

Minutes of weekly Plan meet of 9 Jul 2014 (follow-up of some pending topics from different areas) :

1. FE & OF related :

1.1 Detailed design doc -- pending for long : from 18 June & before (SSK/BAK) : follow-up on subsystems to be converted :

(i) OF Rx system to be completed (Satish Lokhande) : first version has been circulated -- some improvements and additions suggested (e.g. to give reason for 10 dB attn, to give comparison with expected values from SFA report; to mention some precautions and practical issues during assembly etc). Update version has now been circulated -- to discuss and decide follow-up action.

==> to cross-check if circulated or not -- SKL confirms that document is still pending with SSK.

(ii) OF Tx to be started. SSK was to look into this and get it started -- status update is required.

==> no clear update, but SKL thinks it will get done by end of this month.

==> Regular follow-up after 2 weeks.

1.2 Update on results from test range -- pending from 18 June & before (HRB/GSS/SSK) :

(i) phase centre tests for 250-500 CDF : to report on expt with 10 to 20 cm height change in 250-500 feed on one antenna to see how much change in sensitivity is seen.

Tests done on c6 with feed having shortened support legs of the cone (instead of shortened stool) -- comparison of results for 1180, 1280 (default) and 1380 : 1280 & 1380 show slightly better sensitivity at low freq (250-400) but at higher frequencies they match with 1180 (which is quite flat throughout freq range); agreed to try for 1480 to see if there is a monotonic behaviour; also compare with simulation results of GSS. See also 2.1(ii)(c) below. Consolidated results tend to show that the latest level at 1180 height does show a slightly better response; agreed to try with varying heights, using the adjustable stool arrangement similar to that used for the 550-900 feed.

==> no updates on this aspect.

(ii) calculation (based on reference paper) of the expected deflection & comparison with measurements to check if there is significant loss of sensitivity -- GSS to develop refined version more relevant for GMRT, and to see if further expts with 250-500 or 500-1000 feed are useful : cross check of results from code (0.3 dB for 0.5 lambda) wrt curves from Kildal paper was confirmed; for GMRT specific case of 250-500, to get efficiency factor as a function of freq over the band, after porting the data for the feed pattern -- after correcting error in the code, better result (9.9 dB vs 11.6 dB expected) was achieved; follow-up action included trying to use a realistic phase response (instead of 1.0) by reading data from a file etc. Results (reported on 19th Mar) showed better match between measured and expected deflections for the 250-500 system : 327 -- 12.8 dB vs 12.4 dB; 400 -- 12.8 dB vs 12.2 dB; 450 -- 12.4 dB vs 11.4 dB; 500 -- 11.2 dB vs 11.0 dB (some re-work needed for lower frequencies?); computed results (based on change in efficiency due to shift of phase centre) shows likely drop in sensitivity by about 1.4 dB from 250 to 500 -- this can now be folded into the net sensitivity / deflection curves made by GP. Present action items :

(a) GSS has sent a table at 5 MHz steps to GP, who is working on including it -- it appears that the table is with 4-5 points in the band (not clear if these are

measured or calculated values), GP has done interpolation and has got a curve that falls off with increasing frequency, but has been asked to keep the efficiency constant below 250 -- these need to be understood and resolved :

confirmed that the data points were from measurements; holding efficiency const below 320 MHz is deliberate; interpolation appears to have been done ok; final curves for 250-500 still appear to show a bit of mismatch at the edges of the band. high freq side could be due to absence / presence of 540 notch filter -- needs to be investigated a bit. To check if there is any further additional insight into this.

(b) GSS is working on plans to extend this to 550-900 system -- waiting for some of the lightning protection work to be completed.

(c) Meanwhile, comparison of computed results with measurements for good antennas at 250-500 (other than C6) with default height of 1280 and for C6 (with reduced height of 1080) show that computed values are actually better at high freq end for 1080 ht, which is different from the observations which are showing droop at high frq for 1080 (in conflict with first results reported in 2.1 above !) Agreed that GSS should continue with computed curves for different heights (with maybe 10 pts across the band) and compare to see where the max response is and how it falls off with height and freq. and HRB to produce one more round of measured values.

theoretical curve is there for 1180 to 1480 in 4 steps, and 1180 shows the best response; it is now extended to lower values like 1080 and 980, and 1180 is found to give the best response (note : this is for a particular value of ph centre based on range measurements); actual measurements show '1180' is the best among all locations tried so far (1080 & 980 measurements are yet to be carried out); it was suggested that perhaps simulations be carried out towards a few MUCH smaller values (say, 380 / 680) to ensure that expected performance does indeed degrade; or else the simulations would be under question...

==> email update from GSS on 1 Jul 2014 : from simulation results, estimated deflection vs frequency for the 250-500 feed shows that the response shows a peak in the range 580 to 780 mm, which is in sharp contrast to the experimental results which were carried out in the range 1080 to 1480 mm and showed optimum performance around 1280 mm -- this needs closer scrutiny of the simulation code and experimental results.

(iii) status of phase centre checking for ver1 550-900 CDF and CSIRO feeds -- waiting for results with new VVM set-up, after installation of new encoder + notch filter for mobile band :

(a) protection circuit for encoder and improved corrosion protection to be decided: Inteltek will get back on mechanical issues (such as proper alignment of shaft etc) and lightning protection (could also check with our servo team); grounding issues may also need to be checked; water proofing may be needed -- to discuss with HSK also. better grounding/isolation and proper alignment : to outline final plan of action.

Waiting for Inteltek to respond about mechanical alignment and lightning protection; to follow-up about grounding and water proofing, including in-house efforts by Bagde and Ajee. Surge protector was causing problems to encoder and this should checked again; plans for improved water proofing + new side covers (with HSK); Inteltek was working on the re-alignment of the encoder & technical proposal was due around 02 Jul 2014; commercial surge protector is un-usable as it clips signals at 5 volt (need upto 20 V); new in-house surge protector is needed.

(b) new results from tests of ver2 550-900 CDF show : reasonable E-H match at 610 and then degradation in shape and matching at 700 & 800; partially supported by older measurements from Dec 2013 (with slightly different set-up).

Action items : (b.i) compare simulation vs measurement at 610 -- HRB has circulated initial results and some comments had been given on the same; (b.ii) to repeat with more frequency steps and then noise source instead of CW signal

Also to complete the phase centre of ver1 550-900 CDF and CSIRO feeds...

To check latest results, including CW tests with 50 MHz step have that have been done.

Also : test range results for dipole v2a and v2b with cone v2 show that the

degradation of pattern with frequency is worse for v2a than with v2b.

radiation pattern measurements have been done with 50 MHz step & using CW signal;

comparison with simulation results is awaited.

==> email update from GSS of 1 Jul 2014 : test platform removed by HSK for water-proofing work; for surge protection, a board has to be wired in-house with 30V zener diodes.

==> Regular follow-up after 2 weeks.

1.3 Comparison of measured & expected sensitivity curves -- from 18 June (SSK/GP/HRB):

scheme for (re)calculation of expected values across the broad bands to be finalised

(and added to measured curves) : curves now being done with constant QH value and with

variation of T\_lna with freq incorporated; model for the main BPF has also been put

in : the deflection peak now matches fairly well across the band, but the curve rise

and fall at the edges of the band was not quite matching : this is resolved now;

follow-up action to be discussed :

(i) possibility to try it for Lband to be explored -- information gathered has been

started : feed pattern (efficiency) at 3 individual freqs is available, and

measurements are now available for 5-6 frequencies (?);

==> agreed to work with the 3 pt data and do simple interpolation and see what kind of curve is produced.

