Minutes for AMiBA Engineering Telecon

Meeting Date: 30-Oct-2003

Participants:
Australia:
USA: M.T. Chen, F. Patt, T.H. Chiueh, Derek Kubo, P. Ho
Taiwan: Huei Wang, C.T. Li, H. Jiang, West Ho, Ted Huang, Johnson Han, C.J. Ma, Kyle Lin

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Minutes Recorder: C.T. Li
previous weeks comments

I. New Action Items:

AI-30Oct03-1: Bob – Give RCUH a call, and ask Richard about the long term for CSO. Ferdinand will follow up on Nancy on the current space. Discuss with Ming-Tang and others about the idea to establish a permanent lab on the site.

AI-30Oct03-2: Bob/Huei – Contact Paul Clenworld about some MMIC questions - 1) Whether the MMIC has to go back to the states for approval? 2) Whether the test period in Taiwan can be two years, instead of one? 3) What exactly is the checking business in Taiwan?

AI-30Oct03-3: Phillipe/Bob – Summarize the meeting minutes, get more evaluation on platform and make a decision on what to do next

AI-30Oct03-4: Bob/Ferdinand – Come up with a scenario whether it is feasible or not to work on the site excavation by ourselves.

II. Previous Action Items (still open):

AI-23Oct03-2: T.H. Chiueh and Bob - Sort out what to do next, and summarize what has been done so far (for prototype testing).

T.H. Chiueh, Bob – Will get together on Friday morning to discuss it.

Paul Ho – For the prototype testing leader, to inform us as how things are going, whether there are concrete conclusions, whether we're proceeding in the right way, whether the information derived has to be sent back to the engineers? I think that's all we need is some indication of how things are going in terms of testing. That is why I asked you and Bob a week ago to discuss this because Bob raised the concern that he thought the testing was not productive enough. That's why I thought you two can discuss this and come to conclusion. Any revision we just revise if it needs to be revised.

AI-25Sept03-2: Ming-Tang - Volunteered to review all the specs as much as we can, and collect them into one place so that we can look them up.

Ming-Tang – Don't have time to work on it right now, besides finding all the data collected in AMiBA web site. Found several areas with some testing specs, e.g. Ferdinand's calibration system has some tolerance specs.
T.H. Chiueh – Volunteer to work with Ming-Tang. Bob – Let's talk about more on Friday.

Ming-Tang – Continue collecting more info.

AI-18Sept03-1: Bob - Re-visit the testing of phase shifter in a month.

Ming-Tang – Finally got the cryogenic cold test dewar together and running. All the necessary components are in place. We have some test data (dummy and phase shifter at 90 degree, at 15K and room temperature). However, the dielectric slab in phase shifter fell off during the cool down.

Ming-Tang – Johnson has finished the measurement of a dumpy phase shifter in cold test dewar (around 15K) as a reference. Will continue testing the phase shifter.

III. Closed Action Items (as of this meeting):

AI-23Oct03-1: Paul Ho – Discuss with Sun Kwok about whether to keep AMiBA stuffs in new SMA building?

Paul Ho – SAO would like the laboratory facility not to be in this building. Sun is negotiating with them.

Bob/Ferdinand – The backup is the existing lab space. The lab space will be empty for next few months. For the lower part (lab space), there is no commitment made so far. There would be a good chance that in the case we want it, we could have it. The rent is 1.75 per square foot. A kind of easy division is 1500 square feet. Will talk to Ann next Monday or wait for the owner to come back. The number doesn't include utility. We have already cut off the current Cassey building because they need the space fast, and it really isn't appropriate for the lab work. Doing lab work there, we keep getting trouble, electricity getting too hot, not set up for a lab… certainly couldn't do anything heavy duty, cryogenic things, the power couldn't handle it. The rent would be in the order of 2500 to 3000 dollars per month (verbal over the phone).
The alternative two is to use the space in CSO. Will give Richard Chamber a call. The space is cram for us, but useful.

Derek – Is there a room in RCUH for us? Bob – Don't know the answer of that. But since we're in the RCUH project, we've already been offered access to all sorts of room and facility we don't have in SMA building. Derek – The reason I like the idea is because they're physically very close. Bob – Let me ask again. I think that space got eaten up – what was available for us. I can certainly ask again.

IV. Miscellaneous Discussions:

MMIC:

Bob – Tried to call Paul Clenword, but didn't get through. He is working on the plan for export.

