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OFFICE MEMORANDUM

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TO : Biomedical Control Committee Members

DATE: November 14, 1975

FROM : J. A. Helland

SUBJECT : MINUTES OF MEETING - NOVEMBER 7, 1975

SYMBOL : MP-3

MAIL STOP: 844

REPOSITORY LANL/ARC
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First item of business was a talk by Arvid Lundy, giving an overview of the Biomedical Control System. He started by discussing the history. Dick Hutson was first person working on the system -- he developed a list of control functions. Lundy was the second to start, working on the hardware, and Sally Shlaer worked on the software. One of the first questions was whether it should be a computer-controlled system. The deciding factor was the decision to work with mono-energetic fan-shaped beams. Lundy and Shlaer are responsible for the architecture of the system. Since the computer will be doing tasks other than just controlling the beam, the following items were decided upon: RSX-11D (i.e., multitasking), PDP 11/45, CAMAC and MBD. The last two items were MP Division decisions. RSX-11C was used before RSX-11D was available. Since RSX is a real core hog (underestimated), the system eventually grew to 124K of core. Many useful contacts were made during that period, e.g. people at DuPont, Union Carbide, Berkeley (RSX-11D), etc.

Helland asked Lundy if he would have done things differently, knowing what he now knows. He responded that he didn't know enough about the alternatives, but that he grossly underestimated the time for getting the hardware ready. Shlaer did not underestimate the time required for the software development.

They didn't get much interest from other people, except that Don Swenson and Mort Kligerman discussed some problems with them, such as console layout, etc. Lundy and Shlaer went to visit other people in the radiotherapy field, who were using computers; USC was the only therapy center doing much with computers, but their set-up was rather appalling -- no hardware checks, etc. Then they talked with Herring (in Environment), who was doing some studies on errors in radiation therapy. They also went to Stanford, but they weren't using computers except for treatment planning. As of 6 months ago, their system still was not operating with therapy machines. Their system is primarily a set-up/verification system. They visited Berkeley (alpha beam program). The Berkeley system didn't impress them. They also visited Mt. Sinai in New York where they're trying to get a PDP-11 system going for interactive treatment planning. They visited Chicago where there is a PDP-11 system for treatment planning and monitoring patient treatment set-up. In general, there isn't much exciting going on in computer usage in radiation therapy and very little in multitasking. Probably the most integrated system they saw was at Dartmouth, where they have voice feedback (voice synthesizers).



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Radiobiology uses: Control system had to be usable by a visiting radiobiologist with only minimal instruction. We have more or less achieved that goal. For actual treatment there will always be knowledgeable people around, however.

Lundy handed out information on "Biomed Computer Uses." Knapp asked if "operational" means that it's redone on RSX Version 6, checked out and running. Lundy said no. This "operational" means the hardware was put together, the software was written, and it has been operated. That doesn't mean that today it is operational. A number of changes were made during the shutdown that should improve the system, especially in the Control & Monitoring of the Beam Line (Item 1).

Item 2 is Beam Line Modeling for Tuning Studies. This is essentially TRACE, a first-order TRANSPORT type program for the PDP-11. It includes second-order momentum dispersion. Paciotti asked if TRACE was now working. Kittell said he didn't know if it was available, but if sources were available, he could get it going. Helland commented that any program in either FORTRAN or MACRO, can easily be converted from Version 4 to Version 6. Paciotti asked about the related graphics, and was told that they have already been converted.

Item 3 is Patient Treatment Data Logging and Monitoring. Knapp asked if this was running again. Lundy said no, but that there shouldn't be any problems in getting it running, except possibly hardware checkout. Knapp asked if we took the data from the (beam delivery) monitor chambers and digitized then with CAMAC or a current integrator for pion beam intensity. Lundy explained that Doss' system (electrometer) developed an analog signal proportional to beam intensity. This signal is digitized with a 5-D system (A to D converter) and sent to the computer via CAMAC. This is the same signal that drives the Dose-Rate Meter on the console. Knapp asked what signal is used to terminate the patient treatment. Lundy said the electrometer system develops one pulse for each "so-many" picocoulombs of charge. These pulses are counted on a battery-powered scaler on the console, and when the scaler reaches a pre-set count, the treatment is terminated. The entire system is duplicated (except for a common power supply on the electrometer) and the two scalars are compared. If they are sufficiently different the treatment will be terminated. The computer will terminate the treatment (pull the target) if the scaler system fails to do so. Smith asked how the beam is physically shut off; if the target is withdrawn from the proton beam. Lundy said yes and Slit 1 will also be closed. Smith asked how quickly that is done. Knapp replied that the target is withdrawn in a few seconds, and is started early so that the total beam delivered is equal to that which was desired. Bradbury commented that the pre-set counter is adjusted to take into consideration the beam that is delivered after the command for target removal. Smith asked if all of the beam is monitored, and was told it was. Lundy stated that it took about 30 seconds for the full transit of the target mechanism, but in the future it will go out in 3 to 5 seconds. Because the target mechanism is shakey, and because we have no back-up target mechanism, we'll probably start operating again at the slower rate for awhile. Paciotti commented that it depends on the dose rate, i.e. for long treatment times

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(>15 minutes) the speed of target removal is unimportant. Smith asked about using a beam stop instead of pulling the target. He was told that the slits are a form of beam stop, and will be used along with target removal. Knapp commented that target removal is important (even though slits are inserted) in order to maintain a low background radiation for employees, etc. Bradbury noted that even with the target out, the room background will be lower with the slits closed. Paciotti estimated that the radiation level would be ~5 r. per hour with the target in and the slits closed. Bradbury estimated the level would be ~1 r. per hour with the target and the slits open. Kittel noted that it takes 10 to 15 seconds for the slits to close. Smith asked if the target moves hydraulically. Knapp said its a hydraulic stepping motor (not a ram). Lundy said it was 8-1/2 horsepower to move something the size of a cigarette.