(ii) adding the efficiency factor in the code, as discussed in item 1.2 above : has

been done for 250-500 (see above for some unresolved issues there).

GBP and GSS to discuss together and see if it can be moved forward.

==> it appears that the discrepancy on the high freq side is not really significant

(seen only for a couple of antennas out of 10); discrepancy on LF side is still there

and may be due to holding efficiency factor constant below 250 ? to check by seeing

if present cut-off matches the BPF response.

==> Regular follow-up after 2 weeks.

1.4 Testing of 130-260 system -- from 25 June & before (HRB/GSS/SSK/NK)

(i) follow-up from present analysis results (by FE team, NK, as well as PMQC) :

results from new round of interferometric tests by NK now available -- sensitivity

of W1 reported to be significantly lower compared to that of C10 : to check if this

has been resolved now. The FE box for 'W1' was replaced; fresh observations can

now be taken.

==> W1 FE box was repaired and put back and also the dipole; antenna can be used now.

(ii) To check if third feed for 130-260 is ready to installation on antenna : no

matching wideband FE box is available; agreed to try and put it in place of the

235-610 feed in one antenna and use the existing 235 MHz band receiver for doing

the test -- FE team will come back with which antenna can be used (eg. S3) and also

check the new feed on the bench.

due to oversight, wrong sized hole (needed 90mm vs 80mm) implemented in the

'third feed' received; this has to be sent back to Pune workshop for correction;

The work on 3rd FE box expected to be completed by 1st week of July (04-Jul-14);

==> feed has come back after fixing the mechanical problem, but currently its

dipole has been used for W1 repair work ! hence, dipole problem has to be fixed

in order to proceed further ! to check with HRB.

==> Regular follow-up after 2 weeks.

1.5 Follow-up on 550-900 MHz band filters -- from 18 June & before (ANR/SSK) :

(i) comparison of product obtained from ICON with in-house effort and finalisation of plans : technical comparison of individual filter responses shows in-house design to be slightly better; but need to complete integrated unit for insertion loss etc before taking a final decision, including plans for mass production. Tests with integrated unit using new PCB show insertion loss increases to 3 dB now and some change in slope on higher side; to complete chassis and full integration and then repeat the tests and make detailed comparison with ICON results. Some results have been circulated : detailed comparison shows that performance is very similar except for some out of band bumps (at 30 dB level) and slightly slower roll-off ; tried with AC coupling capacitors (no improvement); new board fabricated which after retuning gave much better roll-off; PCB fabrication for this being explored with 2 parties (Argus & Shogini); meanwhile, some realistic cost estimate for in-house production vs ICON design have been done (it appears that getting things done with ICON will be much more expensive) -- to refine this process and reach a conclusion for mass production. Sample PCBs from Argus and Shogini have come -- first test results (without chassis) show ~ 5 MHz shift in 2 sub-bands but better roll-off : to put in the chassis and then confirm the results; to discuss detailed comparison of final in-house product (from Argus and Shogini) and ICON product and decide the course of action.

Final plots show same IL but the higher sub-bands have slightly shifted centre and widths which cross the main BPF upper cut-off; hence, agreed to retune the filter in-house and get modified versions done with Shogini quickly and then take a final decision -- new PCBs should have been tested by now, after resolving the mechanical issues : need status update.

==> new PCB from Shogini works all-right; complete system with chassis is available for one poln; to assemble second poln unit with existing older PCB + new chassis; target to put on C10 FE box for testing with wideband feed. Later, this design will be integrated into the new FE box for 550-900. To check status after 2 weeks.

1.6 Total power detector for FE & common boxes -- from 18 June & earlier (GP/ANR/SSK):

follow-up on plans for final scheme : 20 dB coupler for CB and 10 dB coupler for FE (at final output) with common 20 dB amplifier (Galli-52 instead of Sirenza); feed-thru vs connectorised arrangement also resolved; after lab tests (including monitoring via MCM channel) in FE and common box, sample units installed in C4 FE box and E2 common box. Current action items being followed :

(i) data from 2 units installed on E2 (in common box) shows basic things working ok: more sophisticated tests with on and off source tracking to be done (alongwith digital backend recording, if possible) -- first round of testing showed 11 dB deflection (for 12.4 dB expected), flat-top on-source waveform to be understood; new tests with noise on-off to be reported upon (also if weaker source like Crab has been tried); to try and get some fresh data and see if E2 can be used for night time tests. also to check what is the rms of noise vs least count of adc; data from weak astronomical target (Crab) had been collected (for 6 antennas), and was being analysed.

==> currently installed on E2 and C13; some test data has been taken this week; there is some doubt about whether the script for monitoring works only in subar4 or for all sub-arrays -- GP to check with JPK and resolve, and check the data.

(ii) plans for building 70 units for CB : all PCBs and chassis are now in hand; need to decide plan and schedule for mass production and installation on upgraded

antennas; agreed to work out an algorithm such that new units are made ready to match the typical / expected consumption rate of going into boxes; assembly of 5 sample new units gave some problems : old vs new flux (resolved); 10 units were under assembly for integration on future Common Boxes;  
==> 10 units assembled and tested; 4 have been consumed in the lab in spare common box units; 6 are available.

(iii) for FE version : 2 units had been assembled and found to give identical performance as per specs; problem of feed-thru vs connector was resolved in favour of feed-thru (as per original chassis design); all testing completed in the lab.

(a) first units put on C4 in original 250-500 FE box -- showed random fluctuations, not correlated between the two poln channels; was identified as due to wrong identification of monitoring channel and was fixed; to check if C4 results look ok now.

(b) meanwhile next units put on C13 -- one channel appears to be working fine and data is available but only from one test run, showing some problems in the form of dips; agreed to bring down the box from C13 and test thoroughly in the lab; also, to check if C13 Common box monitors are working or not; a wiring mistake was found, which has been fixed; final box (after correction for locations of filters) should have gone back on C13 -- need status update on this.

(c) Also, new units being assembled (for batch of 20) are showing unexpected change in detector voltage upon connecting input cable etc. -- this was due to the grounding problem which was resolved; manual correction done for 10 units (5 antennas, of which 2 are on antenna and 1 more is getting ready); final PCB has to be modified for the mass production -- this modification has been completed; to decide future course of action.

==> total of 7 antennas have FE power monitor now; only 4 units of the total assembled are available as spare (one of them is malfunctioning).

(d) RC time constant : some feedback from vendor, but not fully satisfactory; no further work done in the lab so far; existing ckt has 10k series resistor (as per data sheet). To discuss results from the lab testing to see item can be concluded.

Last update : measurements done in the lab show some kind of a curve with rms changing inversely with increasing time constant, but the results are not repeatable from day to day, indicating some pick-up in the circuit or the measurement tool; needs to be checked carefully.

==> for (a) separate test for C4 not done -- will happen in the bulk testing; C13 now has updated FE and common box with correct wiring connections, data has been taken but not yet confirmed to be working ok; 5 more antennas have FE power monitoring but we are not sure about the wiring for these (except maybe E2). analysis of test data taken this will show some results. for (d) no new updates -- need to discuss separately...

(iv) status of ITR, which was ongoing, but was halted pending above problems.

==> still pending.

==> Regular follow-up on all issues after 2 weeks.

1.7 Spares for L-band feeds -- from 18 June & before (SSK/ANR) : we have 32 feeds, 2 not working (1 dismantled for making drawings of new feed); all were device failures; now some LNAs have been successfully assembled by Gopi and C3,W1,E2 & E5 have been fitted with these and found working ok. Also, one spare feed has been assembled and installed on W1 and working fine. To update about status of this feed and see if this matter can be closed.

