

SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2)
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JOINT JAPANESE AND AUSTRALIAN PROJECT TO DEMONSTRATE THE BENEFITS OF QZSS
PRECISE POSITIONING FOR AUTONOMOUS TRACTORS**Abstract**

The CRC for Spatial Information (CRCSI) Positioning Program has investigated Japan's Quasi Zenith Satellite System (QZSS) L-band Experimental (LEX) signal (or L6) signal for delivery of real time correction messages to support Precise Point Positioning (PPP) in Australia.

This project evaluated an "Australian made" LEX message, which provides precise positioning correction information through satellite communication rather than via cellular or radio networks. The research developed a new message to support PPP-RTK (Real Time Kinematic) and deliver real time, centimetre-level positioning in areas where traditional GNSS Continuously Operating Reference Stations (CORS) and ground communication infrastructure is sparse and/or not available.

This presentation summarises the results of the research and two successful field demonstrations in Australia of remotely guided (autonomous) tractors for precision agriculture. Several different tests were completed using robotic tractors on rice and sugar cane farms at Jerilderie, NSW and Mackay Queensland. CRCSI joined with the Japanese Aerospace Exploration Agency (JAXA), Hitachi Japan and Australia, Hitachi Zosen, and Australian and Japanese university and private sector partners to demonstrate the practical application of the LEX signal in autonomous agricultural applications.

The first trial delivered dynamic horizontal accuracy of 5 cm with convergence times of 30-60 minutes. These are comparable to commercial Network RTK solutions, but used sparser ground infrastructure and without the mobile phone network. In Mackay, where atmospheric conditions can be extreme, improved 3D positional accuracies and reduced convergence times were consistently delivered. Real time horizontal accuracy of 5 cm and vertical accuracy of 12 cm were achieved. Convergence times of a few minutes were routinely delivered using local ionospheric corrections.

The QZSS satellite(s) with unique augmentation capability (LEX) coupled with cutting edge research in PPP-RTK could deliver real time, high precision positioning data. The trials demonstrated the potential benefits of accurate positioning and guidance data for precision agriculture.