

AERE Harwell 1953

(To the end of January 1956 when RHEL is created under NIRNS)

Officially the first day of work at Harwell was the 1st October 1953. The rent for the AERE house was £2-10 per week. The bus fare from Abingdon to Harwell was 1/4d a day. There was no family car until the early sixties.

Initially Bernard started in the Pickavance group in building 152?. There was also an Injector building, Hangar 7? In due course Harwell building No 412 was to be occupied, outside the wire and on the north side of Fermi Avenue. Started in 1954, this was to house the PLA (Proton Linear Accelerator) and all staff offices and workshops. This would be renamed R12 when later absorbed into the RHEL site. There are a number of photos of building progress over these few years.

Records for the first few years at Harwell continue to be sketchy, probably a settling in period and waiting for the PLA buildings to finish.

The complete specification for UK patent 19610/53 appears dated 6/8/54, in the names of Loach and Adams. This is published on 29/8/56, as Patent specification 755843, two years later!. By this time the declarer of the invention has become the National Research and Development Corporation. It is interesting to note that Patent reprints were printed by Burgess the printers in Abingdon.

In December 1952 the same patent is being filed with the US Patent office, but we have to wait until 1958 to read about the outcome of this. These processes were ridiculously slow back then. Surely by then, the invention has potentially been widely copied or the process become out of date??

On 1st August 1954 a letter was received announcing the transfer of his employment from the Dept of Atomic Energy (MOS), to the new UKAEA.

Into 1955 Bernard continues to lead the section designing and manufacturing Tank 1 (1/2 – 10 MeV) of the PLA. This included mechanical and RF design and the planning of experimental test programmes. Also some theoretical work on associated problems, particularly alignment problems, tuners, tolerances, RF loss distribution and transit times correction. Detailed drawings of the American Bevatron injector and Minnesota accelerator were studied. There is an album of photos of the Minnesota machine, and it all looks remarkably similar to the PLA. In the back of this album are two AERE photos, A2387 and A2386, undated, both showing what looks like part of the PLA injector?, with Bernard present in the latter photo.



From Minnesota album, but it is the PLA?

There was liaison work with Metropolitan Vickers (MV), particularly in connection with controls, vacuum, mechanical and cooling requirements for the whole of the first three tanks of the machine (up to 50 MeV). There is a reprint of a MV publication entitled “A computer for solving some problems in connexion with travelling wave particle accelerators”, dated 1953. This is a mechanical device on a breadboard, apparently an analogue computer!

There is at this point still no building 412 for the PLA. First photos of the building plot start in February 1954.

There is the manuscript for a report by Bernard, dated November 1954, entitled “PLA, tuners for 1.5 metre Alvarez Tanks”. This appears to concern small items within the walls of the injector? tanks to tune the RF. His specifications for tank 1 could not be other than recommendations for tanks 2 and 3 since these were being designed and built by MV??

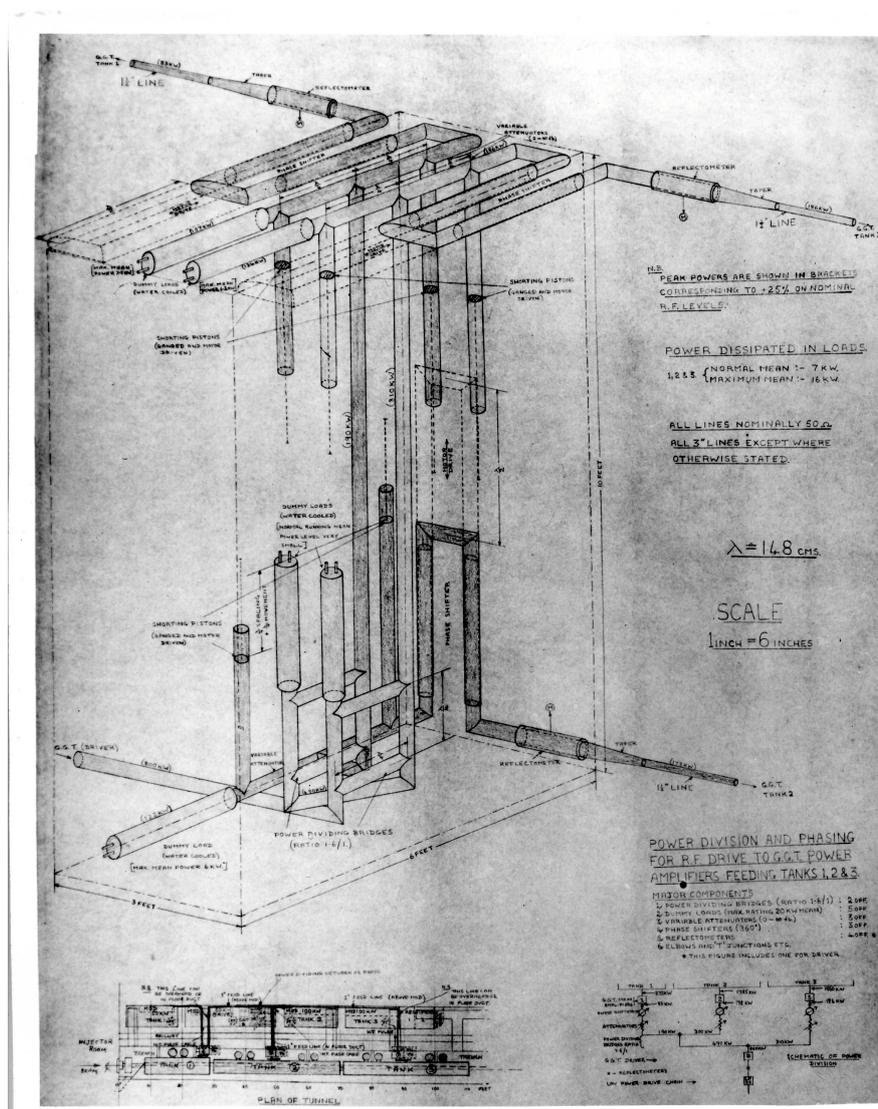
There are a couple of large drawings (tables) of data for tanks 2 and 3, dated December 1954. It is interesting to note that the PLA is still being designed entirely in imperial units, feet and inches etc.