(i) Spares : Agreed to have at least 5 LNAs ready and available as spares : 10 nos

of LNAs had been assembled, tuned and made ready (done); new order for amplifier device needed to make sure enough spares available -- indent had been raised; meanwhile, the 10 nos have been used up (!); also the assembled devices may be having some possible problem with bias point, which needs to be checked. Need status update on these items.

While exploring reason for 'lower deflection', it was found that LNA is drawing unusually lower supply current, even when 'gain' & 'T\_noise' are normal; LNA is being investigated (may need re-tuning?)

==> indent for new devices has been placed by Gopi, but not sure about order and delivery; Gopi has been trying retuning of the newly wired units to understand the low deflection problem (may be related to bias point issues)...

(ii) check status of alternate LNA designs : to try and see if design used for 550-900 can be modified for 1-2 GHz use ; to also check the design done by Abhay Kulkarni -- ANR now looking into this design to see if it can be improved for our needs; design files had been obtained and were being checked by ANR. Status?

==> GP and ANR looking into it : model files to be converted to match simulator used by us; also ultralam2000 was used and that is not available in the market now.

(iii) finalisation of plans for having total of 8 working spare feeds -- from mechanical to electronics :

30 antennas have working Lband feeds; 31st is being assembled back after being dismantled for making drawing -- completed and installed on W1; 32nd is there in Pune wshop and can be shifted back; 3 new feeds were made in 1st round of work; all 3 are in Pune wshop and have been tested for RL with probes; but 2 of them have wrong size of horn and needs to be replaced; all 3 need new covers as old ones were not suitable (may be done in workshop, but not decided yet); in addition, 3 more feeds from Akvira have come : OMT + horn + cover ; also 2 horns have come and can be fitted in the 2 older feeds. Hence, total of 8 spares can become available.

Following issues need to be resolved:

(a) Weight of 3 latest feeds is 18 kg more than earlier feeds -- to check which change in design aspect has caused this increase and whether it can be rolled back. confirmed that the weight increase is 11 kg (72 vs 61 kg) -- will need to live with this difference; matter may be closed now?

==> confirmed that new wt is 72 kg (instead of 61 kg of old one) and matter can be closed.

#31 is working as a usable spare (already in the maintenance cycle); agreed that #32 can now be assembled back (by mech group) and put into service after putting the electronics;

(b) shortfall in electronics for these to be checked and addressed : to confirm that all electronics needed for 4 more spares is available -- this is confirmed and can now be moved to plans for scheduling the population of the spares (see below).

(c) plans for assembling and making completely working feeds to be discussed; to confirm that 3 feeds after powder coating have come to GMRT; FE can attempt to target making ready one feed per month.

==> confirmed that all the electronics is there (except for the LNA retuning problem) also new issue is about mating of probe where there appears to be a mechanical issue (press fit vs threading) ? need to check between SSK and HSK...

==> Regular follow-up on all aspects after 2 weeks.

1.8 Testing of LBand wideband systems on 30 antennas -- from 25 June (PAR/SSK/SN) : (to maintain a proper log of action taken on individual antennas during these tests and debugging activities) :

Main tasks / issues are as follows:

(i) stability of power levels -- can be checked with existing data (also can this be coupled with regular program for monitoring in the control room?); some new data had also been taken in June and results had been summarised : C08 & W01 CH-2??shows ripples at the OF RX output; S04 and E02 show RFI type lines; E06 shows RFI lines in CH1; need status update on follow-up on these matters.

==> new data from 1 July for 14 antennas looks quite decent; two RFI lines 10870-80 likely to be airport radar, other ~ 1280 likely to be due to GPS. C2 has new OF system without attenuation control hence data is not good.

(ii) large (~ 14-18 dB) slope across 400 MHz (e.g. C13, W1, S2...) to be checked and resolved -- can this be checked with the last set of data that has been taken?

==> new data above does not show any major slope or ripple for the 14 antennas.

(iii) ripples and funny bandshapes to be characterised and compared with antenna base measurements to try and identify source of problem and fix it.

==> see above...

(iv) to check if new data include on-off plots (at least for full-band setting for now), and use the same to characterise antenna sensitivity.

==> on-off plots are being produced.

==> To follow-up after 2 weeks.

1.9 Characterisation of recommended attenuator settings for different bands -- from 18 June (SSK) :

(i) values had been given for Lband, 250-500, existing 610; only 130-260 / existing 150 was pending -- to check status of this.

==> some tests are still being done to verify the values before releasing (for 150 / 130-260 systems).

(ii) also, need a discussion if values given to control room are optimal (e.g. 7,7 for Lband sub-bands) -- from tests done by YG and DVL, this appears to be too large?

==> first, to confirm if it 10,10 and 4,4 for full-band and sub-band; second, to redo tests again and confirm present status and then decide about discussion on this topic.

(iii) FE team to test the power levels at OF o/p and cross-check against SFA values : work is still ongoing;

==> for 250-500, this has been done and results incorporated in the updated SFA report; for Lband the exercise is ongoing.

(iv) also, at 1390 some antennas have an extra 10 dB gain stage; to confirm if only 2 antennas remaining to be done;

==> appears that there are only 2-3 more antennas; one of them is S6 which is being done now; 1 or 2 others may be there...

==> Regular follow-up after 2 weeks.

1.10 Releasing existing 610 MHz system as part of the wideband upgrade -- from 18 June (SSK/ANR) : Preliminary tests of existing 610 feed through the wideband path show that ~ 100 MHz usable bandwidth may be possible as part of phase-I uGMRT.

Agreed that only RF filter needs to be changed to new 550-900 BPF (alongwith mobile band and TV notch filters) -- two sample units had been made ready and were put in FE ch1 of C8 & C12; initial RF deflection tests look encouraging : extra 10 MHz on lower side and 20 MHz on upper side, leading to a total BW of ~ 120 MHz (~ 565 to ~ 690 MHz) + some lower level response (5 dB down) upto 780 MHz; action items :

(i) to carry out 2nd round of interferometric tests to characterise the performance;

YG & DVL to report on this. data taken just before MTAC was corrupted by ionospheric scintillations; new data taken one week ago showed problem of low correlations in

GWB; waiting for new, reliable data set to be taken; meanwhile, 3 more boxes with broader filters + notches (x2 channels each) have been prepared and put on C4, S2 & E2; to check current status and decide follow-up.

==> to summarise, 2 antennas (C8 & C12) in one channel; 3 antennas (C4, S2, E2 in both channels); to check (a) availability of filters (b) manpower for doing the job and (c) requirement from users for improved filtering requirements and then decide future course of action. Follow-up after 2 weeks.

1.11 Status of new CSIRO feeds : from 4 June & before (ANR/JNC/HSK) : to report on performance of the newly manufactured feeds -- new results are slightly better compared to ver2 (casting) but not as good as the original ver 1 (machined by Godrej) -- to decide follow-up action.

recently it has been discovered that a major change in the design /drawing required to maintain alignment between different sections [using guide-pins etc]; how to proceed further needs serious discussion about alternate options.

==> HSK to try some new ideas to see if a solution can be found e.g. liquid Al layer to cover ?? To check status after 2 weeks.

1.12 New filters for Lband -- from 21 May & before (ANR/SSK) : Sample Lband full-band BPF had been designed -- has no slope with freq and better insertion loss, and maybe a better option than the existing main BPF; similarly, prototype design of new sub-band filters (with better insertion loss) has also been done.

