Presentation
on
New MCM Programs
&
Qt/QML Based Online_V2 GUI

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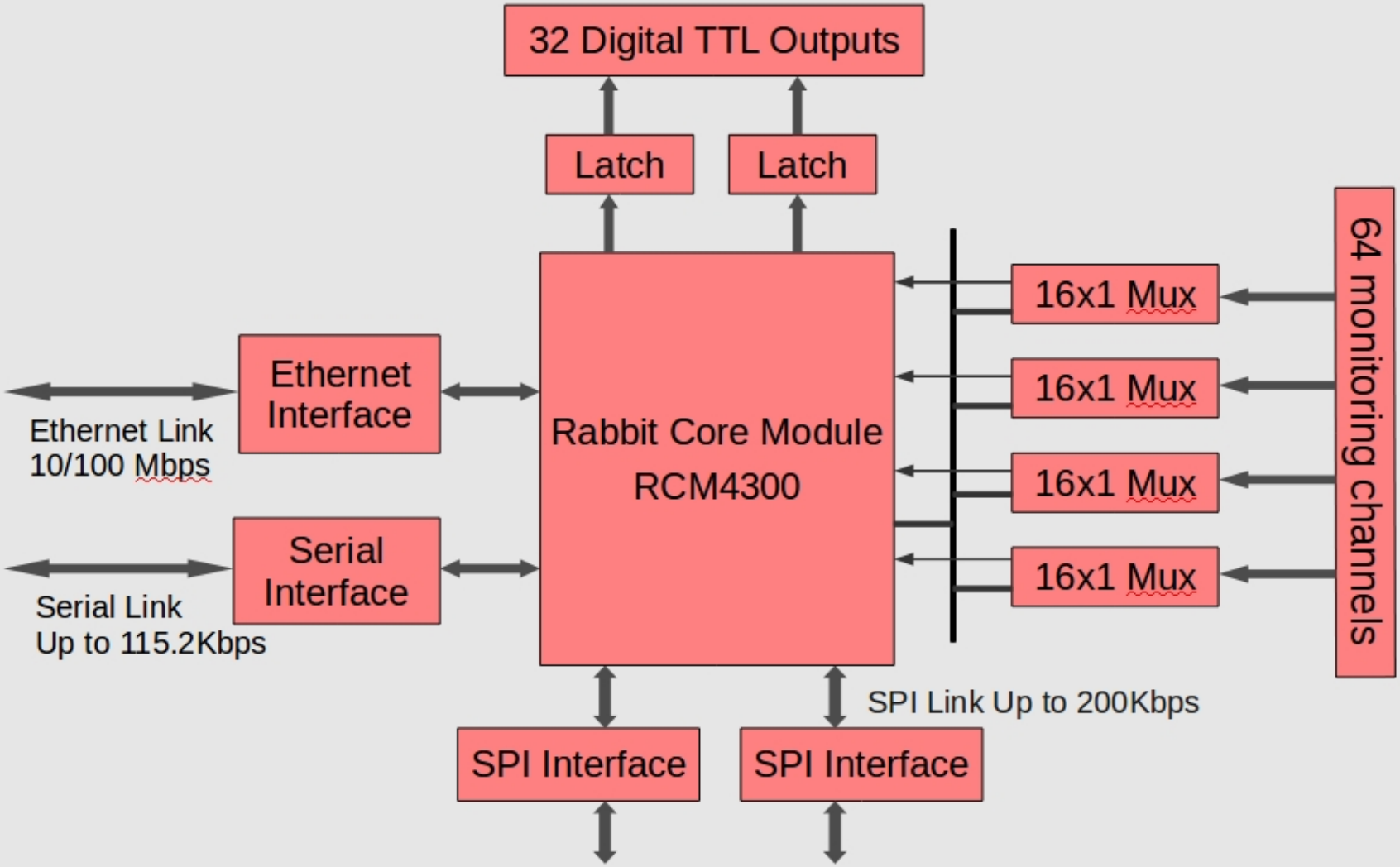
GMRT – TIFR

New MCM

(New Monitoring & Controlling Module)

- New Monitoring and Controlling Module – New MCM is the general purpose card, designed using RCM4300 core module as processing unit.
- Has a motherboard, on which hardware for Multiplexing, Signal conditioning Digital data latching and serial communication is placed. On top of the motherboard, RCM4300 as daughter-board is placed.
- Will be directly interfaced with other systems of GMRT like Front End, Fiber Optics, Analog Back End, Sentinel etc.
- Will monitor and control various parameters of GMRT systems.
- Will also generate the alarm in the erroneous condition and will take immediate precautionary action.

