

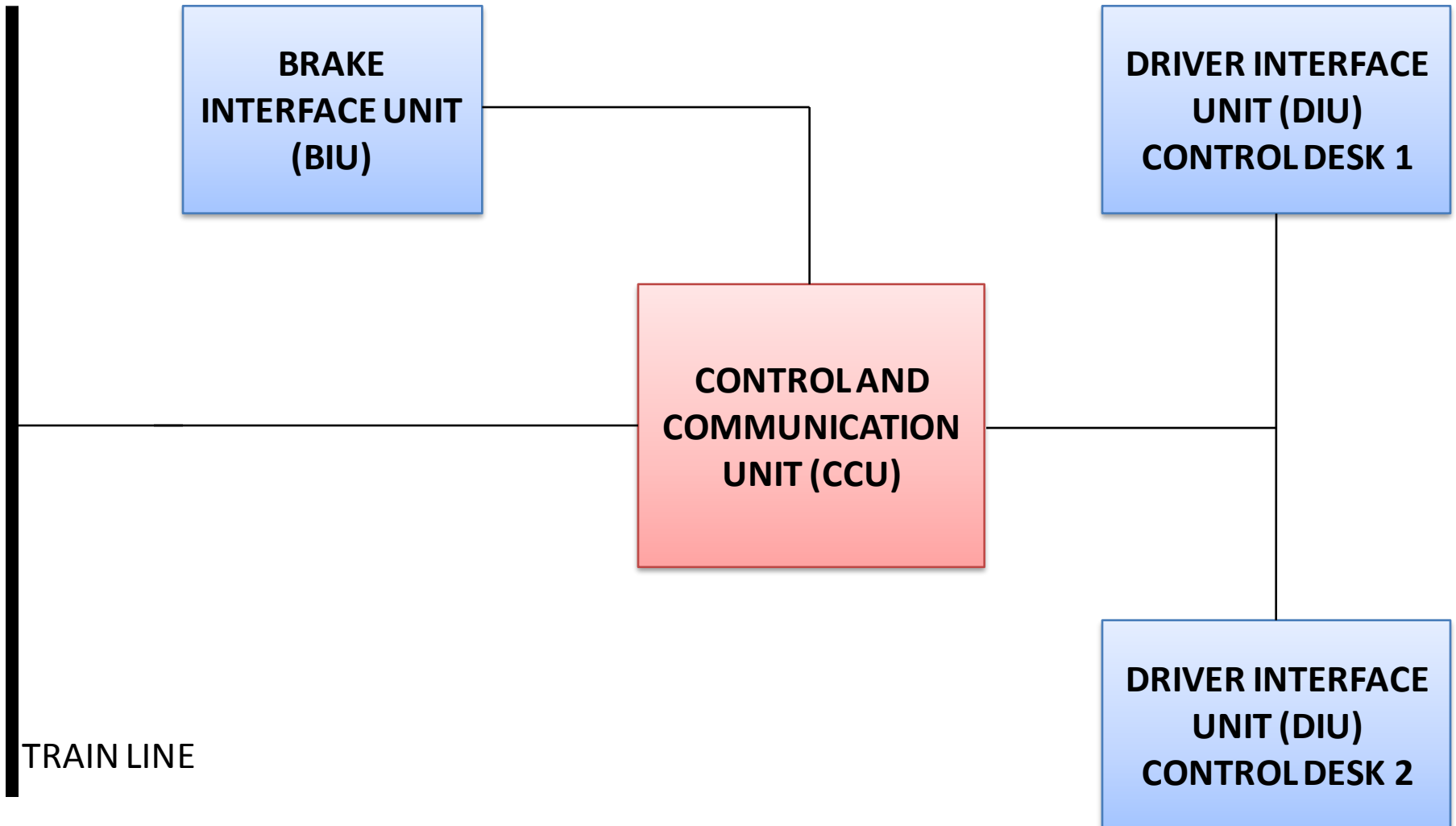
DISTRIBUTED POWER WIRELESS CONTROL SYSTEM (DPWCS)



DISTRIBUTED POWER WIRELESS CONTROL SYSTEM (DPWCS)

- Provides coupling between locos through RF communication.
- Makes it possible to couple maximum of 4 locomotives to the Lead locomotives which can be connected in between or at the end of the train.
- It contains:
 - “Control and Communication Unit” – One No.
 - “Driver Interface Units” – Two Nos., one in each cab
 - “Brake Interface Unit” – One No.