(i) Latest results show that the LF cut-off for the new filters may be much sharper than for existing one -- implication of this needs to be discussed.

==>

(ii) Should we go ahead with the main BPF as a case by case replacement job -- PCBs (stripline) does not need much work for assembly -- can be given for manufacture; new chassis will be needed; population can be done as and when a FE box comes down. PCB order for 70 nos can be sent using existing eps10 board; both pols can be combined in one chassis requiring 35 nos only -- drawing to be finalised for rail-type chassis; to check if existing chassis can be re-used;

==>

(iii) : sub-band filters can be taken up at even lower priority later on.

Matter was presented in Friday meeting at NCRA on 9th May & follow-up action agreed : FE team to generate a formal note describing the new proposed BPF (at Lband FE) + LPF (at antenna base) combination for the final scheme, clearly showing the difference wrt existing system, for final approval via GSG. FE team is working on the note and this is ready and circulated -- to take up for discussion and finalise next step.

==> no direct updates; YG to discuss the note with ANR and follow-up. To check status after 2 weeks.

1.13 Filters at different stages of receiver -- from 18 June, 28 May & before (SSK) :

(i) scheme for filters at antenna base / rx room : 3 type of ckts being designed using the new device : 2, 4, 8 way switches with different possible applications :

(a) notch

filter bank switching in rx room (b) filter bank switching inside FE box (c) rcvr room monitoring (requires higher isolation for highest freq of operation and hence new design?); ckt for 2:1 and 4:1 versions assembled & tested -- 25 dB isolation achieved (changes from 25 to 17 dB with frequency for 8:1 switch); action items:

(a) integrated units for 550-900 with 4 sub-band filters with integration of RFCM switch and compare against ICON units -- see item 1.X above;

(b) for 250-500, agreed to go ahead with the discrete design for now (which is now

fully tested and ready for integration into new FE box); work on integrated PCB has also started -- looks like it may have switch separate from integrated filter PCB; integrated design now looking at 2 PCBs for 4 sub-bands in one chassis + switch PCB in separate chassis -- this design is done and prototype PCB given for manufacture (to Argus) -- any results available? ; need to check about space in rx room for housing these units; availability of filters for testing the prototype set-up : only mobile filter is missing, rest are available; to start plans for testing; switch isolation problem for monitoring of OF o/p -- now getting improved rejection : better than 25 dB below 1 GHz; goes down to 16 dB above 1 GHz; to discuss the above matters against the design that has been circulated.

==> this item needs to be rewritten after proper rationalisation; current update is that team is close to testing the prototype with all the required filters in place with 8:1 switch; results may be available in a week or so; can have a proper review of what has been implemented and how well it is working, after 2 weeks.

(ii) to follow-up on refinements of the scheme for each FE box : update on 250-500 system (first to be done), alongwith LPF from 1750 and above for HI band. sample PCB for 1750 LPF had come and was to be tested + other elements were to be assembled to produce the first unit for 250-500 system : 2 versions (1650 & 1750 MHz cut-off) assembled and tested; it was agreed that 1650 cut-off will be better (in combination with 1800 notch-filter) -- see also the other agenda item.

Current action items :

(a) real-life testing of prototype unit of 1800 notch filter has been done (for the case of full band selection of LBand BPF) : results show that LPF gets rid of large part of the 1800 mobile, but not all of it; with notch filter, almost all of it is gone. Two options are possible : notch filter at rx room in the main signal path -- to test its low frequency response for flatness; LPF always in the path with notch filter switched in when needed. To evaluate the 2 options and decide. Ankur has sent the plot showing LF response showing 0.5 dB change in loss over frequency -- so notch filter permanently in the path may be acceptable option; agreed to use 1650 LPF ONLY at antenna base as the final solution. matter can be closed?

(b) then install in antenna path for field tests -- to be combined with testing of switched filter bank at rx room.

Agreed to decouple these two and put the LPF in 2 antennas ch 1 and inform the users -- can be put at antenna base for 2 antennas and take out when needed for testing of switched filter bank ? Need status update on this.

==> agreed to postpone this item and wait for the switched filter bank testing to be completed and then take stock of the situation.

(iii) FE team to make a full list of various filters put in various signal paths as part of upgrade (including for testing) -- this can be put up on the upgrade info page maintained by control room. This is somewhat urgent. To confirm the status (and methodology used) and decide if this can be closed.

==> agreed that formal email sent by FE team to control room is sufficient and that Nilesh can take action based on it to update the webpage (Nayak to confirm the same with Nilesh).

==> Regular follow-up on different aspects after 2 weeks.

1.14 Finalisation of PCBs and chassis for various notch filters -- from 18 Jun (SSK/ANR):

(i) we have 100 PCBs that can work for either 175, 540 or satellite filter; of these 12 nos are wired up for 540 filter; 2 nos used for satellite filter; will need a total of at least 120 nos of 540 filters for all GMRT (60 each for 2 bands); order

for new components for 120 nos of 540 filter need to be checked; available no of PCBs have been reduced to about 60 now -- need to order more of this PCB. 11 more PCBs received; final numbers needed to be decided (same PCB useful for many units).

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(ii) 80 nos of chassis are available; remaining 20-40 nos to be made (likely to be outsourced; 100 nos chassis ordered for 610 as well as 250-500 (with workshop) -- these were put on hold as lightweight, smaller, rail chassis were being looked into : 20 nos have been asked for; 80 nos of older chassis may be sufficient for 610 system; hence, no need to order more chassis for 610 related work; 100 chassis delivered by mechanical group; to check current status and decide next steps.

==>

(iii) for mobile filter, 60 nos + 10% spare are needed; only 2 PCBs are available; about 50-60 chassis are available; agreed that 10 PCBs for 5 antennas can be ordered for this, using one board of substrate material (which is also needed for other PCBs), using one board (remaining PCBs can be done later on) -- need status update on this; more epsilon10 substrate material needs to be ordered -- has this been done?; 2 PCBs had been ordered (with 850 MHz lower cut-off) and have come -- to report test results from these. 8 units which will fit on one board had been ordered; and 40 boards are available in stock -- hence full set for 30 antennas can be ordered for the mobile notch filter (including spares).

==>

==> FE team to produce a spreadsheet giving details of all the notch filters presently being used, alongwith the type of PCB, total # required, total # available (and where used at present), and plans for procurement; and similar columns for chassis. To check status after 2 weeks.

## 2. RFI related matters :

2.1 RFI tests of ethernet switches for antenna base -- from 18 June & earlier (SN/BAK/SSK): Testing the available switches for RFI & plans for design of RFI box for ethernet switches :

(i) procurement & testing of switches : sample units from Cisco, HP, Dlink and DELL had come and have been tested for RFI -- conclusion from final report is that D-link is much better than others (but it is 2x more expensive than next best option of CISCO by 20K); also, use of shielded CAT5 cable provides significant improvement; agreed to wait till RFI enclosure is ready and do full test with CAT5 for both D-link and CISCO and take a final decision; meanwhile BE group can borrow the units for testing in GAB system. first version of RFI enclosure has been received on 10th Mar, and is under integration in the lab; 2 nos RFI enclosures completed with mouting of filtered and shielded adapters, eth cables, AC pwr line filter, shielding for fan etc; all the 4 available switches tested one by one in these enclosures (on 20-21 March) and draft report was discussed : first results look very good; isolation is about 70 to 35 dB from 100 to 1400 MHz; further, improvement is seen with switch + shielded CAT5 only (without box) and this is best for CISCO -- this could be the final option for all use at GMRT? To be confirmed after the final report is out. As per PAR, same switch that works well for both situations is the D-link and that CISCO will not work well for just CAT5 shielding -- this point needs to be resolved with PAR separately.

