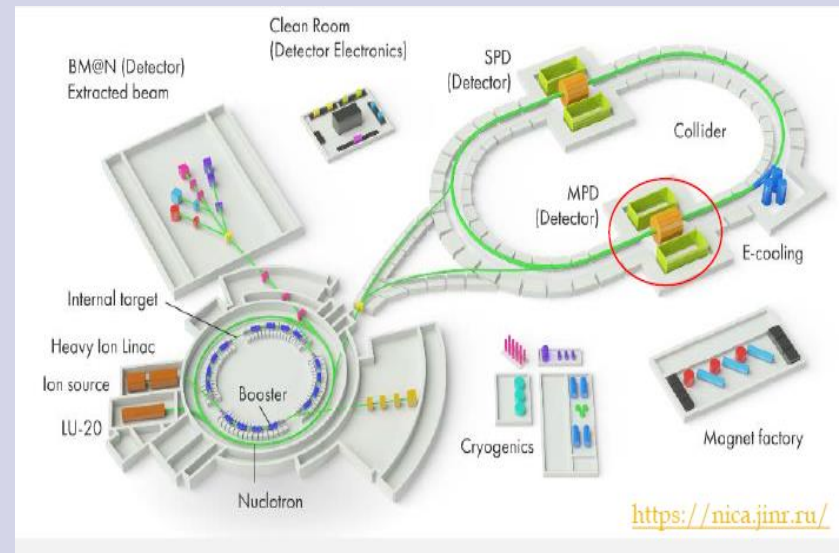


MPD TPC status (08.11.2022)

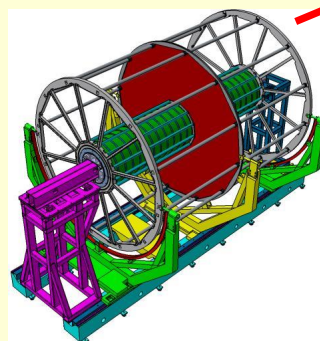
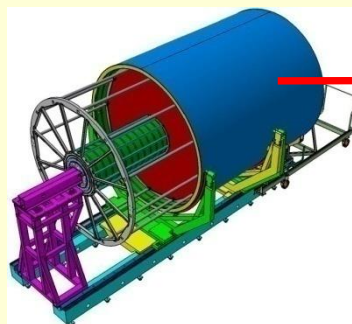
- TPC vessel assembly
- ROC chambers
- Gating grid system
- Electronics
- Gas and cooling systems
- LV+HV system (CAEN)
- Cabling and piping
- Integration TPC to MPD
- Time schedule



Presented by Sergey Movchan

JINR team: 24 persons
Belarus: 10 persons

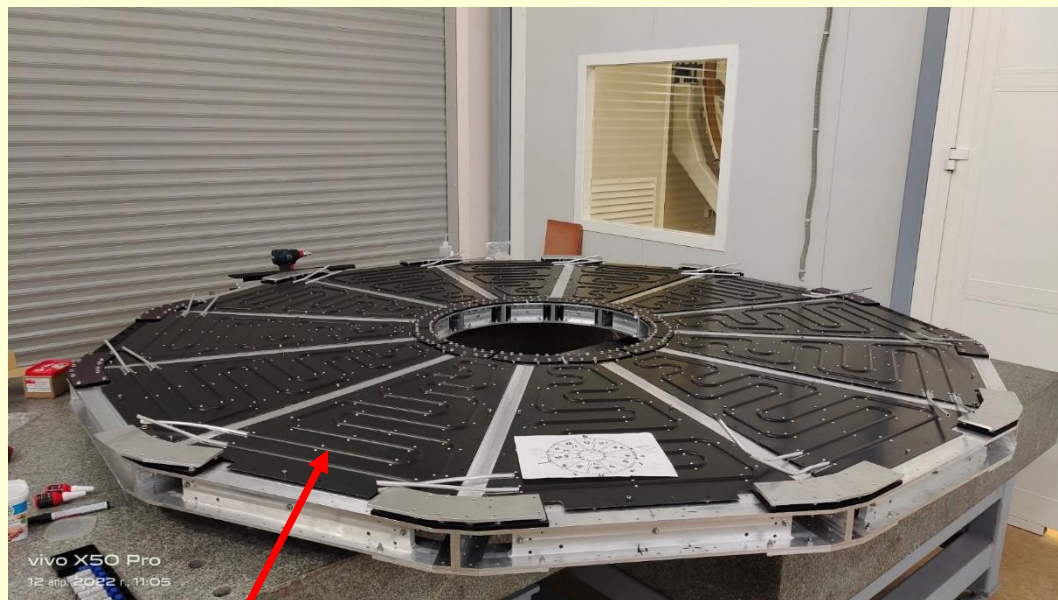
TPC vessel assembly (Bld.217) – common view



C1-C2 and C3-C4 cylinder – assembled
TPC service wheels (2pc) – assembled
HV membrane – tested
TPC field cage assembly – Jan-Feb 2023
TPC vessel ready – March 2023

TPC assembly – in progress

TPC service wheels: status (**Bld.217**)

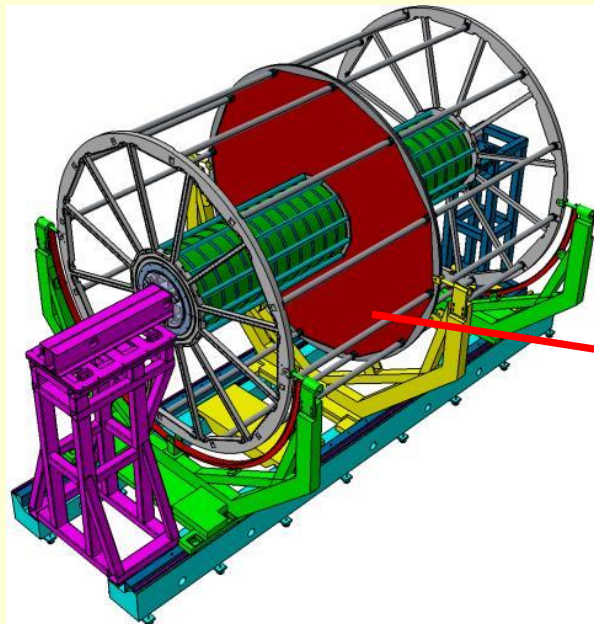


Thermal panels (12pc)



**Both service wheels -
assembled**

TPC field cage rods assembly



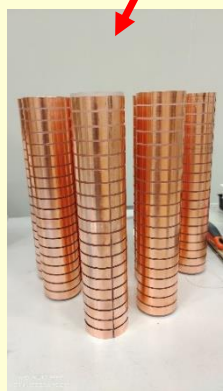
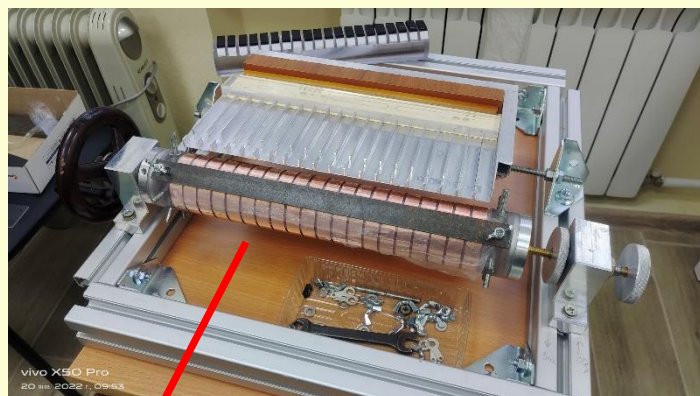
Set up for rod $D=30$ mm assembly



Rods (30 pc) - assembled

TPC field cage rods assembly

Set up for tubes assembly



Set up for D=60 mm rod assembly



Rods D=60 mm – assembling started

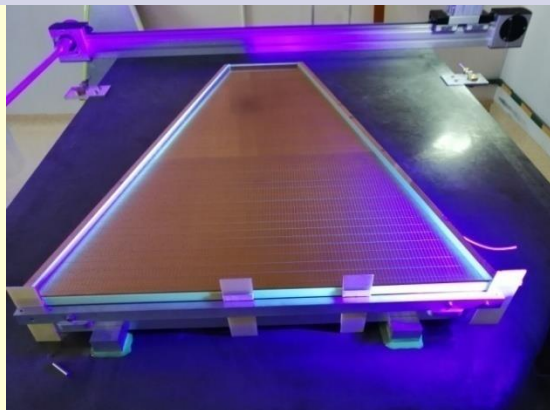
$N=144+11\text{spare}=155$ pc - ready

ROC chambers status

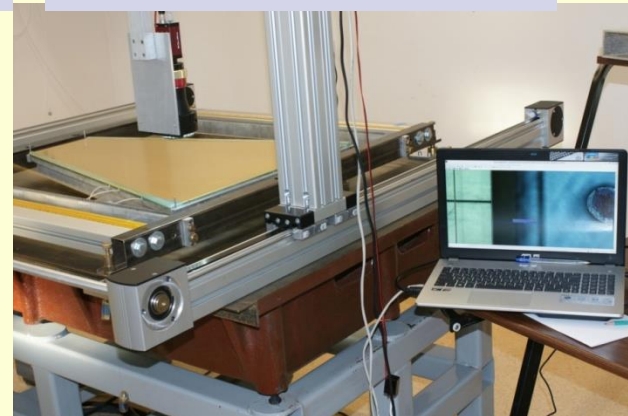
24 pc tested ROCs in stock



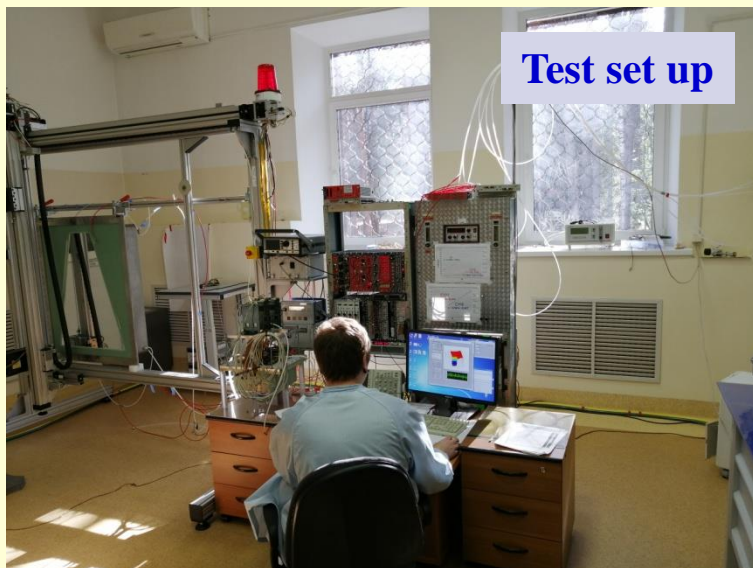
ROC cleaning procedure



Wire pitch check set up



Test set up

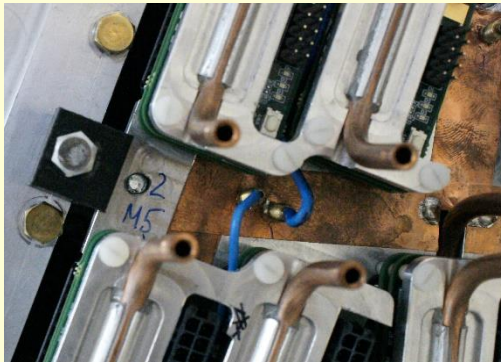


+ 2 pc spare – tested

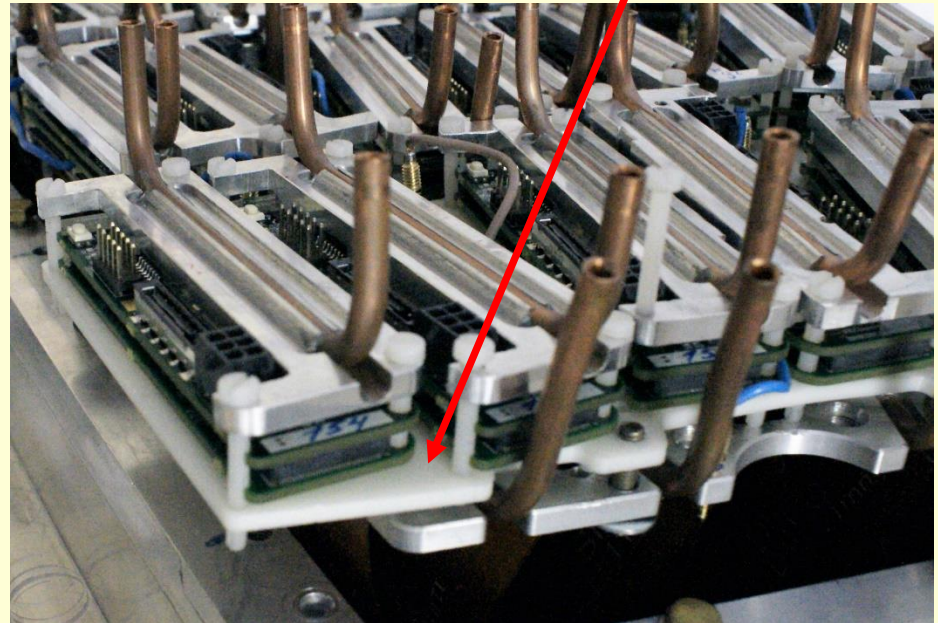


ROC: FE cards **integration**

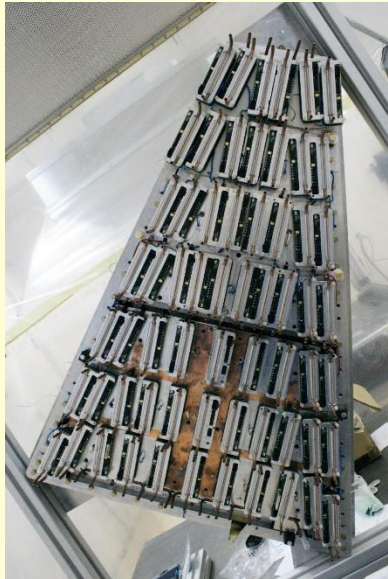
Card
grounding



Additional cooling plate



- FECs can be mount **after**
ROC installation
- Now FECs can be place
in one level