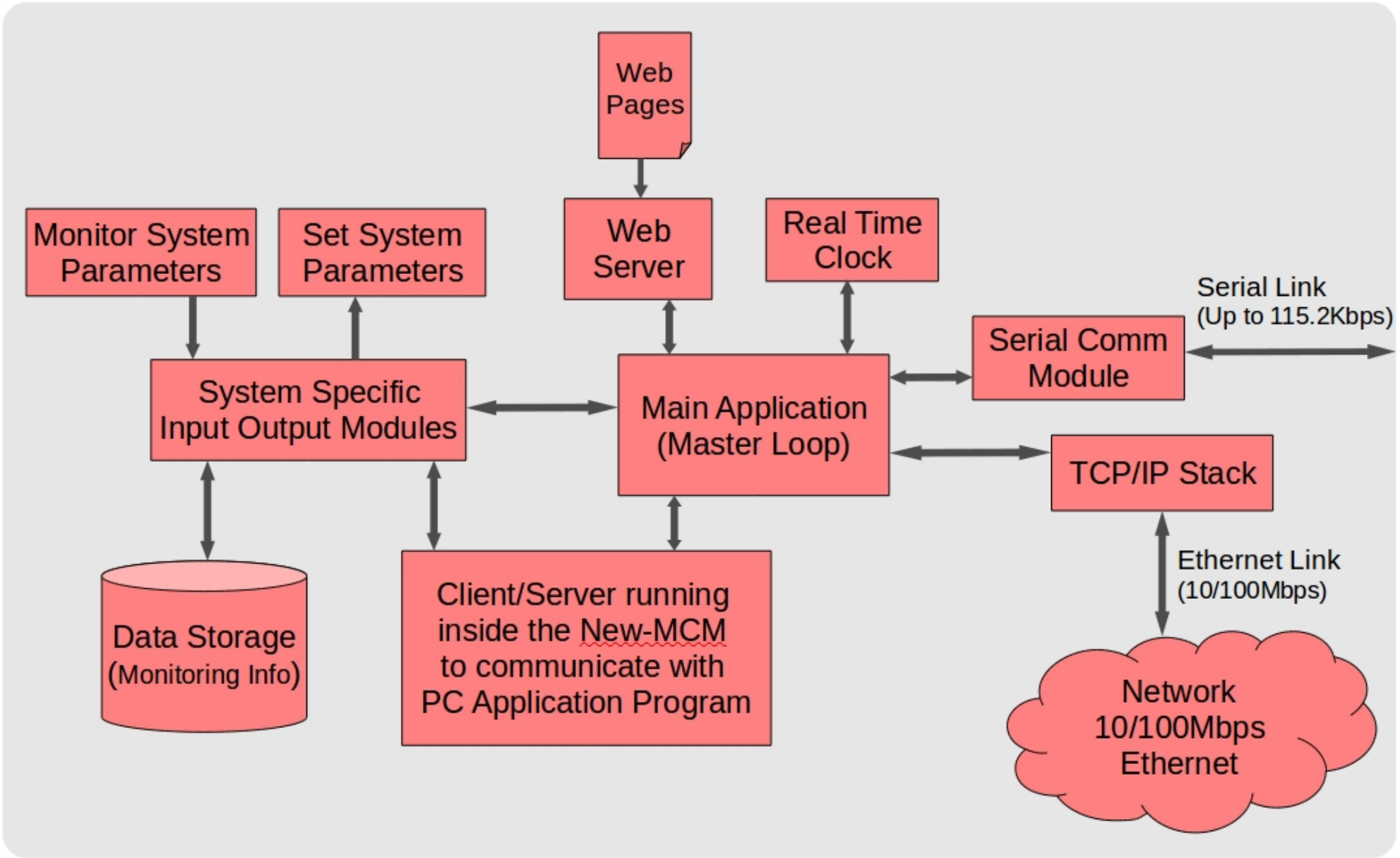
New MCM Hardware Architecture



New MCM Software

- Developed from the scratch using dynamic C, which supports co-operative multitasking.
- Uses the infinite while loop approach instead of using the OS.
- Designed carefully, so it can include all necessary features and exhibit good performance.
- Supports the Communication over the Ethernet as well as Serial link, 64 channel monitoring, 32 bit controlling, up to 1Gb data storage using FAT-16 file system.
- Web server running inside. Web technologies like HTML, CSS, Javascript, XML, AJAX are used extensively.

New MCM Software Architecture



New MCM Programs

- For In House CMS MCM
- For GAB MCM
- For 15m NCRA MCM
- MCM Debug Software : MCM Debug

In House CMS MCM Program

- Designed full fledge MCM program to perform various operation like : Monitoring, Controlling, Preparing Summery, etc. as well as Listening over socket to receive various commands from higher level application.
- Implemented support for various systems : Sentinel, Front End, Fiber Optics, Analog Back End, MCM Self Test.
- Implemented Various commands for such systems : Monitoring, Setting, Initialize, Reset.
- Supports both web and socket version.
- Design efficient command structure to communicate with remote server: [Sequence] [Time-stamp] [System] [Operation] [No of Para.] [Parameter] [arg1] [arg2]

Online_V2 MCM Communication Protocol

- Sequence : Command Sequence ID from Online_V2 Server
- Time-stamp : Time stamp of core online machine
- System : Front End / Optical Fiber / Sentinel / Servo / FPS / GAB
- Operation : Monitoring, Setting, Initialization, Reset
- No of Para. : Number of parameters to be set in one go
- Parameter : System specific parameter/s
- Argument 1 : Channel 1 Argument of corresponding parameter
- Argument 2 : Channel 2 Argument of corresponding parameter

GAB MCM Program

- Communicates with GAB server on loconf machine, which ultimately connects MCM with existing online.
- Implemented various commands for GAB system like : set dmask, set lo, set reflo and mon
- Implemented Ping function to detect broken socket
- Implemented continuous background monitoring.
- Supports both web and socket version.
- Following command structure similar to 15m dish MCM even though it's not efficient.

15m Dish MCM Program

- Similar to GAB MCM but running on Old version of New MCM.
- Communicates with wrapper program on Atithi machine, which ultimately connects MCM with CMS developed by PSPL.
- Supports only socket communication.
- Connected with Sentinel and GAB systems.
- Implemented various commands for Sentinel system like : domon, setcmd, init and reset
- Implemented various commands for GAB system like : domon, set attn, set lo, set reflo, init and reset

MCM Debugging Program

- Only web based program so troubleshooting can be done by using web browser, no other utility is required to debug MCM.
- Monitoring page displays 64 monitoring channels raw data as well voltage values, MCM parameters like Spectrum spreader, Clock Frequency, Real time clock, Digital Mask etc.
- Monitoring web page can update data as fast as every 500 mS, using AJAX
- Setting web page enables user to set 32 bit digital mask, LO Freq, Reference LO, RFI testing parameters, and Network Parameters.

Monitoring page of MCM Debug

New MCM Monitoring Window

IP : 192.168.8.231 Antenna : C00 System : FRONT END

64 MONITORING CHANNELS

01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
827 0.78	826 0.79	827 0.78	829 0.77	828 0.78	820 0.82	825 0.79	825 0.79	824 0.80	825 0.79	828 0.78	827 0.78	826 0.79	823 0.80	820 0.82	828 0.78
17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
828 0.78	826 0.79	826 0.79	830 0.77	830 0.77	820 0.82	829 0.77	826 0.79	828 0.78	822 0.81	822 0.81	826 0.79	823 0.80	820 0.82	827 0.78	828 0.78
33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
829 0.77	819 0.82	827 0.78	830 0.77	823 0.80	826 0.79	826 0.79	824 0.80	824 0.80	828 0.78	823 0.80	828 0.78	829 0.77	824 0.80	825 0.79	824 0.80
49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64
821 0.81	827 0.78	822 0.81	822 0.81	826 0.79	821 0.81	827 0.78	825 0.79	827 0.78	828 0.78	827 0.78	825 0.79	828 0.78	827 0.78	824 0.80	827 0.78