==> for antenna base, small discussion is needed between YG and PAR to clear whether D-link is the best option.

for receiver room, option being tried was to check reduction in RFI of 8-port switch when used with CAT5 cable -- test results show not much improvement; the RFI is not very strong, but there are 2 discrete lines (200 & 250 MHz) which are quite strong; to investigate whether a small shielded enclosure can be built for this switch and will fit into the space available.

(ii) design of RFI enclosure (see item 5.6 below)

was waiting for final report and also final integrated test of switch + PC + Rabbit card + media converter ++ : this has come now? to check if this item can be closed from RFI section and moved completely to Ops section, including plans for follow-up action.

==> Ops group has started on the work requisition for this box (as well as the box for the Rabbit card) ; agreed that the default box for Rabbit can be with the provision for SPI connector which can be "covered" for cases where it is not used; one last round of confirmation with Rajesh Lolap is needed before finalising the drawings; may need to change the location of the fan and drawing to be finalised after this is sorted out. order quantity : 70 nos for Rabbit enclosure (takes care of antenna base requirements, not sure about GAB requirements); and 35 nos for switch enclosure (for antenna base requirements).

==> To have regular follow-up after 2 weeks; meanwhile, to rationalise the items.

2.2 Follow-up on UPS RFI -- from 18 June & earlier (SSK/PAR/RVS) :

(i) procurement of units from Miltech (RVS) : both 1 and 3 kVA units are under discussion; 1 kVA unit not found meeting RFI requirements and rejected; Miltech had offered improved version for 3 kVA unit -- order has been placed for the same long time ago, but the unit had not arrived -- order may need to be canceled?

==> confirmed that both are canceled; Miltech would like a copy of the RFI report, which can be given to them (for the stand alone report on Miltech units).

(ii) UPS units from Ador : 2 nos of 3 kVA was purchased, tested for RFI & cleared; units are in use in C9 and C10. RFI team has added comparative statements at the end of the 2nd report quantifying the repeatability; bigger units : agreed to order 2 nos of 4.5 kVA units with Ador, with option of 2 single phase o/p with different isolation transformers (3 + 1.5 kVA); units were delivered but failed the RFI tests -- lots of discrete lines seen; Ador had taken the units back for modifications -- need an update on the status of these : was waiting for a battery to be added. modified unit from Ador is still awaited?

==> modified version of Ador 4.5 kVA was tested and preliminary results are quite good;

(iii) to finalise plans for going with 3 kVA unit from Ador as the final choice : can we order 10 nos of these as a starting option?

==> RVS is waiting for the budgetary quote from the party.

2.3 Discussion relating to Industrial RFI survey -- from 18 June & before (PAR/SSK) : revised docs (from 2009 and 2012 discussions) had been circulated by RFI group and were discussed in 5 June 2013 meeting (is the document too exhaustive?) : follow-up actions identified :

(i) a form had been prepared for use in the survey and had been discussed in detail and agreed that it is suitable for use; need to finalise plans for entering existing data into this form : one possible candidate (trainee) had been identified and work was ongoing -- 70% was completed; to check latest status -- whether some of the old data can be recovered and entered?

==> this activity will now be superseded with one trying to make the database of equipment and NOC record for the existing industries found in the survey.

(ii) plans for starting survey asap with 2 teams (with extra manpower), lasting for one month, using SoI maps, form etc, to be finalised : 1st week of April was agreed as the start date -- check if this is confirmed by both sides; vehicle requirement (2 nos) to be discussed with admin, as well as accommodation request of DIC members; one more engineer needed for the job has been found? To check which of the above are finalised and can be closed; date was deferred to 1st week of May due to elections; start date further pushed till end of elections; to aim to complete in 2 weeks, but may stretch longer. Finally, useful meeting with DIC happened; survey now scheduled to start on 9th June and complete in 5 days with additional manpower from DIC office. 4 persons from GMRT team will be needed; the survey will give data which will be useful to pinpoint likely hotbeds of RFI in the industrial areas in addition to finding those without NOC.

Survey planned during 22-27 June 2014 week -- to check status of this.

==> survey done during 23-27 June with 4 teams; covered Ambegaon and Junnar talukas ~ 40-50 villages in each; ~ 40-80 working industrial units (large number are closed down or never existed!); action items : to cross-check the list against the ones which have NOC (nothing much can be done for those operating without NOC, except to add to our database and inform them about informing us for changes); single phase welding machines in use, which are hard to account for -- to check with DIC for advice about it; based on the survey results, identify areas where one would like to go and quantify the level of RFI.

==> Regular follow-up after 2 weeks.

### 3. Operations :

#### 3.1 Identification of appropriate ethernet switches for antenna base (and GAB)

-- from 18 June & before (SN/PAR/BAK) : Ops group to work with Comp team and RFI group to plan for trying some of the 16/24 port switches for antenna base use :

(i) tests show that the shielded enclosure appears to be working well (see item 2.1) RFI team to start handing over the information and material to Ops Group; for the switch itself one round of discussion between PAR and YG and then a final call on the matter; meanwhile, can initiate the discussion between RFI and Ops group (with mech group as needed) to initiate the hand-over.

==> see earlier noting related to this.

(ii) plans for BE teams need for switches in GAB system (in receiver room) :

agreed to use 8-port switches for now though they are worse in RFI than the 24 port ones tested for antenna base use, and take a final decision later on -- agreed that all groups can use the same layer-2 switch finally; same for the SMPS power supply -- 2 nos ok for now; need some discussion on this matter, for long-term planning : to work out the max data rate on this switch network (for looking into the communication failure problem); other possible reasons (including socket error checking) discussed, changing to star connectivity from daisy chaining -- matter under investigation; to try the new 24-port switch (maybe CISCO unit) after MTAC. Switch testing by BE group can start after MTAC as per earlier agreement; other items may need a more detailed discussion -- to be done this week.

RFI team to be asked to refresh about relative RFI performance of 8 port and 24 port switch; BE team to take CISCO unit and give it a try as replacement of one 8 port switch and think about replacement of 3 switches.

Original RFI test report of 8 port switch has been circulated -- acceptable or not?

agreed to compare with the case when shielded CAT5 cables are used for the same test

and see if the levels are acceptable -- to ask RFI group to carry out this test.  
==> RFI test is done (see notings in the earlier action item and transcribe as needed)

==> Regular follow-up after 2 weeks; meanwhile, agenda items here (and related) be rationalised.

3.2 New, improved Miltech PC -- from 2 July and earlier (CPK/SN/PAR) :  
Two units of Miltech PC with two changes (more screws on panels + panel mount pwrline filters instead of chassis mount) were under test : conclusion was that PC ok from all aspects. Pending action items :

(i) one earlier i3 unit had failed -- was checked by Sumit : m'board OK; may be in some peripheral connector -- maybe patch cable problem? to check status.

==> testing both ends of the cable to check; PC appears to be ok.

(ii) agreed to initiate the purchase of 10 nos of the final version above -- to check if the indent has been raised.

==> agreed that 10 nos of this machine can be ordered now.

==> Regular follow-up after 2 weeks.

3.3 Interfacing of FE with new M&C system -- from 18 June : Naresh + Charu & Sougata + Rodrigues were working on this; will have full set-up of FE + Common box, but will start with M&C of common box using Rabbit card : initial h'ware connectivity may not be too much work as 32 lines have to be mapped to 16 lines on interface card; low level software for bit pattern setting may be enough to demonstrate basic connectivity; after that, packaging will be the issue.