Set up for **pads calibration** respect to ROC alignment pins



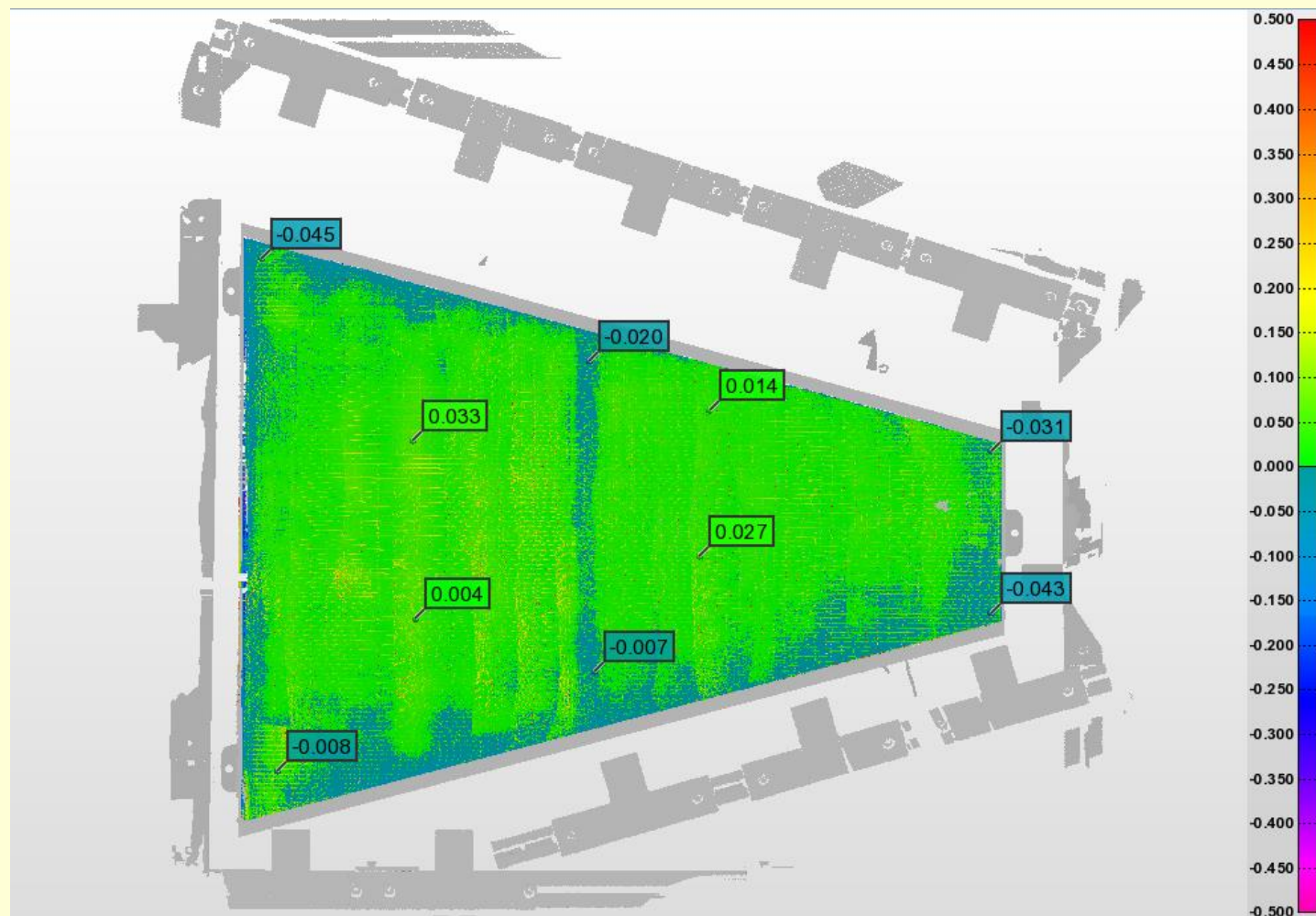
Leica MS60 - 1 second

Leica AT960 ± 10 mkm $+5$ mkm/m

Leica AT403 ± 15 mkm $+6$ mkm/m

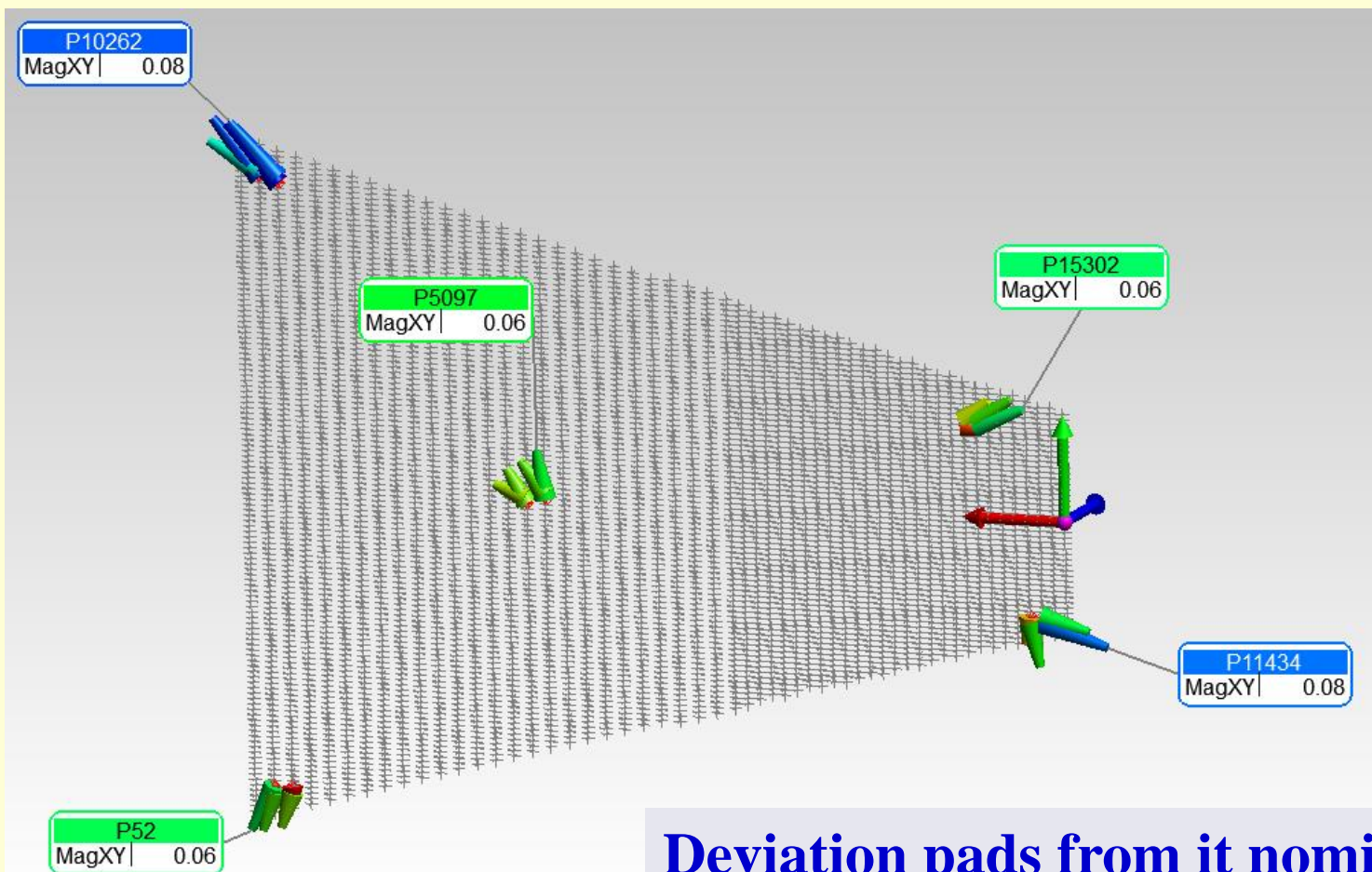
Scanner AS1+AT960 ± 50 mkm

Pad plane unflatness: example



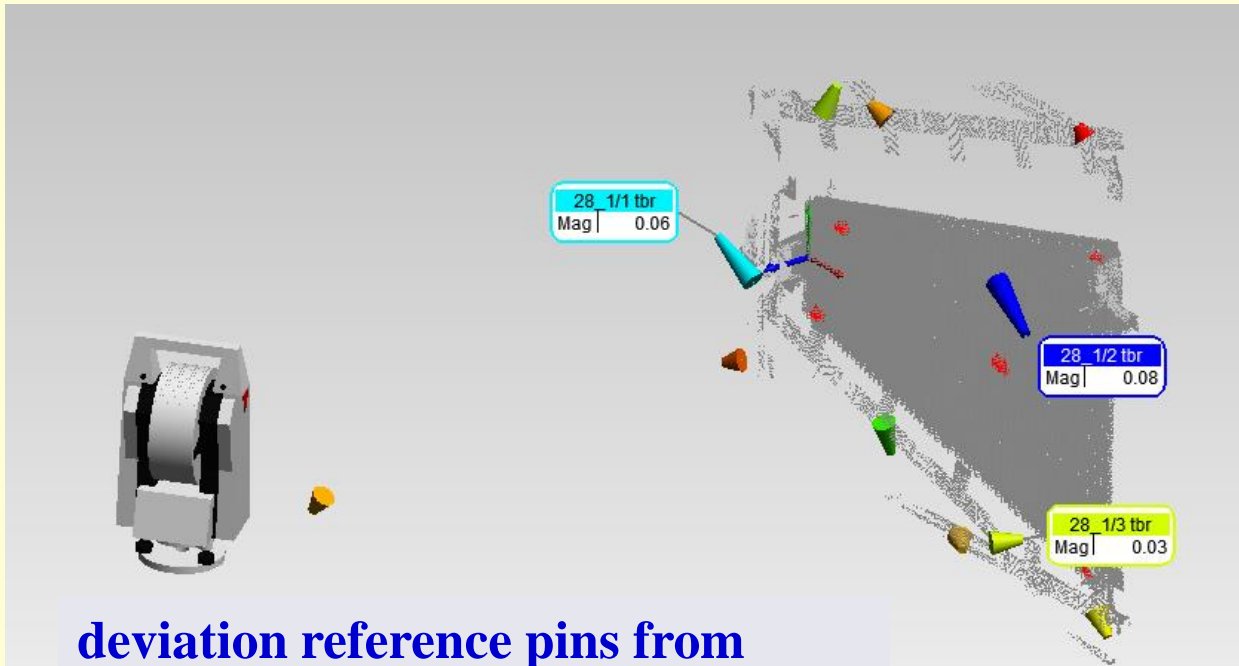
+/- 30 mkm

Pads geometry deviation from it nominal position:



Deviation pads from it nominal position:
systematic - up to 150 mkm (X and Y)

ROC alignment marks



deviation reference pins from
it nominal position - **up to 80 mkm**

Full set of photogram-
metry marks
for all ROC chambers



Summary:

- measurements to do for all
30pc ROCs
- ROC marks and pads calibration
(**computation**) respect to ROC
“reference hole” - **in progress**

