

A proposal to upgrade the Pune – N'gaon fiber optic link and link GMRT–Housing colony to the network

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Dated: 5th Nov 2003

Introduction:

The NCRA–TIFR, Pune university campus is connected to GMRT Observatory, Narayangaon by a 100 Mbps Fast Ethernet link using single mode fiber of DOT/BSNL, Pune. Over years the users of this link has increased and needs an upgrade to higher data rate. The upgrade can be an another 100 Mbps link or a Gigabit ethernet link. With the data rate not finalized this report presents various possibility to upgrade the link cost effectively and off the shelf systems as main criteria.

Scheme 1:

Figure 1 shows the block diagram of the scheme. The scheme proposes one more 100 Mbps fast ethernet link at 1550 nm wavelength in addition to the existing 1310 nm system. The scheme will simply double the existing capacity and it uses Wavelength division multiplexing (WDM) to utilize the same fiber for two links. The scheme uses the existing 1310 nm 100 Mbps faster ethernet system and requires four numbers of 1550 nm transreceiver. The implementation requires WDM–Mux and WDM–De–Mux as shown in the diagram. The total cost of the fiber optic units to implement this scheme is (4 Transreceiver cost + WDM couplers cost) 12,000 \$ approx. The 1550 nm transreceiver can drive a maximum distance of 130 km but it is safe to have good power margin in the link also degradation due to fiber dispersion has to be studied if carried without repeater at Rajgurunagar.

It is also to be noted that to reduce the Narayangaon – Pune traffic, it is better to have at least a 64 kbps link at Narayangaon end. As when the existing 64 kbps link from Pune via Mumbai fails, the GMRT losses connectivity to outside world, having a 64 kbps link from the GMRT end through VSNL will improve its reliability.

Scheme 2a:

Figure 2. shows the block diagram of the scheme. This scheme uses one Gigabit Ethernet systems over the existing fiber link between NCRA–Pune and GMRT–Khodad replacing the existing 100 Mbps fast ethernet link. The figure also shows the manufacturer, model number, unit cost and the numbers of the fiber optic modules required to implement the link. The MRV unit has 850 nm to SM1550 nm repeater which can be directly connected to Gigabit Ethernet switches with optical ports. The Fiber optic units alone cost from 12,000 \$ to 15,000 \$ approx. The cost quoted here is from the information available on the Web.

Scheme 2b:

Figure 3 shows a scheme to connect the GMRT housing colony while increasing the capacity of the existing fiber optic link at 1310 nm. The scheme 2b is an addition to the scheme 2a i.e. 1 Gigabit Ethernet link at 1550 nm will connect NCRA-Pune and GMRT-Khodad and a 1310 nm system will connect GMRT-Khodad and GMRT-Housing colony with a 100 Mbps fast ethernet link. The scheme uses the removed 1310 nm transreceivers mentioned in scheme 2a and uses the same to connect the GMRT-Housing colony. This scheme uses WDM-Mux and WDM-de-Mux. It is to be noted that the number of 1310 nm systems are reduced here and the WDM couplers can be kept at the field joint itself as they are passive device. The fiber is being shared between GMRT-Khodad and GMRT-Housing colony. The configuration permits a leased line connection at GMRT-Housing colony and the same is connected to GMRT-Khodad through the 100 Mbps fast ethernet link at 1310 nm. The traffic is well separated here for the GMRT users. The users at pune also can have access to the leased line at GMRT-housing colony via GMRT-Khodad.