(i) appears that the basic set-up is now working, and tested (by Rodrigues + others); basic difficulty of communicating via Rabbit to FE appears to have been resolved with demo of some commands by Rodrigues et al; to check if all the available commands can be exercised; 2-3 basic control commands have been tested; monitoring commands (6-7 FE + CB monitors need to be tested; need status update on this.

==> no updates on further tests; a report has been produced by Rodrigues -- can be circulated more widely to all the team members for information and feedback; need to decide future course of action.

(ii) to decide the set of high level commands for FE system; for many of these Naresh already has the placeholder to accept the commands and action to be taken has to be programmed, in Rabbit software -- this is to be initiated.

Code for existing commands of common box have been done; can check for new commands in upgraded system and then move to FE box.

==> no clear update on this.

==> To follow-up after 2 weeks.

3.4 Planning for proper space utilisation for new equipment at antenna base -- from 11 Jun & before (SN/CPK/RVS) : long-term plans for proper utilisation of the space at antenna base. Follow-up on 14 Aug discussion on first report : 2nd report has been generated and detailed discussion took place on 5 Feb.

Summary and action items are as follows :

(a) Doing a careful re-analysis of the total load (alongwith individual team members) and separating peak load (e.g. switch on load) from sustained load etc in table 2.

(b) Agreed that peak load requirement (e.g. in-rush current) can be balanced out by synchronised delayed switching on of different units -- this is already implemented to some extent at present. Some discussion about current load of ABR system --

agreed that it could be capped at 4 A (though present supplies are drawing only 0.7 A -- may indicate leaky caps which should be checked); similarly, OFC + FE supply needs to be checked (0.5 vs 3) and new MCM system (PC + Rabbit) ; did a quick run through the other numbers and came up with a tentative suggestion that 5.1 A can go up to 8 A (and hence 10 A is a safe limit) -- this is 2.3 kVA and hence it means 3 kVA is more than enough; to confirm with individual groups and come back.

(c) New power consumption estimate to be made & final UPS capacity to be matched to it.

(d) Diagrams showing rack utilisation to be rechecked for consistency (including some adjustments for antenna to antenna variations?)

(e) Existing servo FPS units can be left where they are; if isolation transformer can be moved out from the rack, then space in that common rack is enough for all growth plans of FE and OF systems; this leaves some empty space in ABR rack bottom that can be utilised for further growth of telemetry system; all new servo growth to be accommodated in the servo racks (or in-situ replacement of existing units); with this, there should not be a crunch for space, but a careful relook in the updated report will help clarify the matter.

(f) the new UPS can have the isolation transformer(s) integrated into it, without increasing its footprint (only height may go up); UPS can be located in the space between the ABR and servo racks -- this has been done in one antenna with the new UPS and can be checked for suitability; final configuration of the UPS can be decided once the load calculations have been refined. also, to check space occupancy of new BLDC servo system vis-a-vis old one.

(g) extraneous items in the surrounding of the racks (electrical fittings etc) can be relocated, as far as possible, to make it convenient for people visiting for work.

(h) report to be updated for relevant items from (a) to (g) above.

Some of the relevant, action related items discussed (vis-a-vis the updated report that has been circulated to all GCs, alongwith a request to help with load tests and measurements) -- to follow-up on action from these.

fresh inputs from measurement of in-rush currents : going typically upto 3 to 5 Amps total for ABR; hence, 1 kVA is more than enough for ABR racks; servo side is 2 Amps; taking a max of 10 Amps for switch-on is ok, including servo; hence, 3 kVA should be fine. RVS suggests that instead of 2 isolation transformers, it may be better to have one (for ABR electronics) and one direct connection to servo. RVS to produce a suggested wiring diagram for these connections.

Space utilisation : refined diagram is being prepared and it appears that the space constraints are manageable; to have an updated report on this to be circulated.

Work ongoing to update the table of loads, and to update the space utilisation diagram, and a proposed wiring diagram by RVS (alongwith SKB).

Current action items :

(i) Final max load estimate to be confirmed to see if 3 kVA UPS can be finalised : generally agreed that this is ok, though still some doubts linger -- to check and close in next 2 weeks : can this be closed now?

(ii) RVS + SKB have produced an updated wiring diagram : discussed in some detail; agreed that the scheme of keeping 3 kVA isolation in ABR arm with option for servo to be on this or not, is OK scheme; issue related to sharing of main star-delta transformer at input to shell to be resolved in discussion in SMEC.

(iii) Updated report showing the updated space utilisation plans to be made ready : agreed that items (e) and (f) should be sufficient to take care of space requirements; new diagram without isolation transformer in the racks and proposing

utilisation of the space can be added and report to be circulated -- this has been done and a final meeting to clear all the aspects needs to happen today.

New, updated report has been produced. This item can now be taken to the logical conclusion : net outcomes can be summarised and follow-up action to be finalised.

==> list of actionable items :

- (i) ordering of 10 nos of UPS
- (ii) a closer to final wiring diagram for servo + ABR is needed
- (iii) minor relocation of items on the wall of the shell
- (iv) making one antenna as a prototype or model where all the configurations are made as per the recommendations : C8 or C11 -- to be identified.

==> To arrange regular follow-up after 2 weeks; meanwhile to rewrite this agenda item after proper rationalisation.

#### 4. Back-ends :

##### 4.1 Documentations :

(i) Detailed design doc -- pending for long : from 18 June & before (BAK) : analog back-end was being done by Hande : 2nd version had been circulated in April. Next level of document going down to chassis level is to be made ready -- to check status of this.

==> no clear item; not discussed.

(ii) ITRs for analog back-end systems and digital systems to be taken up : analog back-end : Sandeep and Navnath to look into; pkt corr first level has been done and circulated -- waiting for feedback; GWB first version (by Reddy + Irappa) has also been circulated; authors are working on a second version with additions -- this should have been circulated by now; need to discuss contents and decide follow-up action. Modified version has been circulated; to discuss and finalise next step.

==> item not discussed.

==> to take up for followup after 2 weeks.

4.2 GPU corr (GWB-II) : release of 4 node, 8 input, 200/250/400 MHz version -- from 2 July & before (SHR/SSK/BAK) : (NOTE : GWB-I is existing released system !) : agreed to make 4 T7500 nodes with C2050/C2075 Fermi GPUs + remaining 4 T7500 nodes as host machines (to take care that these are the ones that transient pipeline uses presently so that sharing is possible); this should have ALL basic modes : total intensity and full polar IFR modes; IA + PA BFR modes with process\_psr pipeline attached; full GUI support; to come up in trial code section without affecting the presently released mode.

(i) testing of GWB-II interferometry mode with different OF attenuation values to check variation of correlation coefficient -- DVL + YG to provide an update. It looks like working ok now, with the sig gen LO. To confirm if working ok with the new, modified synthesiser mode.

==> to summarise when DVL is back.

(ii) beam modes in GWB II : new version with separate kernel (outside phase shift kernel) for beam formation has been developed (compute load is 7% increase on 2050 GPU); IA mode tested; PA mode completed and tested; phasing implemented & tested; 610 MHz with 200 MHz LPF -- to test with different setting in pmon to check S/N effects; process\_psr pipeline has been completed and released; first version of SOP has been released; pending action items :

(a) GUI changes for flexible phasing to be checked with SHR & NSR -- YG and others to test and report back.

==> to check and see if it can be closed.

(b) beam mode still working with fixed channel and time factors -- need to be made general purpose; this should have been completed by now.