Huei – Don't feel comfortable because he said that prior to delivery of MMIC, we will most likely need the US state department to approve it (the plan). Like to clarify that with him. Hope that the plan to inspect all the MMICs will not make everyone of us panic. Can not conclude until see the plan. Will not be available next week. Suggest that Bob could talk to Paul first. Bob – Are you concerned about the amount of time to evaluate? Huei – Paul said he'd like to keep it within one year, but I think in the beginning we're talking about two years. The only concern I have is because those testing may be time consuming if we need to wait for equipment or someting. Right now we tried to prepare everything, but still there is something we may miss. Bob – Possible solution to plan ahead that you test one kind of circuits, and wait to ship the other type that they are not all there at once? Huei – In his(Paul) email, he said MMIC control is achievable within one year. Don't see what the difference is between one year and two years. If he really insists, I am OK with one year. But if this is not really critical or we need to write down the time frame, I would prefer to have two years.

Paul Ho – Summary of the questions – 1) Whether the MMIC has to go back to the states for approval? 2) Whether the test period in Taiwan can be two years, instead of one? 3) What exactly is the checking business in Taiwan?

Bob – Maybe I should ask him time frame to start?

Huei – The export license for chips of our own designs, plus 20 Sander Weinreb's design, has been approved. Will follow up the required documentation.

Receiver:

Ming-Tang – We are making the mechanical components for the next 5 receivers. The contract has been signed few days ago. Do need to talk to Prof. Chu. Haven't heard from

him for a while. There are several issues that need to resolve with him. Will ship the 1st receiver when the lab space issue is settled. Todd Gaier is working on all the MMIC amplifiers right now. Tried to correct the error that they made.

Ming-Tang – We are ready to ship receiver #1, depends on where we are going to ship it to, haven't had a shipping address yet. Basically the testing in Taipei is pretty much there, we'd like to ship it here for further testing, while receiver #2 will stay in Taipei for electronic test. Paul Ho – Lab will take some time to set up since you're moving. Ming-Tang – Sometime ago when we're talking about this, we're told that we (AMiBA) will move together into the new SMA building. In that sense, the environment should have been set up already. We will take less time to set it up. But if that turns out to be not feasible, it will take longer time to prepare because we need to get the CSO building cryogenic lines and compressor, etc. Paul Ho – What is the current situation? Ming-Tang – Up to this morning, we don't know whether we're going to move our AMiBA stuff. Paul Ho – There is some issue between SAO people whether they want to keep the building only for SMA stuff or not. We need to address this issue with Sun Kwok quickly, how Sun intends to deal with it? I'll take an action item to talk to Sun about it.

Ming-Tang – We had a new version of the noise coupler made. West Ho has done the dimension measurements. It looks encouraging. We're going to send it back to gold plating. However, we do have a simulation, and it looks the current design should work. Ferdinand – if the noise injection behind the sub-reflector works, that could save us money on the receiver components.

LO/IF:

Correlator:

Derek – Received the covers for DC amplifier modules and installed them. Will ship 16 of them first, including 8 of them for XY modules (Have Marki change the sex of connectors already). Have the 1st IF module installed in the prototype, and finished running several fringes. It is working quite fine. Will keep it up there for a while.

C.T. – Johnson and I were working on the bias circuit for the Triquint amplifiers because we just realized that we need to turn on the gate voltage first before turning on the drain voltage. West and Mark finished the front panels for all 4 PCBs. Sent out a schedule for multiplier correlator module to Paul Shaw to see if we can proceed with it? Derek – For those SiGe mixers, is their 1/f noise low enough for AMiBA application? C.T. – For the 1st version, the corner frequency of 1/f noise is around 800 Hz, below 1 KHz. The chips I have is the 2nd version. They modified the design a little. Haven't have the 1/f noise checked out yet. Derek – Is there a possibility that we can use this design for 13 element explansion? C.T. - The current dimensions are much larger that it won't fit in the current frame. I plan to make one or two modules for now just to see if we can use this approach. Bob – If I understand right, this is the development for the next phase for 13 elements? C.T. – Actually this is proposed in e-AMiBA. I'd like to ask Paul Shaw whether we can proceed right now or we have to wait until the proposal gets approved? Bob – Really what you're asking is the first step of development, because you really don't even have the right size yet. But you want to get electronic and those characteristics right and then work on shrinking it in size. I imagine it is very much a financial question. Wouldn't it also be a priority question, giving all the other stuffs to do, to construct? Does this take away from those efforts, or somebody else working on it? C.T. – I think for each person, it will probably take one or two weeks to work on it. I think it should be OK. Bob – We got to complete the other stuffs right now. That is the concern. Man power and financial, we are in the crunching of both in the whole project.

