Pierre Auger Southern Observatory
Communications Task

Dealing With Tanks with Difficult Radio Links
PDJ Clark - July 2005
Background

As the surface array expands towards its full size, some detectors will inevitably be placed in positions that are highly unfavourable to good radio communications. A good example of this would be the El Chacay wooded area inside the array boundary.

This problem should affect a very small number of tanks - probably no more than 10-30 tanks for the whole array. However, the issue must still be addressed.

We always knew that we would have a few difficult radio links - I believe that now is the time to start dealing with them.
Persistent 'untenable' radio links from Tanks that have partial connections adversely affect data taking from neighbouring members of the same base-station sector (i.e. up to 60 other detectors).

Consequently, very badly performing links cannot be simply left operating in the radio network - they must be disconnected, thereby losing all data from that detector until its link can be improved to a satisfactory level.
So What Needs to Be Done?

- Identify those detector positions that are likely to cause problems - ideally prior to deployment
- Make funding available to allow for the upgrade of the antenna systems on affected tanks
- Appoint a Technical Manager to oversee the upgrade operation
Identification and Reporting of 'Poor Comms' Detectors

- By Inspection of The Site
- By NetMon Feedback
- Post Identification
By Inspection of The Site

- The earlier in the deployment process that this happens, the better
- Co-ordination of the effort to identify problem tank sites early (e.g. by Ingo) would be most helpful
- Reporting can be done.....
  - By Surveyor
  - By Prior Knowledge
  - By Tank Deployment team
  - By Water Deployment Team
  - By Electronics Deployment Team - not ideal as this is 'late in the day'
By NetMon Feedback

- This is the least desirable method as it occurs post-deployment
Post Identification

- A register of 'difficult tanks' needs to be established and maintained.
- It will take a while to modify the antenna system for each tank so a prioritisation process needs to take place to address those tanks that are having the most affect on overall data-taking and allow those to be dealt with first.
A budget will be required to implement the enhanced antenna installations (typical cost for 30m mast = U$S1500 - U$S2000) - see quote:

The Technical Manager in charge of this duty will need to be able to make equipment purchases for each tank that needs modification. I propose that Paul M controls the budget and signs off on each installation as parts are required.
Technical Manager

Who - I propose Jorge Abraham for this task.

Task - to maintain the register of known 'Poor Comms' Sites

Task - to design appropriate technical solution for each difficult detector site - here technical assistance, including radio simulations will be supplied from Leeds

Task - To oversee purchasing and installation of enhanced antenna system

Task - To verify operation of Upgraded detectors and re-integrate them permanently back into the array
Technical Solutions

- Tanks in Trees - On edges of wooded areas
- Tanks in Trees - Within wooded areas
- Tanks Obscured from Tower by hills
- Tanks in a local hollow
Tanks in Trees - On edges of wooded areas

- Step 1: Test performance to all possible alternative towers
- Step 2: Use tall free-standing mast to clear trees
Tanks in Trees - Within wooded areas

- Tanks surrounded by trees will probably not connect to any towers without modification
- Step 1: Use tall free-standing mast to clear trees
Tanks Obscured from Tower by hills

- Step 1: Test performance to all possible alternative towers
- Step 2: Use a passive repeater antenna assembly on the hill ridge-line
Tanks in a local hollow

• Step 1 : Test performance to all possible alternative towers
• Step 2 : Use enhanced height free-standing mast, of sufficient height to clear hollow (i.e. > 4m)
Dealing With Tanks with Difficult Radio Links

Thanks for reading this - now lets talk....