan for this equipment.

As part of the collaborative projects with Cambridge, NPL would support the delivery of impact throughout the progression of projects from early concepts to delivering directly to industry need. This would be facilitated through NPL's extensive experience in generating industrial impact. Hence, NPL would be considered by Cambridge as an impact partner, and in this context, the NPL and Cambridge partnership would accelerate the transfer of best practice through to industry using NPL's extensive industrial partner networks.

I would like to take this opportunity to wish you all the best in the submission and success of your proposal.

Yours sincerely,

Dr Gareth McGrath
Group Leader – Functional Materials Group (Materials Division)
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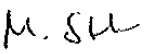

Dr Mark Stewart
Senior Research Scientist – Functional Materials Group (Materials Division)