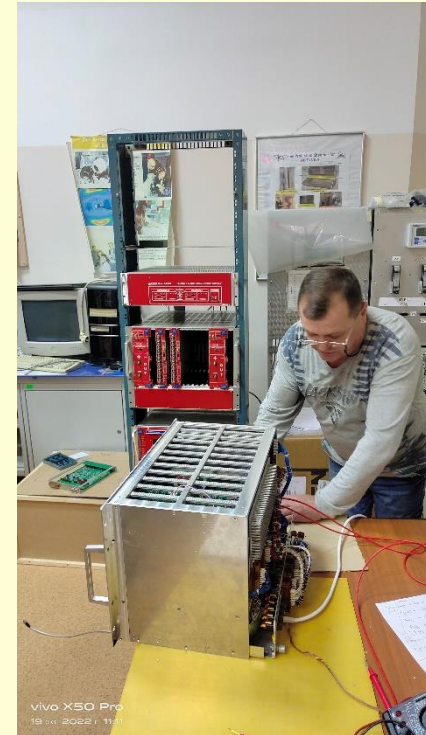
ROC gating grid system (Minsk)



Pulse rise time
- 500 ns, **OK!**



Prototype
power supply
test



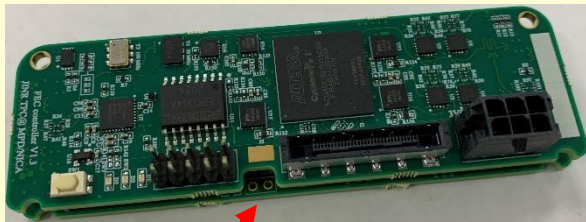
Mass-production – started

Delivery to JINR – **Dec 2022**



TPC electronics: test set up

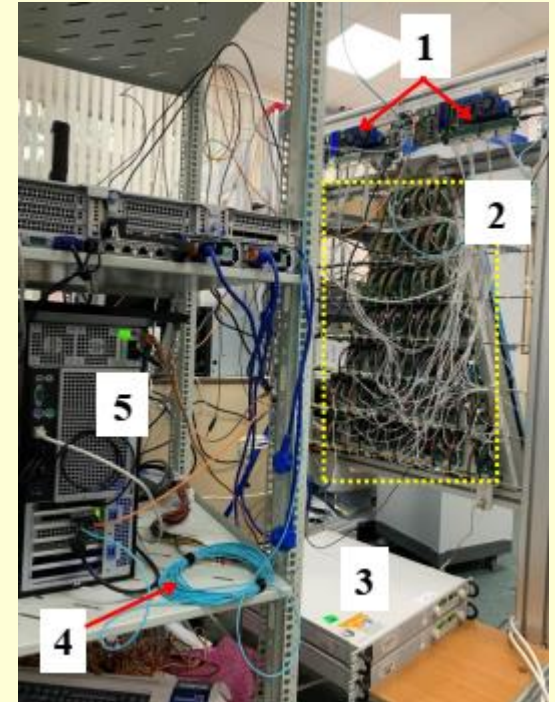
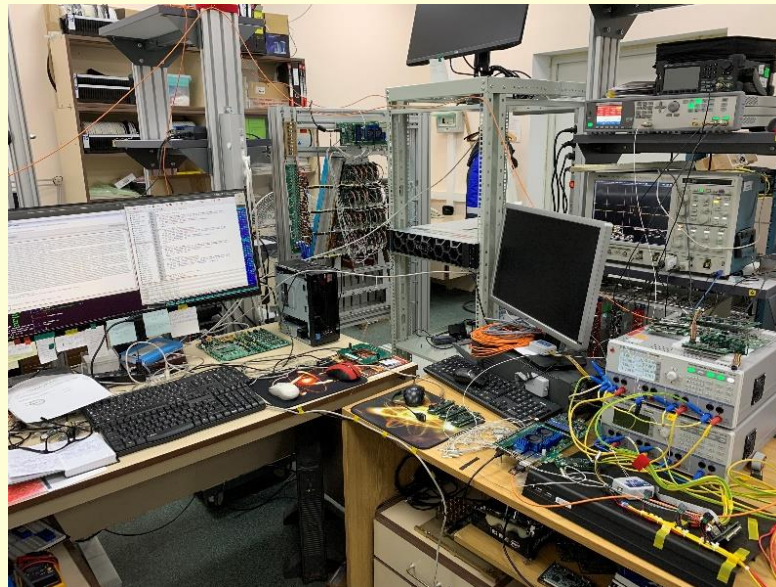
Production version of the FE card:



Analog power
supply connector
for SAMPA board

1. RCU prototypes
2. FECs on the ROC (62 pc)
3. LV power supply
4. DCU card connected with RCU via fibers
5. Readout server

**3968ch readout system
powered via LVDB**

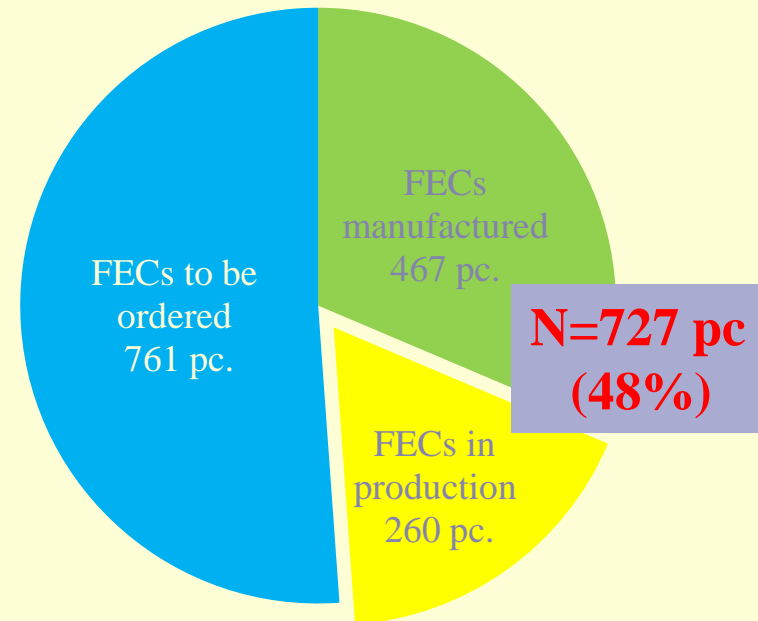


DAQ prototype:
62 FE cards, RCU prototypes,
ROC, 2pc LVDBs, server interface
board - **tests ongoing**

TPC electronics: status



TPC FE cards production status



- **727** FECs of 1500 were produced.
- Tests of the FEC basic functionality were shown the target characteristics (Noise and stability).
- Testing of the readout system for one **ROC** is ongoing.

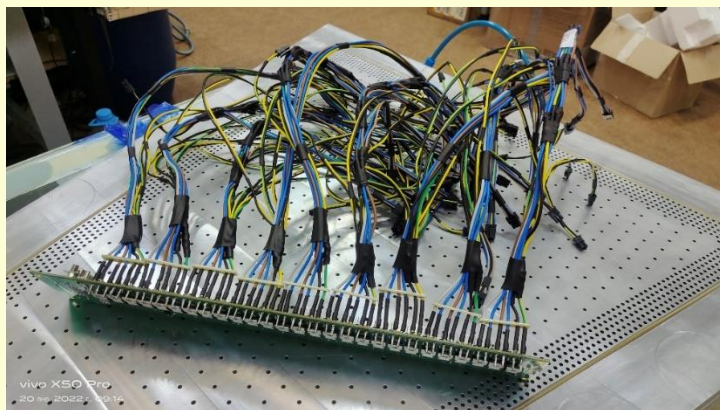
11 ROCs chambers will be completed at the end of 2022.

FE power cables

Option №2



Option №1



60 pc LVN9 were send back to Minsk:

- modification connection of power cables to LVN9 - **in progress**
- modification of LVN9 output voltages to FECs - **in progress**
- test of LVN9 with cooling radiator under full load (analog – 70 A, digital – 50 A) – **in progress**

TPC R/O electronics: power consumption

| Electronics | Power |
|--|--|
| SAMPA FEE ($2 \times 62 \times 24 = 2976$ pc) | (1,016-1,2) W x 2976 ~ (3024 ÷ 3571) W |
| FPGA ($62 \times 24 = 1488$ pc) | (2,55-2.65) W x 1488 ~ (3792 ÷ 3943) W |
| LVDB (48 pc) | (76,1-80) W x 48 ~ (3652 ÷ 3840) W |
| R/O controllers (24 pc) | 200 W x 24 ~ 4800 W |
| TOTAL: | (15268 ÷ 16154) W |

P~16 kW

FE cooling radiators (INP BSU Minsk)

Bottom cooling plates



Set of top cooling plates



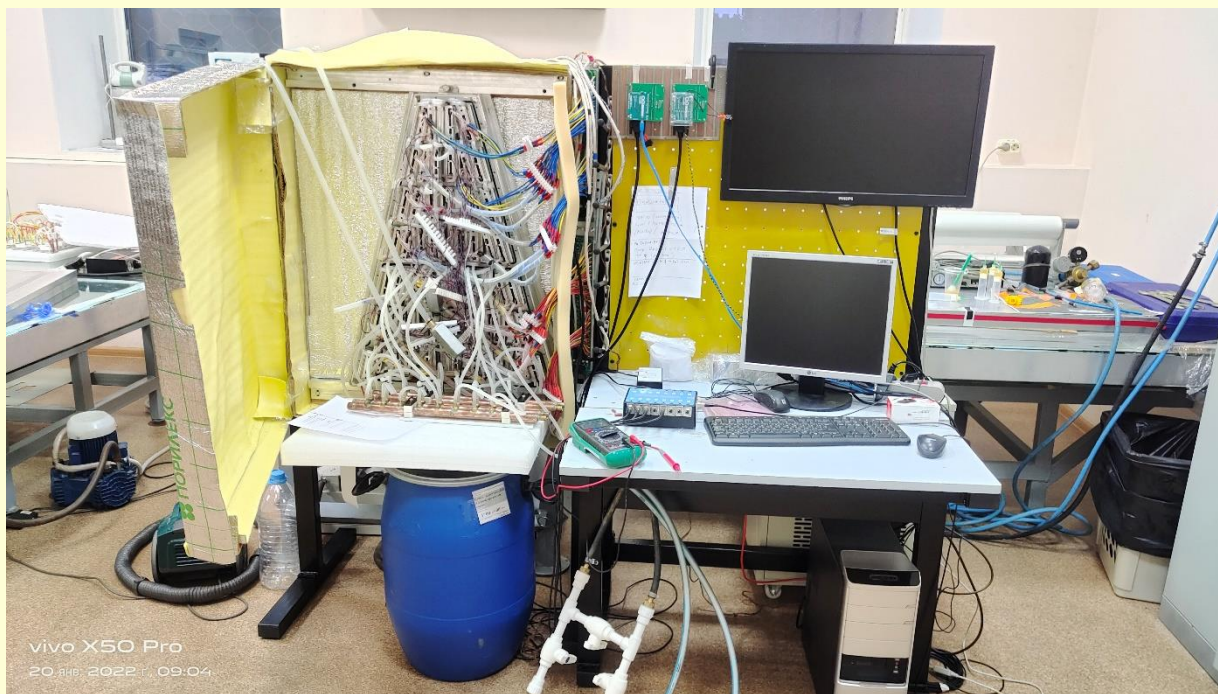
Cu tube Din - 3.16 mm
Plates thickness - (4+4) mm



TPC+ECAL cooling system:
tender -> **INP BSU, Minsk**
JINR-INP contract – in progress