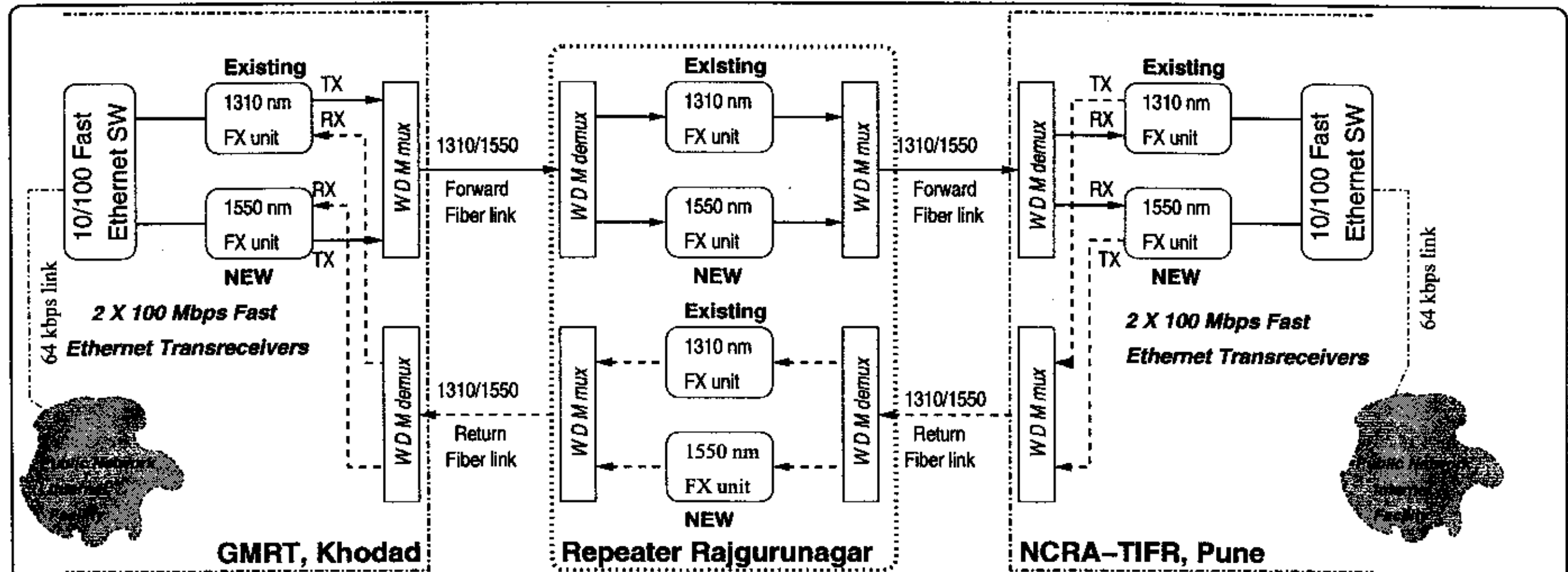
Scheme 2c:

Figure 4 shows a refined scheme that the fiber optic transreceiver can be kept at Narayangaon telephone exchange and the existing copper wire between VSNL and Narayangaon telephone exchange can bring us the leased line connection to GMRT. To connect to GMRT-Housing colony an over head fiber optic line is suggested. This will speed up the connectivity to colony as problems exist in making a loop with the existing fiber link at GMRT-housing colony.

Scheme 2d:

Figure 5 show the final scheme for connecting Pune-N'gaon link to GMRT-Housing colony. Since the earlier finalized proposal as shown in *appendix 1* took off from the DOT end the scheme was modified as show in Figure 4. Here the Pune-N'gaon link upgrade to high data rate is postponed. Connecting GMRT-Housing colony to the link and a leased line at GMRT end was given priority. Here based on above priority the Pune-N'gaon 100 Mbps link gets terminated at GMRT-Housing colony and the VSNL leased line of 64 kbps gets connected at GMRT-Housing colony through copper wire with a repeater at Narayangaon telephone exchange. The details of the connection is shown in figure 5 and 6. The VSNL uses a HDSL link similar to ADSL. The HDSL-RAD modem gets connected to the VSNL router with the interfaces shown in figure 5. It is to be noted we have avoided a Cisco router to convert copper wire interface to 100 Mbps R-J45 interface by insisting for a modem with RJ-45 interface at our GMRT-Colony end.

From the GMRT-Housing colony the 100 Mbps link get connected to GMRT-Khodad via the existing fiber through the W-arm fiber as mentioned earlier. The scheme uses spare units of 1310 nm transreceiver from NCRA-Pune. Thus the additional cost of fiber optic transreceiver is reduced here, but there may be a poor reliability over the copper cable. A