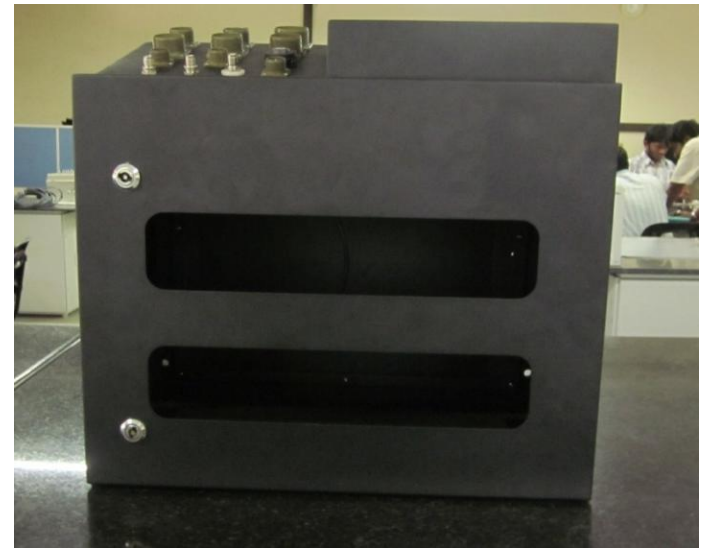
DPWCS IMPLEMENTATION BLOCK DIAGRAM



SALIENT FEATURES

CONTROL & COMMUNICATION UNIT (CCU)

- Processing Unit Powered with a redundant 32 Bit processor along with Interfacing unit for various kind of inputs.
- Redundant Processor
- 2 GB of solid-state memory to store events (logging).
- Real Time Clock (RTC) to enable recording of time tagged events
- External Watch Dog timer (WDT) for ensuring system health.



A View of CCU

SALIENT FEATURES

CONTROL & COMMUNICATION UNIT (CCU)

- USB2.0 for Downloading and uploading
- 1500V isolation from Field Signals
- Data Logging for Event & Failure
- Operating Voltage 70 to 136V DC
- Operating temperature up to 75°C.



CCU In the Machine room

SALIENT FEATURES

RADIO (part of CCU)

- Frequency Range 405 to 407 MHz
- Channel Spacing 12.5/25kHz
- Carrier Power 10 W / 50 ohm
- Data speed of radio 19200 bps @ 25 kHz,
- MTBF >60 years

SALIENT FEATURES

DRIVER INTERFACE UNIT (DIU)

- 10.4" LCD with Touch Screen.
- Compact Design.
- Automatic Brightness control.
- User Friendly Interface.
- 10/100MBPS Ethernet Interface.
- Audio visual Indication for alert.



DPWCS DRIVER CONTROL PANEL

OTUS WIRELESS DPWCS 30.01.2013 13:09 RSSI -50dbm
Loco No 13 LEAD DIU Online

Self Loco 1 Auto Off

BC 0.0 **BP** 4.4 **MR** 9.2 **FP** 5.9

Loco no : 13 Notch Position : 0 DB Position : 0

AF 26.7

Satellites 0

Lamp Indication

LSDJ	LSGR	LSB
LSCHBA	LSRSI	LSP
LSOL	LSDBR	LSSIT
LSAF	SANDING	LSBCR

Sanding Disabled

Ungroup

BP OK Self Test

SALIENT FEATURES

BRAKE INTERFACE UNIT (BIU)

- The BIU shall not interfere or cause any loss to the existing functionality of the IRAB system.
- System shall provide full control of the Automatic (Train) brakes, the Independent (Loco) brakes and emergency brakes.
- Capable to control the pressure with an accuracy of 0.05 kg cm².
- During communication interruptions, BIU isolates itself from brake synchronization.