ROC+FE cooling set up

Set up



Chiller

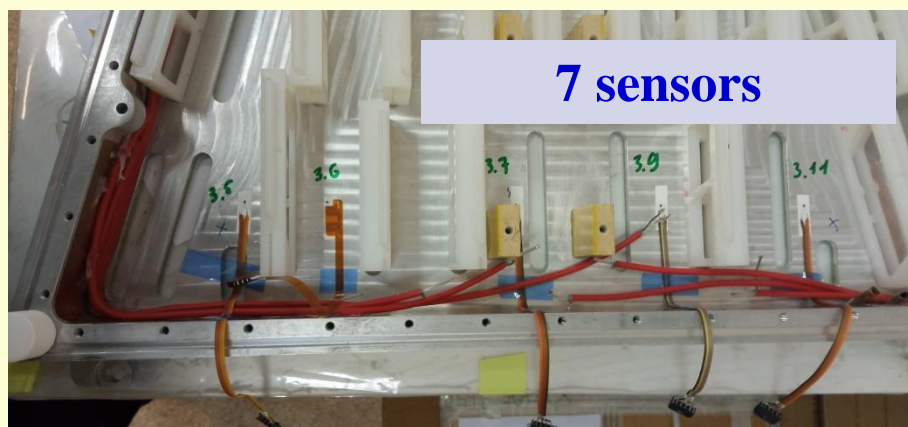
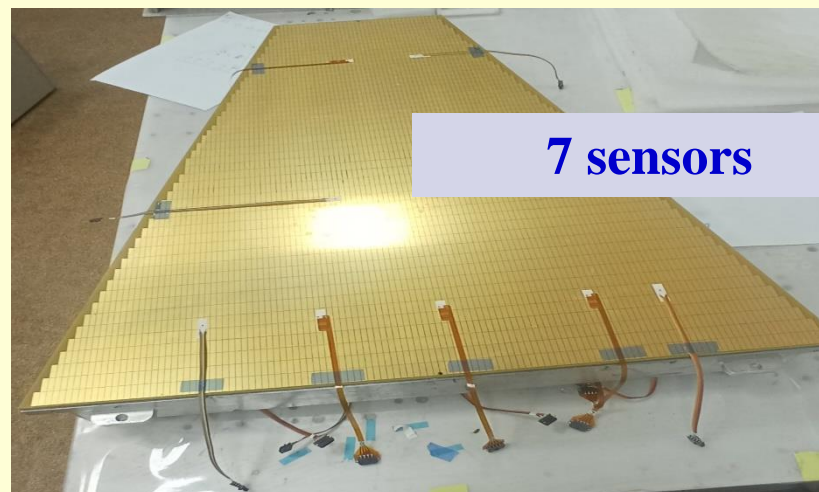
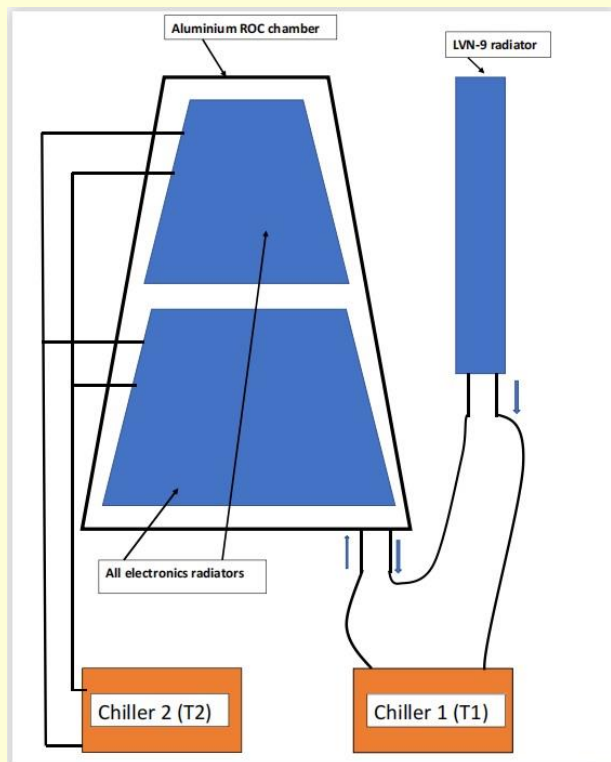


LV power

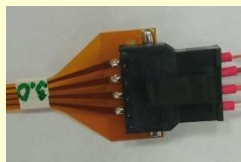


Tests – in progress

Cooling: sensors

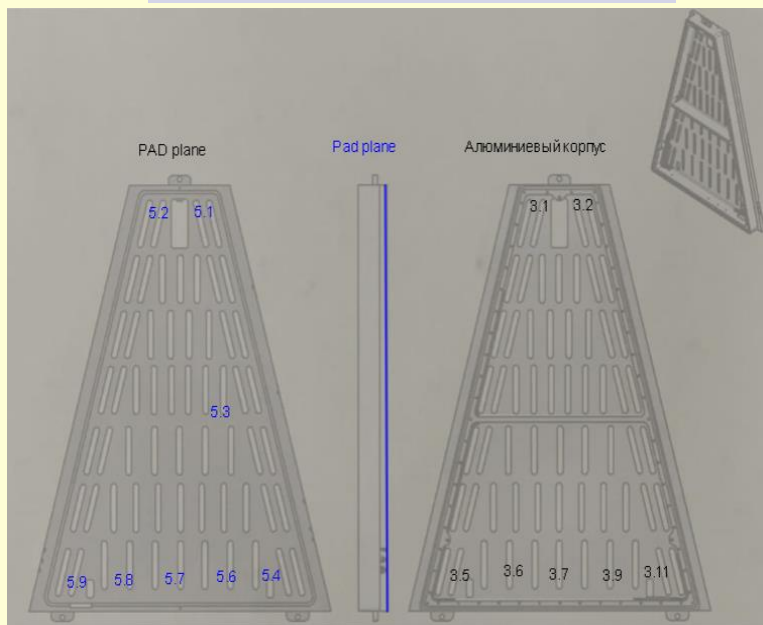


T sensor based on Pt100



ROC + FE cooling: results

ROC + pad sensors



FE card sensors



Air: T=23 degree (C)

| Water FECs T (C) | Water ROC T(C) | SAMPAs dT (C) | FPGAs dT (C) | Pads dT (C) | ROC dT (C) | T Min (C) | T Max (C) | Comments |
|------------------------|----------------------|------------------|-----------------|-------------------|------------------|-----------------|-----------------|----------|
| 17 | 25 | 3÷5 | 7 | 0.27 | 0.6 | 18 | 33 | |
| 19 | 22 | 3÷5 | 7 | < 0.2 | 0.2 | 20 | 35 | optimum |

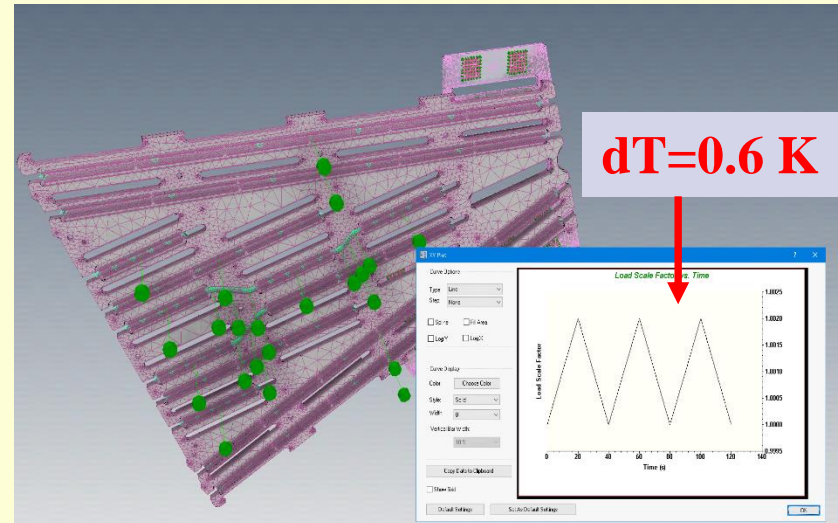
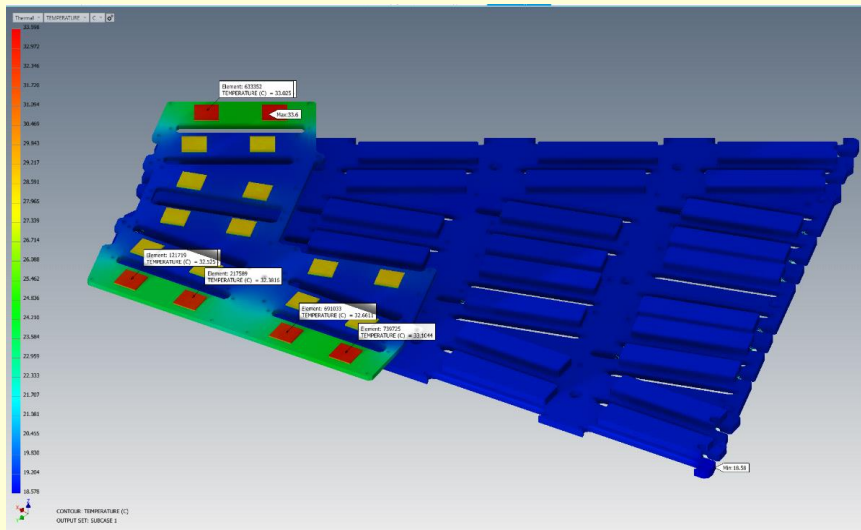
Cooling (Autodesk Inventor Nastran): **simulation**

Electronics water: $T=19\text{ C}$

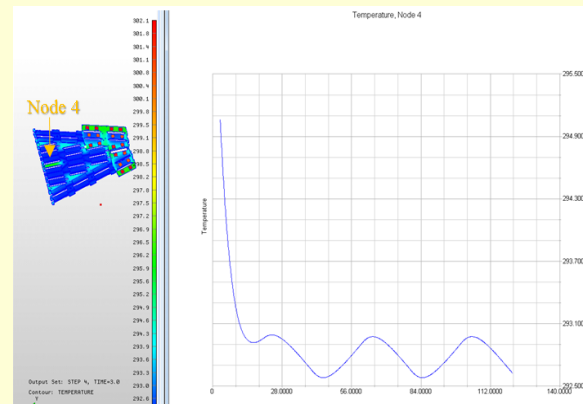
ROC water: $T=22\text{ C}$

Air: $T=23\text{ C}$

chiller simulation

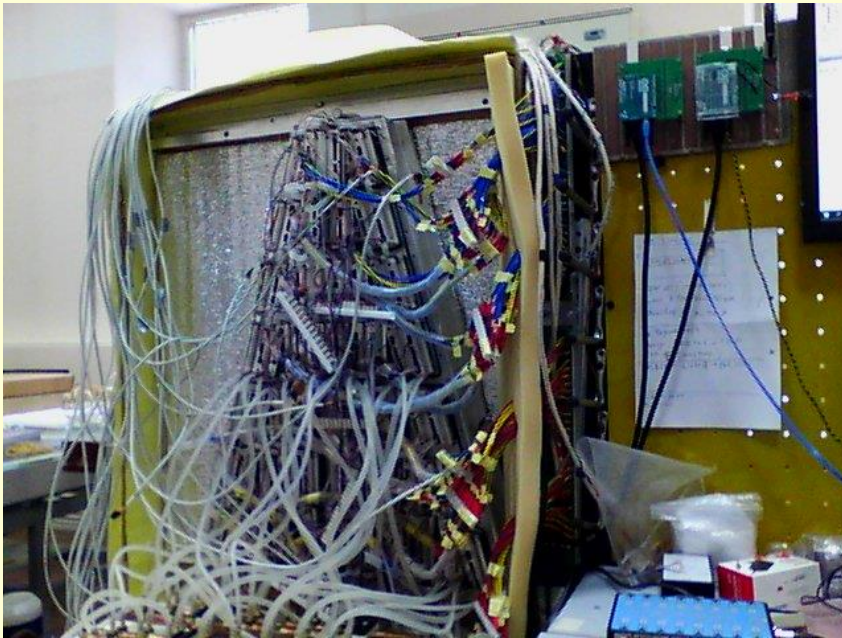


**Experimental and simulation
results are comparable**

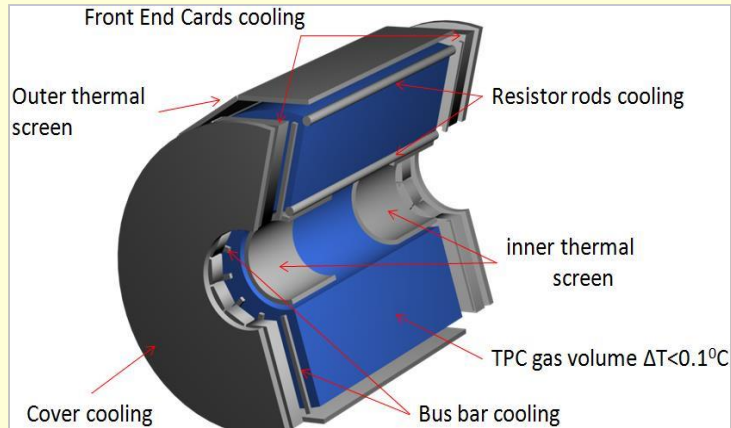


$dT=0.4\text{ K}$

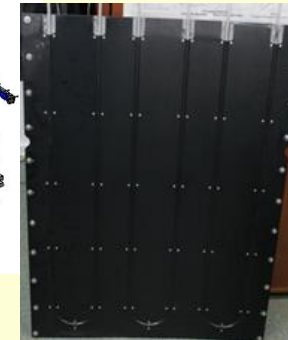
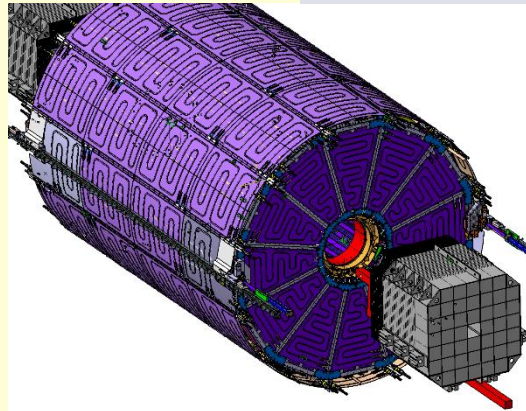
Example of “normal” cooling