Unit req.	Numbers	Make	Part no.	Unit Cost	Remark	Total cost
1550 FX Transreceiver	4 Nos	MRV	MC102FRM/S5	~\$ 2200	100 base FX MM to SM 1550, 50 - 130 km	\$ 8800
		Canoga permings	9119		UTP - FX SM 1550 nm 120 km	
		Lascomm	LD3800C100		UTP-SM, 100 km	
		TC Comm.	TC3200		UTP - SM, 100 km Universal media convt.	
		RAD	AMC-101		UTP - SM, 110 km Universal media convt.	
1550 FX Repeater	4 Nos	MRV	MC102FRS4/S4	\$ 2200	100base FX SM-SM repeater, 1550, 50 - 110 km.	\$ 8800
WDM Mux	4 Nos	JDS		~ \$ 350		\$ 1400
WDM deMux	4 Nos	JDS		~ \$350		\$ 1400

Figure 1

X-Plan Pune - N'gaon Fiber optic link

Scheme 1 by: S.Sureshkumar, EE-D

Dated 20/05/03

Note: This scheme may cost between 10,000 to 12,000 US Dollars. This provides two independant 100 Mbps Fast Ethernet link between GMRT, khodad to NCRA-TIFR, Pune. Prices can be slightly less when we claim educational institute concession octroi exemption etc.

