Confidential Notes from a visit to Japan –
Asian-Pacific Radio Science Conference, Tokyo, 1-4 Aug. 2001
Visit to NAOJ and discussion with Mitsubishi, Nobeyama and Mitaka, 4-8 Aug.

To: AEC (R. Brown, M. Rafal, R. Kurz, M. Ishiguro, R. Kawabe, A. Wootten, S. Guilloteau, T. Hasegawa) and C. Cesarsky, R. Fischer, J. Kingsley, T. Andersen, N. Ukita
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1. The Conference. The conference was an Asian URSI gathering with several hundred participants. The Radio Astronomy Commission J room was filled with some 50 - 60 people. Most participants were from Japan with sizeable delegations from China, Taiwan, India and Australia. A small number of Americans and Europeans completed the audience. Wolfgang Wild gave a good review of the ALMA receiver developments. Several other ALMA aspects were covered by our NAOJ colleagues. The visibility of ALMA, and references to it in other talks, was good.

The conference was quite interesting in that it has given me a pretty good impression of what people are doing in this part of the world. Particularly noteworthy are the efforts in Taiwan and China, both Shanghai and Purple Mountain Observatory in Nanjing. The mm-astronomy development there is now run by young (first generation post cultural revolution) people with a good education, some of them abroad.. Both Wolfgang and I found the experience worthwhile.

2. Meeting with Mitsubishi people. During my stay in Tokyo, Ukita had arranged (on his own initiative) a diner meeting with three people from Mitsubishi. Present were Mr. R. Sugiyama (management, Osaka), Mr. Y. Saskato (commercial) and Mr. S. Matsumoto (engineer). The conversation remained rather superficial and no deep specific aspects of ALMA antenna procurement were discussed. However, Mitsubishi's strong interest in building the antennas was stressed. The need to divide the "cake" was touched upon. The commercial man was most active and he showed interest to get in touch with the other ALMA antenna contractors. I told him, that I could not act as intermediary and that it needed be done on his initiative. They explained that they are very much in favour of building a complete antenna, even if it can't be 64 of them. I stressed that we want 64 identical antennas, built to one design. I also introduced the idea of a joint venture and suggested that having their name on 64 antennas, be it together with one or two other names, might not be all that bad. We did not discuss a possible co-operation between companies further.

During the walk to the station after diner, Mr. Sugiyama (the Manager) asked me whether ALMA would let Mitsubishi build all antennas. My answer was "I am afraid not" for the reason that also in the other countries, just as in Japan, there are requirement for “just return" to the "local" industry for the money provided by the funding agencies. He seemed to understand and accept that.

In discussing this later with Ukita, he believed the question was more aimed at finding out whether we would accept Mitsubishi as main contractor of all antennas, whereby parts would be farmed out abroad to satisfy our conditions. All together, I believe their main goal was to take the chance to present themselves to a person of the "other" side of ALMA and to indicate their preferences as to their activities. This is a usual way of approaching possible business relations in Japan.

3. More Mitsubishi. While visiting Nobeyama, Ukita and I spent a full day and evening with Mr. K. Miyawaki of Mitsubishi, who had been "ordered" to show up by Ukita to discuss in more detail technical aspects of the antenna and the procurement models. He is a senior engineer and leader of the design office. He has done much work in design of antennas and telescopes (e.g. Subaru and ASTE). The three of us discussed in a pleasant and open way many aspects of the project.

In particular Mr. Miyawaki gave quite a lot of detail on the design ideas for the 12 m prototype. In the course of this exchange, I provided some aspects of the other two prototype designs, but not much more than what is known to Ukita already from his contacts with us. He was extremely curious about the EIE receiver cabin of CFRP, which, he said, Mitsubishi could not possibly realise economically. I gave no details. Also, I told them about Vertex' need for a lot of Invar in the receiver cabin to control thermal effects. This seemed to be new to them; it appeared that they believe to be able to do this with steel and good insulation.

To me, one of the most interesting points of the Mitsubishi design is the reflector panel. They state that the machined aluminium panel will have a fabrication rms of only 3 micrometers (EU and US have 8 in the spec and our companies are not significantly below that at the present state) and a weight of 15 kg/m^2 (without adjusters). Also the panel has a three point (kinematic) support. When I asked the cost estimate, I was told 400 k$ per reflector. This is comparable to EIE's cost as mentioned in the CDD documents. I was also told that achieving the 3 micron economically was mostly a result of the fabrication procedures (about which he remained totally silent!) than of a superior quality milling machine.

We then went into a discussion of the procurement model. At Ukita's request I explained the boundary conditions to the procurement, our current ideas about the organisation, concentrating on a "diversified" model centred on a Joint Venture (JV) of three companies, one contract and a three-way invoicing system, which would allow us to fulfil the requirements of the funding agencies. Ukita added a few minutes in Japanese! I then brought up the idea of early contact between the three prototype companies, after the delivery of the last proto-antenna, with the aim of getting them to think about the JV early. I also explained the evaluation process and the current ideas of decision making within the ALMA Management, in which one design would be selected to be fabricated within all three regions. The reaction was careful, but not hostile. In particular Mr. Miyawaki said that he saw only one major technical problem in dividing the fabrication over more than one company; namely the area of CFRP structures, where it would be difficult to assure identical products from different companies even based on one design. I believe, he has a point.