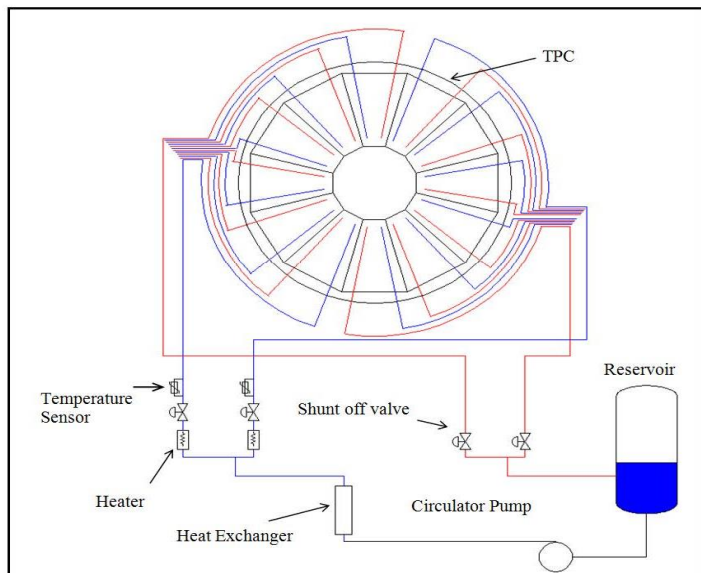
TPC cooling system



Barrel part – shorter and fixed to TPC instead TOF structure

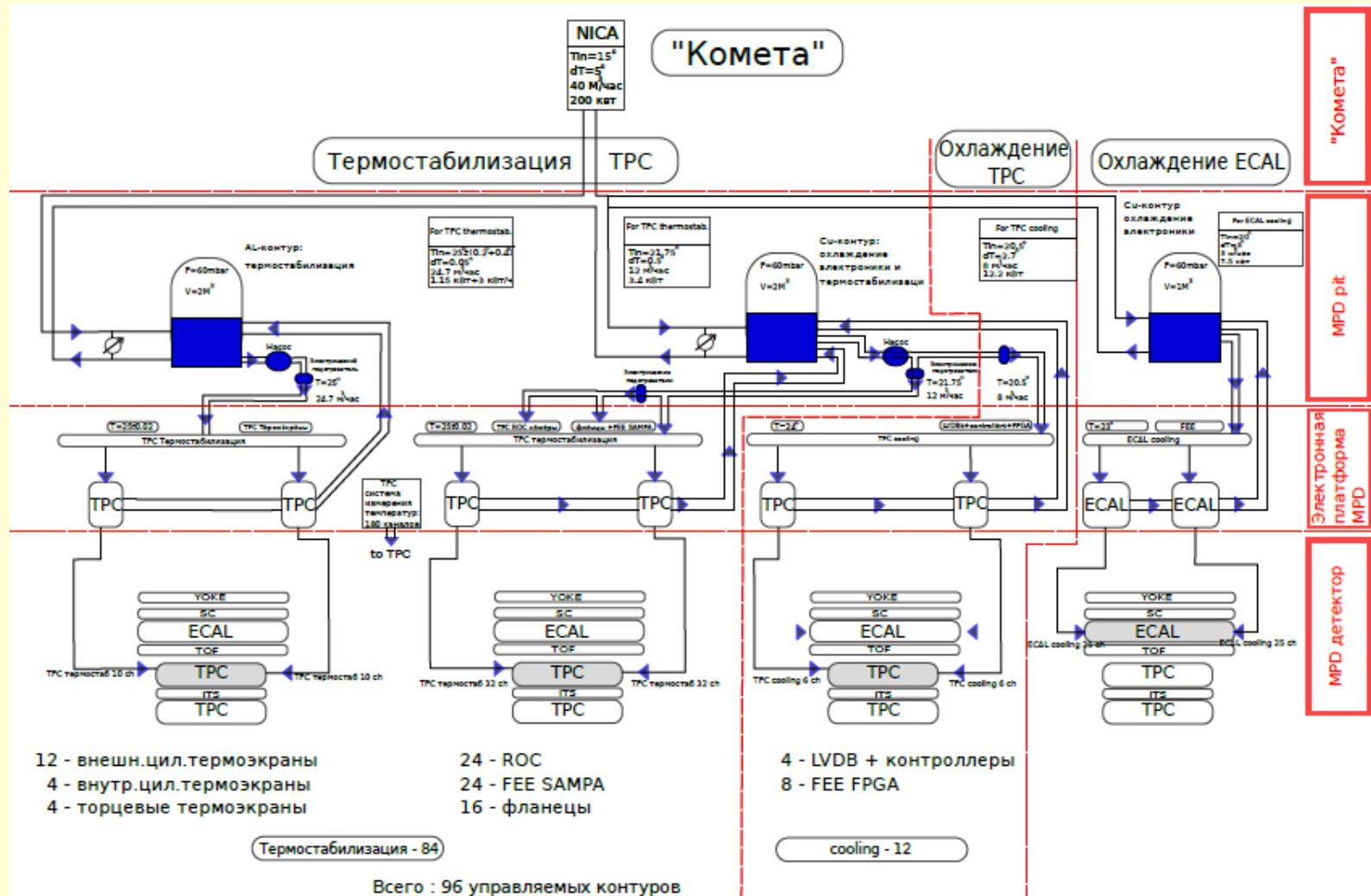


Full set – delivered

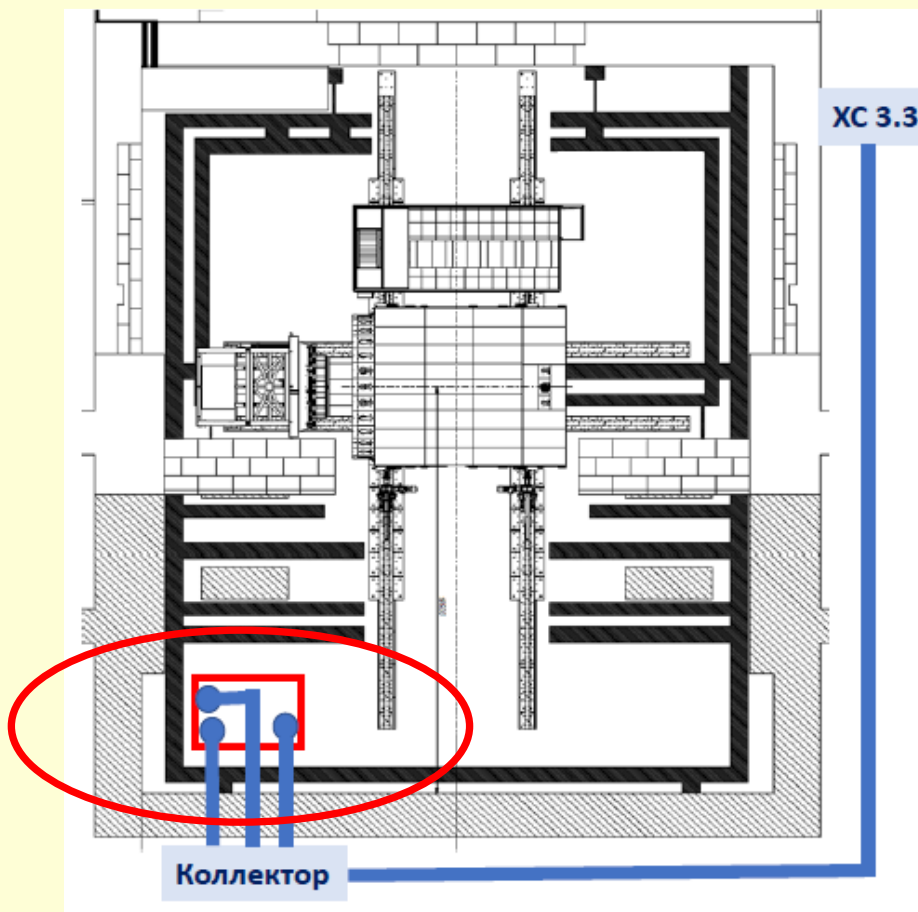


contract JINR-INP BSU (Minsk) – in progress
delivery – 30 September 2023
operation under manual control – during beam test 2024
fully automatic control – 30 September 2024

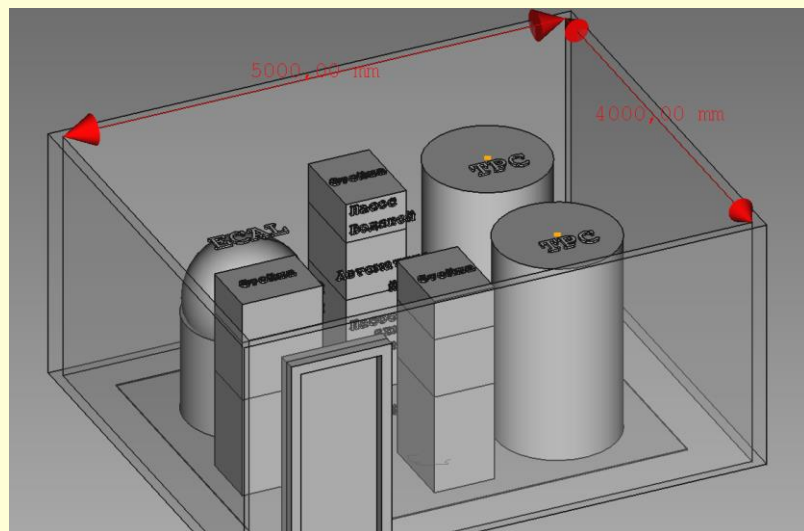
TPC+ECAL cooling system: scheme



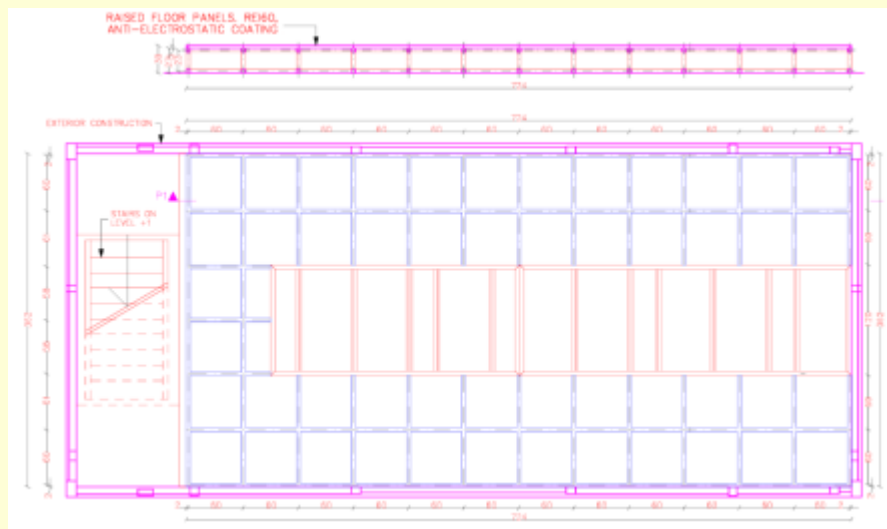
TPC+ECAL cooling system



TPC+ECAL cooling system



**$S=4 \times 5 \text{ m}^2$
 $h=2.5 \text{ m}$**



**6 racks
 $S=1.2 \times 3.6 \text{ m}^2$
 $h=2.2 \text{ m}$**

TPC+ECAL: power consumption

| Parameter | TPC thermal stabilization | TPC cooling | ECAL cooling |
|-----------------------|---------------------------|-------------|--------------|
| N loops | 60 | 36 | 10 |
| Electronics P (kW) | 1.3 | 16 | 7.5 |
| V (m ³ /h) | 36 | 8 | 3.24 |
| m (kg/sec) | 10 | 2.2 | 0.9 |
| Water heat, dT | 3 | 0 | 0 |
| P1 (kW) water heat | 126 | 0 | 0 |
| P2 (κBT) racks | 1 | 1 | 1 |
| P1+P2 (kW) | 127 | 17 | 8.5 |