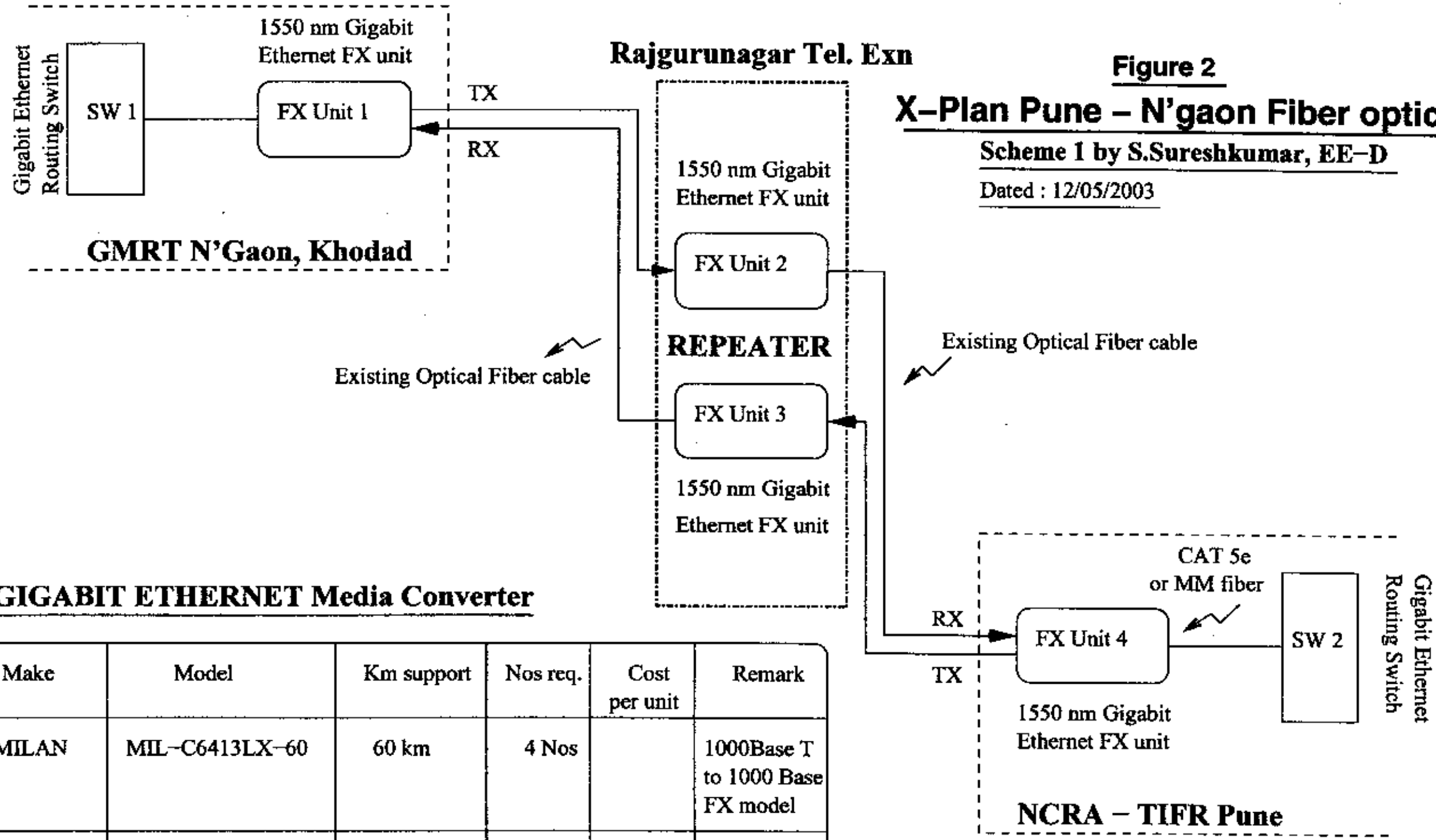