==> no new update.

(c) float to int conversion logic has been implemented for scaling but needs a cross-check -- user controlled scaling factor has been provided; updated SOP also provided; to check if this topic can be closed.

==> from BE team this is completed; need user side check to be done.

(d) availability of psr\_mon on nodes 53 and 54 for recorded data is there; for shm attach needs some work; this is still pending -- to be done along with (ii) above.

==> no new update.

(e) header for beam mode data : to be taken up in the present situation and incorporated alongwith the PA mode; to discuss further to see if it should be introduced at the time when sub-array is being tested -- pending.

==> no new update -- need a discussion.

(iii) SOP to be made ready : NSR to be asked to update SOP to include PA mode; also to check the directory structure etc being used by beam mode data acquisition systems; some of the suggested changes can be done more easily and will happen shortly; others may be done at the time of GWB-III set-up; to check if updated SOP has been released and is found acceptable for present. Mains power off and on procedure for entire GWB to be added and user feedback to be taken -- updated version has been circulated; to check if this topic can be closed.

==> from the team the updated is pretty much complete; user feedback is awaited.

(iv) spikes in channels that are power of 2 : this problem needs to be discussed, understood and fixed. SHR has started looking at it, but no clear clues yet. may help with test using digital noise source; effect is seen in packetised corr also; now checking offline with raw voltage data acquired through Roach board, and with digital noise generated on Roach board; KDB has digital noise source + GWB spectra now running and some of the issues can be investigated; testing with noise generated in digital domain does not appear to show the problem. not clear what is the best thing to do now. SHR believes it is in ADC, but need a bit more thinking... a different ADC in the same slot or something else?

need to fix : differences between the CPLD versus FPGA generated waveforms;

==> some tests to be tried for one of four output of ADC.

==> Regular follow-up on relevant items next week.

4.3 GPU corr (GWB-III) : next gen system -- from 18 June & before (SHR/SSK/GSJ/BAK) :

New improvements needed for finalising the design for the full 32 ant, dual pol system : 4 new DELL machines are in the rack and wiring + cabling is complete, running with analog noise source; new code with 2 x 10 Gbe I/ + improved logic for assigning specific threads to each core + env variables is completed (tested for 200 MHz / 8 bits and 400 MHz / 4 bits, 16 inputs and working ok with no pkt loss); ongoing action items :

(i) improvements in GPU code using K20 card (SHR/SSK) : cross-check on FFT code (done and can be closed); calibrating MAC performance vs data reshuffle load (done and no further improvements look possible; can be closed); some changes in the overall stream organisation of the code to get better overlap between data transfer and computation and also less number of times that global memory is accessed inside the MAC -- shows ~25% improvement for 32k chan and 64 input mode. 16k channels is

20% and much less for 8k channels. pending action items :

(a) looking at XGPU code (with Pradeep & Vinay of nvidia) -- there is some progress in these efforts -- to report current status.

(b) trying sample PA beamformer code to estimate load etc. -- will come when PA beam mode is released in GWB-III -- to confirm that load is less than 7% for both beams? old estimates are for C2050, ratio may change on K20. To leave pending for some time. ==> XGPU work is ongoing; ~20% improvement; last round of testing with variable gulp size remains to be done to see if any further improvement is possible. fraction of time for beamforming is 6% for K20.

(ii) other improvements in code :

(a) issue of net\_sign[] flipping (LSB/USB modes of correlator) to be resolved : needs some change in GPU & DAS code; for GWB-II, it was agreed to not fix this problem in GWB code, and a patch was provided for LTA files -- this has been done and tested ok; to fix the code ab initio in GWB-III; pending for now.

==> no update on this, need to discuss with SSK.

(b) long-term items like provision for control of FPGA and other peripherals (like sig generator) for different modes -- details of existing provisions to be discussed and plans for final configuration to be finalised: agreed to identify one PC for control of all the peripherals related to GWB; this m/c can / is interfaced to online via a socket and GUI can send commands via this -- already done for loading of FPGA files, needs to be extended for other applications; pending for now.

==> no updates

(iii) to start testing 400 MHz BW mode -- how best to conduct these tests? the hardware (nodes + FPGA boards, i/o wiring, power cabling etc are all ready; changes in the main code to handle 4 bits etc have been done (?), but some pending tasks were there : 2 x 10 Gbe has to be integrated with the correlator code; proper delay correction for 4-bit mode needs some changes; also choice of which 4 bits to use needs to be decided -- right now it is set for 4 MSbits; handling of 4 bits in main code is now completed; 2x10 Gbe integration with correlator code also done; delay correction 4-bit mode under test;

==> all the above are tested with noise generator input; 16input 400 MHz 4bit just fits (no room beamformer!); with pseudo DAS interface, using 3 host machines. need some software updates in DAS chain to handle more than 2048 channels; to start planning for interfacing with real online system and see where the bottle-necks may be.

(iv) Layout and racks (GSJ/BAK) : layout diagram to be updated and long-term plan for racks to be initiated; 3 different kinds of President racks discussed -- to try and finalise after one more round of discussions including RVS (also, new vendor Jyoti Tech); meanwhile, agreed to get 2 nos of cyber racks on urgent basis : 2 nos of cyber racks ordered with President -- to check delivery status; for the "cool" racks, not much response from President; some response from Jyoti Tech; need to follow-up and decide course of action; meanwhile, 3 nos of half-height racks were getting ready -- two nos are populated with the 4 new nodes each, the other will have 8 Roach boards; clk and input cabling to be finalised; dialogue ongoing with President but no firm date of delivery -- to check with purchase dept about follow-up; meanwhile, to initiate dialogue with Jyoti Tech for 2 similar racks. 3 half-height racks are almost ready, except for some wiring; host nodes to be kept separately.

==> 2 racks from President have come; no active response from Jyoti Tech; need clearer update about situation with the 3 half-height racks.

(v) procurement of accessories like network cards, disks, cables etc to be looked into -- 20 nos of CX4 based dual 10 Gbe cards to be purchased -- these are compatible

with T620, may give some trouble with R720 (for 2 GPUs). indent submitted and only party quoted -- in last stages of clearance for placing the order. Status?

==> 20 nos of CX4 cards have come and being tested; to confirm that this order is enough to meet our long-term requirements;

(vi) new purchase of Roach boards etc : follow-up on status of order -- expected date of delivery was given as June ! GJS had followed-up with Mo Ohady about this with a request for fast delivery -- appears that our boards are going to be tested soon by Mo, so shipment should happen soon; to check if these have been shipped and the expected date of delivery.

==> Roach boards have come; test bench is being made ready; total number to be verified against long-term requirements.

(vii) purchase of 4 new host machines for GWB III : to decide configuration of host machines (disk i/o to be kept in mind) within next few days; also to check if SSD is a viable option now for recording of data. Investigation shows that SSD vs SATA has pros and cons; it may be possible that one class of server may be there that supports both; to check if we can shorten this process by choosing basic server that meets the requirements using SATA disks -- to confirm final choice of units being ordered and status of the procurement.

==> 4 nos of T620s (2 nos have 16 TB and 2 nos have 4 TB disks) should be getting ordered soon.

==> Regular follow-up after 2 weeks.