**1-st floor on the electronic platform:
6 racks (size 1.2x3.6 m, h=2.2 m)**

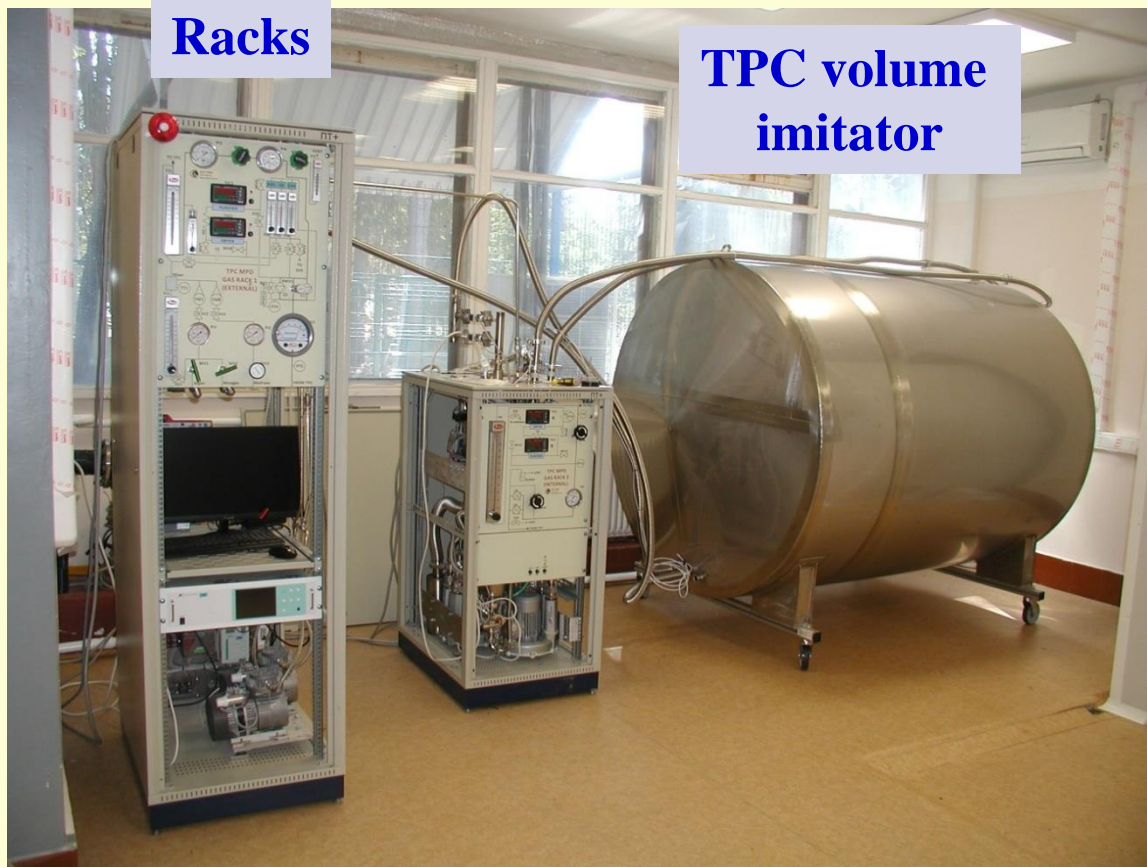
TPC gas system

Gas supply



Racks

TPC volume imitator



Tests - in progress
(H2O and Q2 sensors are replaced)

TPC LV+HV system

LV&HV system based on CAEN rad. hard design:

(up to 2000 Gauss and 15 kRad)

- power converters A3486 AC/DC (380 V -> 48 V) – 15+3 pc
- EASY3000 crates – 14+2 pc
- LV module - A3100B (8V/100A) – 48+8 pc
- LV module - A3100HBP (14V/50A) – 6+2 pc
- HV modules –A3540P (+4kV/1mA) – 8+3 pc
- HV modules –A3540N (- 4kV/1mA) – 2+2 pc

Status:

LV+HV system: JINR-CAEN contract **signed**

Expected delivery date to JINR:

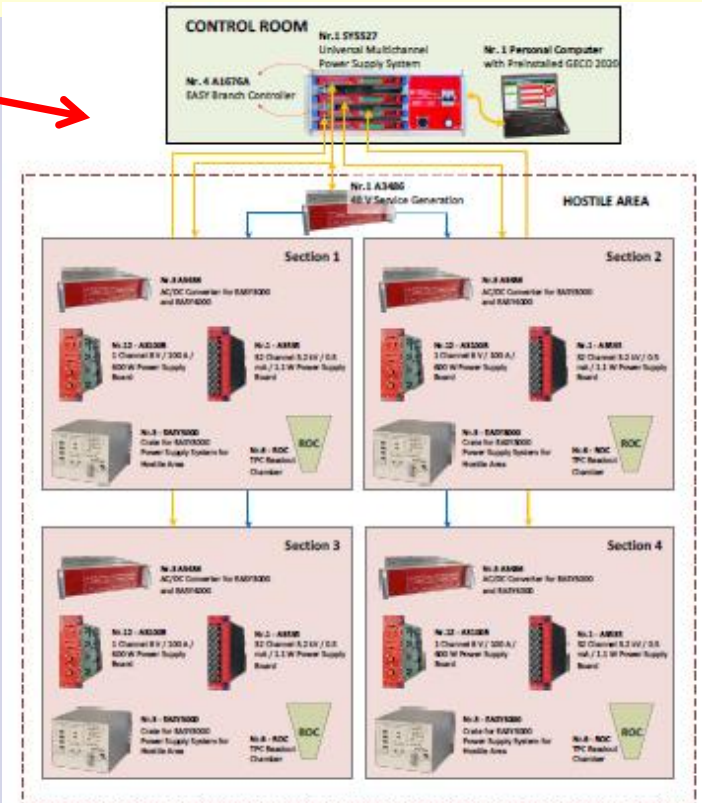
– September 2023

test system – tests ongoing

LV cables (halogen free, low smoke):

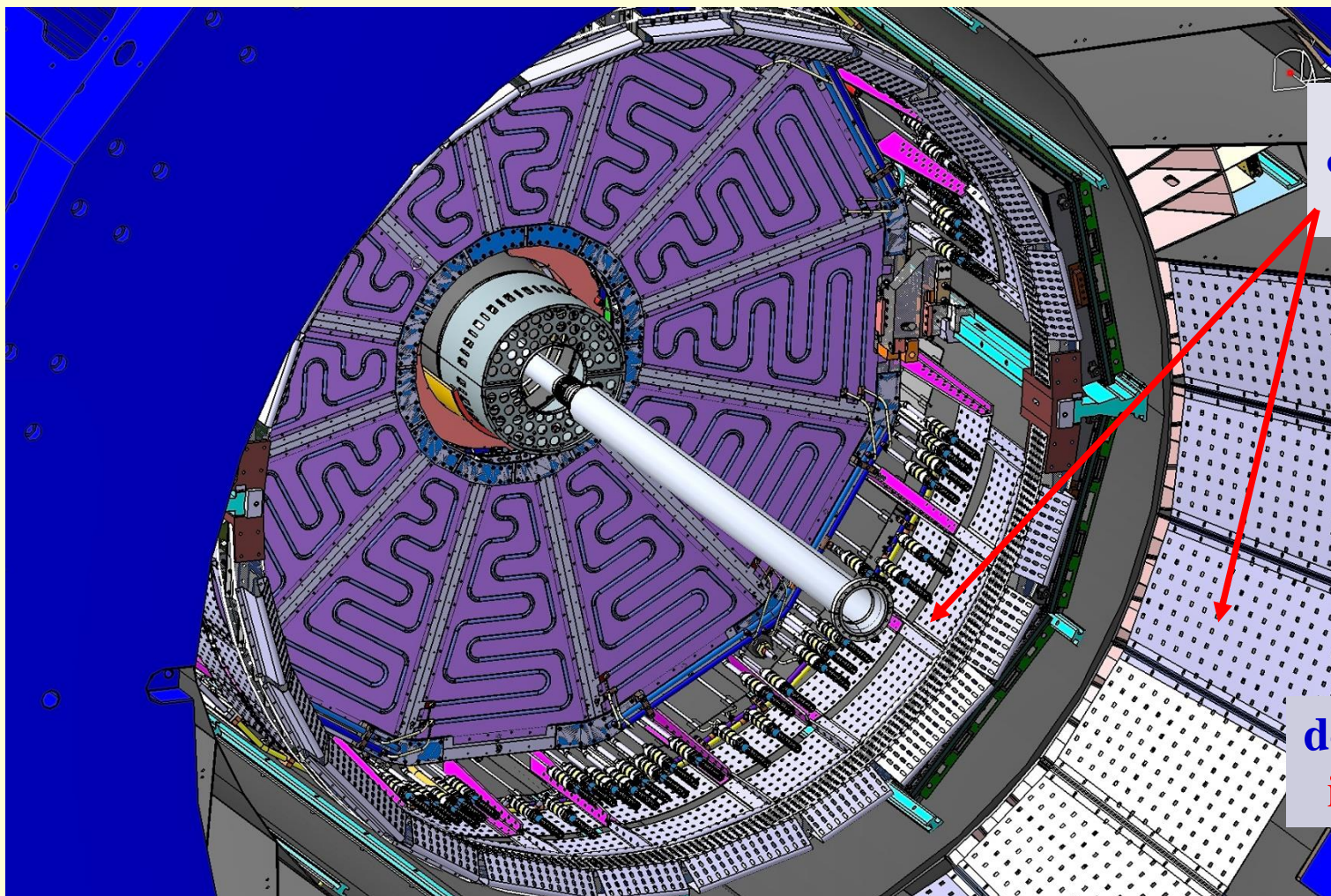
new cable S=50 mm² – contract **signed**
delivery date to JINR - Feb 2023

HV cables - ordered





TPC cables and pipes integration

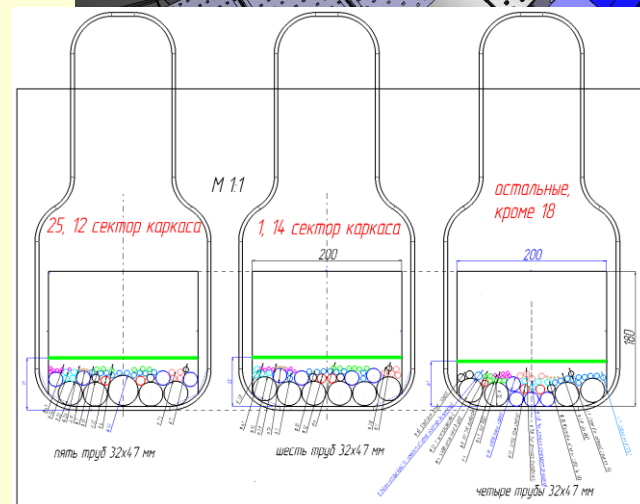
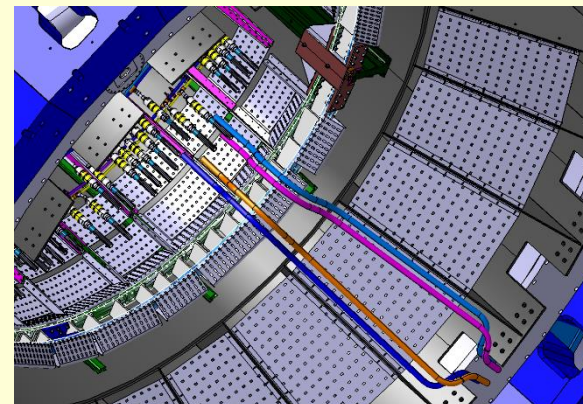
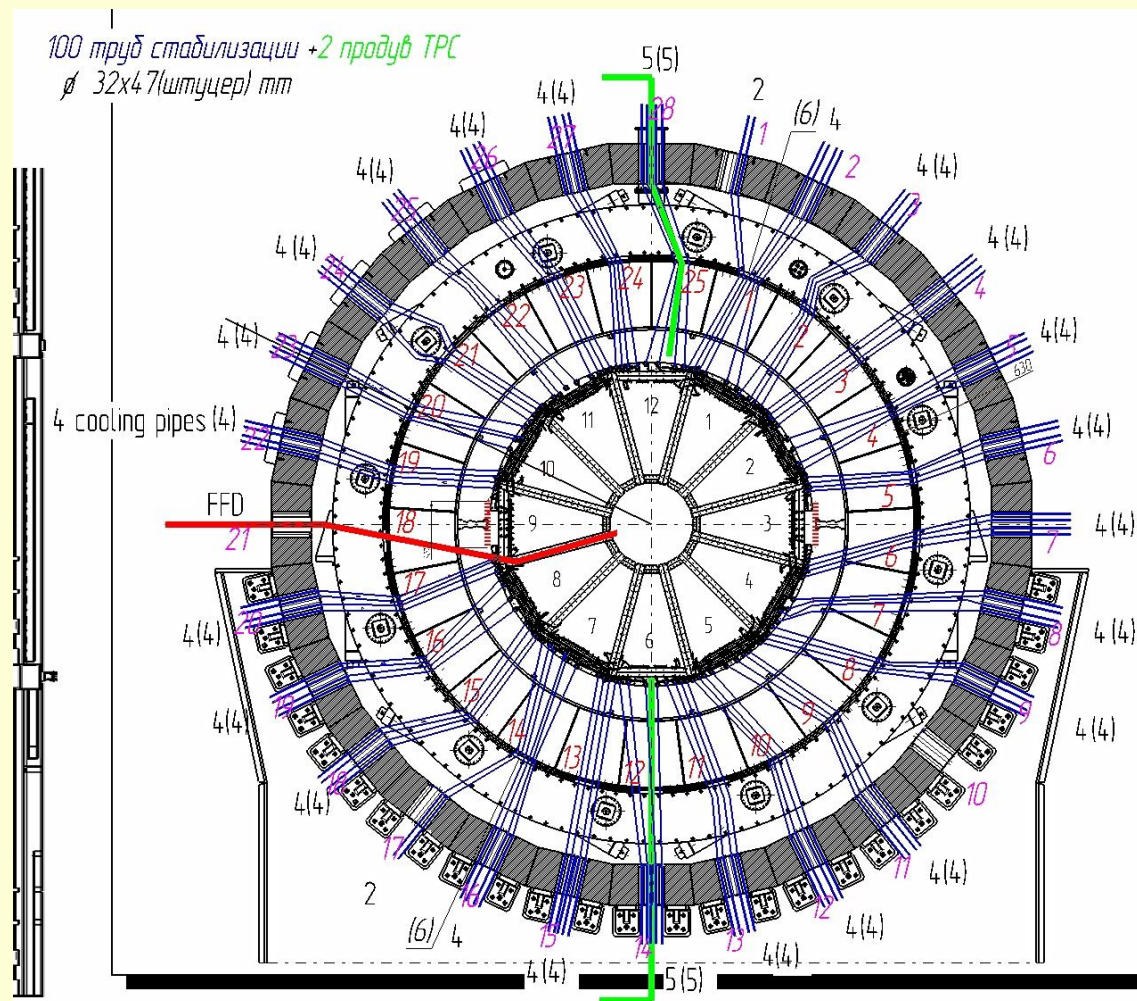