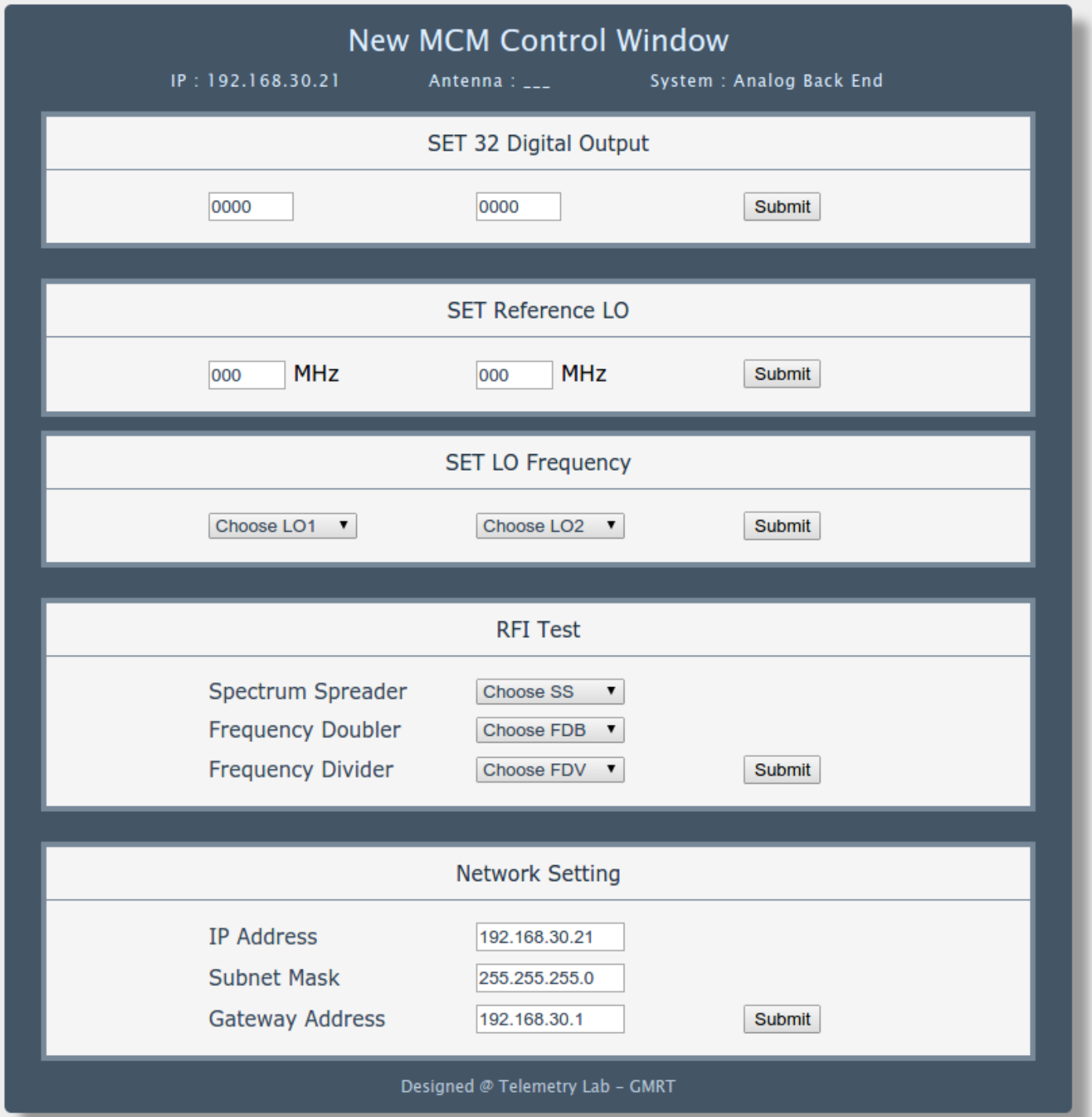
MCM STATUS

Spectrum Spreader	Normal (0 to 50MHz)	Normal (Above 50MHz)
Frequency Doubler	On	
Frequency Divider	1	
MCM Frequency	60 MHz	
Real Time Clock	12 - 11 - 2014	12 : 25 : 46
Digital Mask	0000	0000

FRONT END SYSTEM STATUS

Band Selection	327	327
Solar Attenuation	14	44
Channel	SWAP	
Sub-Band Selected	1060	
RF Power	ON	
Calibration Noise	LOW	

CONTROLLING PAGE OF MCM DEBUG



Testing of MCM Program

- More than 30 MCMs are running continuously in GAB system since 2012.
- 8 MCMs in local lab test set up are running continuously since 2012. MCMs are running without any issue because of robust software architecture.
- Tested Sentinel and Fiber Optics systems of C01, C04, C06 antennas
- Before that we also tested single antenna single MCM at C01, C04, C06, C09, C12 , S02, S04
- Tested Sentinel, Fiber Optics, Front End and GAB systems in Lab
- MCM Debug is extensively being used by lab members for tuning 64 monitoring channels and testing MCM features before its release.
- MCMs are interfaced with Sentinel and GAB system of 15m dish Antenna at NCRA are running very smooth since 2011.