Derek – How is generally the correlator frame design? Ted – We got the quad pack correlator frame two weeks ago. We got few problems with correlator modules into the frame because the dimensions from Dasiy-Joson? are a little bit bigger than the drawing. We solved the problem. West is working on putting power divider together with the BMA connectors. Then we can try to put them together to see how the connectors align. After that, I'll send you the details about what we got, also the drawing. After we discuss this, we can proceed the production type.

Derek – Re-visit the issue about the gain and phase stability with respect to temperature. Ran a test on the Celeriteck amplifier in 1st section, measured the gain variation about –0.5dB across 10-degree C change in temperature. Anticipate about 1.5 dB increase in power to the correlator module during the evening time. For phase, we've seen –2.2 degree per 10-degree C change. The other aspect about phase is the cable. We do have

some long cables – 6-meter Andrew Helix cables, and another 3-meter segments between the 2nd section and 3rd section. We calculated the opposite slope is about 5 degrees at 10 GHz in phase per 10-degree rise.

C.T. – Besides the readout board, also checked out the other 4 PCB boards (TP, XY, Readout2Acq, and TP2Acq) we got. Waiting for the electronic parts for them (ordered from Digi-key). Then we can put them together. Have got some comment from Warwick about the circuit of the data acquisition board. Hope to finalize the design in next week.

Platform/Mount:

Bob – Had a long telecon on Monday on platform. Asked Phillipe to summarize where we stand on things are still out-standing, needed to be done for work on the platform. Phillipe is going to prepare a list on that. Talked to Bob Romeo about that. He is certainly available and ready to refund? When we have more firm plans what we want to do. First we should get Phillipe to summarize the minutes.

Ferdinand – Talked to Phillipe two days ago, got some email from Paul Ho, and report from Comrade? about the installation in Germany, if the platform has some major problem. Talked to Bob about that this morning. I think we should have a telecon meeting. I propose a written report from Phillipe, Ted, Bob Romeo. We already got something from Comrade. We understand Comrade's concern about the whole mount could collapse if the mount has some major problem and break apart. That will damage the Jack-screws and the drives. That would be a major disaster. He has to play safe on his side to protect Vertex's investment so far. By looking at the picture, I would be rather cautious. I don't know what to do yet. Paul Ho – Sounds like the stand? plates were under-designed according to Phillipe. There are supposed to be L-shape anchors that were not in place. I don't know how that happened. Ferdinand – That is strange. If this is CMA's problem, then they have to fix it as soon as possible. I also see a lot of missing bolts, thread off… That needs to be fixed. Each bolt is part of the structure, and has to be in place. If we want to attach receiver, correlator, and all the electronics, and the thread comes off, we will have flying parts all over the place in a couple of weeks after mounting it. I would recommend that We rather have a very firm approach, then come to CMA that they get this up to specs.

Calibration System:

Ferdinand – Ordered the V-type to WR10 transition. That should be delivered soon. That should improve the roll-off a little bit at the higher end. Everything is more compact, less expensive because I only need one component. We plan to do a test up on the summit with the 60-cm dish. Talked with Prof. Chiueh about the calibration. We got some ideas together, and how we could do an amplitude calibration, and a phase calibration, and how we could combine those together. Have no time to summarize that all up and communicate with John Payne. Will do hopefully early next week. John Payne's RAL photonic detector at 3mm waveguide band would be a good comparison to the coaxial device that we have. So it seems that coaxial device may work well. That would be a big money saver. Apart from that we just have to keep going on the test. We talked about the specs very briefly. Would like to do a few more tests before, and have something together that the test team can use there on the test mount to play with. That takes few weeks to finish it. May need Peter's or someone else help to put that all together. Hope by next week we have the first result on ML. For the V-type to WR10 transition, that does not exist on the market before. Wisewave technology developed something with Edward Tom. This improves very much the loss from the V-type to WR10. If you go from V to WR12 or WR15, and you have an E-probe in the waveguide, your back-short position is optimized for that wavelength, but it's not optimized for 3mm wavelength. The V-type connector is almost good up to 120 GHz. Edward designed one of those transitions with Wisewave, and moved the waveguide back-short in the right position. If you look at specs sheets, there is only 1dB insertion loss. I guess we have about 20dB insertion loss with the wrong transition. It all works but you have the roll-off, power loss, and reflection. RAL device is a waveguide photonic detector. The output of RAL photonic detector is the WR10 waveguide. But it's much more expensive.