Item 4 is Patient Record Keeping. At present all we're doing is keeping a record of each patient treatment on mag tape. These records are occasionally referred to well after the treatment. Smith asked if the total dose (running total) for a patient is updated after each treatment. Lundy said no, but with adequate disk space it now could be done, but that should be developed by the UNM Cancer Center.

Item 5 is Experimental Data Acquisition. This refers to the Q Project, which was originally developed at Biomed, where the first (CAMAC) trigger module was designed and built. The Q system was discussed and it was pointed out that Henri Vander Beken will discuss Q at a future meeting. Knapp suggested that item 5 should reflect the fact that Q can control equipment as well as collect data. Paciotti pointed out the fact that, other than beam tuning, John Dicello is the only person who has requested the use of Q, and he is now bogged down. Swenson said that he is bogged down because he needs PACE, and that system is at a standstill. Knapp pointed out that PACE (ADC) is not needed very early to get the channel tuned and running. Paciotti said that if it takes 6 months to develop it, we are already 3 months behind. Swenson suggested that we talk to Dicello about what he needs because he feels he isn't getting what he needs. Helland said we'll invite him to a future meeting. Paciotti suggested that tuning be done with DOS, rather than Q (RSX), but no one is available to do the work on DOS, so the tuning will probably be done with Q. Smith suggested that potential users of Q, e.g. Dicello, Richman, Amols, submit specifications as to what they need. Knapp pointed out that there are so many things to do, and so little time to do them in, that this committee must sort things out and set priorities for the tasks.

Helland brought up the subject of agendas for future meetings, suggesting that Lundy finish his discussion on hardware at the meeting on November 10, 1975, that Kittell discuss software at the meeting on November 14, 1975, and that Vander Beken discuss the Q Project at the meeting on November 18, 1975. No one objected.

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Knapp said that if Paciotti has strong feelings about not implementing the Q system for data acquisition (tuning), we should know that, and know the arguments for both sides so we can make a decision about it. This is a very important thing. Everyone should know why we have decided one way or the other.

Item 6 is Pion Beam Treatment Planning. Bill Shlaer has done a lot of work on this already. Pete Berardo will be working on this, using the CDC 7600 computers, so for the time being this subject is not important for this committee. Lundy pointed out that we have purchased a 20-inch Versatec plotter and a 20-inch digitizing table for treatment planning. The digitizing table was a gross mistake, because we need a lighted table to be used for digitizing X-rays. Helland suggested putting electro-luminescent tape on the digitizing table to illuminate the X-rays.

Item 7 is Data Exchange with UNM Cancer Center. Kligerman has put a high priority on this item. The DEC-NET software system looks the best. The Cancer Center is budgeting for this system. Based on past experience, Smith felt that this item should be given low priority. UNM has 9-track mag tape, so that is incompatible with Biomed.

Item 8 is Treatment Couch and Beam Energy Degradation Control. Lundy felt that one entire meeting should be devoted to this subject, and that it could wait months.

Item 9 is Simulator Data Logging. Bradbury suggested that an entire meeting be devoted to this subject also.

Item 10 is Computer Communications. Berkeley now has a system that is very similar to our system. Transferring data back and forth between Berkeley and LAMPF is very desirable. This has been done with disks in the past, but that hasn't worked out very well. Livermore is developing a similar system, modeled after our system. Duke University Medical School got interested in data acquisition for nuclear medicine and used our system as a model. NCI did not fund them so that failed. Computer communications with such systems is very desirable for software developments. A dial-up system is desired. Leased telephone lines were discussed. Leased lines to Berkeley and Livermore now exist.

The discussion was diverted to other subjects that anyone might like to bring up. Smith and Vander Beken both said they never received Knapp's original memo setting up this committee. Bradbury pointed out the fact that much of the list of items to be studied by the committee was generated by Vander Beken. Kittell pointed out the fact that we are losing our data analyst (Dolores Mills) and that we need some additional programming support. A discussion was carried on concerning the data analyst.

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November 14, 1975

Helland asked Bradbury about the PR's that have been submitted to him by Lundy. Bradbury discussed the PR's and it was decided that they should be discussed in detail at a future meeting.

Helland discussed software priorities, as he would like to see them set. He has asked Kittell to concentrate on the magnet codes; Art Chavez to concentrate on the software for Slit 1; Vander Beken to work on the Q Project leading to a "marriage" between Q data acquisition and the data analysis programs that Helland has converted from DOS to RSX; Martin MacRoberts to work on the software for the knobs and buttons; and Pete Berardo to work on Treatment Planning. These points were discussed by the committee, and no one raised strong objections.

Helland then asked if Lundy could concentrate on the "Button" hardware. He said he was working on the DAA connection to the telephone terminals and would like to finish that first. Since that would take only a week, the majority of the committee agreed that that would be OK, providing he get to the "Button & Knob" hardware in ~1 week.

The meeting was adjourned.

Distribution:

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