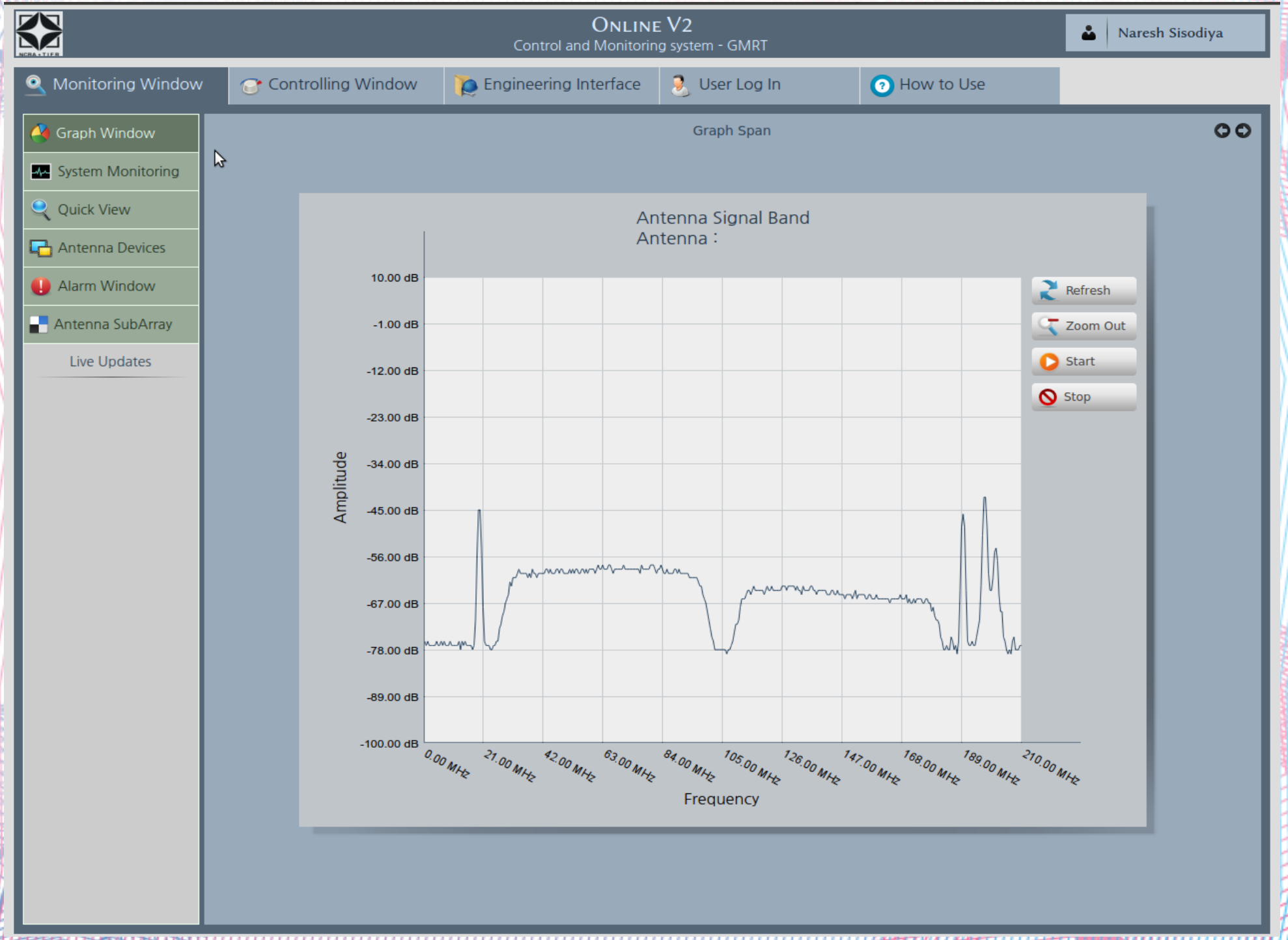
Qt/QML Based Online_V2 GUI

- Online_V2 GUI is designed using Qt/QML because it supports easy integration of logic and graphics.
- Logic is written in C++ as well as JavaScript
- Graphics is written in QML which is more like CSS
- Data communication between GUI and core application can be done via various methods like : using XML file, over Socket and direct database access.
- As of Now Four interfaces are designed : Monitoring, Controlling, Engineering and User Management.
- Testing : Online_V2GUI has been tested during April 2014 MTAC, October 2014 MTAC, Front End, Fiber Optics, GAB, and Sentinel Lab Testing.

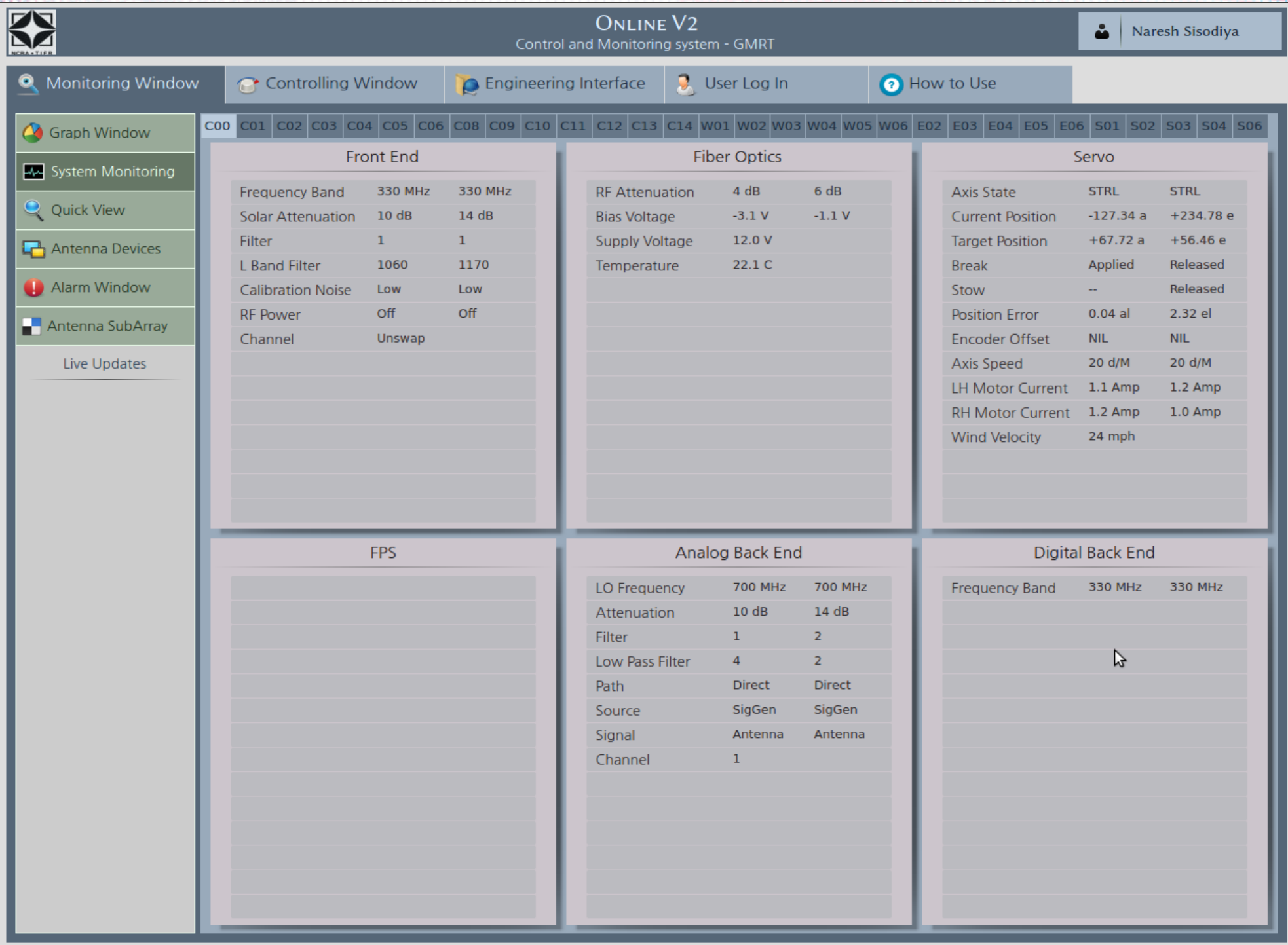
Monitoring GUI

- Monitoring GUI includes various User Interfaces : Graph Window, System Window, Antenna devices Window, Alarm Window.
- Graph Window : To display various zoom-able graph.
- System Window : To display all parameters of all system of the antenna.
- Antenna device Window : To display all network device at antenna and at receiver room.
- Alarm Window : To display all system alarm with priority and level.