Brake Interface unit

SALIENT FEATURES

BRAKE INTERFACE UNIT (BIU)

- Provision for Manual isolation
- Open/ Closed Feed back for BV out Valve
- Train Brake and Locomotive Independent Brake control available
- Scalable for Services Braking request application from TSS application



Brake Interface unit in Machine room

***CCU AND
BIU IN THE
MACHINE
ROOM***



FUNCTIONAL FEATURES OF DPWCS

- The system ensures authorized Login.
- The system considers BP continuity for Grouping
- Intelligent Neutral section negotiation is possible on all remote Loco.
- Pantograph lowering at trailing Locos corresponding to the Lead is possible.
- Train Parting is identified and the same is indicated on the DIU.
- Dynamic Brake is synchronised on the Trail Loco.

FUNCTIONAL FEATURES OF DPWCS

- On communication Failure the trailing Loco should come to zero notch. On resumption the self test shall be performed to ensure the identity and of trail loco and indication to be provided at DIU.
- If the Lead loco fails it is possible to work the train from the Lead at a restricted speed through DIU.
- It is possible to shutdown/energies remote locos from the lead locomotive through Driver interface unit.

FUNCTIONAL FEATURES OF DPWCS

- Possible to control traction notches or Braking notches from Lead locomotive through Driver interface unit.
- System is capable of identifying fault during the operation and displaying on DIU.
- Complete synchronizing of Remote Locomotive with the Lead Locomotive.
- BP Continuity check before grouping two locomotives.

FUNCTIONAL FEATURES OF DPWCS

- Automatic Neutral Section Negotiation in remote locos.
- Manual Traction Control for remote locos.
- Sensing of Train Partings.
- Fail Safe Logics.
- All parameters of Remote Locomotive available at Lead Locomotive screen.
- User Friendly operation

DIFFERENCE BETWEEN CONVENTIONAL AND DPWCS ENABLED TRAIN

CONVENTIONAL TRAIN

With Conventional Train the Tractive Force is applied from the front



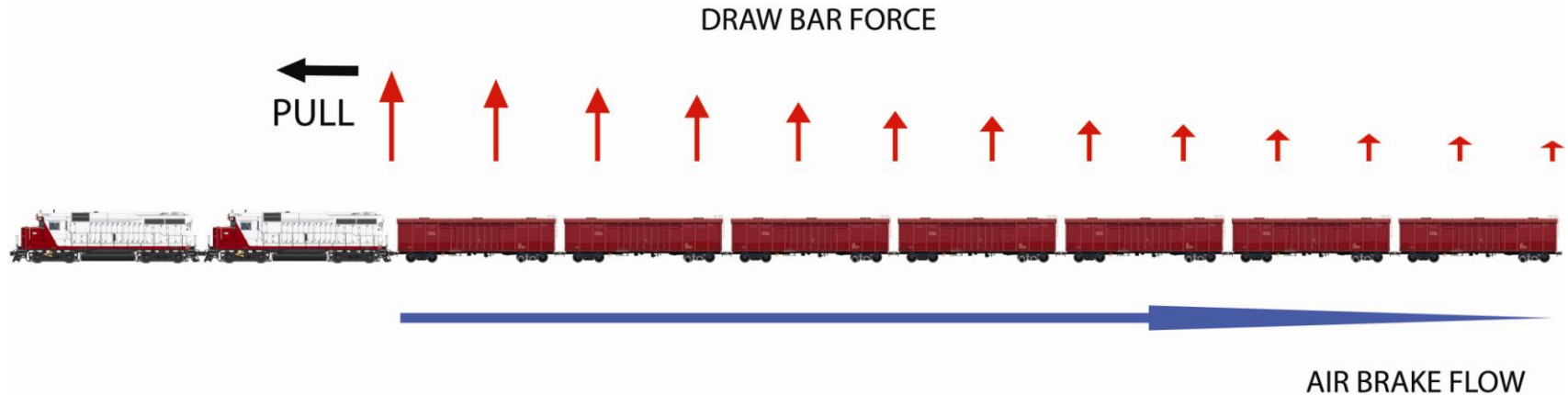
DPWCS ENABLED TRAIN

Locomotives can be anywhere in the train consist as all the Locomotives are synchronized over the Radio Link.



