Phenomena	Phenomenon monitoring	Cause monitoring	Mitigation	Ground testing	Instruments
Spacecraft reference potential change (e.g. so-called spacecraft high voltage charging).	spacecraft potential	electron spectrum 100eV to 50keV, cold plasma density (0-100eV), Ion spectrum 100eV to 50keV,UV spectrum, photoemission current, modification of material properties in space	particle emitters, plasma contactor, material properties, grounding strategy	charging experiments and numerical simulation, secondary yield data, photoemission yield, conductivity,	charged particle detectors(e.g. electrostatic analysers, solid state), potential probe (e.g. vibrating probe), plasma sensor, EUV spectrometer
Differential surface charging.	differential potential	electron spectrum 100eV to 50keV, cold plasma density (0-100eV), Ion spectrum 100eV to 50keV,UV spectrum, photoemission current, modification of material properties in space	particle emitters, plasma contactor, material properties, grounding strategy	charging experiments and numerical simulation, secondary yield data, photoemission yield, conductivity,	charged particle detectors(e.g. electrostatic analysers, solid state), potential probe (e.g. vibrating probe), plasma sensor, EUV spectrometer
Internal surface charging.	internal surface potentials	internal charging currents, electron spectrum >40keV, dose-rate	high temperature, material property, surface coatings, surface grounding, shielding strategy, UV lamp	charging experiments and numerical simulation, secondary yield data, photoemission yield, conductivity,	potential sensor, dose monitor (e.g., solid state detector, pin diode, radFET, photodiode), current collection plates.
Deep-dielectric charging	intenal electric fields electrical potential embedded charge distribution	internal charging currents, electron spectrum >40keV, dose-rate	high temperature, material property, shielding strategy, grounding		potential sensor, dose monitor (e.g., solid state detector, pin diode, radFET, photodiode), current collection plates. Pulsed Electro Acoustic (PEA) sensor
Surface charging effects on e.g. plasma instruments.	electric fields around s/c, sheath thickness	plasma density and temperature	electron gun, plasma contactor, bias voltage		langmuir probes?, plasma instruments
Charging interactions with electric thruster plumes.	plume density, plume electric fields, density of charge exchange ions		neutraliser	charge exchange coefficients	QCM Ion spectrometer (0-100 eV) potential sensor
Charging induced sputtering	sputter rates	ion density, ion momentum	electron gun, plasma contactor	sputter yields v energy	ion spectrometer
Charging induced molecule and ion contamination	contamination rates	contaminant density	heating ion bombardment	charging experiments and numerical simulation, secondary yield data, photoemission yield, conductivity,	QCM Witness plate (through reflectance measurement) Ion spectrometer
Dust charging and sticking	dust potential, dust deposition rate	electron spectrum 100eV to 50keV, cold plasma density, Ion spectrum 100eV to 50keV, EUV	potential control mechanical covering charging and collecting techniques	charging experiments and numerical simulation, secondary yield data, photoemission yield, conductivity,	QCM optical techniques
Electrostatic sticking (SA, inflatables, solar sails)	surface potentials, electrostatic force	electron spectrum 100eV to 50keV, cold plasma density (0-100eV), Ion spectrum 100eV to 50keV,UV spectrum, photoemission current, modification of material properties in space	particle emitters, plasma contactor, material properties, grounding strategy	charging testing	electrostatic analyser, potential probe (e.g., Langmuir, vibrating probe), UV spectrometer
Charging differences in docking procedures and EVA	frame potential	electron spectrum 100eV to 50keV, cold plasma density (0-100eV), Ion spectrum 100eV to 50keV,UV spectrum, photoemission current, modification of material properties in space	particle emitters, plasma contactor, material properties, grounding strategy (e.g. high resistance contact)	charging experiments and numerical simulation, secondary yield data, photoemission yield, conductivity,	electrostatic analyser, potential probe (e.g., Langmuir, vibrating probe), UV spectrometer
Material modifications (electric field induced conductivity, plasma-contaminant modifications, cracking e.g. of ITO)	material characteristics e.g. conductivity, surface conductivity, optical properties, cotamination rate	electric field measurement, potential measurement	heating, material selection		potential sensor, electric field sensor, ion mass spectrometer, atomic oxygen sensors
Tether systems and vxB induced voltages and currents	Collected current, particle transport, wave spectrum	B field, plasma density, plasma temperature, distribution function	current limiting resistance, particle emitters, current control		potential sensor, charged particle energy spectrometer, current probe
Interference induced by electrostatic sheath and induced plasma on EM systems	electromagnetic field in kHz-GHz range	sheath and plasma distribution		plasma experiments	electrostatic analyser, plasma probe (e.g., Langmuir)
Spontaneous discharges and triggered discharges	EM field in MHz-GHz range current in MHz-GHz range, location(e.g. optical , radio, electrokinetic sensor), current threshold sensor, flashover development	Potential E-field external cause	EMC protection, particle emitters, plasma contactor, material properties, grounding strategy, geometry	charging experiments and numerical simulation, secondary yield data, photoemission yield, conductivity,	antenna current probe, potential sensor, camera
Power loss and current flow from exposed elevated voltage systems	current budget	coupling to the plasma	control coupling	plasma chamber	current probe
Photoelectron ans secondary disturbance of sensors.	0-100 eV electron 0-100 V potential	EUV, X 0-100 eV electrons, electron spectrum 100eV to 50keV, Ion spectrum 100eV to 50keV	geometry design choice of material potential control	photo-e and secondary -e characterisation	particle spectrometer electrostatic probe, EUV and X ray sensors
Plasma perturbation from microparticle impacts (antennas,…).	wave form in MHz range	micro-particle env	wave filtering	impact test	radio antenna, high frequency potential sensor
Active plasma sources (emitters, thrusters, contactors).	flow speed spreading potential perturbation contamination	n/a	neutraliser	plasma chamber	particle spectro qcm