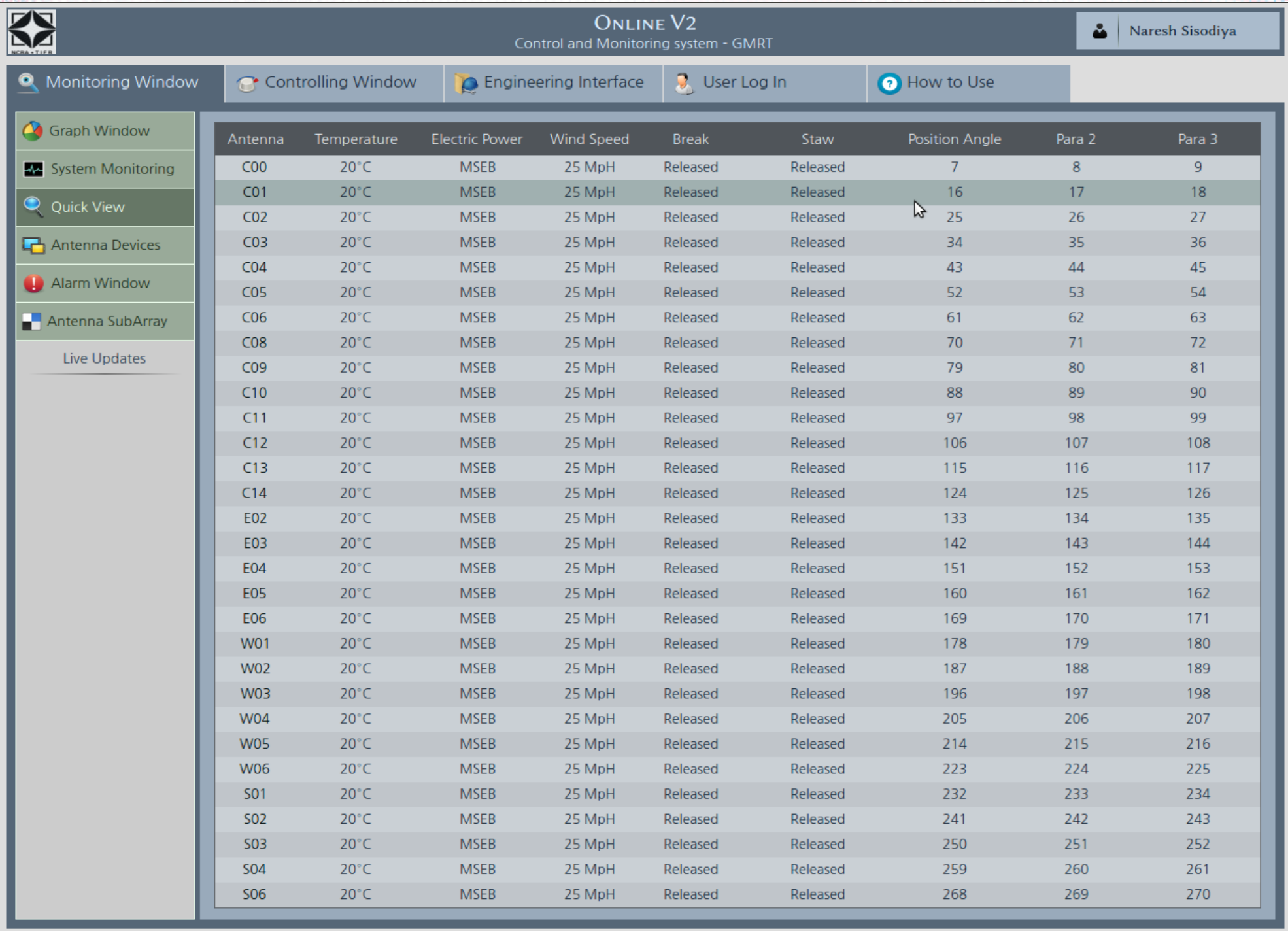
Graph Window



System Window

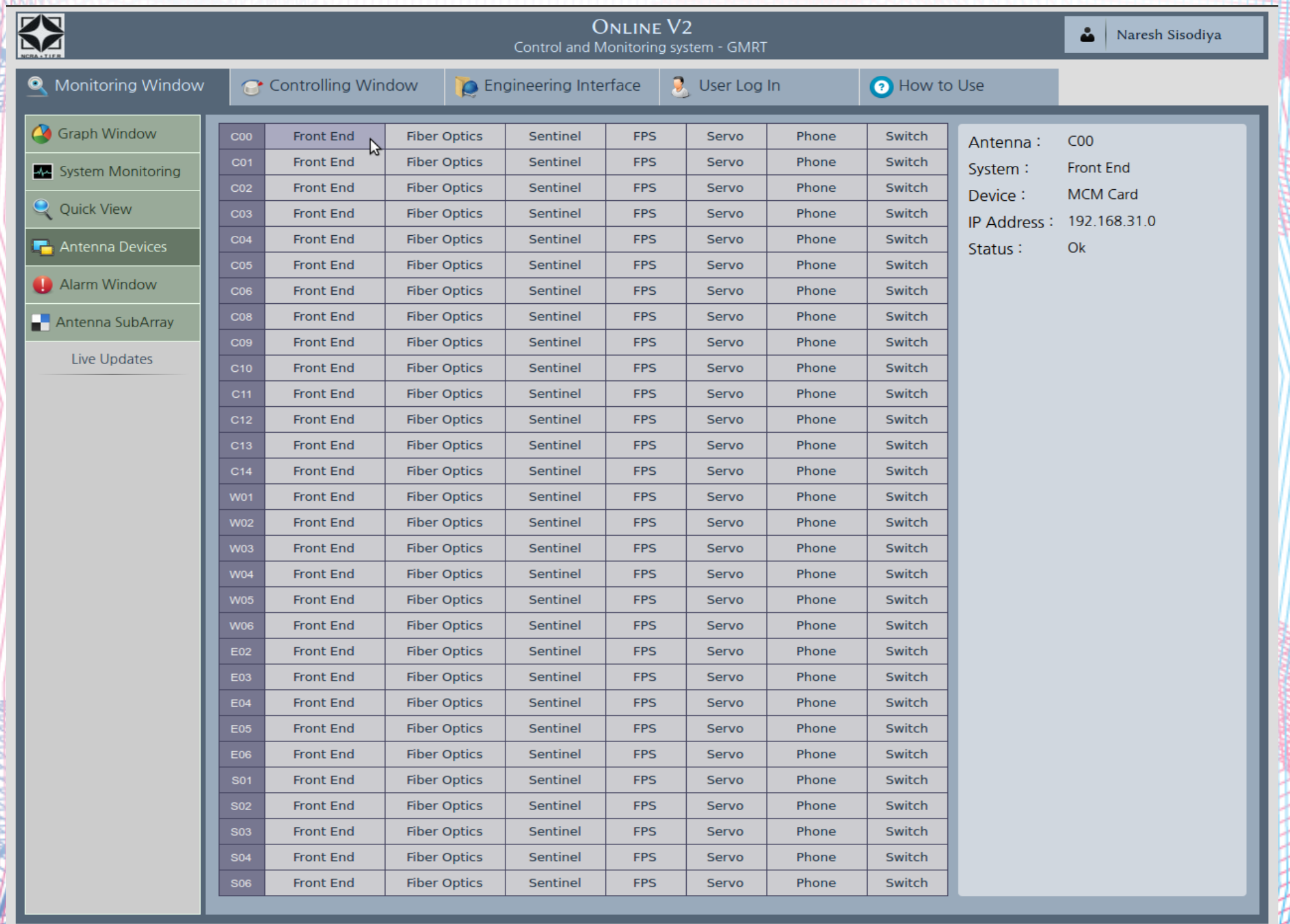


Quick View Window

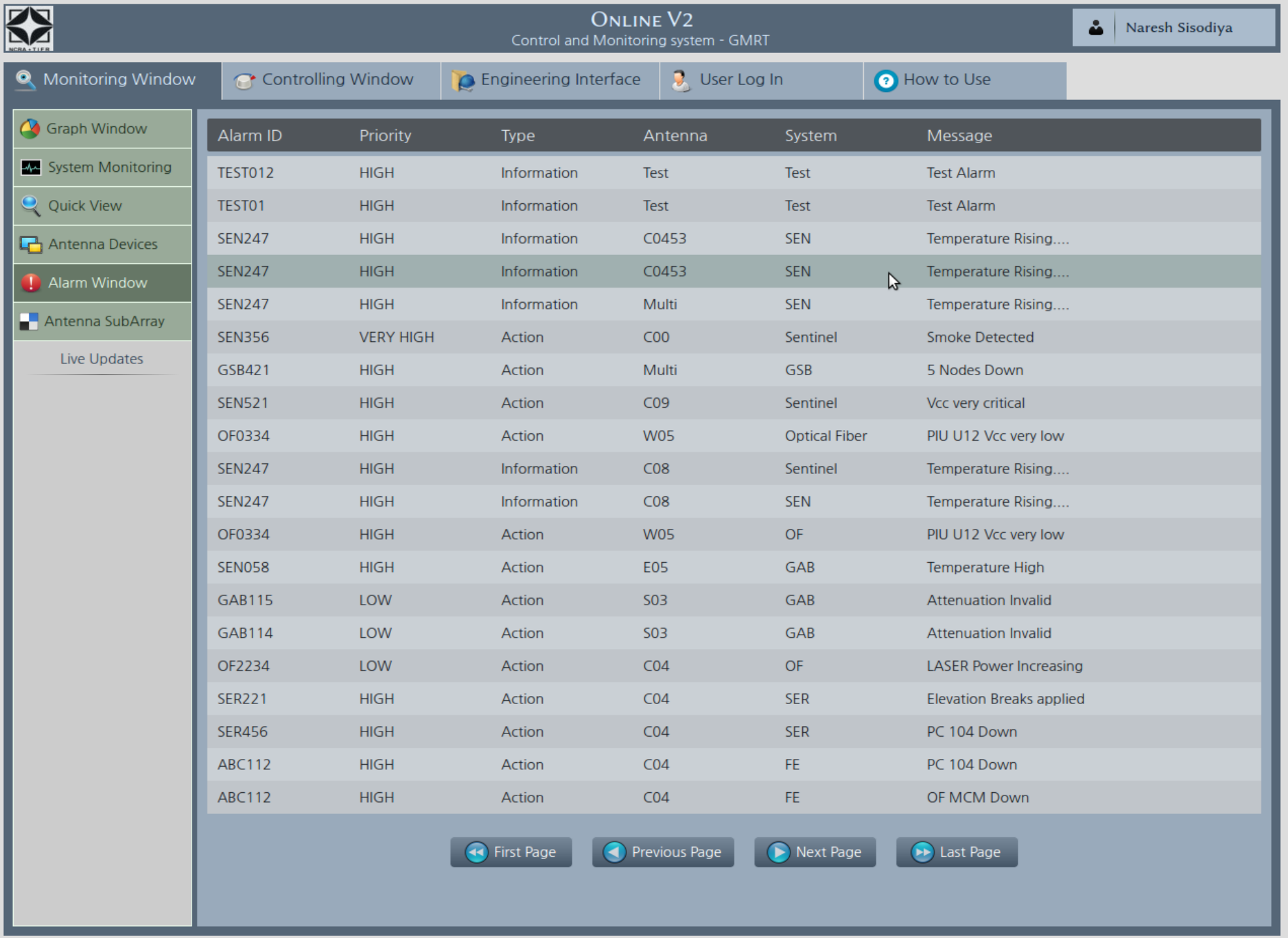


Antenna	Temperature	Electric Power	Wind Speed	Break	Staw	Position Angle	Para 2	Para 3
C00	20°C	MSEB	25 MpH	Released	Released	7	8	9
C01	20°C	MSEB	25 MpH	Released	Released	16	17	18
C02	20°C	MSEB	25 MpH	Released	Released	25	26	27
C03	20°C	MSEB	25 MpH	Released	Released	34	35	36
C04	20°C	MSEB	25 MpH	Released	Released	43	44	45
C05	20°C	MSEB	25 MpH	Released	Released	52	53	54
C06	20°C	MSEB	25 MpH	Released	Released	61	62	63
C08	20°C	MSEB	25 MpH	Released	Released	70	71	72
C09	20°C	MSEB	25 MpH	Released	Released	79	80	81
C10	20°C	MSEB	25 MpH	Released	Released	88	89	90
C11	20°C	MSEB	25 MpH	Released	Released	97	98	99
C12	20°C	MSEB	25 MpH	Released	Released	106	107	108
C13	20°C	MSEB	25 MpH	Released	Released	115	116	117
C14	20°C	MSEB	25 MpH	Released	Released	124	125	126
E02	20°C	MSEB	25 MpH	Released	Released	133	134	135
E03	20°C	MSEB	25 MpH	Released	Released	142	143	144
E04	20°C	MSEB	25 MpH	Released	Released	151	152	153
E05	20°C	MSEB	25 MpH	Released	Released	160	161	162
E06	20°C	MSEB	25 MpH	Released	Released	169	170	171
W01	20°C	MSEB	25 MpH	Released	Released	178	179	180
W02	20°C	MSEB	25 MpH	Released	Released	187	188	189
W03	20°C	MSEB	25 MpH	Released	Released	196	197	198
W04	20°C	MSEB	25 MpH	Released	Released	205	206	207
W05	20°C	MSEB	25 MpH	Released	Released	214	215	216
W06	20°C	MSEB	25 MpH	Released	Released	223	224	225
S01	20°C	MSEB	25 MpH	Released	Released	232	233	234
S02	20°C	MSEB	25 MpH	Released	Released	241	242	243
S03	20°C	MSEB	25 MpH	Released	Released	250	251	252
S04	20°C	MSEB	25 MpH	Released	Released	259	260	261
S06	20°C	MSEB	25 MpH	Released	Released	268	269	270