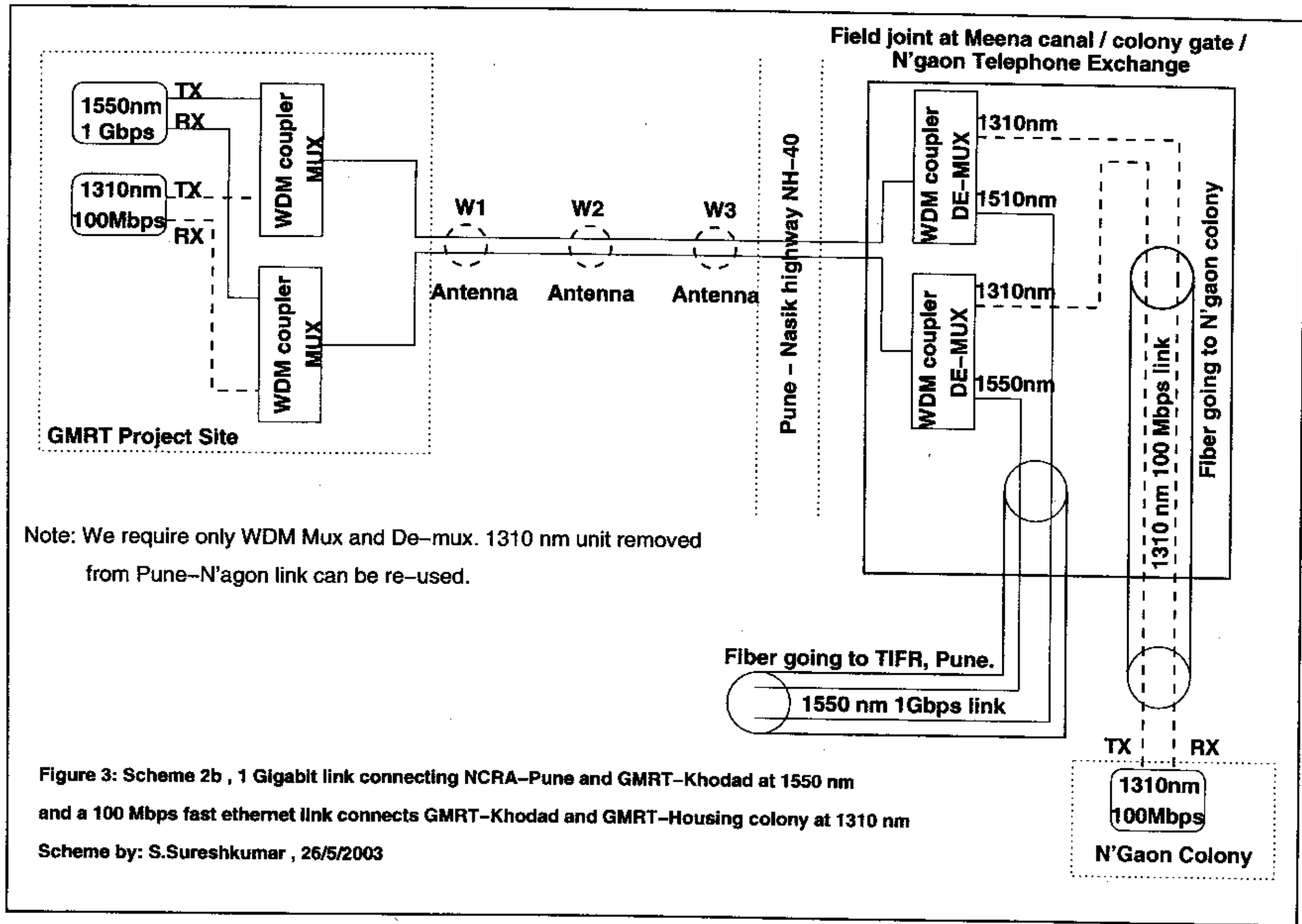


