Electrons in the Jovian Magnetosphere

Voyager 1, 2 PLS in situ measurements – Primary purpose is to summarize the analysis technique

Date	Authors, title, reference	Summary
1978	Sittler, E.C., PhD MIT	
1980	Sittler & Scudder, An empirical polytrope law for solar wind thermal electrons between 0.45 and 4.76 AU: Voyager and Mariner 10, JGR, 85, 5131	No discussion of how electron density and temperature are derived from the Voyager PLS data.
1981	Scudder, Sittler, Bridge, A survey of the plasma electron environment of Jupiter: A view from Voyager, *JGR, 86,* 8157	Good background overview. Refers to SW papers (Sittler & Scudder 1980; Sittler 1978 PhD) for technique. Neglects secondary electrons. Emphasis on S/C charge (<10V) and return current. Good comparison with electron densities determined from PWS and from ions (McNutt). Samples of middle magnetosphere and sheet crossings (V1 & V2) Thot~constant at 1keV, Tc dips from 50-30eV down to ~10eV, ne bumps up by factor of ~3

1982	Hartle, et al. Titan's ion exosphere observed from Voyager 1, *JGR, 87*, 1383	"Electron feed-through [Vasyliunus, 1971] is produced by suprathermal electrons such as those observed within Saturn's outer magnetosphere [Sittler et al. 1981]. It is a result of changes in the electron trajectories when the voltage applied to the modulator grid is switched between its lower and upper levels at the synchronous detection frequency to define a particular energy per charge channel. These trajectory changes cause those electrons intersecting the collector plate near its edge alternately to hit or miss it, resulting in a small but non-negligible square wave current that is in phase with the positive ion current, thus increasing that current. The feed-through current can be simulated with a program used to generate synthetic ion distributions (described below), except that electrons instead of ions are fed into the instrument when it is in its positive ion mode. The suprathermal electrons observed near Titan can be approximated for these purposes with a Maxwellian distribution of density and temperature equal to 0.01 cm- 3 and 1 keV, respectively. Using this model, we computed the electron feed-through, which was then subtracted from the observed ion fluxes before analysis." "The ion analysis does not yield a model-free interpretation of the ion distribution functions in terms of fluid parameters. Instead, using a numerical code (developed by V. M. Vasyliunas) for simulating the convolution of the instrument response and model ion distribution functions, we calculate 'synthetic distributions.' Since more than one ion species may be present, the composition and other appropriate parameters of the model distribution (density, temperature, bulk velocity) are varied, and the synthetic and observed distributions are compared until an optimum match in all four sensors is acquired, thereby yielding estimates of the model dependent parameters."
1983	Sittler, Ogilvie, Scudder, Survey of low-energy plasma electrons in Saturn's magnetosphere: Voyagers 1 and 2	No discussion of technique. Refers to Sittler (1983) NASA report
1983	Sittler, E.C., Plasma Electron Analysis: Voyager Plasma Science Experiment, GSFC Tech. Memo. 85037	Transmission formula (5), Angular Response function shown Fig 3 (from?). Reduced d.f. given as analytic function (see correction). Discusses fitting procedure – iterating to get S/C potential as well as moments. Secondary electrons (p15) – when Tc>20 eV affects lower channels (just cut off) Ion FeedThrough (section 7) – refers to Hartle (1982 - except that paper does not help) for the VMV simulation program. Is this PMODEL??!! Shows for Saturn feedthrough is 2 orders of magnitude too low to be concern. For Jupiter could be an issue – when nhot/ne>1% (report says <1% - typo?). Fig 9 shows example where top 2 channels needed to be ignored due to ion feedthrough

1987	Sittler & Strobel, Io Plasma Torus Electrons: Voyager 1, JGR, 92, 5741	Analysis of electrons referred to Scudder et al. (1981), Sittler et al. (1983), Sittler (1983).
1988	McNutt, R.L, Net current measurements and secondary electron emission characteristics of the Voyager Plasma Science Experiment and their impact on data interpretation, MIT CSR-TR-88-6	200 pages of gory detail. Would be nice to have an executive summary.