Structures for
cables and pipes
fixation

design –
in progress ...



TPC cables and pipes integration



design –
in progress ...

TPC racks (4-th floor, 8pc)

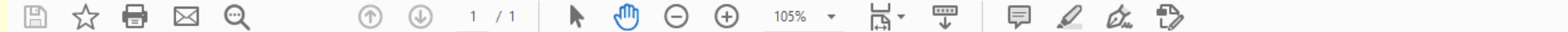
4 floo PLATFORM - Лист1 v04 07_06_2022.pdf - Adobe Acrobat Reader DC (64-bit)

Файл Редактирование Просмотр Подпись Окно Справка

Главная Инструменты 4 floor PLATFORM -... × ? Войти

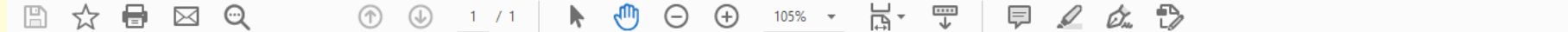
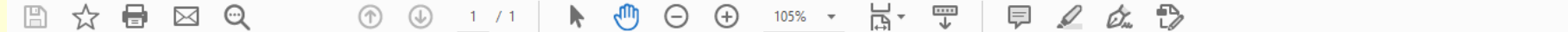
Главная Инструменты 4 floor PLATFORM -... × ? Войти

Главная Инструменты 4 floor PLATFORM -... × ? Войти



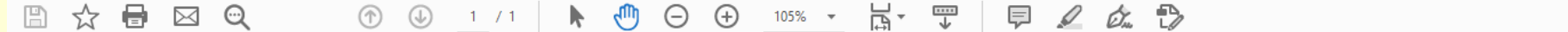
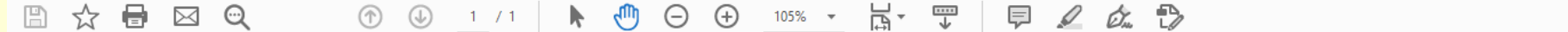
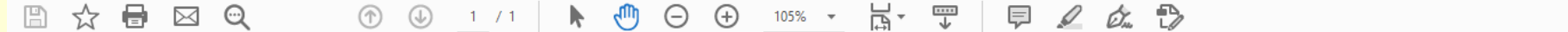
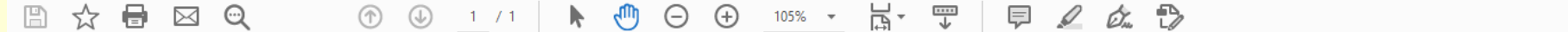
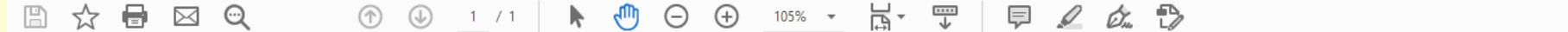
1 / 1

105%



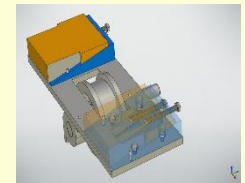
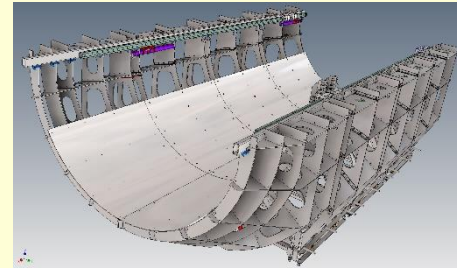
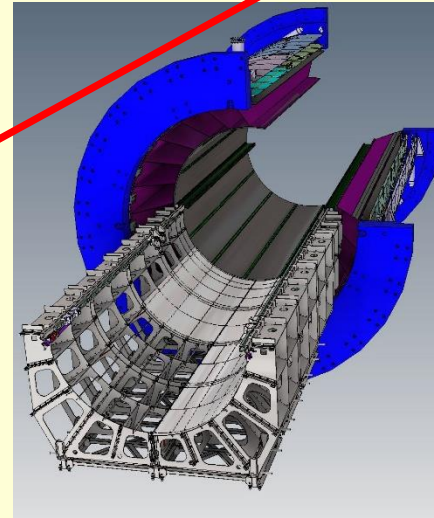
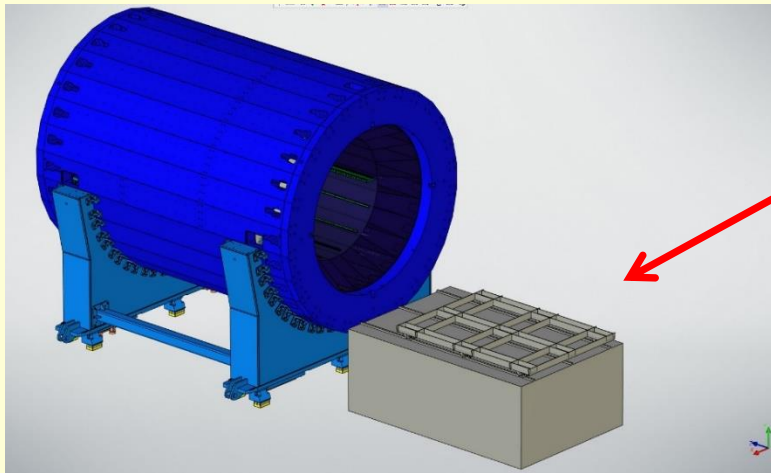
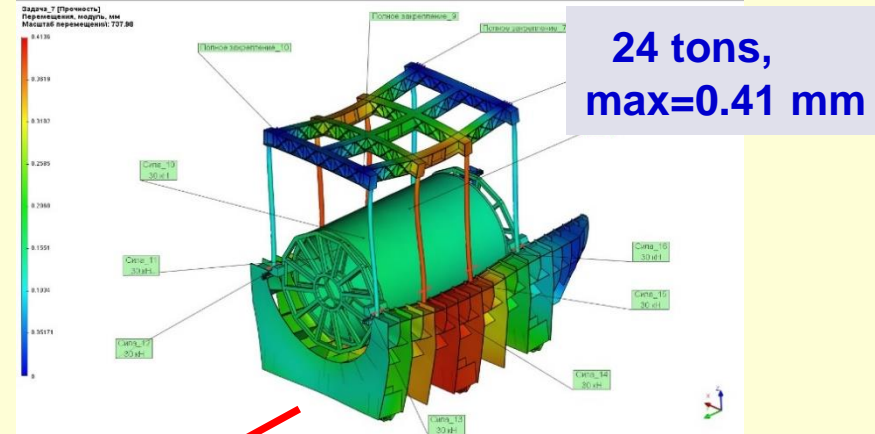
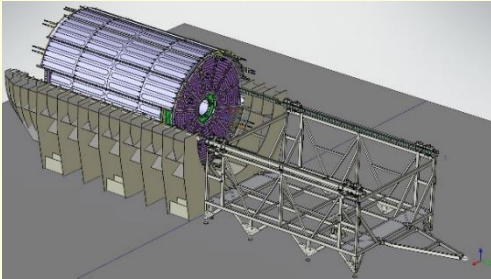
1 / 1

105%

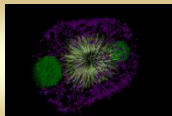
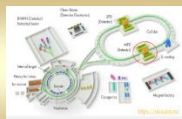