Figure 2
X-Plan Pune - N'gaon Fiber optic link
 Scheme 1 by S.Sureshkumar, EE-D
 Dated : 12/05/2003

GIGABIT ETHERNET Media Converter

Make	Model	Km support	Nos req.	Cost per unit	Remark
MILAN	MIL-C6413LX-60	60 km	4 Nos		1000Base T to 1000 Base FX model
MRV	MC102FRM/S2	60 km	4 Nos		SX850 nm to SM1550 nm repeater
Provantage Supplier	AT-MC1005/4-10 www.provantage.com	70 km	4 Nos	\$ 3756.74	1000 T to 1000LX SC

Note: Assuming present 1310 nm 100 Mbps unit removed and replaced with Gigabit Ethernet link the cost could be between 12,000 to 15,000 US Dollars for fiber optic transceiver only.



Note: We require only WDM Mux and De-mux. 1310 nm unit removed from Pune-N'agon link can be re-used.

Figure 3: Scheme 2b , 1 Gigabit link connecting NCRA-Pune and GMRT-Khodad at 1550 nm and a 100 Mbps fast ethernet link connects GMRT-Khodad and GMRT-Housing colony at 1310 nm

Scheme by: S.Sureshkumar , 26/5/2003

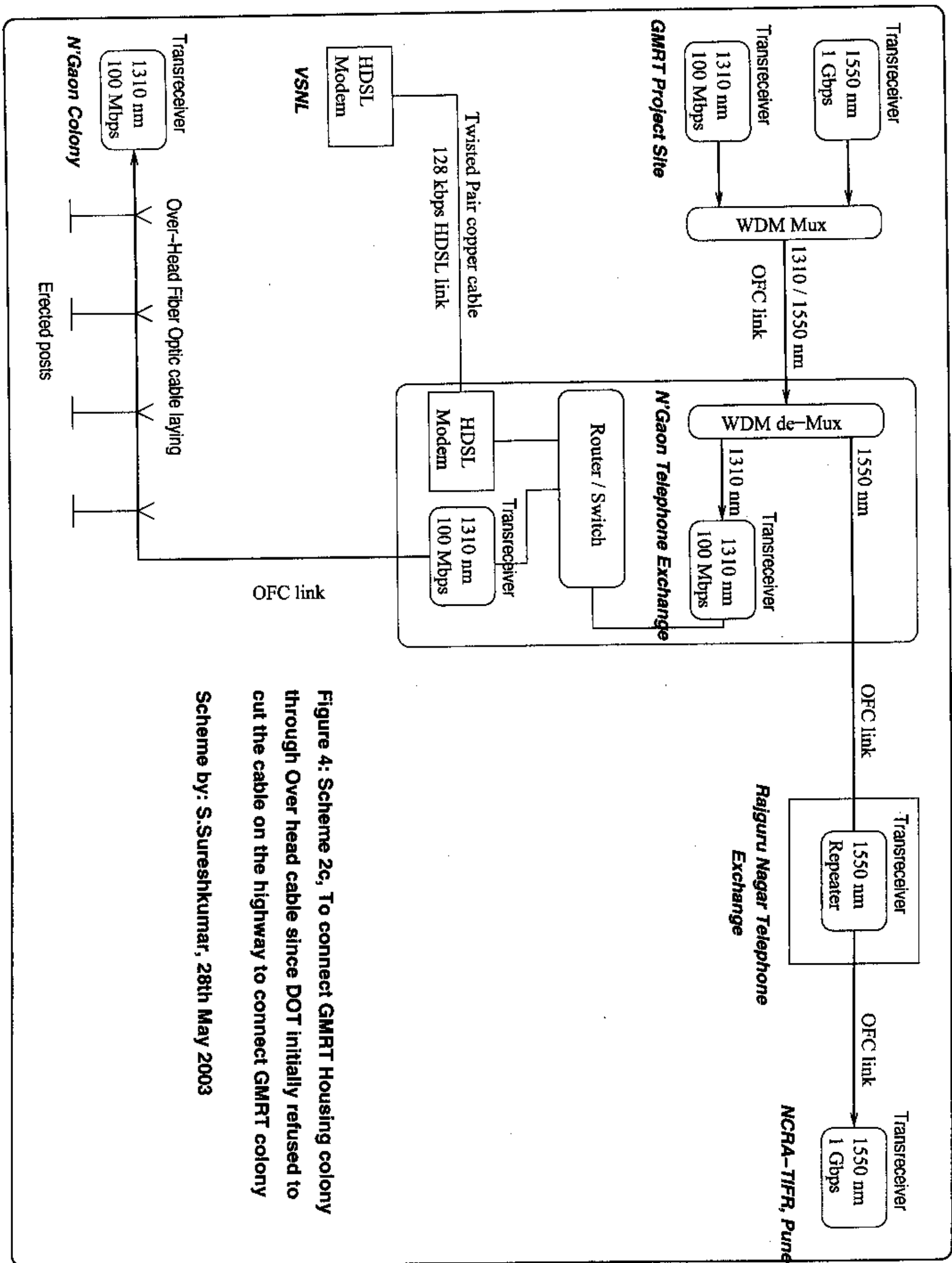


Figure 4: Scheme 2c, To connect GMRT Housing colony through Over head cable since DOT initially refused to cut the cable on the highway to connect GMRT colony

