Grant Agreement No.: 312745

Project Acronym: CONSORTIS

Project Title: Concealed Object Stand-Off Real-Time Imaging for Security

CONSORTIS
Final Publishable Summary Report

Project duration 01/01/2014 – 31/12/2017

20th of February, 2018

FIGURES

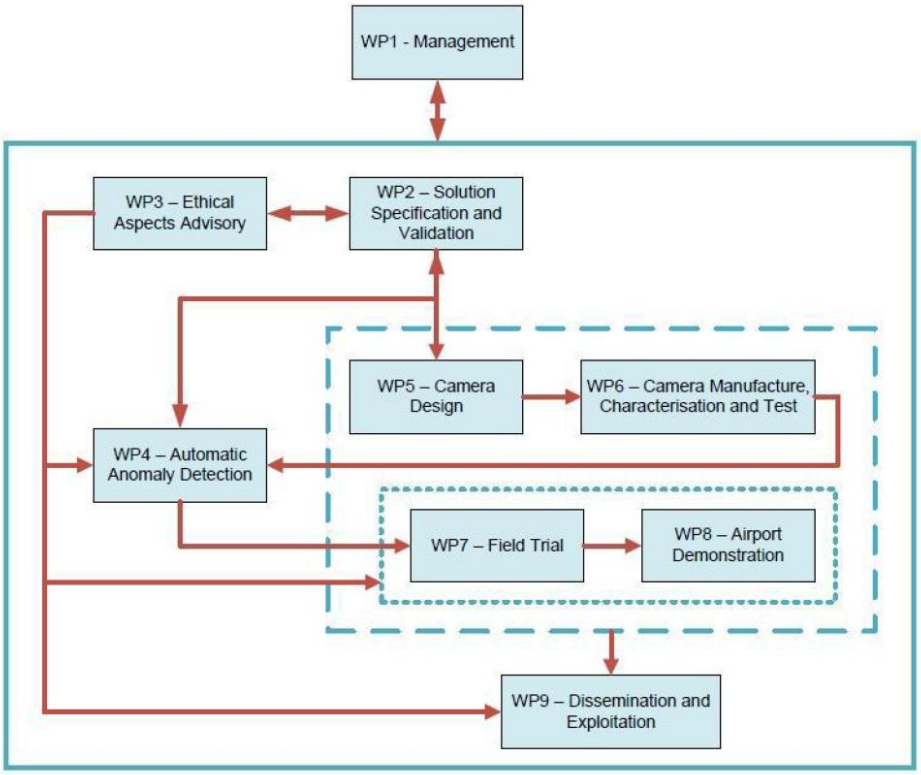

Figure 1 - Pert diagram showing the connections between the Work Packages.