Antenna Devices Window



Alarm Window



Alarm ID	Priority	Type	Antenna	System	Message
TEST012	HIGH	Information	Test	Test	Test Alarm
TEST01	HIGH	Information	Test	Test	Test Alarm
SEN247	HIGH	Information	C0453	SEN	Temperature Rising....
SEN247	HIGH	Information	C0453	SEN	Temperature Rising....
SEN247	HIGH	Information	Multi	SEN	Temperature Rising....
SEN356	VERY HIGH	Action	C00	Sentinel	Smoke Detected
GSB421	HIGH	Action	Multi	GSB	5 Nodes Down
SEN521	HIGH	Action	C09	Sentinel	Vcc very critical
OF0334	HIGH	Action	W05	Optical Fiber	PIU U12 Vcc very low
SEN247	HIGH	Information	C08	Sentinel	Temperature Rising....
SEN247	HIGH	Information	C08	SEN	Temperature Rising....
OF0334	HIGH	Action	W05	OF	PIU U12 Vcc very low
SEN058	HIGH	Action	E05	GAB	Temperature High
GAB115	LOW	Action	S03	GAB	Attenuation Invalid
GAB114	LOW	Action	S03	GAB	Attenuation Invalid
OF2234	LOW	Action	C04	OF	LASER Power Increasing
SER221	HIGH	Action	C04	SER	Elevation Breaks applied
SER456	HIGH	Action	C04	SER	PC 104 Down
ABC112	HIGH	Action	C04	FE	PC 104 Down
ABC112	HIGH	Action	C04	FE	OF MCM Down

Controlling GUI

- Provides Interface to set various system parameters
- Setting can be provided to single antenna or Multiple Antennas
- Systems included are :
  - Front End
  - Fiber Optics
  - Sentinel
  - Servo
  - FPS
  - GAB
  - GSB

Online V2

Control and Monitoring system - GMRT

Naresh Sisodiya

Monitoring Window | Controlling Window | Engineering Interface | User Log In | How to Use

Select Sub Array: Master | Modify SubArray | Create SubArray | Delete SubArray | Select Antenna

Front End

Frequency Band	50 MHz	50 MHz
Solar Attenuation	0 dB	0 dB
Channel	Unswap	
Sub Band Selection	Sub 1	
RF Power	Off	
Calibration Noise	Low	Submit FE

Servo

Position Angle	Azimuth		Angle1	Angle2	Submit PA
Target Angle	Azimuth	Time	Angle1	Angle2	Submit TA
Hold	Azimuth	Submit Hold			
Stop	Azimuth	Submit Stop			
Stow	Azimuth	Submit Stow			
Stow Release	Azimuth	Submit Stow Release			

Cold Start | Close | Abort | Reset HW

Optical Fiber

RF Attenuation	00 dB	00 dB	Submit OF

Feed Positioning System

Turning point	100	Low RPM	100
RAMP Down Count	100	RAMP Up Count	100
Break Difference	100	Stop Time Count	100
Max Angle	100	Min Angle	100

Submit FPS

FPS Init | FPS NULL | Calibrate | Free Run | Reboot | FPS Stop

Analog Back End

LO Frequency	600000 KHz	600000 KHz
Reference LO	10 MHz	10 MHz
Attenuation	00.0 dB	00.0 dB
Filter	0	0
Low Pass Filter	200 MHz	200 MHz
Path	Direct	Direct
Source	Synthesizer	Synthesizer
Signal	Antenna RF	Antenna RF

Submit GAB

Digital Back End

Mode	Realtime	LTA	8
Stokes	Full Stokes	Control	Online
Final Bandwidth	0	Acquisition Bandwidth	33.333333
Beam 1	Off 30	Beam 2	Off 30
F Stop	On	Gain Equalizer	On
BaseBand LO	32 MHz	Edge Frequency	0
Max Channel	256	Channel Number	0 to 255