CONVENTIONAL CONFIGURATION 1

Conventionally following configurations were used:



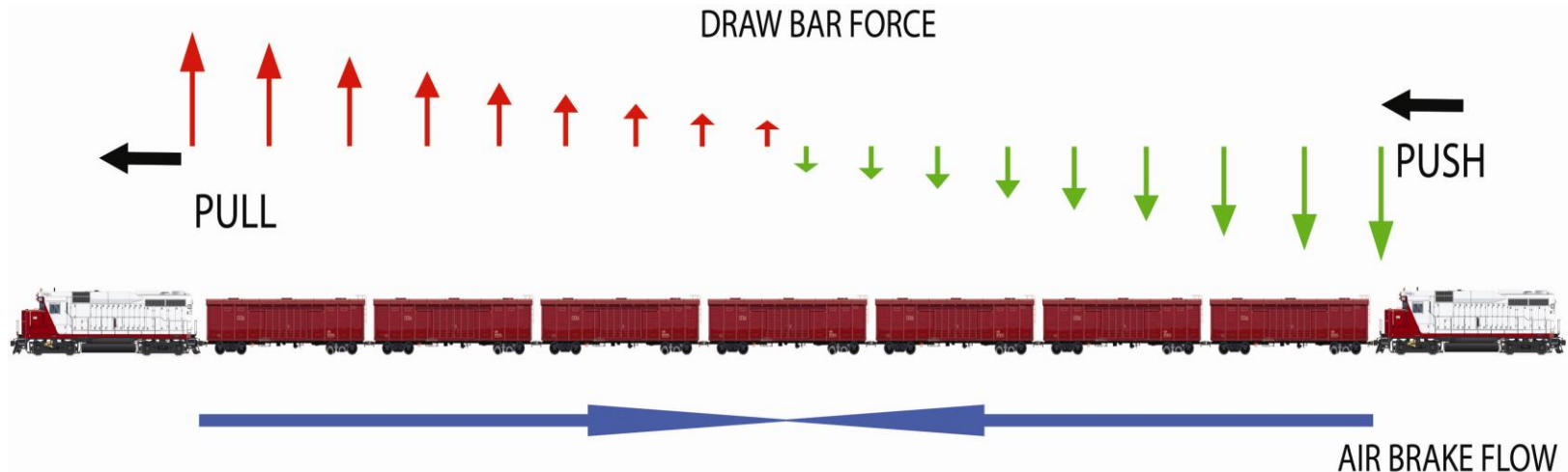
Advantages :

- Higher tractive effort available.
- Single driver can operate train.

Dis advantages:

- Higher coupler forces.
- Train length limited to 58 wagons in case of UIC braking.
- Localized force acting on the Track

CONVENTIONAL CONFIGURATION 2



In this configuration the locomotive at the rear provides a pushing force which is very useful in hilly terrains but implemented without DP (Manually synchronized over walkie talkie).