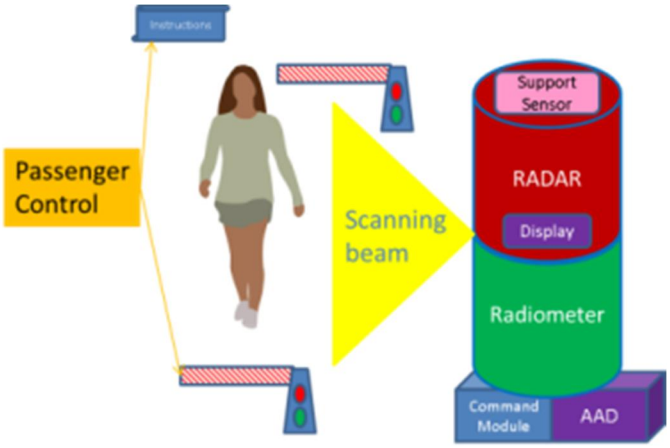

Figure 2 - Architecture of CONSORTIS

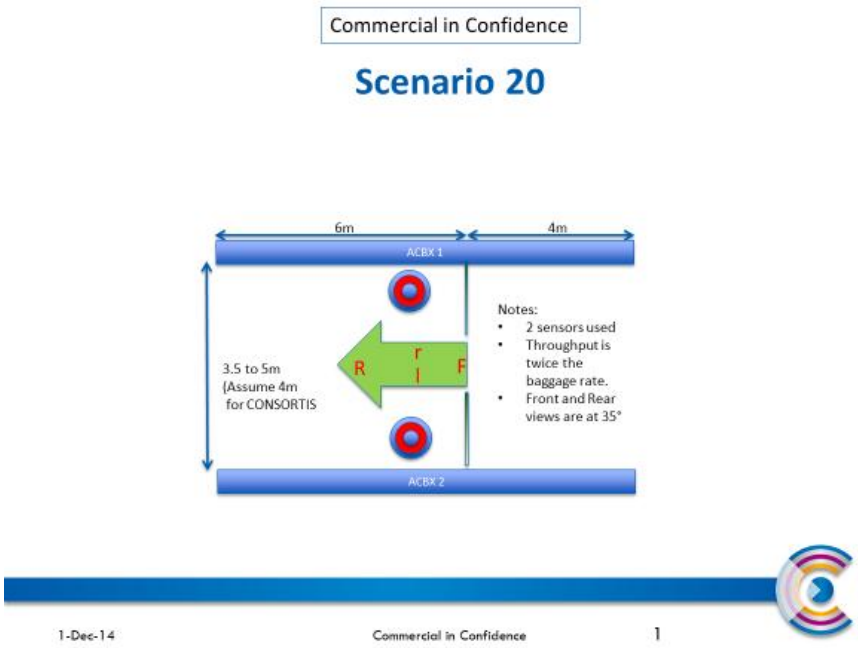

Figure 3 - Scenario presented to, and preferred by, the airport operators

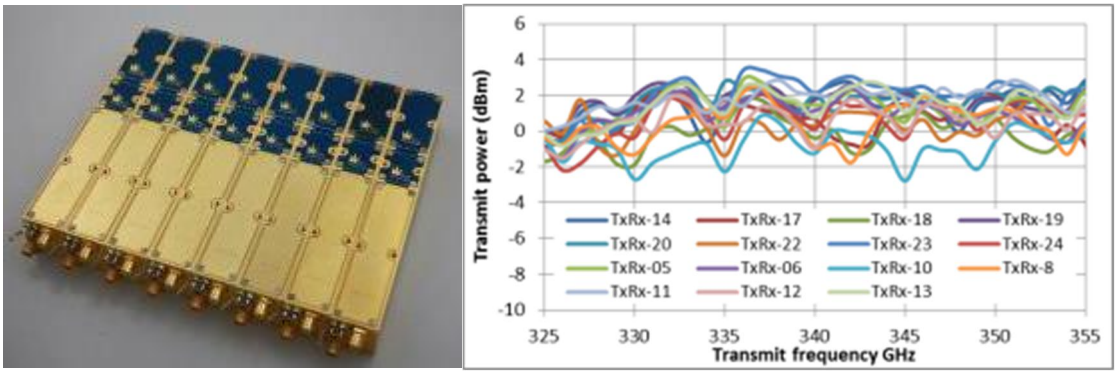

Figure 4 - Eight of the radar transceivers (left) and transmit power versus frequency for all 16 units (right) showing small spread in values (for 340 GHz components)

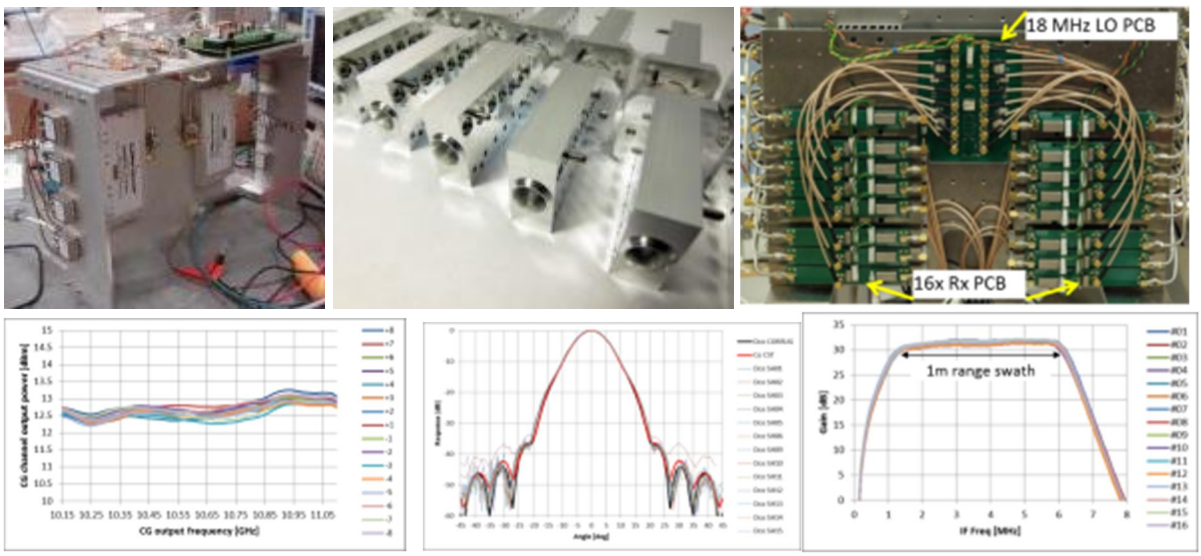

Figure 5 - Chirp generator (top left) with excellent channel balance in output power versus frequency (bottom left); smooth-walled spline profile feedhorns (top centre) with excellent far-field pattern repeatability and agreement with simulations (bottom centre); 16-channel receiver/demodulator (top right) with excellent channel balance defining range swath.