4.4 Testing leakage, coupling and correlated noise in new back-end chain -- from 18 June (BAK/YG/++) : detailed tests had been done by Vikram Jaiswal (with SSK, SHR and YG) and report has been circulated; follow-up action item discussed between SCC, BAK & YG : for GAB systems, some follow-up action for testing the leakage has been initiated; need a more detailed discussion for actions for the GWB FPGA & GPU subsystem; procedure for testing to be done with GWB-II release modes to be clarified and tried out -- checking to see if earlier results can be reproduced -- working as expected; plus some new tests showing a few other things -- to be checked and taken up for discussion; new tests show significantly different results for cross-coupling for GAB+GWB; this needs to be understood better -- confirmed that these tests used sig gen LO, whereas earlier tests used synth LO; maybe separate tests for the analog system can be done -- these have been carried out now, and results can be discussed.

==> no discussions; follow-up after 2 weeks.

4.5 Walsh modulation : prototype set-up on Roach board -- from 2 July, 18 June (SCC/BAK): plans of BE team for implementing prototype scheme -- basic unit for switching using sq wave signal from GPIO pin tested ok; was put in main PoCo correlator and was being tested; walsh waveform delay functionality has been added now and can set delay from 1 to  $2^{32}$  clk samples (!); with this, variation of correlation with delay has been tested; to generate final plot showing this behaviour (done?); to aim for a robust algorithm for hunting for the peak and detecting; can also think of a test case of showing cross-correlated signal goes away with modulation with square wave in one channel; Walsh pattern being put in the Roach2 : ok, as very few slices are needed; issue of accuracy of the oscillator being used in the Walsh generator; what about synchronisation of starting?; Identified 3 possible action areas for work:

(i) to complete the Walsh modulate and demodulate set-up in the lab -- almost ready.

(ii) to optimise the hunting algorithm;

(iii) to demonstrate cancellation of unwanted signals in ADC card and/or GAB

==> some mismatch between the CPLD waveform and FPGA waveform for the Walsh signal. looks like the problem is in the CPLD logic and needs some debugging... to check

status again after 2 weeks.

#### 4.6 Next-gen time & frequency standards -- from 18 June & before (NDS/BAK) :

(i) brief update from BE team from visit to NPL was provided in last discussion; waiting for detailed report to be circulated draft (maser report already circulated) complete report has been circulated today -- need to schedule a discussion.

not much movement on this; YG to see if invitation to Sengupta & team can be made, for a visit to GMRT.

==> item not discussed.

(ii) plans for follow-up action :

Meanwhile some problem with Rb locking of one unit; remote help from Europe to try out diagnostics.; also to check about spare unit at RAC and unit at 15m for use in case of emergency when 2nd unit is to go for repair; Rb unit being sent for repair -- will come in 3 months. Standby arrangement : to use the 2nd unit from RAC (without Rb which had gone bad earlier) and try with a spare Rb unit. To check status of this; vendor has confirmed that unit has gone faulty and agreed to replace.

==> item not discussed.

#### 5. Other items :

##### 5.1 New python assembly design -- from 18 June (HSK/SSK) : FE group wants the

python configuration in E6 to be adopted for all antennas -- this needs to be discussed with mechanical group and finalised; FE and mech have dicussed about plans for modified python assembly that will give additional protection to cables; mech group had circulate a short note on their view of the matter, alongwith photos; this was discussed and existing vs E6 system was compared; Action item :

(i) modified E6 design with hinge-like support to be put on one central square ant -- short-term solution -- ready to be installed and tested : FE team to check status and identify "weak" antenna for this work : proposed to put on C4; now installed on C4; to decide follow-up action.

==> to watch the set-up on C4 and do periodic inspection for checks of (a) damage to hose (b) hose clamps (c) water entry etc -- first inspection 2 months from now to be done by mech and fe teams.

(ii) IGUS cable wrap -- new technology prototype to be developed and tested on quadripod; also option of hose without wire impregnation -- long-term solutions.

1] hose without wire impregnation

2] Entire hose assembly under procurement (long-term solutions).

Quotes for both items received : item 1 is Rs 10k for 10m (4 antennas);

item 2 is 60k each -- will try on the quadripod test range;

quotation had been received for one of each; current status update required on placing of order and delivery date.

==> order has been placed for one of each and delivery due date is this week.

==> regular follow-up after 2 weeks.

##### 5.2 Problem of access to FE boxes with 500-1000 CDF feed -- from 18 June & before

(HSK) : Update on new solution being designed by Mech group -- tested in situ and found working ok; agreed to use this for present; for future where bigger and heavier boxes will come into play, mech group will think of an improved solution, including an option for removing one feed and bringing the stool inside the basket;

quick status update from mech group, with detailed follow-up later on. Action items agreed upon : first to check with new heavier box and see if existing solution is practical; if not, then to work on new option; meanwhile, a few alternative options are being explored by mech group, with target of 1800 mm height for boxes with max weight up to 150 kg (?), quotes received from some parties -- follow-up to be discussed. Item has been introduced in SMEC for broader follow-up -- HSK has circulated the relevant material; to check about plans for ordering of the unit. ==> multi-party enquiry has been floated; 13th July is last date; order can be placed after that only. To check status after 2 weeks.

5.3 Fabrication of 6 spare L-band feeds -- from 18 June & before (SSK/HSK) : Order to Akvira for 3 nos (with enclosure) + 2 extra horns. Hence, total of 6 feeds will be ready + 1 dis-assembled unit + 1 old feed at Pune -- so total of 8 spare feeds will become available.

Feeds inspected at Akvira site - many corrections / suggestions for improvements have been made [e.g. improved probe mount : press-fit vs. screws; M4 -> M5; etc]; delivery expected (after these modifications) by end-March'14; one assembly made ready at NCRA w'shop and sent to GMRT last week; 3 sets have been delivered at GMRT; fabrication of 3 enclosures is under process; and procurement of 3 enclosures is in progress; need a status update.

==> 3 new feeds after powder coating had come to GMRT; there was some issue about the thickness of the plate used for mounting connectors and some in-situ modifications have been done on one of them and it is found working ok; pending clearance for the other two; and decision needs to be taken for the 3 new ones not yet delivered -- these are complete and ready with the vendor, except for the finalisation of the above plate. Regular follow-up after 2 weeks.

5.4 Design of RFI enclosure -- from 18 June & before (HSK/PAR) : (see item 2.2) inputs for front panel design given to R. Lolap for completion of drawing; prototype was to be fabricated in w'shop, but is now outsourced (?) -- getting ready for placing order (somewhat excessive cost due to all-machining design -- ok for prototype unit, but different solution can be looked at for mass production) -- to expedite the delivery as much as possible : order has been placed; delivery of 2 nos delivered to NCRA Stores on 3rd Mar -- delivered at GMRT now; waiting for test results before deciding follow-up action... while waiting for the decision on the main box for the switch (milled unit), agreed to try one with bending of plates + 4 vertical welding joints to see it provides a viable RFI option. Agreed to go ahead with 2 units on trial basis.

==> for the bigger box (meant for the switch) second option using bent plates + welding (?) has been tried but air gaps are visible and that does not appear to be a viable option; hence, back to milled box solution (~ Rs 25 k per unit), for which 2 units exist, and now Ops group has to take over and order in mass quantity. To check the status again after 2 weeks.

5.5 Improved software for work requests -- from 18 June and before (HSK/SJ) : To review the current process of taking job orders for better facilitation of the tasks with end users like electronics groups. YG discussed offline with HSK : to look to fill the lacunae in the process with maybe new development of in-house version? Agreed to try and get this done in-house with Joardar -- can be taken up after completion of ongoing tasks related to electrical -- to confirm plans and status : work not started yet; needs a discussion with Joardar -- it should be possible to take up the job now, as electrical task is over; to check if this is underway now.

==> dialogue is underway between HSK and SJ on the matter. To check status after

2 weeks.

