CERN – European Organization for Nuclear Research
European Laboratory for Particle Physics

CTF3 Note 027 (Min.)
(Klystron Acceptance Test)
PS/PO/Note 2001-032 (Tech.)

Visit to Thales Electron Devices (formerly Thomson Tubes Electronique) on Tuesday, 26th June 2001

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Geneva, Switzerland
July 2001

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CERN Persons Present: - Mr. T. Fowler, Mr. G. McMonagle

Thales Persons Present: - Mr. Belna (afternoon), Mr. Buenas (afternoon), Mr. Boghossian, Mr. Delfourt (morning), Mr. Ichac

1. Klystron Acceptance Test

A new klystron (type is TH2100C serial no. 040) was being tested which will replace an older klystron diagnosed as unrepairable last year.

The tests were performed successfully to the agreed contractual standards with three defined working points for the tube at 20 MW, 25MW and 37 MW.

The acceptance test data sheets are attached.

2. Factory Visit

The testing of the klystron was then followed by a factory visit to view the klystron manufacturing process. A few interesting facts emerged during this tour:

i.) There is a klystron TH2128 (fo 2856MHz) with similar RF structures as that of our TH2100C tube, but with a vacuum vacuum window. This tube can produce 45 MW peak RF output. Thales says that they are now confident the 2100C klystron can be conditioned to 45 MW as well, but this would increase the price of the klystron to compensate for the extra conditioning time in the test bay. This is a new development as they have recently changed the design of the output cavity of the klystron. There is now a possibility of sending recently manufactured tubes back to Thales to be conditioned to this level. A list of our TH2100C klystrons that we have in stock as reserves will be sent to Thales and they will tell us which ones can be conditioned to 45 MW and what the price will be. This will probably be the cheapest way of increasing the available power capability of the modulator klystron systems for CTF3.

ii.) A 1.3 GHz klystron was shown to give us an idea of physical size for the 1.5GHz klystron the will be bought from Thales. The klystron should be compatible with our existing klystron HT tank with limited modification to the interface plate. More worrying is that the klystron and focussing magnets will be approximately 400 to 500 kg heavier that the existing 3 GHz klystron, plus extra lead shielding is needed which will also increase the weight of the whole assembly. We must check that our existing lifting equipment will have the capacity to manoeuvre this extra weight safely.

iii.) Thales are actively testing braising methods for using diamond RF windows.

3. 1.5 GHz RF components and assemblies for RF deflectors, and sub harmonic buncher in CTF3

Following on from the factory tour a round table discussion on 1.5 GHz components took place. Some important points came to fruition from these discussions and must be dealt with urgently if we want to have the existing infrastructure available in 2003 for CTF3.

Apart from L Band waveguides, nothing else exists at 1.5 GHz operating frequency. The lead-time for development, then fabrication of these components is estimated at 18 to 24 months from reception of order. Thales would expect a delay time of two months to prepare an offer from any price enquiry and we should assume the same delay schedule from any other manufacturer that we ask to tender. It is now imperative that the technical specifications and price enquiry should go out as soon as possible to stick to the CTF3 installation schedule.

The following points were raised in the discussion with Thales that may be of use when preparing the price enquiry.

The flanges on the output of the narrow band klystron, which are standard L Band type CPR650F, are not usable with a vacuum joint.

The design and manufacture of components, such as couplers, attenuators, phasors etc. will be easier if they are to operate in a pressurised system rather than vacuum.

Thales are not knowledgeable of any components that are built to work in vacuum in the L band, including RF loads.

An L band RF window, SF6/vacuum, is being studied by Thales for another client. It should be noted that the flange on the vacuum side is being modelled from an existing type at another frequency used by an American manufacturer. The flange will be half height to that of the CPR650F, and the window includes a taper structure to adapt to this flange. (Probable importance to finalise flange type rapidly to inform Frascatti for the RF deflector design.)

Each deflector will require two RF windows, as the terminating loads, if designed by Thales, will not work in vacuum. This is also true for the sub harmonic buncher.

Price enquiry should clearly separate broadband requirements from the narrow band requirements but state that where possible a multipurpose component will be given priority to enable spare part replacement in both the higher power narrow band systems and the lower powered 150 MHz broadband systems.