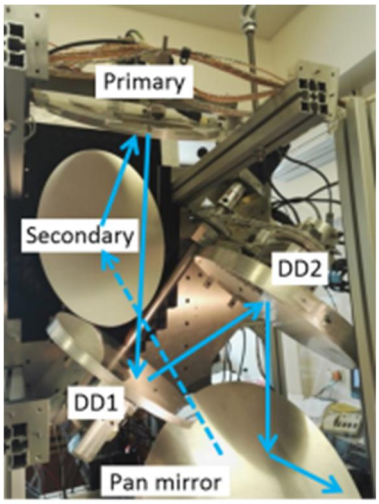

Figure 6 - Radar optics hardware

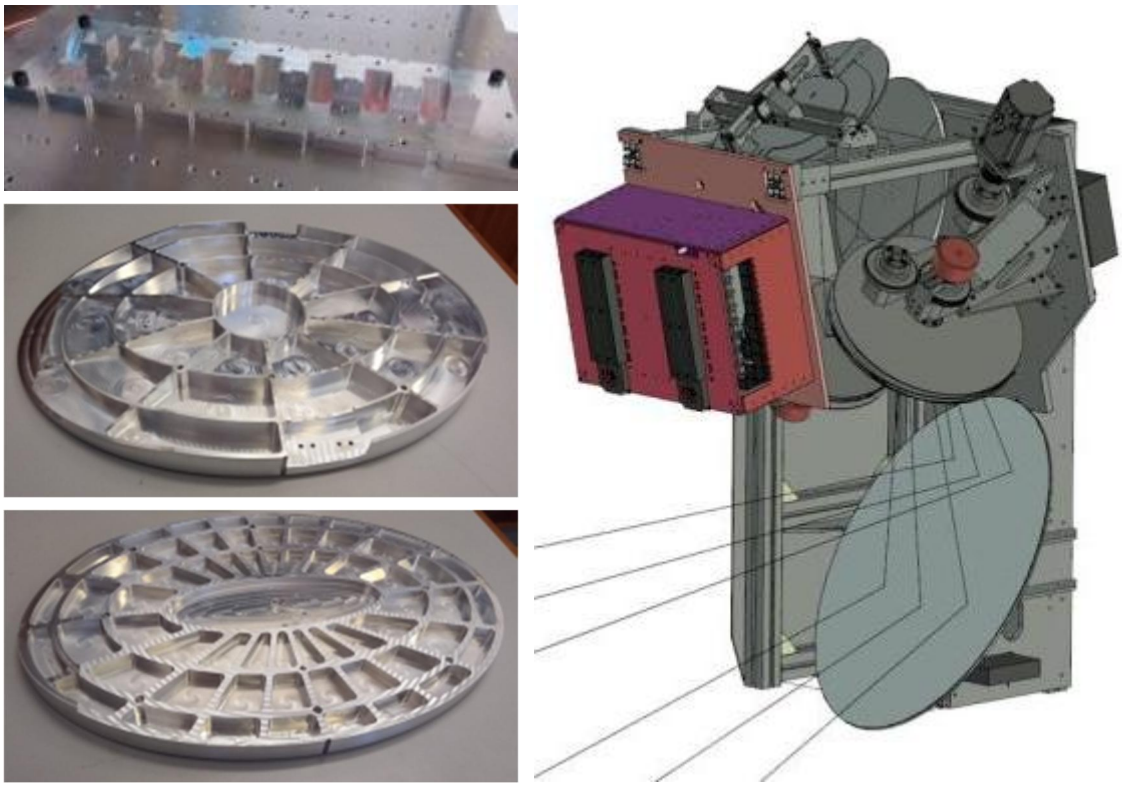

Figure 7 - Mini-mirror array (top left); Dragonian primary (centre left) and secondary (bottom left) showing lightweighting on rear; CAD model of radar subsystem mechanics.

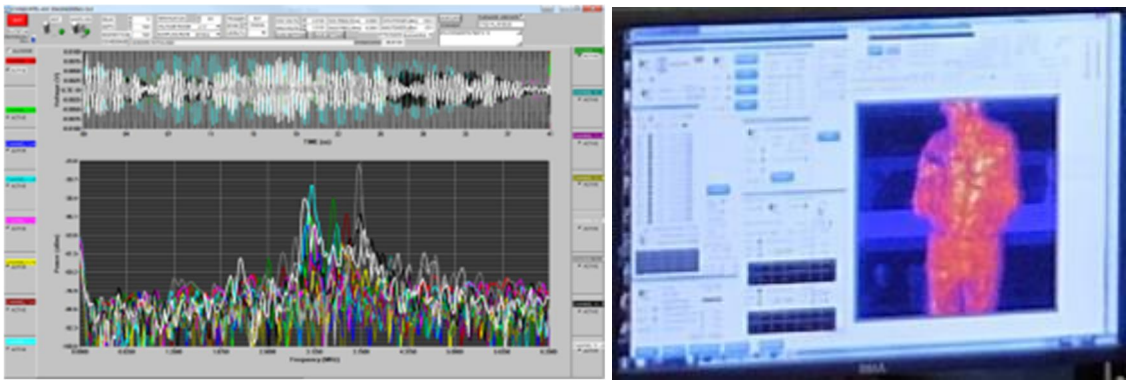

Figure 8 - Radar engineering display showing raw range profiles (left) and main radar display with live intensity image (right).