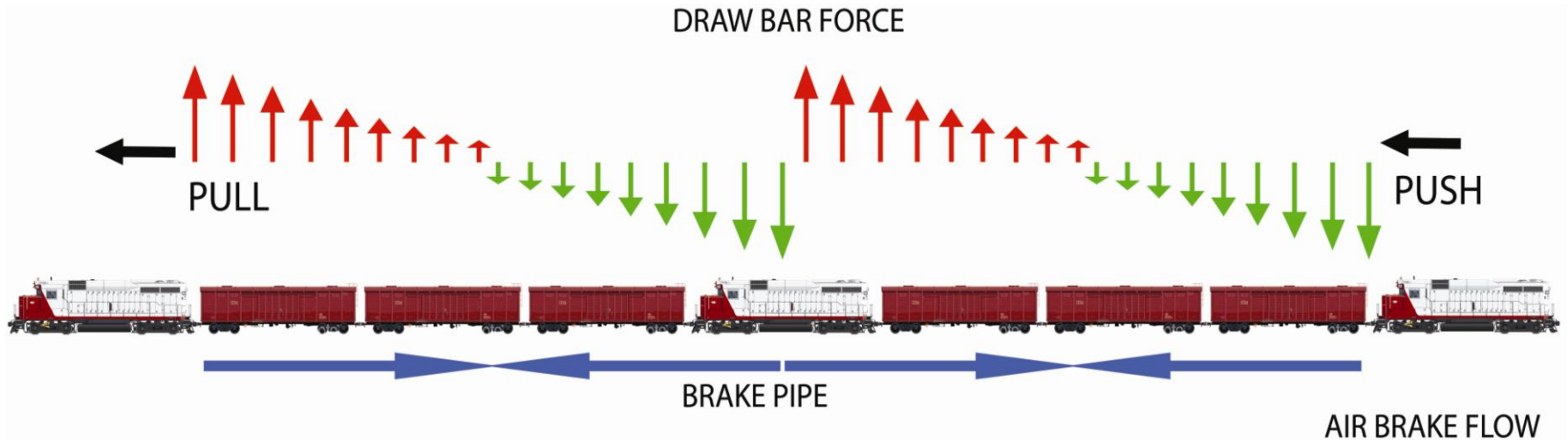
ADVANTAGES :

- Higher tractive effort available.
- Lower coupler forces

DIS ADVANTAGES:

- High risk of error as no automatic safety interlocks available. Synchronization of locomotives is done via walkie talkie voice communication between drivers .

POSSIBLE OPTIMAL CONFIGURATION WITH DPWCS



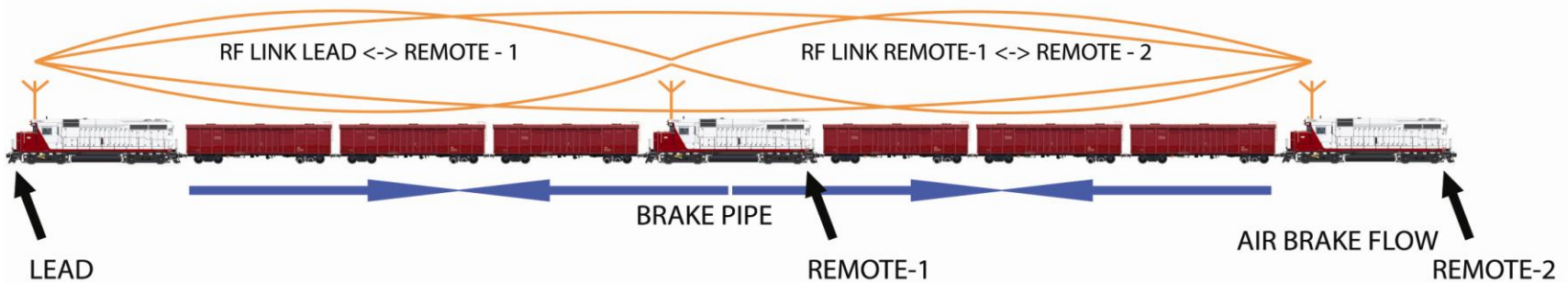
The above is an optimal configuration to increase hauling capacity and can be implemented with DPWCS.

ADVANTAGES :

- Higher tractive effort available.
- Lower coupler forces
- Faster braking. Brake pipe charging time reduced upto 50%.