The manuscript for Publication PLAC9, “Manufacture, measurement and operating temperatures and frequencies for the PLA”, was written but not yet published, (author?) January 1955.

Some design features of the American Bevatron injector were copied in the PLA design. There are some photos of one of the other American machines, which I take to be the Bevatron, which seems to be huge in comparison.

There is a typed copy in duplicate of a rhyme concerning the problems of building the PLA, complaining of a building with nothing it it! Undated. by "Prof Peierls".

There is a large hand drawing by Bernard dated March 1955, showing PLA power division and phasing for RF drive to GGT power amplifiers feeding tanks 1, 2 and 3. This includes a plan of the tanks in a tunnel 110 feet long, being fed from the adjacent injector room.



The final version of Bernard's draft drawing for the Power Division

PLAC10, "PLA tanks 2 and 3: Design notes and data", Wilkins, JJ, is published in March 1955, with a reference to Loach (unpublished). Not sure if this is PLAC9, published a month later in April 1955.

"PLA for nuclear research and the AERE 600 MeV project", Pickavance, (1955 reprint), tells us that the first tank will be similar to the Bevatron injector at Berkeley, and the first tank of the Minnesota machine. Metropolitan Vickers manufactured much of the waveguide and RF equipment. Valves of grounded grid triode type were being designed by both AERE and the English Electric Valve co. Additionally, London University was developing a Klystron for 400 Mhz operation.

AERE GP/R 1578, "A matrix treatment of four arm bridges", Mullett, is published about early 1955, presumably relating to the RF side of the PLA, and refers to Bernard's work published previously (AERE 391).

The ACR for 1955-56 states that he took responsibility for controlling a team working on the design and construction of the whole of the 50 MeV PLA, (except the injector). This included liaison with MV for all aspects of design and construction. Also he was responsible for design of a high level power dividing system feeding RF power to the accelerator, as depicted in the above drawing?.

Also theoretical work was done during the year including the design of a pre-buncher and an investigation into the possibility of providing a continuously variable output energy to the PLA.

He was also responsible for the organisation of a symposium on "Machines for High Energy Physics in the UK" held at Harwell in May. Also a meeting was organised on the subject, in December.

His ACR fails to mention the extra responsibilities of fatherhood due to the birth of his second child, the author, in 1955.

According to the next ACR for 56-57, the design and construction team continues under his leadership during 1957. Work involved mechanical engineering, high vacuum, radio frequency (200 Mhz) and electronic controls, and the physics of machine performance.

Liaison with MV Ltd continues.

There were also theoretical investigations into possible structures for a 10-15 MeV high current PLA to be used as an injector for a large Proton Synchrotron (could this be the start of Nimrod?) He became partly responsible for the design of a 200 Mhz 2 Mw Klystron amplifier as an alternative source for the PLA.

"A theoretical and experimental investigation of anisotropic dielectric loaded linear electron accelerators", by Harvie, Mullett, Walkinshaw, Bell and Loach, is published by IEE in July 56 (published in the society proceedings in 1957).

On 30th Jan 56 the project is transferred to NIRNS (National Institute for Research into Nuclear Science) at the new Rutherford High Energy Laboratory (RHEL).

At home some interesting projects included the construction of a polished wooden console to house the new Pye VT4 television set which he had bought in order to be able to receive TV from the remote transmitter at Alexander Palace. Another major project was the construction of a reel to reel tape recorder built using a Truvox deck, a project which was to continue at least until 1955, before it was properly finished. The early version built just before leaving Malvern had to be modified and the deck exchanged with Truvox before satisfactory performance could be obtained with piano recordings. Even so, some interesting recordings exist, made in Malvern before they came to Abingdon. This recorder was a source of many hundreds of hours of recordings to be made over the next 20 years well before most people had ever heard of recording sounds at home. The material includes both family at home and radio and TV programmes.



Home built tape recorder, based on a Truvox deck.

-----000000000-----