components are tied to primary parameter values of a given model configuration. Changes to parameter values are integrated with components of the diagram, dynamically depicting corresponding changes within the diagram. This serves as a visual confirmation of the configuration change made.

The Pressurant Tank IS enables the representation of editable liquid propellant Rocket Propulsion Test Analysis (RPTA) core model configuration parameters as textbox controls, annotating a graphical Pressurant Tank schematic. Edits made within the text boxes reflect dynamically in a changed visual state of the schematic. This enables a first-ever means for editing RPTA model configuration parameters in a visual context of the configuration component being affected.

The prototype development of schematic interaction utilizes Excel's pre-defined graphics called auto-shapes, requiring no other coding or external licensing of other software. The new interactive schematic function, designed as a top layer skin, enables rapid development and customization with little change to the underlying Model Configuration Editor (MCE). PSME's client application interactive schematics design allows for quick and efficient customizations that may be required in support of mission activities.

# Magnetic and Electric Field Polarizations of Oblique Magnetospheric Chorus Waves

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A theory was developed to explain the properties of the chorus magnetic and electric field components in the case of an arbitrary propagation angle. The new theory shows that a whistler wave has circularly polarized magnetic fields for oblique propagation. This theoretical result is verified by GEOTAIL observations. The wave electric field polarization plane is not orthogonal to the wave vector, and in general is highly elliptically polarized. A special case of the whistler wave called the Gendrin mode is also discussed. This will help to construct a detailed and realistic picture of wave interaction with magnetosphere electrons.

It is the purpose of this innovation to study the magnetic and electric polarization properties of chorus at all frequencies, and at all angles of propagation. Even though general expressions for electromagnetic wave polarization in anisotropic plasma are derived in many textbooks, to the knowledge of the innovators, a detailed analysis for oblique whistler wave mode is lacking. Knowledge of the polarization properties is critical for theoretical calculations of resonant wave-particle interactions.

# Variable Sampling Mapping

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The performance of an optical system (for example, a telescope) is limited by the misalignments and manufacturing imperfections of the optical elements in the system. The impact of these misalignments and imperfections can be quantified by the phase variations imparted on light traveling through the system. Phase retrieval is a methodology for determining these variations. Phase retrieval uses images taken with the optical system and using a light source of known shape and characteristics. Unlike interferometric methods, which require an optical reference for comparison, and unlike Shack-Hartmann wavefront sensors that require special optical hardware at the optical system's exit pupil, phase retrieval is an *in situ*, "image-based" method for determining the phase variations of light at the system's exit pupil. Phase retrieval can be used both as an optical metrology tool (during fabrication of optical surfaces and assembly of optical systems) and as a sensor used in active, closed-loop control of an optical system, to optimize performance. One class of phase-retrieval algorithms is the iterative transform algorithm (ITA). ITAs estimate the phase variations by iteratively enforcing known constraints in the exit pupil and at the detector, determined from modeled or measured data.

The Variable Sampling Mapping (VSM) technique is a new method for enforcing these constraints in ITAs. VSM is an open framework for addressing a wide range of issues that have previously been considered detrimental to high-accuracy phase retrieval, including undersampled images, broadband illumination, images taken at or near best focus, chromatic aberrations, jitter or vibration of the optical system or detector, and dead or noisy detector pixels. The VSM is a model-to-data mapping procedure. In VSM, fully-sampled electric fields at multiple wavelengths are modeled inside the phase-retrieval algorithm, and then these fields are mapped to intensities on the light detector, using the properties of the detector and optical system, for comparison with measured data. Ultimately, this model-to-data mapping procedure enables a more robust and accurate way of incorporating the exit-pupil and image detector constraints, which are fundamental to the general class of ITA phase retrieval algorithms.