Submit GSB

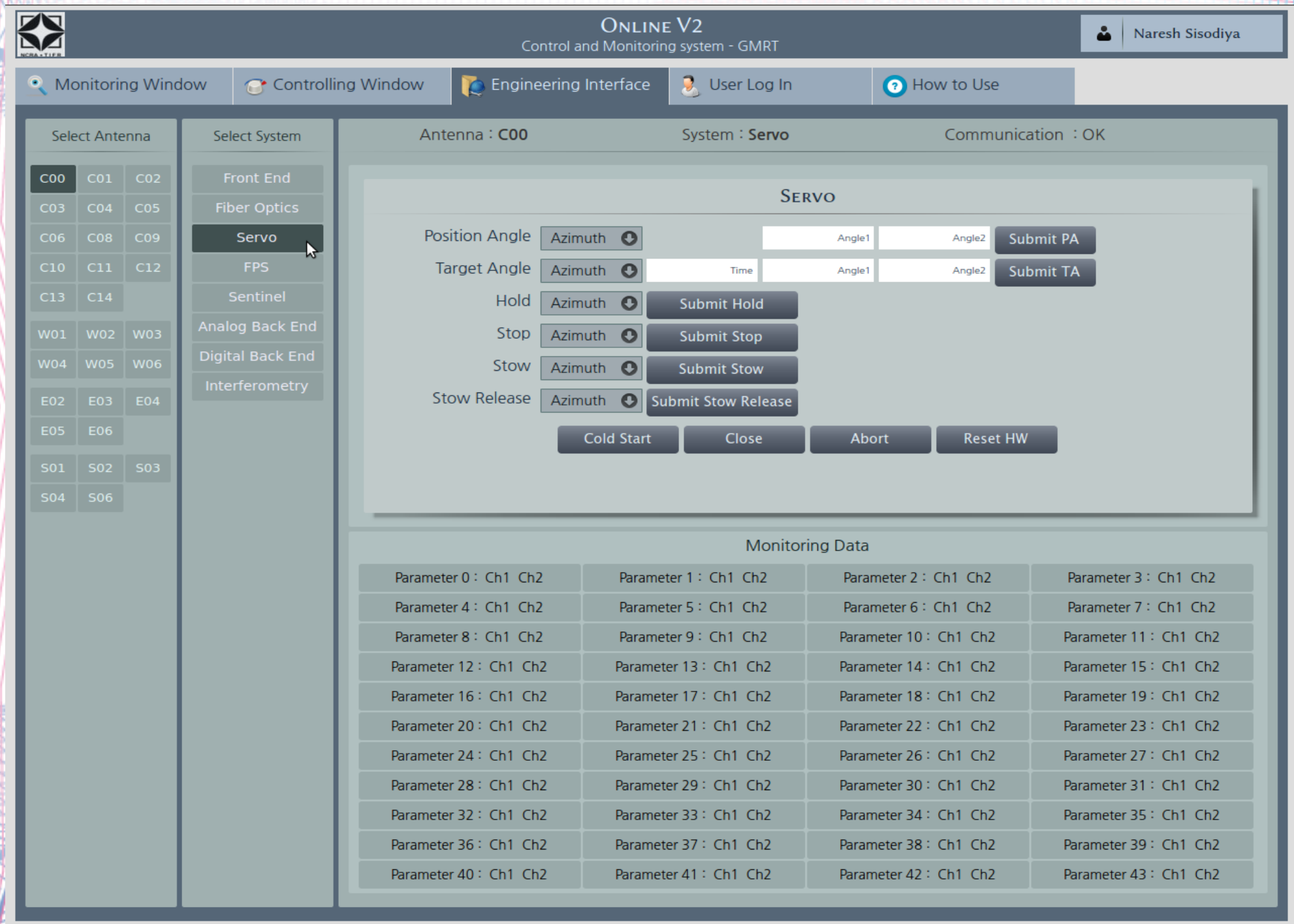
Sentinel

Digital Mask	0000 Hex	0000 Hex	Submit Sentinel

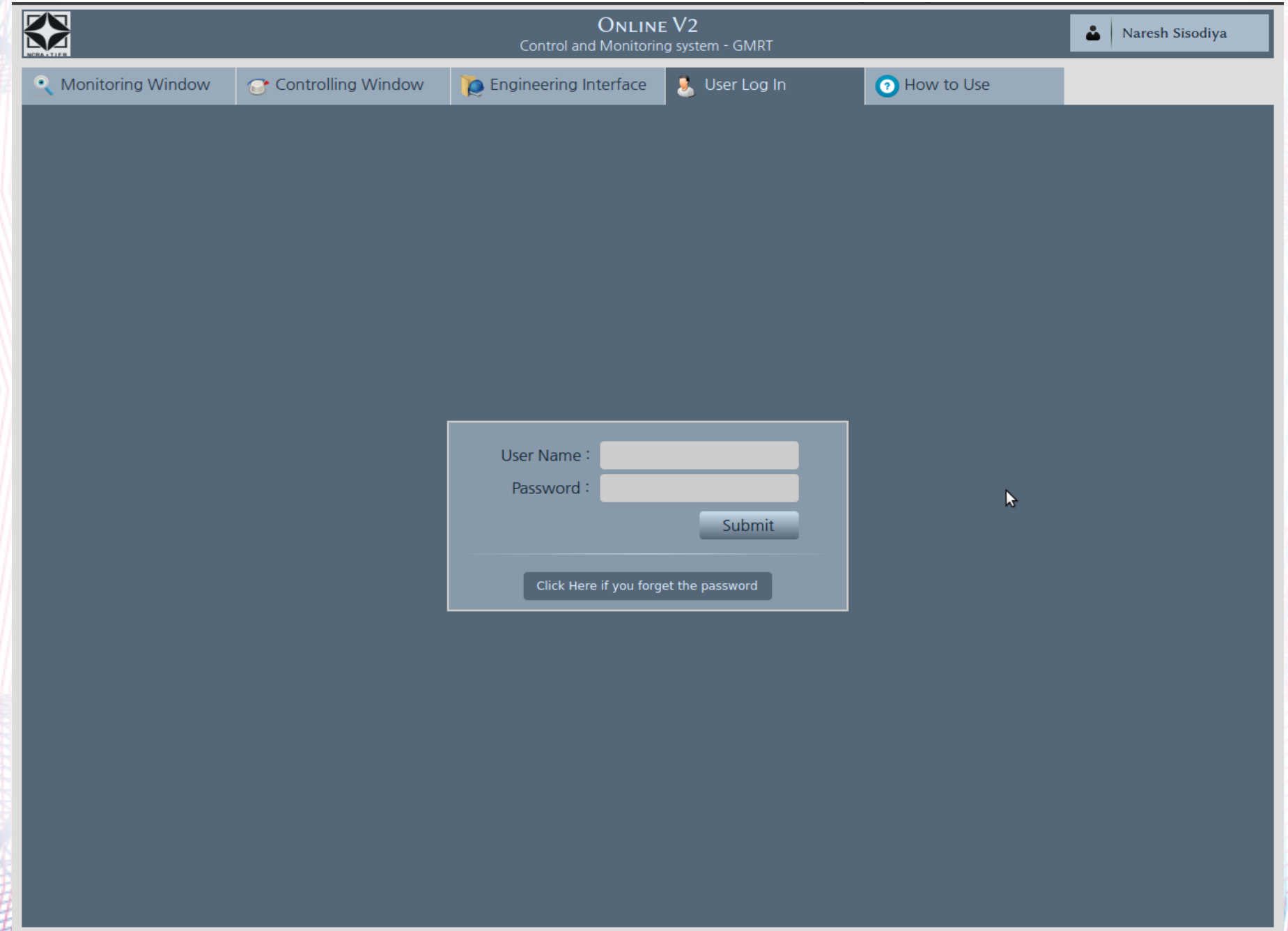
Engineering GUI

- Engineering GUI provides setting of system in more detail.
- Functions which are very system specific will be included here.
- Accessible to only system experts for testing their own system.
- Single Antenna Single System can be selected.

Engineering Interface



User Log In


Online V2
Control and Monitoring system - GMRT
Naresh Sisodiya
Monitoring Window
Controlling Window
Engineering Interface
User Log In
How to Use
User Name :
Password :
Submit
Click Here if you forget the password

Lets have
Questions & Answers....

Thank You.....