| CYMMA | | | | | | | | | | CYMMA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 | 131 | 132 | 133 | 134 | 135 | 136 | 137 | 138 | 139 | 140 | 141 | 142 | 143 | 144 | 145 | 146 | 147 | 148 | 149 | 150 | 151 | 152 | 153 | 154 | 155 | 156 | 157 | 158 | 159 | 160 | 161 | 162 | 163 | 164 | 165 | 166 | 167 | 168 | 169 | 170 | 171 | 172 | 173 | 174 | 175 | 176 | 177 | 178 | 179 | 180 | 181 | 182 | 183 | 184 | 185 | 186 | 187 | 188 | 189 | 190 | 191 | 192 | 193 | 194 | 195 | 196 | 197 | 198 | 199 | 200 | 201 | 202 | 203 | 204 | 205 | 206 | 207 | 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 | 221 | 222 | 223 | 224 | 225 | 226 | 227 | 228 | 229 | 230 | 231 | 232 | 233 | 234 | 235 | 236 | 237 | 238 | 239 | 240 | 241 | 242 | 243 | 244 | 245 | 246 | 247 | 248 | 249 | 250 | 251 | 252 | 253 | 254 | 255 | 256 | 257 | 258 | 259 | 260 | 261 | 262 | 263 | 264 | 265 | 266 | 267 | 268 | 269 | 270 | 271 | 272 | 273 | 274 | 275 | 276 | 277 | 278 | 279 | 280 | 281 | 282 | 283 | 284 | 285 | 286 | 287 | 288 | 289 | 290 | 291 | 292 | 293 | 294 | 295 | 296 | 297 | 298 | 299 | 300 | 301 | 302 | 303 | 304 | 305 | 306 | 307 | 308 | 309 | 310 | 311 | 312 | 313 | 314 | 315 | 316 | 317 | 318 | 319 | 320 | 321 | 322 | 323 | 324 | 325 | 326 | 327 | 328 | 329 | 330 | 331 | 332 | 333 | 334 | 335 | 336 | 337 | 338 | 339 | 340 | 341 | 342 | 343 | 344 | 345 | 346 | 347 | 348 | 349 | 350 | 351 | 352 | 353 | 354 | 355 | 356 | 357 | 358 | 359 | 360 | 361 | 362 | 363 | 364 | 365 | 366 | 367 | 368 | 369 | 370 | 371 | 372 | 373 | 374 | 375 | 376 | 377 | 378 | 379 | 380 | 381 | 382 | 383 | 384 | 385 | 386 | 387 | 388 | 389 | 390 | 391 | 392 | 393 | 394 | 395 | 396 | 397 | 398 | 399 | 400 | 401 | 402 | 403 | 404 | 405 | 406 | 407 | 408 | 409 | 410 | 411 | 412 | 413 | 414 | 415 | 416 | 417 | 418 | 419 | 420 | 421 | 422 | 423 | 424 | 425 | 426 | 427 | 428 | 429 | 430 | 431 | 432 | 433 | 434 | 435 | 436 | 437 | 438 | 439 | 440 | 441 | 442 | 443 | 444 | 445 | 446 | 447 | 448 | 449 | 450 | 451 | 452 | 453 | 454 | 455 | 456 | 457 | 458 | 459 | 460 | 461 | 462 | 463 | 464 | 465 | 466 | 467 | 468 | 469 | 470 | 471 | 472 | 473 | 474 | 475 | 476 | 477 | 478 | 479 | 480 | 481 | 482 | 483 | 484 | 485 | 486 | 487 | 488 | 489 | 490 | 491 | 492 | 493 | 494 | 495 | 496 | 497 | 498 | 499 | 500 | 501 | 502 | 503 | 504 | 505 | 506 | 507 | 508 | 509 | 510 | 511 | 512 | 513 | 514 | 515 | 516 | 517 | 518 | 519 | 520 | 521 | 522 | 523 | 524 | 525 | 526 | 527 | 528 | 529 | 530 | 531 | 532 | 533 | 534 | 535 | 536 | 537 | 538 | 539 | 540 | 541 | 542 | 543 | 544 | 545 | 546 | 547 | 548 | 549 | 550 | 551 | 552 | 553 | 554 | 555 | 556 | 557 | 558 | 559 | 560 | 561 | 562 | 563 | 564 | 565 | 566 | 567 | 568 | 569 | 570 | 571 | 572 | 573 | 574 | 575 | 576 | 577 | 578 | 579 | 580 | 581 | 582 | 583 | 584 | 585 | 586 | 587 | 588 | 589 | 590 | 591 | 592 | 593 | 594 | 595 | 596 | 597 | 598 | 599 | 600 | 601 | 602 | 603 | 604 | 605 | 606 | 607 | 608 | 609 | 610 | 611 | 612 | 613 | 614 | 615 | 616 | 617 | 618 | 619 | 620 | 621 | 622 | 623 | 624 | 625 | 626 | 627 | 628 | 629 | 630 | 631 | 632 | 633 | 634 | 635 | 636 | 637 | 638 | 639 | 640 | 641 | 642 | 643 | 644 | 645 | 646 | 647 | 648 | 649 | 650 | 651 | 652 | 653 | 654 | 655 | 656 | 657 | 658 | 659 | 660 | 661 | 662 | 663 | 664 | 665 | 666 | 667 | 668 | 669 | 670 | 671 | 672 | 673 | 674 | 675 | 676 | 677 | 678 | 679 | 680 | 681 | 682 | 683 | 684 | 685 | 686 | 687 | 688 | 689 | 690 | 691 | 692 | 693 | 694 | 695 | 696 | 697 | 698 | 699 | 700 | 701 | 702 | 703 | 704 | 705 | 706 | 707 | 708 | 709 | 710 | 711 | 712 | 713 | 714 | 715 | 716 | 717 | 718 | 719 | 720 | 721 | 722 | 723 | 724 | 725 | 726 | 727 | 728 | 729 | 730 | 731 | 732 | 733 | 734 | 735 | 736 | 737 | 738 | 739 | 740 | 741 | 742 | 743 | 744 | 745 | 746 | 747 | 748 | 749 | 750 | 751 | 752 | 753 | 754 | 755 | 756 | 757 | 758 | 759 | 760 | 761 | 762 | 763 | 764 | 765 | 766 | 767 | 768 | 769 | 770 | 771 | 772 | 773 | 774 | 775 | 776 | 777 | 778 | 779 | 780 | 781 | 782 | 783 | 784 | 785 | 786 | 787 | 788 | 789 | 790 | 791 | 792 | 793 | 794 | 795 | 796 | 797 | 798 | 799 | 800 | 801 | 802 | 803 | 804 | 805 | 806 | 807 | 808 | 809 | 810 | 811 | 812 | 813 | 814 | 815 | 816 | 817 | 818 | 819 | 820 | 821 | 822 | 823 | 824 | 825 | 826 | 827 | 828 | 829 | 830 | 831 | 832 | 833 | 834 | 835 | 836 | 837 | 838 | 839 | 840 | 841 | 842 | 843 | 844 | 845 | 846 | 847 | 848 | 849 | 850 | 851 | 852 | 853 | 854 | 855 | 856 | 857 | 858 | 859 | 860 | 861 | 862 | 863 | 864 | 865 | 866 | 867 | 868 | 869 | 870 | 871 | 872 | 873 | 874 | 875 | 876 | 877 | 878 | 879 | 880 | 881 | 882 | 883 | 884 | 885 | 886 | 887 | 888 | 889 | 890 | 891 | 892 | 893 | 894 | 895 | 896 | 897 | 898 | 899 | 900 | 901 | 902 | 903 | 904 | 905 | 906 | 907 | 908 | 909 | 910 | 911 | 912 | 913 | 914 | 915 | 916 | 917 | 918 | 919 | 920 | 921 | 922 | 923 | 924 | 925 | 926 | 927 | 928 | 929 | 930 | 931 | 932 | 933 | 934 | 935 | 936 | 937 | 938 | 939 | 940 | 941 | 942 | 943 | 944 | 945 | 946 | 947 | 948 | 949 | 950 | 951 | 952 | 953 | 954 | 955 | 956 | 957 | 958 | 959 | 960 | 961 | 962 | 963 | 964 | 965 | 966 | 967 | 968 | 969 | 970 | 971 | 972 | 973 | 974 | 975 | 976 | 977 | 978 | 979 | 980 | 981 | 982 | 983 | 984 | 985 | 986 | 987 | 988 | 989 | 990 | 991 | 992 | 993 | 994 | 995 | 996 | 997 | 998 | 999 | 1000 | 1001 | 1002 | 1003 | 1004 | 1005 | 1006 | 1007 | 1008 | 1009 | 1010 | 1011 | 1012 | 1013 | 1014 | 1015 | 1016 | 1017 | 1018 | 1019 | 1020 | 1021 | 1022 | 1023 | 1024 | 1025 | 1026 | 1027 | 1028 | 1029 | 1030 | 1031 | 1032 | 1033 | 1034 | 1035 | 1036 | 1037 | 1038 | 1039 | 1040 | 1041 | 1042 | 1043 | 1044 | 1045 | 1046 | 1047 | 1048 | 1049 | 1050 | 1051 | 1052 | 1053 | 1054 | 1055 | 1056 | 1057 | 1058 | 1059 | 1060 | 1061 | 1062 | 1063 | 1064 | 1065 | 1066 | 1067 | 1068 | 1069 | 1070 | 1071 | 1072 | 1073 | 1074 | 1075 | 1076 | 1077 | 1078 | 1079 | 1080 | 1081 | 1082 | 1083 | 1084 | 1085 | 1086 | 1087 | 1088 | 1089 | 1090 | 1091 | 1092 | 1093 | 1094 | 1095 | 1096 | 1097 | 1098 | 1099 | 1100 | 1101 | 1102 | 1103 | 1104 | 1105 | 1106 | 1107 | 1108 | 1109 | 1110 | 1111 | 1112 | 1113 | 1114 | 1115 | 1116 | 1117 | 1118 | 1119 | 1120 | 1121 | 1122 | 1123 | 1124 | 1125 | 1126 | 1127 | 1128 | 1129 | 1130 | 1131 | 1132 | 1133 | 1134 | 1135 | 1136 | 1137 | 1138 | 1139 | 1140 | 1141 | 1142 | 1143 | 1144 | 1145 | 1146 | 1147 | 1148 | 1149 | 1150 | 1151 | 1152 | 1153 | 1154 | 1155 | 1156 | 1157 | 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1301 | 1302 | 1303 | 1304 | 1305 | 1306 | 1307 | 1308 | 1309 | 1310 | 1311 | 1312 | 1313 | 1314 | 1315 | 1316 | 1317 | 1318 | 1319 | 1320 | 1321 | 1322 | 1323 | 1324 | 1325 | 1326 | 1327 | 1328 | 1329 | 1330 | 1331 | 1332 | 1333 | 1334 | 1335 | 1336 | 1337 | 1338 | 1339 | 1340 | 1341 | 1342 | 1343 | 1344 | 1345 | 1346 | 1347 | 1348 | 1349 | 1350 | 1351 | 1352 | 1353 | 1354 | 1355 | 1356 | 1357 | 1358 | 1359 | 1360 | 1361 | 1362 | 1363 | 1364 | 1365 | 1366 | 1367 | 1368 | 1369 | 1370 | 1371 | 1372 | 1373 | 1374 | 1375 | 1376 | 1377 | 1378 | 1379 | 1380 | 1381 | 1382 | 1383 | 1384 | 1385 | 1386 | 1387 | 1388 | 1389 | 1390 | 1391 | 1392 | 1393 | 1394 | 1395 | 1396 | 1397 | 1398 | 1399 | 1400 | 1401 | 1402 | 1403 | 1404 | 1405 | 1406 | 1407 | 1408 | 1409 | 1410 | 1411 | 1412 | 1413 | 1414 | 1415 | 1416 | 1417 | 1418 | 1419 | 1420 | 1421 | 1422 | 1423 | 1424 | 1425 | 1426 | 1427 | 1428 | 1429 | 1430 | 1431 | 1432 | 1433 | 1434 | 1435 | 1436 | 1437 | 1438 | 1439 | 1440 | 1441 | 1442 | 1443 | 1444 | 1445 | 1446 | 1447 | 1448 | 1449 | 1450 | 1451 | 1452 | 1453 | 1454 | 1455 | 1456 | 1457 | 1458 | 1459 | 1460 | 1461 | 1462 | 1463 | 1464 | 1465 | 1466 | 1467 | 1468 | 1469 | 1470 | 1471 | 1472 | 1473 | 1474 | 1475 | 1476 | 1477 | 1478 | 1479 | 1480 | 1481 | 1482 | 1483 | 1484 | 1485 | 1486 | 1487 | 1488 | 1489 | 1490 | 1491 | 1492 |

Integration TPC to MPD: tooling



Tooling manufacture – August 2023



MPD TPC status 2022: **summary**



Status:

• TPC:

C1-C2 and C3-C4 cylinders

- assembled

TPC field cage assembly

- **Jan-Feb 2023**

TPC vessel ready

- **March 2023**

TPC service wheels (2pc)

- assembled

• ROC chambers

Test of FE (62 cards) with ROC

- 24 +2 spare tested

Flat cables (28 sets + spare)

- **preparation ongoing**

FE radiators (28 sets)

- ready

LVN9 stabilization boards (28 sets)

- **narrow plates– modification in progress**

FE power cables (28 sets)

- **modification in progress**

Alignment pins (120 pc)

- **modification in progress**

Pads alignment (calibration)

- manufactured, ready

Assembly FE with ROC

- data processing **in progress**

Test of installation ROC to TPC

- procedure is ok

Gating Grid system (GGS)

- move to May 2023 (will be used mock up at bld.205)

- Dec 2022

• Electronics:

FE electronics (**727 cards (48%)**)

- ready

Rest part of FE electronics (800 cards)

- **will be manufactured during 2023**

RCU controller

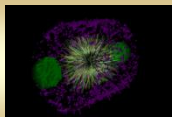
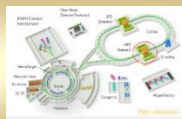
- design done, prototype manufactured, tests done

Integration RCU controllers to TPC

- 2023

RCU mass-production

- 2023



MPD TPC status 2022: **summary**



Status of sub-systems:

DAQ:

DAQ set up #1 (FE tests at room 107) - ok!

DAQ set up #2 (FE tests at Minsk) - ok!

Gas system - tests ongoing, integration to MPD started

TPC cooling system - tender **finished**

HV+LV systems (CAEN) - 10% delivered, contract signed, delivery to JINR – **sept 2023**

Laser calibration system - UV lasers and beam distribution systems delivered, rest parts – ordered

Slow control system – integration to common TPC SC system - **not started yet ...**

Cabling and piping:

TPC cabling and piping design - in progress

TPC trays design - in progress

TPC trays manufacture - summer 2023

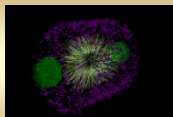
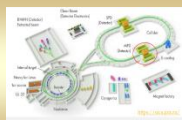
LV bars and LV cables manufacture - summer 2023

HV cables manufacture - summer 2023

Gas piping - summer 2023

Cooling piping - summer 2023

Patch panels - summer 2023



MPD TPC status 2022: **summary**



Status:

Integration TPC to MPD:

TPC racks (8pc)

- layout optimization in progress

TPC rails (calculations, manufacture) - Feb 2023 → June 2023

on critical path

rails installation to MPD

- **July 2023**

Tooling for installation TPC to MPD:

design

- finishing

tooling manufacture

- Jan-July 2023 (7 month)

delivery to JINR

- **August 2023**

TPC+ECAL cooling systems installation – up to Sept 30 2023

TPC schedule:

TPC installation to MPD

Oct-Nov 2023

cabling and piping

Sept-Nov-Dec 2023

MPD commissioning

Jan-Feb 2024



TPC status

Thank you !