Scheme by: S.Sureshkumar, 28th May 2003

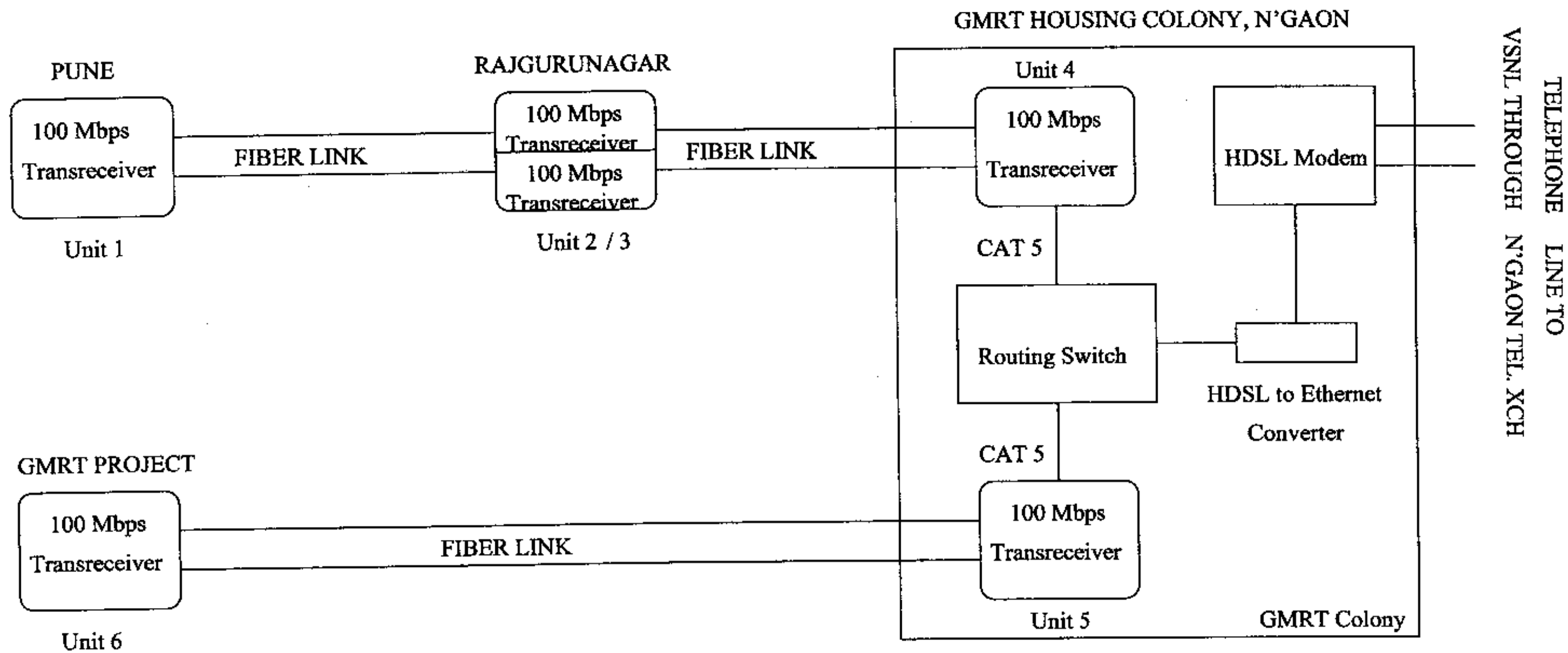
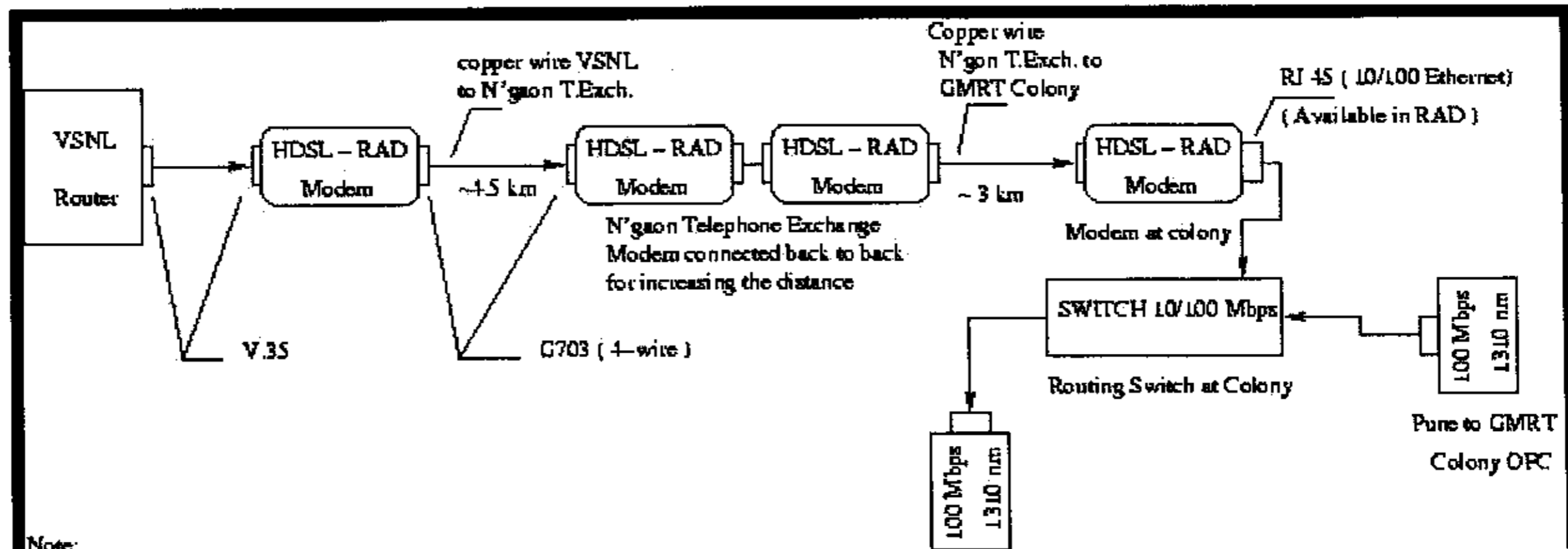


Figure 5: Scheme 2d: Presently 4 units of 1310 nm transreceivers working in the link. Now we require two more units to establish this configuration. The spare units of two numbers available at Pune is being used here to support two additional units of 1310 nm.

Scheme by: S.Sureshkumar, EE-D,

Dated 16/06/2003



Note:

This is the minimum configuration one can have to connect GMRT colony
 The HDDSL modems are from RAD-COM and equivalent product not available in D-link (checked on Net)

Since this modem cannot drive total 8 km we need additional one pair of modems which will increase cost by another 1 Lakh.

Cisco router can be avoided since HDDSL - RAD modem give RJ-45 interface.

The GMRT end fiber unit to be shifted to Colony and between colony and GMRT site we can have D-link modem for 50 km available off the shelf.

Cost has to be enquired for this one pair of 100 Mbps 1310 nm Transceiver.

A Switch is a must and if it can also be configured as a router it will be better at colony. Or else we can have a PC as a router to have less traffic between colony and NCRA, and Colony and GMRT.

Reliability of telephone line between N'gaon Exch. and Colony is poor and chance of link going down is high.

If Budget permits then connecting VSNL through our 100 Mbps link from N'gaon Exch. to colony will be good as shown in my earlier proposal.

