

08:30	Registration and Refreshments
09:00	<p>Chairman's Opening:</p> <p>Professor Yang Hao, Professor of Antennas and Electromagnetics, Queen Mary, University of London, UK Professor Stefano Maci, Professor of Electromagnetics and Antennas, Department of Information Engineering, University of Siena, Italy</p>
09:10	<p>Keynote Opening Address: Transformation optics - a design tool consistent with Maxwell's equations</p> <ul style="list-style-type: none"> • Examining how transformation optics controls light by replacing the conventional ray picture of light with the electric and magnetic field lines introduced by Faraday • Enabling negative refraction for the first time through the use of metamaterials, thus allowing the invention of a perfect lens unlimited by wavelength • Using transformation optics devices to focus light into volumes of the order of a cubic nanometre and generating very intense fields with very low input power • Future applications of transformation optics in molecular sensing, non-linear devices for switching and phase conjugation. <p>Professor Sir John Pendry, Chair in Theoretical Solid State Physics and Co-Director, Centre for Plasmonics & Metamaterials, The Blackett Lab, Imperial College London, UK</p>
09:50	<p>Controlling waves with geometry</p> <p><i>Theory:</i></p> <ul style="list-style-type: none"> • Examining the generalisation of transformation optics to non-Euclidean geometry and how this can be useful for designing optical devices • Showing that transformation optics is not limited to coordinate transformations and that - in certain circumstances - better optical devices can be designed through the consideration of non-Euclidean geometries • Demonstrating that the optical device equivalent to the geometry of a sphere can be used to create both an effective lens and an invisibility device • Reviewing the practical problems with manufacturing these devices <p><i>Practice:</i></p> <ul style="list-style-type: none"> • Case study of experiment carried out at University of Exeter: controlling the propagation of surface waves within a 2D plane through patterning a specially designed metallic structure on the surface • Demonstrating that the effective geometry experienced by the waves bound to the surface can be given in terms of the surface impedance • Lessons learnt in understanding how the microscopic metallic structure relates to the effective geometry • Review of some early experimental results and simulations <p>Dr Simon Horsley, Lecturer, University of Exeter, UK</p>
10:20	<p>Transformation optics for metasurfaces</p> <ul style="list-style-type: none"> • Basic principles <ul style="list-style-type: none"> ○ introduction to "metasurfing" ○ surface and leaky waves

	<ul style="list-style-type: none"> ○ transformation optics ● Bounded metasurfaces <ul style="list-style-type: none"> ○ guided mode metasurfing ○ isotropic unbounded wave metasurfing ● Unbounded metasurfaces and new antennas <ul style="list-style-type: none"> ○ spiral LW antennas ○ anisotropic metasurfing and polarisation control ○ circularly polarised isoflux antenna ● Conclusions <p>Professor Stefano Maci, Professor of Electromagnetics and Antennas, Department of Information Engineering, University of Siena, Italy</p>
10:50	Refreshment break & networking
11:15	<p>Microwave metamaterials and metasurfaces for transformation optics</p> <ul style="list-style-type: none"> ● Broadband, high index metamaterials for the design of transformation optics devices ● Transformation optics of surface waves ● Surface wave absorbers ● Moving towards impedance matched metamaterials <p>Dr Alastair Hibbins, Senior Lecturer, University of Exeter, UK</p>
11:45	<p>Transformation electrostatics</p> <ul style="list-style-type: none"> ● Controlling electric currents and potentials using transformation electrostatics ● Benefits of transformation statics over transformation optics/electromagnetics as an efficient methodology to freely design and realise novel DC devices ● Using the analogy between electrically conducting materials and resistor networks to design such DC devices using the circuit theory and fabricating a series of DC invisibility cloaks, concentrators, carpet cloaks and illusion devices with exceptional results ● Manipulating steady currents with the control of anisotropic conductivities for use in other potential applications, e.g. electric impedance tomography, graphene, natural resource exploration and military hiding <p>Professor Tie Jun Cui, Associate Dean, School of Information Science, Southeast University, China</p>
12:15	Lunch, networking opportunity, poster session and exhibition
13:45	<p>Examining Transformation Optics (TO) - a practitioner's viewpoint</p> <ul style="list-style-type: none"> ● Practical aspects of TO-based design of lenses and cloaks ● Identifying problems arising in the fabrication of materials with properties dictated by TO for the design of cloaks and lenses ● Revisiting the TO algorithm to address issues pertaining to dispersion, narrow bandwidth losses and polarisation sensitivity of materials required for cloaks and lenses ● Alternative interpretation of TO using concepts of FDTD algorithm and Field Transformation (FT) ● Designing practical lens and absorbing blankets to reduce scattering by using TO and FT <p>Professor Raj Mittra, Professor of Electrical Engineering, Pennsylvania State</p>

	University, USA
14:15	<p>Transformation electromagnetics in antenna engineering</p> <ul style="list-style-type: none"> • Antenna design requirements and fundamental limits • Design methodology of antennas from transformation electromagnetics • Numerical validation and experimental demonstration of antennas from transformation electromagnetics • Discussion and future directions <p>Professor Yang Hao, Professor of Antennas and Electromagnetics, Queen Mary, University of London, UK</p>
14:45	<p>Metamaterials-enabled transformation electromagnetics RF and optical devices</p> <ul style="list-style-type: none"> • Transformation electromagnetics/optics design techniques • Metamaterial design considerations for enabling transformation electromagnetics devices • Examples of transformation electromagnetics devices for RF applications • Examples of transformation electromagnetics devices for optical applications <p>Professor Doug Werner, John L. and Genevieve H. McCain Chair Professor, Pennsylvania State University, USA</p>
15:15	Refreshment break & networking
15:40	<p>Manufacture of graded materials for electrical and communication applications</p> <ul style="list-style-type: none"> • Manufacture of nanocomposites layers and their electrical permittivity properties • Manufacture of graded materials for communications applications – why? • Simple passive and active arrangements • Design and property measurements of graded materials – challenges • Future directions <p>Professor Patrick Grant FEng, Cookson Professor of Materials, Deputy Head Maths, Physical and Life Sciences Division, Oxford University, UK</p>
16:10	<p>Panel discussion An opportunity to discuss some of the main points arising from the day with a selection of our respected speakers.</p>
16:50	Chairman's Closing Remarks
17:00	Close