downconverters take up fewer resources because they operate at lower bandwidths than doing the entire downconversion process from the input bandwidth for each independent channel. These second-stage downconverters are each independent with fine frequency control tuning, providing extreme flexibility in positioning the center frequency of a downconverted channel. Finally, these second-stage downconverters have flexible decimation factors over four orders of magnitude.

The algorithm was developed to run in an FPGA (field programmable gate array) at input data sampling rates of up to 1,280 MHz. The current implementation takes a 1,280-MHz real input, and first breaks it up into seven 160-MHz complex channels, each spaced 80 MHz apart. The eighth channel at baseband was not required for this implementation, and led to more optimization. Afterwards, 16 second stage narrow band channels with independently tunable center frequencies and bandwidth settings are implemented. A future implementation in a larger Xilinx FPGA will hold up to 32 independent second-stage channels.

This work was done by Charles E. Goodhart, Melissa A. Soriano, Robert Navarro, Joseph T. Trinh, and Elliott H. Sigman of Caltech for NASA's Jet Propulsion Laboratory. Further information is contained in a TSP (see page 1).

The software used in this innovation is available for commercial licensing. Please contact Dan Broderick at Daniel.F.Broderick@jpl.nasa.gov. Refer to NPO-47431.

Dimmable Electronic Ballast for a Gas Discharge Lamp

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Titanium dioxide (TiO_2) is the most efficient photocatalyst for organic oxidative degradation. TiO_2 is effective not only in aqueous solution, but also in nonaqueous solvents and in the gas phase. It is photostable, biologically and chemically inert, and non-toxic. Low-energy UV light (approximately 375 nm, UV-A) can be used to photoactivate TiO_2. TiO_2 photocatalysis has been used to mineralize most types of organic compounds. Also, TiO_2 photocatalysis has been effectively used in sterilization. This effectiveness has been demonstrated by its aggressive destruction of microorganisms, and aggressive oxidation effects of toxins. It also has been used for the oxidation of carbon monoxide to carbon dioxide, and ammonia to nitrogen.

Despite having many attractive features, advanced photocatalytic oxidation processes have not been effectively used for air cleaning. One of the limitations of the traditional photocatalytic systems is the ballast that powers (lights) the bulbs. Almost all commercial off-the-shelf (COTS) ballasts are not dimmable and do not contain safety features. COTS ballasts light the UV lamp as bright as the bulb can be lit, and this results in shorter bulb lifetime and maximal power consumption. COTS magnetic ballasts are bulky, heavy, and inefficient.

Several iterations of dimmable electronic ballasts have been developed. Some manifestations have safety features such as broken-bulb or over-temperature warnings, replace-bulb alert, log-bulb operational hours, etc.

Several electronic ballast boards capable of independently lighting and controlling (dimming) four fluorescent (UV light) bulbs were designed, fabricated, and tested. Because of the variation in the market bulb parameters, the ballast boards were designed with a very broad range output. The ballast boards can measure and control the current (power) for each channel.

This work was done by Marius Raducanu and Brian D. Hennings of Lynntech, Inc. for Johnson Space Center. For further information, contact the JSC Innovation Partnerships Office at (281) 483-3809. MSC-24333-1