Also we need to get permission to put our equipment at N'gaon exchange.

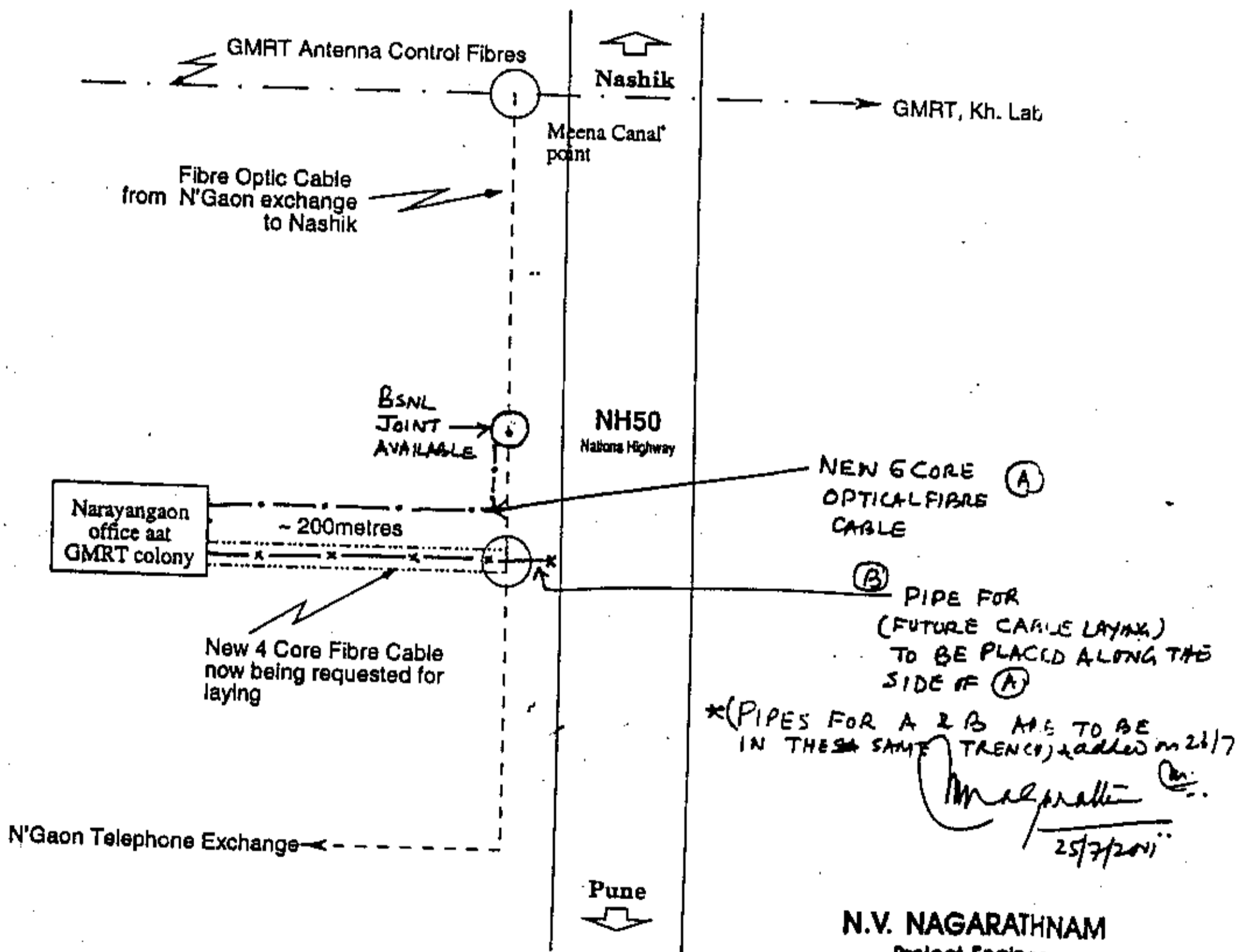
Figure 6:

Scheme by: S.Sureshkumar / Aba Adoni

Dated 24/07/2003

APPENDIX - 1

FIBRE OPTIC CABLE LAYOUT NEAR NARAYANGAON



* (PIPES FOR A & B ARE TO BE IN THESE SAME TRENCH) added on 26/7
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 25/7/2011

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