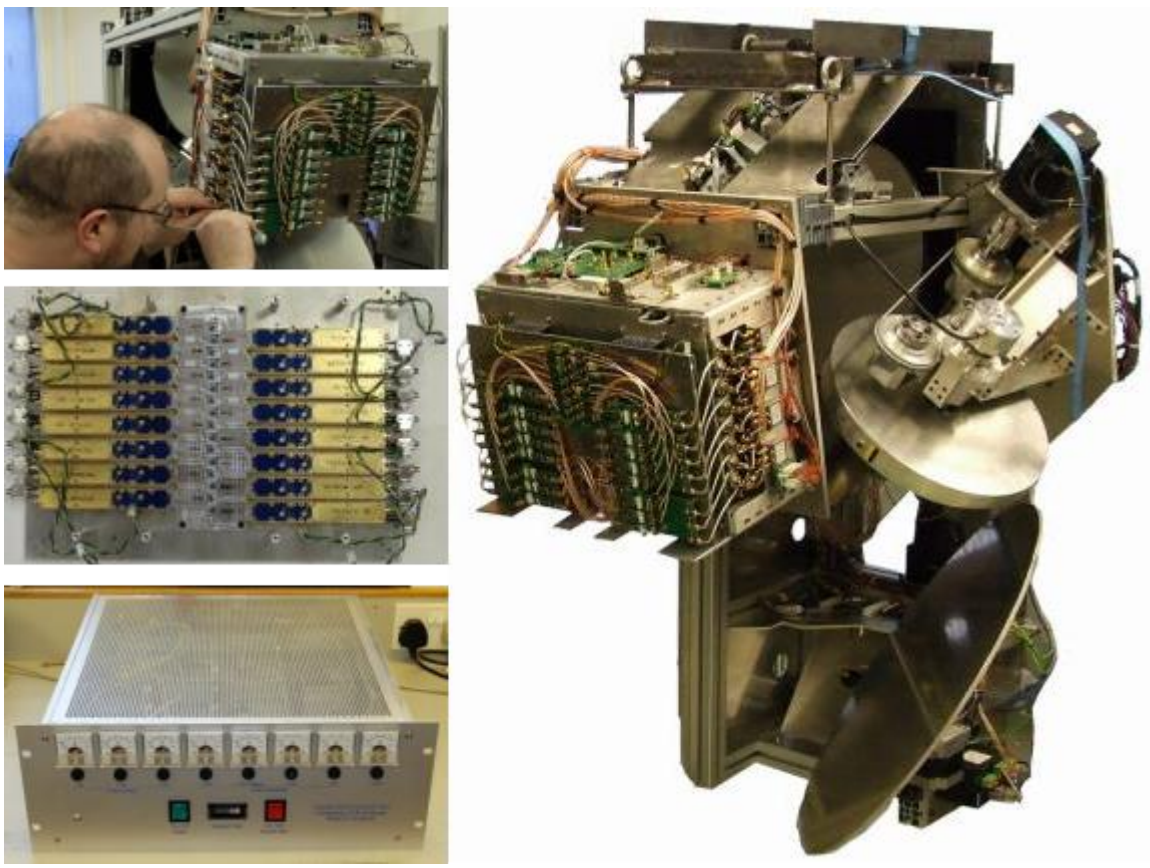

Figure 9 - Radar subsystem integration: front end assembly (top left), focal plane array (centre left), custom power supply (bottom left), and complete radar subsystem (right).

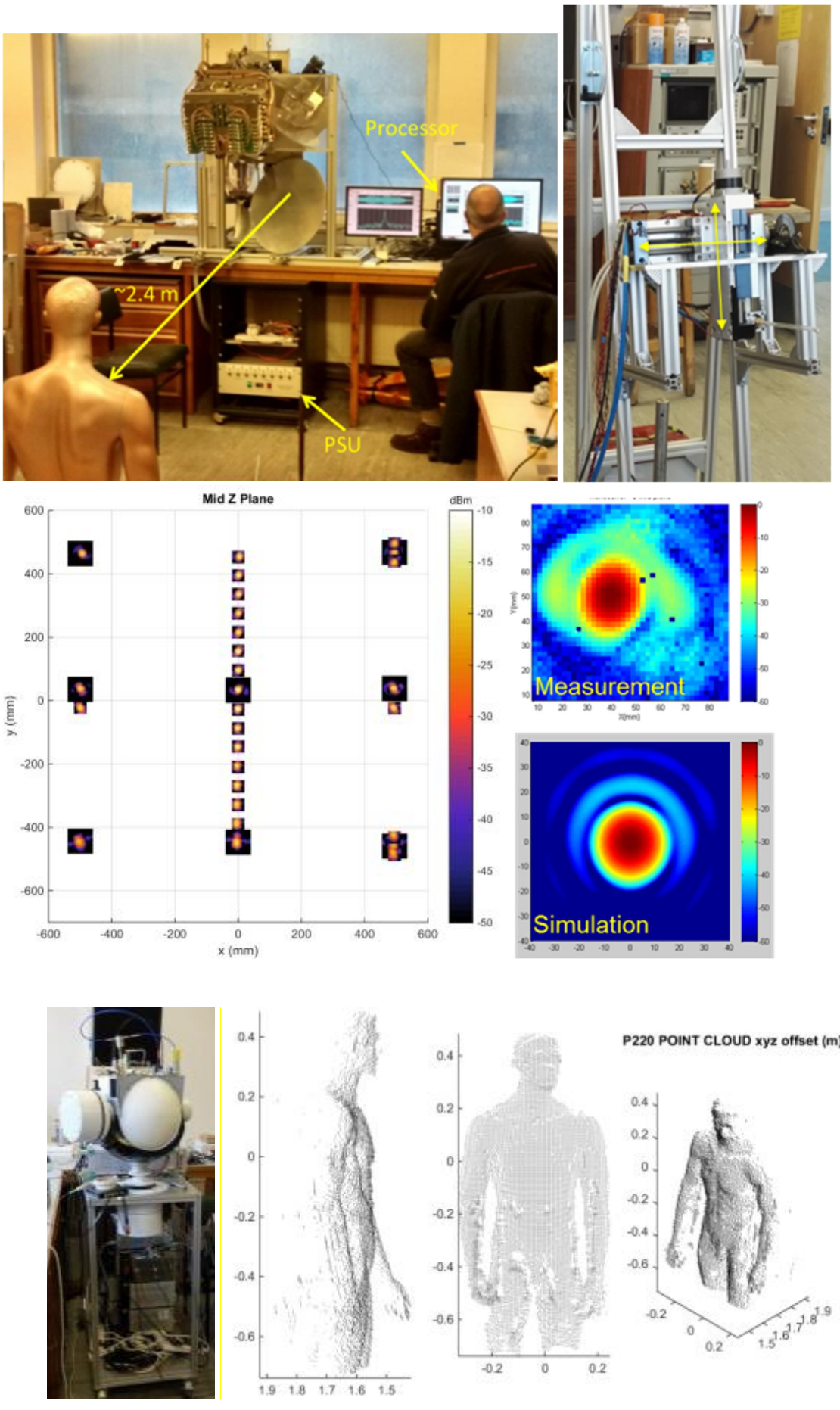

Figure 10 - Pathfinder 200 GHz radar (left) and resulting 3D radar map of mannequin (right)

