DBF

As mentioned in my cover letter a large proportion of the work I have done as been based around multi-channel antennas. This work has given me a thorough grounding in multi-channel techniques such as ABF and STAP. Therefore, have a good understanding of the systems side of these techniques. I have also done some basic hardware modelling for Radar 2 where the effect on jammer nulling caused by channel mismatch was studied. This work involved trying to accurately model analogue dispersion effects and how they can be compensated. As part of this work I was involved in modelling the effects on STAP and ABF of the new RFIF. The modelling of this process has given me some exposure to the ideas behind parallel cascade analysis and it is an area where I am keen to learn more. The RF modelling area in general is where I would like to learn more.

I also have experience with requirement capturing and documentation. Last year I wrote the calibration MCD for Radar 2. Firstly, this work involved looking across the Captor and Raven systems and identifing the relative pros and cons of each calibration scheme. This gave me valuable understanding of the hardware in these systems. Secondly, This work gave me experience of writing requirements and capturing the rationale behind those decisions.

As part of my work with counter-stealth mode I have gained a large amount of experience with fractional time delay and resampling methods. Fractional time delay will play a crucial role in the true time delay done at the subarray level. As part of my literature review I investigated different filter techniques such as Farrow filters and polyphase filter banks for implementing time delays.

DBF Advantages

Beam Shaped Flexibility
Analogue: Fixed beam shape one designed.
Subarray: Partially reconfigurable by digitally adjusting beamforming weights at subarray level.
Element : Fully reconfigurable

Simultaneous Receive Beams
Analogue: Limited by beamforming manifold complexity.
Subarray: Partially reconfigurable. Multiple beams can be created digitally at subarray level. As these beams are steered away from subarray pattern direction, directive gain is reduced as the beam peak rolls off with the subarray pattern and high periodic sidelobes develop.
Element level Digitisation: Multiple, simultaneous and independently steered receive beams are possible. The beams can be independently scanned anywhere within the array scan volume.

Jamming and interference suppression:
Analogue: Sidelobe canceller using auxiliary receivers
Subarray and ELD: Adaptive cancellation, STAP and ABF.

IDR: describes the ratio between maximum and minimum possible received power of a receiver without the receiver being driven into overload.
Sigma_max*RMax^4/(sigma_min*RMin^4)
IDR for subarray and ELD=BaselineIDR/Num or RxRs as each RxR recieves only fraction of total power therefore harder to drive non-linear.