Dear Paul,  
 Thanks for your hospitality and a good day. Looking forward to the next one, Thursday May 17.

Best wishes, Ralph

**Antarctic Ice Imaging Radar, Lai Bun Lok, Matt Ash, Paul Brennan**  
 The PCB form of the system has been successfully tested and deployed. It also overcame the random phase jumps previously experienced. A wide-band bow-tie antenna is being designed.  
The combination of very high range precision with relatively long ranges may be relevant to other applications, e.g. in metrication. Hence it may be profitable to bring it to the attention of the Renishaw Company.

**Active target location with FMCW circular-array radar, Shashi Halai, Paul Brennan**  
 A PCB version has been successfully designed and tested. A troublesome side-band echo might be eliminated by filtering or logical processing of the video output. However, probably the best answer is correlation to the expected main and side-band echo pattern, since this will provide a signal-processing gain against thermal noise and discrimination against clutter not conforming to the specified pattern.   
 Direct coupling from the transmitter could overload the receiver. This could be avoided by preventing back-radiation from the transmitter and placing it (directly or, preferably, laterally displaced) in front of the receiver.  
 The receiver beam pattern can be tilted downwards by the use of an inverted-cone monopole antenna and/or by using a conical “ground-plane” (with serrated edges to diffuse reflections).  
 The identity coding feature has not yet been incorporated in the beacon. However, it should be easy to include its recognition in the post-detection video processing.

**Avalanche imaging radar, version 2, Matt Ash, Mandana Ardeshir Tanha, Pail Brennan**   
 An unidentified fortuitous point target permitted some useful calibration, but placing a corner reflector at a succession of planned locations permitted a major improvement in this.  
 The MIMO concept, with a widely offset second transmitter, could be used to double the effective antenna aperture – more generally, the effective aperture can be multiplied by the number of suitably placed transmitters. However, the application probably does not permit consecutive MIMO transmitter activations, and it is uncertain whether concurrent transmissions can be made sufficiently orthogonal. Orthogonal bit structures might however be considered.    
 It is important to shape the receive beam to avoid reception of grating lobe signals. This is can probably best done by steering explicit nulls at the known (±14°) positions of the left right grating lobes.

**Remote sensing to identify promising areas for oil or gas prospecting, Maurice Ezeoke**  
 Maurice has measured the electrical characteristics of a range or representative ground samples.   
 Sandy soils, e.g. in Arabia or Canada, tend to be free of vegetation. Hence multi-spectral video imaging can distinguish dark brown, very wet or oily ground from very light brown dry sand. Wet sand can then be distinguished by its much higher radar reflectivity.  
 Where the surface is covered by vegetation, we must rely on the likely effect of oil in the ground on that vegetation:

* In very wet climates, oil might possibly be recognised by modifying ground fertility.
* In rather dry climates, oily ground should be recognisable as a result of the better retention of water, and hence better growth.
* In intermediate climatic conditions, the beneficial effect of the start of a wet season should appear more quickly over oily ground, and the deleterious effect of the end of the rainy season should appear more slowly.

In some geological conditions, relatively low-frequency radar, with good ground penetration, may provide a sufficient approximation to seismic sounding, to pin-point promising areas.

Best wishes to all,

Ralph