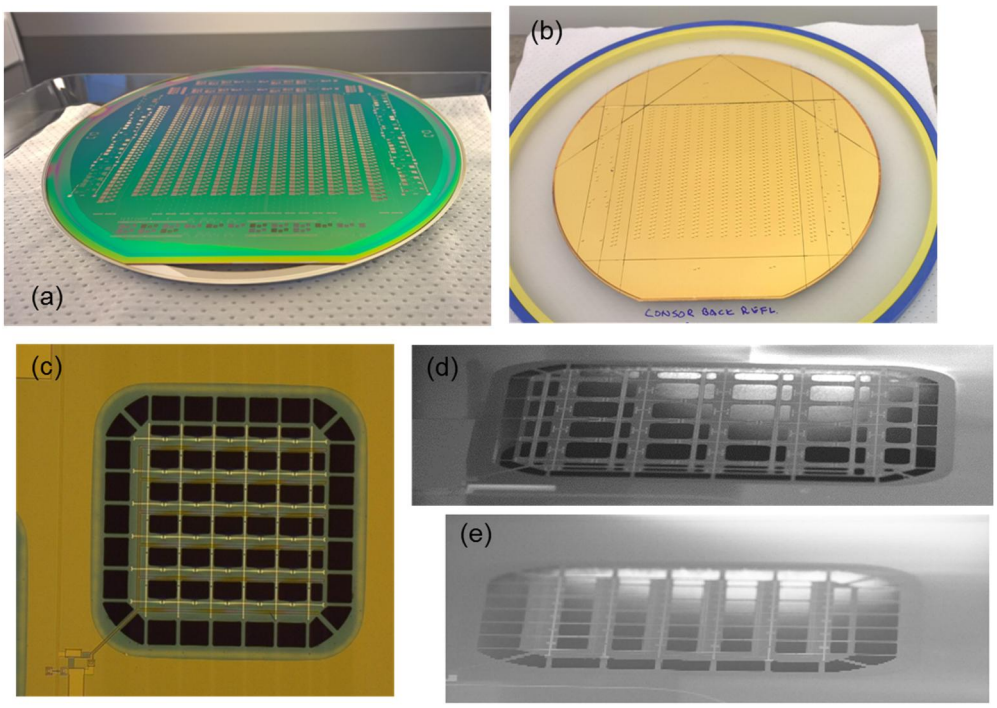

Figure 11 - (a),(b) Radiometer detector wafers (membrane wafer, and back reflector wafer, respectively) prior to stacking. (c) Optical and (d),(e) scanning electron micrographs of single detector elements showing the basic structure of the ~300 nm thick membranes hosting the active elements.

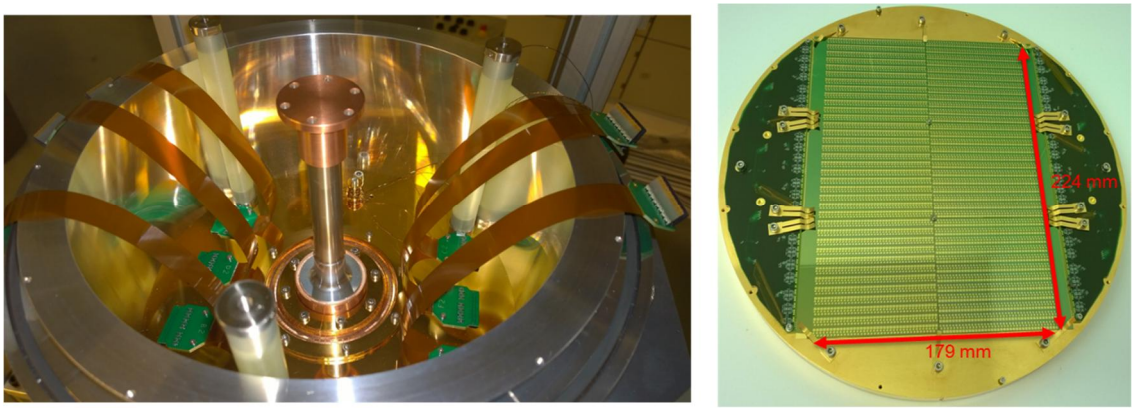

Figure 12 - Left: The radiometer subsystem in the construction phase showing a part of the microwave flex readout wiring prior to the attachment of the focal plane. Right: the focal plane with detector wafers with 8208 detector elements integrated on the cold plate.

