



## **VISION SYSTEMS, AND AGC, ARE IMPROVING THE PASSENGER EXPERIENCE ONBOARD TRAINS WITH ELECTRONICALLY DIMMABLE WINDOWS USING RESEARCH FRONTIERS SPD-SMARTGLASS TECHNOLOGY**

*This week, a new generation of SPD-SmartGlass Passenger Window solutions are being launched at 2018 Innotrans in Berlin, Germany*

**Berlin, Germany – September 20, 2018** – At the recent Research Frontiers (Nasdaq: REFR) quarterly conference call, President and CEO Joe Harary remarked; “Trains can be our second-biggest market in the next few years... train cars with our technology are well along with their performance testing on the rails... new trains are being built as we speak using our SPD-SmartGlass in them.”

This week’s InnoTrans trade show in Berlin illustrates the growth of SPD-SmartGlass in the rail industry, with solutions that improve the passenger experience and benefit train operators. Train manufacturers, operators, and train window suppliers primarily in Europe and Asia have all been working with Research Frontiers’ patented SPD-SmartGlass technology which allows passengers and crews, at the touch of a button, to change the tint of the windows on a train. The windows also interface with climate control systems for automated control. This technology enables control and management of heat, light and glare coming into railway cars to make train cars more comfortable, safer, quieter, and more energy efficient. By using SPD-SmartGlass technology, passengers and crews can “tune” the amount of light coming into the train to preserve and enhance views and reduce unwanted glare.

Innotrans, the leading international trade fair for transport technology, is the stage for the world premier of new electronically dimmable window (EDW) solutions using SPD-SmartGlass technology. AGC, and Vision Systems, both licensees of Research Frontiers, launched their respective latest generations of SPD-SmartGlass EDWs for the rail industry. These “smart windows” control and manage both beneficial and undesirable outside elements entering train cars through passenger windows. Vision Systems also unveiled another new solution, “Info-Vision” window, which integrates an electroluminescent display into the SPD-SmartGlass EDW.

Vision Systems recently commented about their new EDW generation: “Thanks to a new industrial process that has already been tried out successfully for the aeronautic and marine industries, Vision Systems’ smart shading systems provide enhanced optical quality, 30% lower cost and a wider range of packaged solutions adapted to each project.”

Most trains with traditional window shades have passenger windows that are also highly tinted, in an attempt to reduce the amount of time the shades must be down due to excessive light, glare or solar heat. While this reduces somewhat the time the shades have to be down, it remains ineffective for many lighting conditions. Even when the shade is up, the tint of the window limits the passengers’ views outside the train during dusk, nighttime and pre-sunrise hours. SPD-Smart windows eliminates this problem with its ability to be in an optically clear state.

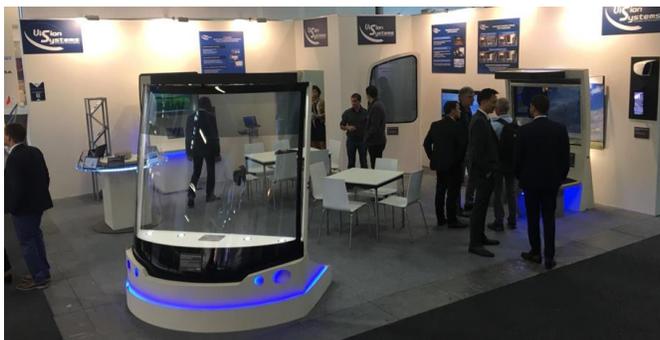
SPD-SmartGlass EDWs dramatically improve the passenger experience, by instantly and precisely managing the optimum amount of healthy daylight for passenger comfort and well-being, *and* rejecting uncomfortable heat and noise. Also, an important feature of the passenger experience onboard trains is experiencing the magnificent views. With windows using traditional shades, views are blocked at all times sunlight, glare or heat are uncomfortable. SPD-SmartGlass is the solution, by enabling passengers to instantly and precisely “tune” the window’s tint to a level that allows them to continue to enjoy views yet remain extremely comfortable, even in direct sun.

## Vision Systems at InnoTrans

In a Vision Systems press release, their Nuance product line of SPD-SmartGlass solutions using their new generation technology were reviewed.

Some of the products using SPD-SmartGlass for the train industry being showcased this week in Berlin include:

- EDWs with integrated control system electronics (on the passenger window EDW itself), for rapid installation in both new train car production, and retrofitting existing train cars.
- SPD-SmartGlass solutions for the driver cabin, to eliminate glare on the dashboard with side and back window EDWs, and/or SPD sun visors integrated into the windshield.
- “Info-Vision” window, which integrates an electroluminescent display into SPD-SmartGlass windows. This combines the benefits of the EDW with information available directly on the window, such as time to destination, remaining distance, temperature, service options, and train schedules.