APPLICATION OF THE DISTRIBUTED POWER WIRELESS CONTROL SYSTEM

RF LINK LEAD <-> REMOTE - 2

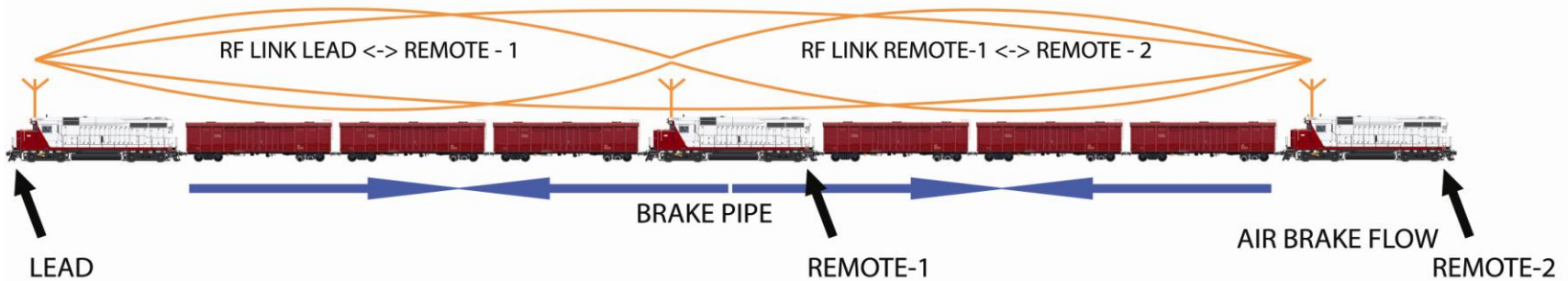


In the above DPWCS enabled configuration:

- The remote loco can duplicate all actions of the driver in the lead.
- The locomotive at the head/leading position would be manned, all other locomotives would be unmanned.
- The system can monitor train braking at remotes and provide feedback to the lead.
- It is possible to isolate the system in case of fault.

APPLICATION OF THE DISTRIBUTED POWER WIRELESS CONTROL SYSTEM

RF LINK LEAD <-> REMOTE - 2



- Train parting can be detected and if occurs all remote locomotives to come to idle.
- The system is capable of simultaneously handling multiple trains equipped with the DPWCS in a radius of 3 kms efficiently and without loss of communication loss.
- The system operates in the 406 to 407 MHz UHF licensed band for Indian Railways.

STATUS OF PROVISION OF DPWCS

1. Details of RSP

- | | |
|-----------------------------|--|
| (i) Year of sanction | 2010-11 |
| (ii) Title of RSP | Supply , fitment & commissioning of Locotrol |
| (iii) RSP No. | 1126/10-11,324/11-12 & 298/12-13 |
| (iv) Qty & sanctioned cost- | 10 sets (20 Nos), Rs.6.587 Crores |

2. P.O Details

P.O. No. 47.11.9002.1.70417dt -31.03.2012,
M/s. Lotus Wireless Technologies India Pvt Ltd,
VSKP , Qty-08 sets(16 Nos),Cost-Rs.3.116 Crores

3. Original DD

16.08.2012

4. Inspecting agency

RDSO

5. Distribution

Sr.DEE(TRS) AQ/CR =03 sets,
Sr.DEE(TRS) LGD/SCR=03 sets,
Sr.DEE(TRS)TATA/SER=01 set,
Sr.DEE(TRS) BIA/ SECR=01 set.

STATUS OF PROVISION OF DPWCS

6. Inspection call to RDSO by firm - 25.07.2012
7. RDSO clearance after inspection - 21.03.2013
8. Allotment of frequency (WPC) - 02.05.2013
9. Present Status Material received at ELS/AQ & ELS/LGD. Under commissioning. DP extension received up to 30.6.2013
10. Date of field trials After receipt of network operating license from WPC wing, Ministry of Communications & IT (Expected by the end of May'2013)
11. Provision of leaky cables in tunnel no.1AB(KM-124, NE Ghat, Kasara-IGP) CR HQ ,S & T branch has awarded the work to M/s.TVM signaling & Transportation Ltd, Bangalore on dt 29.04.2013