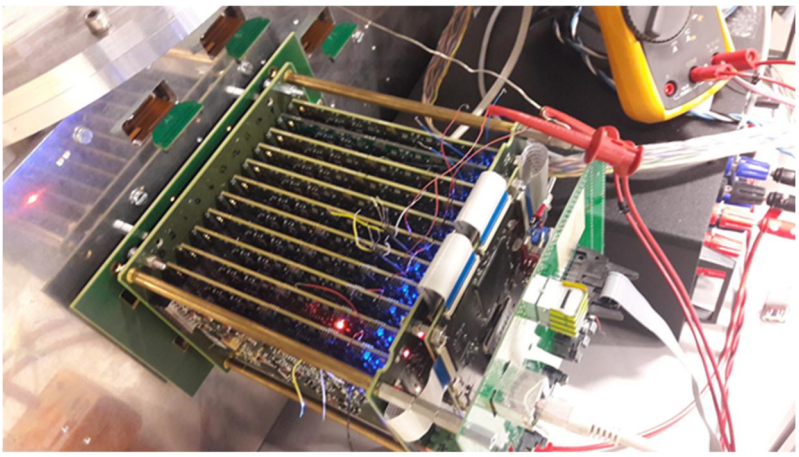

Figure 13 - Readout electronics installed onto the radiometer.

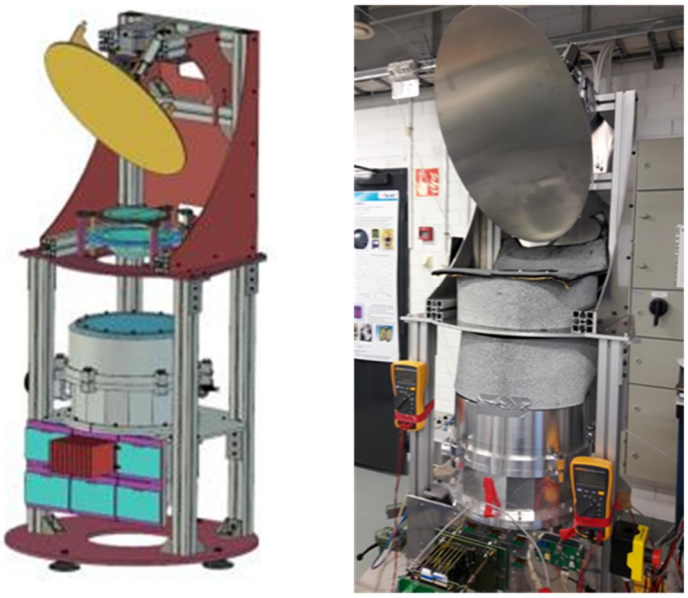

Figure 14 - Left: the CAD model of a radiometer subsystem. Right: the system as constructed for subsystem testing.

Fig. 15 - On left active radar lifted with crane and about to be installed. In the middle and on right fully assembled enclosure with openable maintenance doors.

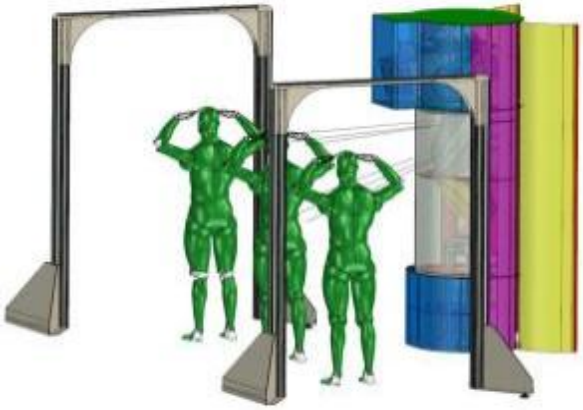

Fig. 16 - CAD model of full CONSORTIS measurement system and gates.

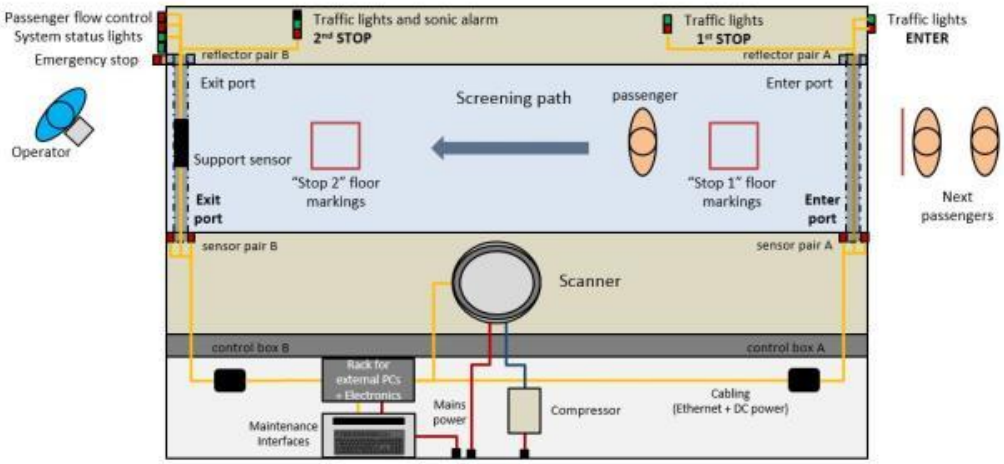

Figure 17 - Passenger Control System functional layout.

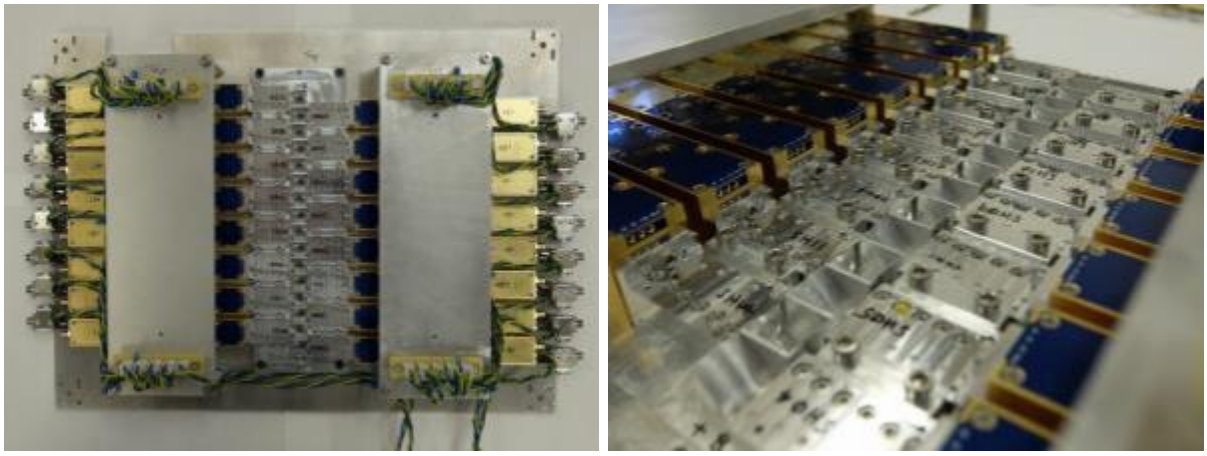

Figure 18 - Radar 16 channel, 340 GHz, transceiver focal plane array (left) and close-up of feedhorns (right).

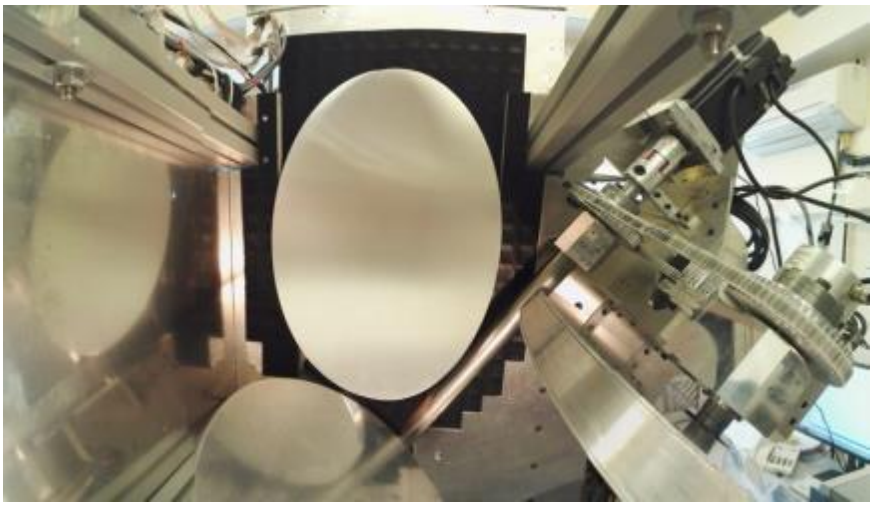

Figure 19 - Radar optomechanics, internal view.

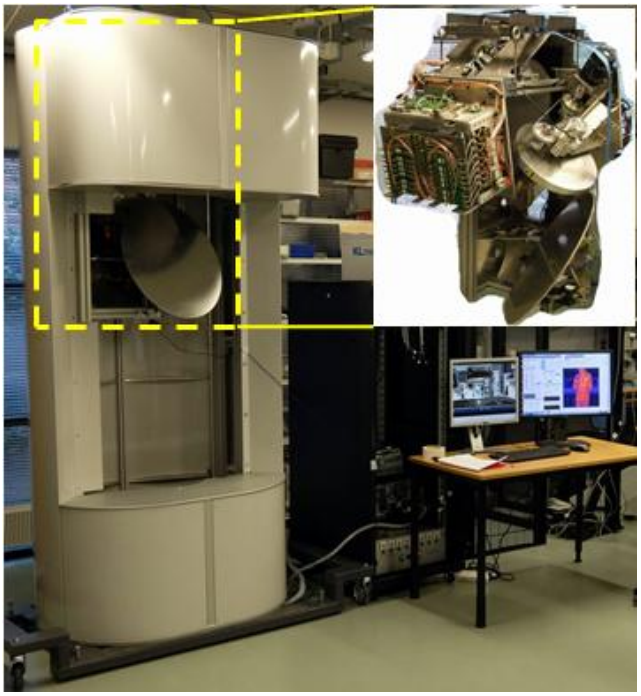

Figure 20 - The CONSORTIS system enclosure showing the location of the radar subsystem and the radar itself (inset).