*At top: Vision Systems booth at 2018 InnoTrans, and Info-Vision window integrating an electroluminescent display into an SPD-SmartGlass electronically dimmable window (EDW). At bottom: Vision Systems Nuance V2 Multizone SPD-SmartGlass EDW, with various zones being controlled for maximum comfort.*

We invite you to read the [Vision Systems press release](#) for more information.

## Vision Systems Rail Industry Projects

Vision Systems was one of the first companies to introduce their Nuance brand of SPD-Smart windows and its benefits to the train industry. Their Nuance solution was installed on the mockup of Aeroliner 3000 by Vogler Studio two years ago with the first generation of dimmable windows. The second generation of this solution is currently in production for two new main train projects.



*Full-scale mockup of the AeroLiner3000, with Vision Systems Nuance brand of SPD-Smart EDWs (Electronically Dimmable Windows) – shown in a darkly tinted state at top right and bottom left.*

In addition to the above information, Vision Systems confirmed at Innotrans that they were working on other high volume train projects with major commuter train manufacturers and operators.

## AGC at InnoTrans

[AGC](#), a leading Tier 1 supplier of transparencies to the rail industry for over 50 years and licensee of Research Frontiers' SPD-SmartGlass technology, is also prominently featuring SPD-SmartGlass EDWs. In a recent article entitled [AGC at Innotrans with smart glass for transportation](#), it was noted; "AGC's booth will feature AGC's smart glasses for transportation... Wonderlite light control glazing, that switches from clear to dark at the simple touch of a button." Wonderlite is AGC's brand name for its SPD-SmartGlass EDWs. (AGC has also developed Wonderlite for the automotive industry – please view [this video](#) of a "Wonderlite glassroof.")

Vision Systems also has a presence at AGC's Innotrans booth. AGC is presenting a complete passenger window integrating Vision Systems' SPD-SmartGlass dimmable solution.

## AGC Rail Industry Projects

In an [AGC news release](#) last year, the company announced that its "...light control glass, WONDERLITE, has been adopted for JR East luxury sleeper train, Train Suite Shiki-shima... the front carriage, containing a special area for enjoying panoramic views of Japan's landscape, has been outfitted with WONDERLITE light control glass, which makes it possible to adjust passing sunlight simply with a switch...The train embarked on its maiden journey on 1 May <2017> and seats have already been booked up until March 2018."

## Continental Corporation at InnoTrans

[Continental](#), in a September 18 press release, indicated that “At InnoTrans, Continental will unveil a number of new innovations, including an intelligent technology for darkening glass panes and a range of individual surface designs.... The ‘Intelligent Glass Control’ (IGC) system by Continental provides passengers with the flexibility to adjust the amount of light and the color of their window or other glazed areas to suit their needs. The technology, which was originally developed for the automotive industry, relies on a film sandwiched between two panes of glass and connected to an electronic control unit (ECU).”

View the [Continental press release](#) for more information and a simulation of the system in action.

Global Rail News [published an article](#) about Continental at Innotrans, noting; “The level of transparency... of the glass can be adjusted via a control system, which can be programmed to respond to external conditions, such as sensor data on sunlight intensity.”

## Other SPD-SmartGlass Rail Industry Projects

Numerous rail industry projects are in development and not being disclosed publicly. However, some information is starting to emerge. For example, this month, in the article [“What’s inside dome car number two?”](#) published in Railway Age magazine, the SPD-SmartGlass EDW feature on the “GoldLeaf” cars (to be produced by Stadler Rail) for the new Rocky Mountaineer train entering service in North America was highlighted: “The GoldLeaf dome cars are scheduled for regular service with the beginning of the next season.... Large dimmable panoramic windows provide an unobstructed view and can be adjusted in tint according to outside ambient lighting conditions.”

## About Research Frontiers Inc.

Research Frontiers (Nasdaq: REFR) is a publicly traded technology company and the developer of patented SPD-Smart light-control film technology which allows users to instantly, precisely and uniformly control the shading of glass or plastic products, either manually or automatically. Research Frontiers has licensed its smart glass technology to over 40 companies that include well known chemical, material science and glass companies. Products using Research Frontiers’ smart glass technology are being used in tens of thousands of cars, aircraft, yachts, trains, homes, offices, museums and other buildings. For more information, please visit our website at [www.SmartGlass.com](http://www.SmartGlass.com), and on [Facebook](#), [Twitter](#), [LinkedIn](#) and [YouTube](#).

*Note: From time to time Research Frontiers may issue forward-looking statements which involve risks and uncertainties. This press release contains forward-looking statements. Actual results could differ and are not guaranteed. Any forward-looking statements should be considered accordingly. “SPD-Smart and “SPD-SmartGlass” are trademark of Research Frontiers Inc. “Nuance,” “Nuance V2,” “Nuance V2 Multizone,” and “Info-Vision” are trademarks of Vision Systems. WONDERLITE is a trademark of AGC.*

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