It became clear to me that the thinking in Japan about these procurement aspects has been guided by the assumption that the Mitsubishi antenna will be selected. This I have noticed in the discussions with the NAOJ people, but it was apparent also in the reactions of the Mitsubishi engineer. So I asked them to find an answer to the question: "how are you going to react to, and arrange for, participation by Mitsubishi in the series fabrication of the ALMA antennas of a non-Mitsubishi design?" It was clear that this question has not (yet) been seriously pondered. For good measure, I added that they also should seriously think about having significant parts of their design (if selected) fabricated in EU and US.

Some miscellaneous points.

* assembly in Chile. Mitsubishi does not have good and strong connections with Chilean companies. So they believe that it would be more expensive if they would take responsibility for the assembly than, for instance, in the case of ESO. Ukita stated that he prefers the Mitsubishi company involved in the assembly anyway. We did not explore this issue further.

* Mitsubishi also believes a metrology system will be needed to reach the pointing spec. There is no clear concept for such a system now. Ukita has played a bit with a laser and "position sensitive detectors" on the ASTE, but up to now without much useful results. At least, he did not present any data.

* Ukita noted that in the current three-way Project-Division Japan is charged with providing the three transporters. He said that they are not working on designs, but would take the finalised EU/US design. But if Japan should build them, he (Ukita) would from now on like to be intimately connected to the ongoing design efforts. I promised him to convey this to the ALMA management.

Summarising:

The chance to talk in detail with a leading design engineer about these aspects certainly was useful. I believe, I have made it clear that there are a number of organisational conditions to the antenna procurement which will require flexibility and willingness to collaborate from the Japanese partner, regardless which antenna design is finally picked for the series fabrication. I hope that this would help Mitsubishi take a realistic approach to the project in the knowledge that they are by no means certain of their selection and even less of their overriding position in the procurement.

Technically, we agreed that a "diversified" fabrication based on a single design can be accomplished, be it with some more effort and risk. A very good project supervision would be mandatory.

They will have to get themselves in the mood for a Joint Venture, but the reaction was not negative. Early discussion between the three prototype-partners seemed acceptable, if it would occur after delivery of the last proto-antenna. I confirmed that we would not do this any other way.

4. Procurement Model with NAOJ colleagues. The following day at Mitaka two hours were spent with Ishiguro, Hasegawa and Ukita discussing the ALMA antenna procurement alternatives, departing from my Memo of 20 July. I summarised the proposed scheme and added that it was heavily influenced by discussions at ESO. It is very much a discussion piece, not a proposal, even less a decided matter.

The JV idea finds support, but the Japanese colleagues are not certain that this can be "sold" to the Japanese government and/or industry. They seem to be in favour of early notification of prospective companies regarding the modalities of the production bidding through a preliminary CfT.

Ishiguro is afraid that the Japanese system may not allow a full JV structure, in that Japan would need to contract specific companies for specific actions/deliveries. I asked that they put on paper as much as they know about their boundary conditions, so we can try to incorporate these in the overall scheme for the procurement. I added that because of ignorance on my part regarding the details of the Japanese conditions, the current JV proposal is heavily influenced by the European experience. We need input from Japan to make the needed modifications to accommodate the specific Japanese aspects. They promised to do so soon.

Regarding our idea to release all three designs with the preliminary enquiry (after delivery of the last prototype antenna), NAOJ is currently negotiating the design ownership issues with Mitsubishi. They are not certain how far they will succeed. The question was raised if the JV could have more than three members. We agreed that this might be possible, but that the total number should be limited, perhaps to no more than 5.

On the issue of design changes in the production antenna with respect to the prototype design, we all feel that small changes, proposed by the JV and maintaining the full performance responsibility of the JV, would be acceptable.

Ishiguro expressed his desire to maintain strong competition in the production bidding process. We agreed that this is not fully commensurate with the JV idea. I advanced my opinion that in these highly specialised products a relation of trust and collaboration between Institute and Company has often led to superior deliveries for an acceptable price. [As illustration I mentioned the different approaches for the Effelsberg telescope and the GBT.]

The proposal to MEXT is based on a strict vertical model (where Mitsubishi builds 21 complete antennas) and Ishiguro is very reluctant to any change, because this could jeopardise their detailed discussions of the proposal with MEXT. I assured that the current JV proposal and discussions should in no way lead to a change in the Japanese proposal now at the table at MEXT. I added that if final agreement on the procurement modalities is reached within ALMA, their MEXT model might need adjustment. This was noted and accepted.

MEXT is asking many detailed questions, which are interpreted at NAOJ as a good sign. Also MEXT is asking them to save about 20% on the roughly 100 M$ they are asking for additional institutional support over the 10 years or so, but has not put the pure ALMA budget

amount under pressure (yet). So, they feel pretty good, despite the fact that some of them have to appear at MEXT almost daily on very short notice with answers to new questions!

Finally, Ishiguro explained that he does not want his contract manager to be exposed to the alternative procurement ideas, as discussed today, and hence wants to hold off a meeting of the contract managers, as proposed by Kurz. After the Japanese funding is assured, such a meeting could take place. Until then he wants the discussion on procurement models limited to the "inner" ALMA management without Japanese contract managers and other administrators.

In summary:

I believe that our Japanese colleagues acknowledge the need for some form of innovative procurement procedure to satisfy the different conditions posed by the respective administrations and governments. They seem to feel positively towards a Joint Venture, but are unclear to what extent Japanese procurement rules might allow this (and to what extent Mitsubishi would go along with that!). They promised to provide input regarding their situation in this area in the near future. We agreed that in the overall ALMA planning an agreement on a procurement procedure within ALMA should probably be reached by the end of 2001.