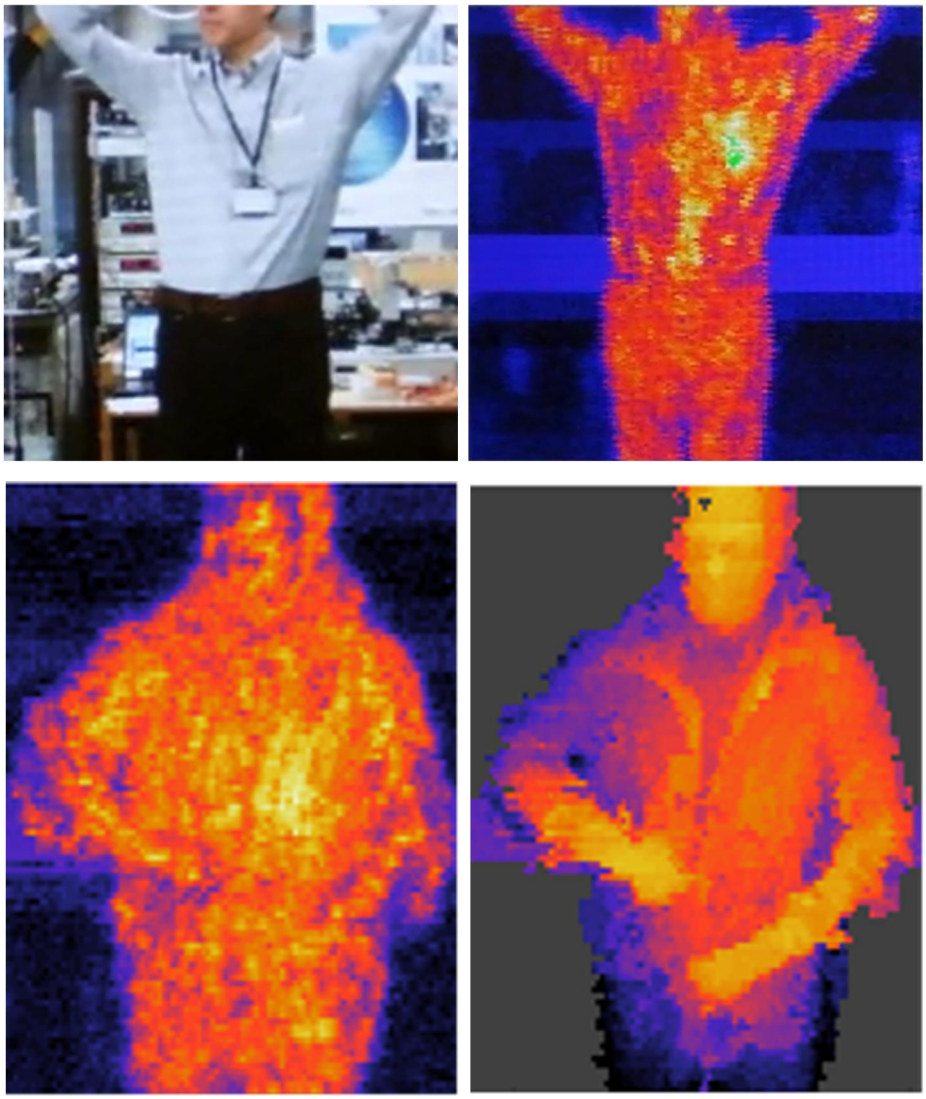

Figure 21 - Visible view seen by the 340 GHz radar (top left) and corresponding raw radar frame shown as maximum intensity image per line of sight (top right). Single radar frame of subject wearing outdoor jacket shown as maximum intensity per line of sight with 60 dB colour scale (left) and colour coded as range to maximum intensity (right).

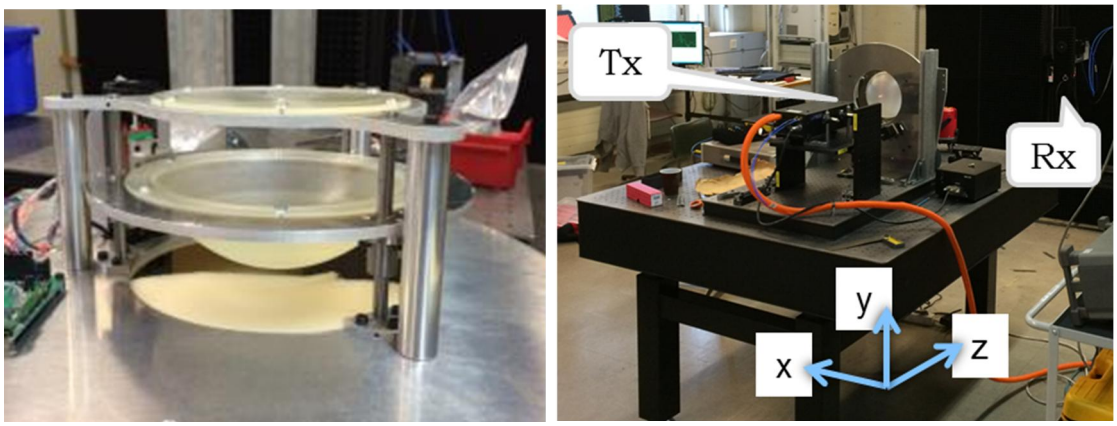

Figure 22 - Refocusable radiometer dual lens (left). The dual lens in testing at 500 GHz in antenna near-field measurement range (right).

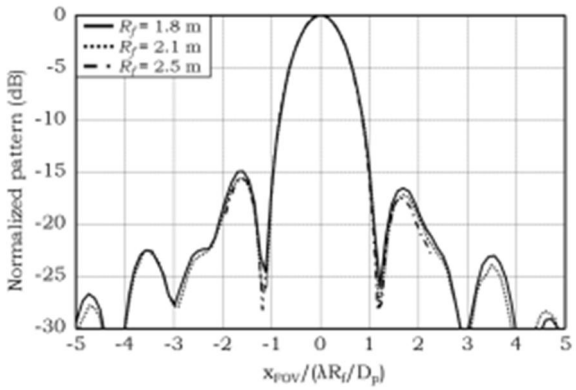

Figure 23 - The measured radiometer beam patterns show very constant beamwidth and side-lobe level for all the re-focusing positions.