Ferdinand – Got a working amplifier from summit. I fired everything up and I will show it to Kyle after this meeting. It's working and it has 45-dB dynamic range without any amplification. I should a report written soon. Like to talk to John Payne before sending anything official out. It looks very promising. We like to have receivers up to ML to do some further test. Some good news – I talked to Adward? Tom this morning, he has some good suggestion about the photo-diode to WR-10 transition. Actually he developed with Wisewave? a V-type connector to WR-10 transition, instead of going from V to WR-15, WR-15 to WR-10. This is one component. He did some test with that. With that we should have no problem up to 115 GHz. I'll look into the improvement on it. Maybe buy one or two V-to-WR10 transition from Wisewave.

C.T. – How wide is the bandwidth of the mixer? Ferdinand – I tuned from 91 to 98 GHz, and I got a response at both ends of frequency range. At 91 GHz, the response is strong like 1dB, at 98 GHz, it rolls off at the upper band, which I think it's the roll-off of my V-to-WR15 transition. It's a double-sideband mixer so I can not tell where I'm actually at because I don't inject the line. The actually bandwidth I can't tell. But with the new V-type to WR10 transition, as Tom told me, I am pretty confident that we can cover the whole band. There may be some roll-off. The test on AMiBA receiver will tell us. C.T. – How do you select between frequencies? by changing the LO frequency? Ferdinand – Yes. C.T. - Is it possible that you're picking up lower sideband around 60 GHz? Ferdinand – No, that is below the cut-off frequency of the WR10. At 91 GHz (LO) of double-sideband mixer, I would say I detect noise change at 87 GHz, and at 89 GHz LO, I would say that I detect something at 102 GHz. But the amount of upper-lower sideband ratio, I can't tell because it's a combination of both. Looking at this number, I am pretty confident to say that we cover with current noise diode from 80 up to 105 GHz. I am missing that measurement. We have to do it up in the summit. We also calculate the noise power that we inject - a rough guess, without knowing the noise temperature of mixer we have, is on the order of 500 to 1000 K. It looks like a 10,000 or 5,000 K mixer, and the amount of change we see is about 500 to 1000 K, way much than we need.

DC Power/ Distribution:

Enclosures:

Site:

Ferdinand – Louse-wee construction will pick up the updated blue prints this afternoon. Hopefully he will provide us some revised number soon.

Ferdinand – I was up at the site with 4,5 construction folks. We walked about the ML for few hours. They looked at every detail, asked lots of questions. I handed out copies of site design, electrical… They made very good comment on how to do these, and what kind of equipment they need. But I guess Tai-sei will come up around a million dollar quote on this one, which is way too much that we can't afford. Few days before I was up on the mountain with Mo-key and related construction company. However, he came up with un-reasonable numbers. Luke looks still the best one (for excavation). I had a quote based on the new version of drawing. Mo-key put in numbers for electrical. I contact thru Taisei another electrical company. They will give me a quote, Hopefully. I do not have time to contact the rental company again. (I was up at MK, and now the move is coming) Paul Ho – It looks to me there is enough information. There are lots of people who bid at very high price, either we live with one of these guys or to rent the equipment and our own operators. We should come to a decision and just do it. Set the budget to be around 50,000 – the budget for the excavation. Ferdinand - The site actually becomes a full-time occupation for one person. We need more help, maybe one more person to actually push on this much harder.

Dishes:

Ferdinand – I will go over with Kyle after this meeting. Identify everything that needs to be sent back to Taipei.

2-Element Prototype Testing:

Kyle – Yesterday we went to install LO back to the system. It looks like it go back to the original status that we took some fringe from the sun. We will check whether the detail has changed, but there's no obvious change. We tried to use 1st section to suppress the power below 2 GHz, but on the spectrum it doesn't roll off, maybe because IF originally has too much power below 2 GHz. Our plan now is to find out phase center and pointing center difference. We will do that tomorrow. Another thing we have done is that we have measured the production type correlator responsivity below 2 GHz. Below 2 GHz, we measured at 200 MHz difference, there's some oscillation. At very low frequency, there is almost no response, begins to rise and have a peak around 1 GHz, go down and rise again at about 1.8 GHz. This is maybe related to the 3 GHz peak in the measurement before. For the IF spectrum from Ming-Tang, it looks like new receiver will not have much power below 2 GHz. We probably don't have to worry too much about the responsivity below 2 GHz.

Ming-Tang – We have been doing the prototype test for quite sometime. Do we have a conclusion of issues of hardware that is going to be related to our future observation? The issue should be raised, things that should not happen on the production? Can anyone come up with a list about it?

Schedule: